Vol. VII, No. 10
25 Cents a Copy

January, 1927

U. S. Postage
2c. Paid
Los Angeles, Calif.
Permit No. 941

American Cinematographer

Published in
Hollywood, California

By American Society
of Cinematographers

The World Famous Pike's Peak, Situated at Colorado Springs, Colorado.

Reproduced from the Location Library of the American Society of Cinematographers, Hollywood

THIS MONTH:

A Cinematographic Forecast for 1927—By Daniel B. Clark, A.S.C.; New 16 mm. Film Library Founded—By Hamilton Riddel; A Professional's Notes for Amateurs (Part Three)—By Joseph A. Dubray, A.S.C.

Vol. VII JANUARY, 1927 No. 10

American Cinematographer

FOSTER GOSS, *Editor and General Manager*

Contents:

An educational and instructive publication, espousing progress and art in motion picture photography.
Subscription: United States, $3.00 a year; Canada, $3.50 a year; foreign, $4.00 a year; single copies 25c.
Published monthly by THE AMERICAN SOCIETY OF CINEMATOGRAPHERS, *Inc.*
Advertising rates on application.
1219-20-21-22 Guaranty Building, Hollywood, Calif. Telephone GRanite 4274

PROJECTION • *Conducted by* EARL J. DENISON

Economy Seen *in* Good Equipment

By Daniel B. Clark, A.S.C.

Dilapidated Outfits Prove Burden *to* All Concerned, Including Audiences

Being connected with the Tom Mix company at the Fox Studios takes the writer to every section of the West for location scenes in the productions which we make. Most of these location trips send us to sparsely settled sections. If we are not camping out or roughing it, we find our headquarters in some small Western town where the chief attraction probably is a motion picture theatre. (We have learned that we never get so far in the backwoods as to be out of the territory of a film house.)

Inspects Equipment

Because I am interested in the subject of projection, I invariably take the first opportunity to make friends with the projectionists at such houses. I find that we have much in common, the projectionist being just as interested in my line of work as I am in his. It is always a matter of interest for me to observe his equipment in the projection room, just as he usually likes to look over our camera paraphernalia.

Neglected

Now to get to the point of this article:

In many of these houses, I have found up-to-date equipment. In others, I am sorry to say, I have found projection facilities sadly neglected. Very often, in the more modest establishments, the owner or manager presides over his own projectors—and has done so for many years past. It goes without saying that he is not an expert on the maintenance of his equipment, no matter how simple or foolproof it may be. He gets a passable picture on the screen, and that is all.

In still other instances, the same type of equipment prevails in houses where there are projectionists. The possibilities are that the projectors, new or second-hand, started out in the custody of the exhibitor, who, on becoming more prosperous, turned his projection room over to a projectionist. The latter, no doubt, inherited a run-down lot of instruments. It required and continues to require all his ingenuity to keep them anywhere near their original and just stage of efficiency. He no doubt is obliged to put in much of his time—and that of his employer—in keeping his apparatus in running order.

Not Possible

Now I don't think that such conditions are fair to the projectionist. Nor are they fair to the audiences. Nor are they fair to the exhibitor himself. If you were running a taxi system, you wouldn't expect to get by with an antiquated fleet of cars. It stands to reason that no matter how conscientious the projectionist may be with the equipment, which has suffered from ill treatment in the past, he cannot screen as good an exhibition as he would be able to if he had modern and up-to-date equipment.

No Economy

I can't see where the exhibitor can cling to the idea of economy in maintaining a worn-out system of projection. Repairs, working time, and faulty screenings more than offset any possible savings. Out of respect to every one concerned, it is my belief that in many of such houses, the best thing to do is to install a completely new array of projection apparatus. The investment involved—and it is an investment—would be more than rewarded in the elimination of repair bills, better screening, etc. Then don't let us lose sight of the effect that such equipment will have on the projectionist. I don't hesitate to say that up-to-date equipment proves a tonic to his morale. I feel that, in this respect, he is like the cinematographer, who, I am sure, enjoys the urge of having a highly efficient and modern camera outfit to serve him and, in turn, to have cared for—and not a ramshackle bunch of moving parts that might function, and might not.

The EDITOR'S LENS • • focused by FOSTER GOSS

Why Not *a* Cinematographer?

¶ Reports are appearing that Josef von Sternberg, whose reputation for "genius" persists despite two shelved pictures out of three recent directorial attempts, has been engaged to be director of photographic effects on a Paramount production of a Ben Hecht story.

¶ While as yet we do not know who is to be the cinematographer on the picture in question, we venture to believe that Paramount executives would not have had to go outside their own ranks to find some one whose abilities fitted him to be a "director of photographic effects."

¶ It is our belief that this would have been a splendid opportunity to rely on the imagination plus the scientific efficiency of some cinematographer. We believe that such an assignment would be a fitting reward to some deserving and competent cinematographer.

¶ If, when and after Mr. von Sternberg serves in the capacity mentioned, we would be interested to know just how much was contributed by the cinematographer selected toward any photographic effects appearing in the picture.

Panchromatic Predictions

¶ As predicted by Daniel B. Clark, president of the American Society of Cinematographers, in an article re-printed in another part of this issue, watch panchromatic during the coming year. This form of stock, which is steadily swinging into general usage, is something for the cinematographer to conjure with.

¶ Accepted methods of lighting and the like—with the widespread employment of panchromatic—will undergo changes. In fact, with this end in view, innumerable researches have already been conducted, the results of which will be forthcoming shortly.

¶ Another factor in the favor of a more universal adoption of this type of stock is the recent reduction in its cost. Producers who hesitated to try it heretofore on a wholesale scale now have economic barriers removed, and are coming to the point of shooting entire productions, going into lengthy footage, with it.

A Welcome Improvement

¶ A refreshing departure from exhibitor journal's methods is seen in the *Exhibitors Herald* in the matter of the reproduction of still photographs showing "behind the scene" shots in studios.

¶ In the past, it has been the custom to designate, in the captions, every one except the cinematographer who is passed over as some sort of nameless mannikin. We are told that the *Exhibitors Herald* is insisting on the cinematographer's name's being included in captions on all stills submitted to that publication's offices. Congratulations are in order for the editorial forces of the *Herald,* including Ray Murray and Harry Nichols, of the Hollywood offices of the paper. May the other trade journals follow their example.

Glass Stages

¶ If one would note the evolution of film production practice, let him check the fate of the vast glass-covered stages in the various studios. These were planned to allow production on days when the elements would have made it impossible to work—the glass keeping the disagreeable weather out but allowing enough light to enter for filming purposes. Many of these stages, if they stand at all, have had their glass painted over, thus cutting out the source of natural lighting. All of which comprises one of the changes that artificial illumination has wrought.

Mr. Carr's Opinion

¶ Writing in his own column in the *Los Angeles Times,* Harry Carr, journalist, critic, motion picture expert, scenarist, contributor to fan magazines, and philosopher, states:

¶ *"But there are not a dozen really fine cameramen in the entire industry. Nine-tenths of them are mere crank-turners. Those who really and truly understand the properties of electric lights and understand artistic composition are mostly not."*

¶ Of course we would like to know who Mr. Carr thinks the dozen are. Then we would also like to know Mr. Carr's basis of judging cinematographers. That would make interesting reading, even in Mr. Carr's "The Lancer" column.

More *on* Make-up

¶ Appropos of our remarks last month on make-up, let us not forget the plight of the cinematographer who is filming a star who, in the course of a picture, changes make-up as often as it occurs to his or her fancy.

Amateur Cinematography

New 16 mm. Film Library Opened

By Hamilton Riddel

THERE has, since the inception of the 16 mm. amateur motion picture outfits a little over three years ago, been a demand by owners of these outfits for professionally produced films, such as are shown in the motion picture theatres of the country. To meet this demand, the Kodascope Libraries were formed, and made immediately available to all owners of the amateur outfits, a very complete list of films. This service was rendered on a rental basis only and many amateurs availed themselves of it. The Kodascope Libraries were, and still are, a most welcome adjunct to the amateur for the full enjoyment of his 16 mm. projector.

Own Library

However, many owners cannot afford, nor are they inclined, to avail themselves of this rental service which, while very reasonable, considering the high value of the films rented, is an item of expense that is only compensated by a day's use of the film subject rented. In many cases the amateur wished to have permanently several professional subjects. Only recently were the Kodascope Library releases made available for outright purchase by the amateur who wished to have on hand, in his home, a film or two to present to his friends when an impromptu performance was to be given. Still, however, the purchase of a professional 400-foot Kodascope reel involved an expense of approximately $50. And naturally, it was not feasible to divide a reel so that the purchase price might be made lower, as the library subjects, almost without exception, were only complete when in the 400-foot lengths. The problem of supplying those amateurs who wished to purchase outright small reels of professional subjects, and those who wished to have the same, supplementing the Kodacope Library releases, still remained unsolved.

Only recently has this situation been worked out, with the result that increased and sustained interest of the amateur cinematographer will be acquired. With the acquisition of this interest, photographic history will repeat itself and many innovations will materialize, for the present-day high standard of professional photography can be traced to the interest of the amateur of past years.

New Plan

It was with this paramount idea before him that William Horsley, a pioneer himself in the motion picture industry, and who owns a professional film laboratory in Hollywood, has innovated and made possible the purchase of professional subjects on 16 mm. film and in short lengths; and, which is an important item to the average amateur cinematographer, the price of these short length reels is very nominal, being only fifty cents to one dollar more than the 100-foot reel of Cine-Kodak negative film used in the 16 mm. motion picture cameras. These subjects are in 100-foot lengths, and are reductions made from the standard 35 mm. professional films.

Equipment

Recently the writer had the pleasure of being shown the 16 mm. department which Mr. Horsley has established in his laboratory. At present there are four private projection rooms; three for the "rushes"—films just finished and which are run for inspection purposes—and the other where the completed, edited films are shown. The projection rooms for the "rushes" are equipped with Bell & Howell Filmo projection machines, while the other room contains a Model A Eastman Kodascope projector with the large lamp equipment.

A Series Depue and Vance optical reducing machine is employed for making the 16 mm. reductions. The machine resembles, and incorporates the principles of, a motion picture projector. It is entirely driven by motor. On one side of the reducing machine is a lamphouse and in front of it is a film gate, through which the standard size negative is fed from the supply reel. As the negative passes the aperture, the image is projected through a lens which is so ground as to reduce the image

(Continued on Page 23)

William Horsley, Pioneer *in* Motion Pictures, Sponsors Idea *for* B & H Release

A Professional's Notes *for* Amateurs

Part III

By Jos. A. Dubray, A.S.C.

Formulae, Figures *and* Facts Recorded *in* Third Installment *of* Technical Series

(Continued from Last Month)

IT is evident that the reflecting surface of a mirror can be other than a plane surface, as we have heretofore assumed.

A curved mirror may be *spherical-concave; spherical-convex; conical; parabolical,* etc., according to the form of its curvature.

The surface of a spherical-concave mirror is that of the interior face of a one-Case segment of a hollow sphere, silvered, smooth and polished, turned toward the incident light; while a spherical-convex mirror presents to the incident light the bulging surface of a sphere.

In the same manner, a conical mirror is a reflecting surface shaped as a cone, and a parabolic mirror whose surface is generated by the revolution of the arc of a parabola.

We shall not dwell on the reflecting properties and image formation of curved mirrors, because of their extremely limited use in photographic instruments.

We will limit ourselves to note that *spherical mirrors* do not form sharp images due to a phenomena called *spherical abberration by reflection,* if their aperture is subtended in an angle exceeding 8 to 10 degrees, and the *parabolic mirrors,* which are free from this defect, are extremely difficult to construct with the precision wanted in all optical instruments.

* * * *

IN the brief outline on Reflected Light, dealt with in the preceding chapter, we did not have to concern ourselves with the *medium* in which light was travelling. Both, the Incident and the Reflected Ray, were assumed to travel in the medium *air.*

Let us consider, now, a ray of light, which is emanated by a luminous body in a certain medium, and strikes the surface of another medium of different nature than the first. Let this second medium be a transparent one, and let the ray of light be *monochromatic,* or of *one color* only.

When Light is incident at the surface of separation of such two media, one portion of it is *reflected back* in the first medium; part of it is *absorbed* by the second medium, and the remaining portion, is *refracted,* and transmitted through it.

We have already stated that light travels following a straight path, independent of the nature of the medium, but its velocity varies according to the molecular composition of the medium, and the wave-length of the light.

While considering *monochromatic light,* we shall concern ourselves, only with the nature of the *medium.*

In the *atomic* and *molecular theory,* an *atom,* is considered to be the smallest quantity of *matter,* that takes part in chemical reactions.

We all know that water is a compound of two elements, *hydrogen and oxygen.* Following chemical nomenclature, water is expressed by the formula H_2O which means that *two* parts of hydrogen compounded with *one* part of oxygen, form *water.*

It is obvious, that there must be a *minimum* quantity of oxygen, which is capable of compounding with two *minimum* quantities of hydrogen, in order to form *one minimum* quantity of water.

These minimum quantities of elements, which are so small that they are invisible even through a microscope, and are indivisible by chemical reaction, are called *atoms,* while the minimum quantity of the compounded is called a *molecula.*

Briefly, *one atom* of oxygen, compounding with *two atoms* of hydrogen, form *one molecula* of water.

Atoms and moleculae are separated from each other, but possess the power of attracting each other, thus holding onto each other, and the extent of this power, determines the *density* of the body.

The separation between atoms and moleculae permits consideration of the existence of the luminouferous *ether, within* all bodies.

Recent investigations have greatly developed the atomic and molecular theories, and the atom itself is considered to be an aggregation of extremely small electrically charged particles, called *"electrons."*

Electrons, or charges of negative electricity, are supposed to be in constant, rapid, orbital motion, somewhat similar to the motion of the planets around the Sun, the sun of the electrons being, perhaps, a particle charged with positive electricity.

The number of electrons, in an atom, is supposed to determine its nature.

Prof. Millikan, precognize the existence of still smaller particles, or *sub-electrons.*

Electrons and sub-electrons are considered as forming the connecting link between *ether* and *matter,* and as determining by their arrangement and their motion, all optical phenomena that divert from the *ether* itself.

IT is evident, that when light passes from the *free ether,* into the *ether* pervading inter-atomic spaces, a retardation or slowing of its speed will happen.

This retardation, is caused by the behavior of the light-waves.

FIGURE 5. Light waves in vacuo and in a denser medium.

The speed required to carry a wave-crest from A to B, (Fig. 5), is termed the wave-speed.

The dotted line shows the behavior of light-waves in *free ether* or *vacuo,* but when light passes through a medium, its front waves continually die away as shown by the full line in the figure, and are constantly replaced by the following waves, each of which proceeds further than the preceding one, while new waves are constantly forthcoming, from the luminous body.

This dying away and replacement of waves, results into a retardation of their velocity.

The group of waves, illustrated in the figure, moves then at a lesser speed than the speed of the individual waves and this speed is lesser, the denser the medium is.

The change of speed is cause of a *change of direction* of the light ray, which change of direction takes place *at the surface of the second medium,* and is termed *"refraction."*

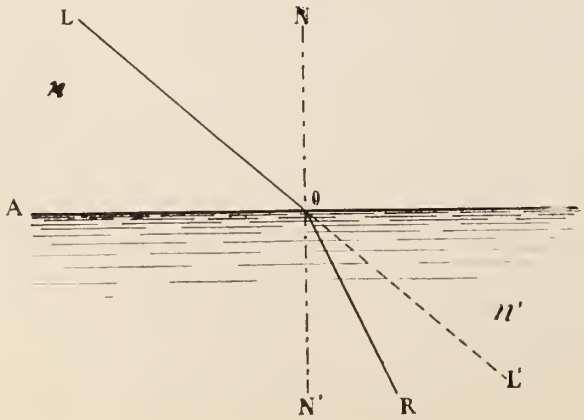


FIGURE 6. Single refraction of Light.

Let n and n' be the two media, and let n' be transparent and denser than n.

Let A B, be the surface of the Medium n' and NN' the Normal to A B at the point O.

Let L O be an incident ray of monochromatic light, impinging upon the surface A B at O.

It is observed that the ray, instead of following a straight line in the direction L L′, is bent at O, or *refracted* in the direction O R.

The angle L O N, which the Incident ray makes with the Normal, is called the *"angle of incidence."*

The angle R O N′, which the ray makes with the Normal, is called *"angle of refraction."*

The angle R O L′, which the ray makes with the imaginary prolongation of the incident ray within the medium, is called the *"angle of deviation."*

IT is the phenomena of refraction that make a stick appear bent when partially immersed in water. It is also through refraction that a much-heralded experiment can be made.

Place a coin in an empty basin, and place your eye in such a position that the brim of the basin barely masks the coin from your sight. Slowly pour water into the basin, without changing the position of the eye and soon you will be able to perceive the coin. The coin, acts as a luminous body, and it is the bending or refraction of the rays emitted by it, when passing from the Medium Water into the Medium Air, that seem to change the position of the coin itself.

It should be borne in mind, that in this experiment, the rays pass from a denser medium (water) into a rarer one (air).

This brings to our mind the Law of reversibility of Light. In Fig. 5 if the luminous point was situated at R (i.e. in the denser Medium), the refracted ray would follow the path O L in the rarer medium, and the Angle of Refraction, would then be greater than the Angle of Incidence.

Experimentation has proven that the phenomena of *refraction* always occur when light travelling in one medium is incident upon the surface of another medium of dif-

(Continued on Page 19)

Duplication *of* Motion Picture Negatives

Continuous Form *of* Machine Found Best *to* Develop Master Positive *and* Dupe Negative.

*By J. G. Capstaff and M. W. Seymour**

Contrast Control Property May Be Used *to* Advantage *to* Get Highest Grade Work.

(Continued from Last Month)

If the master positive and duplicate negative are to be printed by contact, great care must be taken to insure close and uniform contact of the films at the printing aperture; otherwise, the advantages of the high resolution emulsion will be lost. It is obvious enough that poor definition will result if the films are out of contact during printing, but it is not so obvious that lack of uniformity in contact can do any particular harm. If the two films are not in close contact over the whole picture area, a patchy image is produced which, on projection, resembles uneven development. To test a printer for uniformity of contrast, a print should be made from a strip of evenly fogged and developed negative film. If the printer is in perfect adjustment, the print will show an even tint, while imperfect adjustment will give the patchiness referred to. The best type of printer has a curved track and pressure plate. The radius of curvature should be small, about 1½ inches, and the pressure plate should be undercut over the picture area so that it presses only on the sides of the film over the perforations.

Unit Magnification

When projection printing is resorted to for printing either the master positive or the duplicate negative, the lens chosen should be one designed to work at unit magnification. Ordinary camera lenses do not give their best definition under these conditions, because they are designed to focus sharply objects at a distance. Clearly, the focusing of the printer lens must be very critical if the sharpness of the original negative is to be attained. It is important to keep the lens clean, since the slightest mark or film of dirt on the lens will scatter the light rays and distort the tone reproduction.

For developing both the master positive and the duplicate negative a good form of continuous machine is best. Next to this comes development on a reel. The spacing of the supports on the reel should be close, so that the film will lie in a smooth spiral. Wide spacing of the supports gives uneven development.

If tank development must be used, the rack should be lifted completely out of the developer once every minute so as to prevent rack marks.

Developer

The developer recommended is:

	Metric	*Avoir*
Elon	4 grams	1 lb. 10 oz.
Hydroquinone	1 "	6½ oz.
Sodium Sulphite	75 "	33 lbs.
Sodium carbonate	25 "	11 lbs.
Potassium bromide	1.5 "	10½ oz.
Water to	1 liter	50 gals.

With unused fresh developer at a temperature of 68° to 70° F., the effective maximum of contrast ought to be attained in about four minutes. Development beyond that required to give maximum contrast must not be given or increased graininess will result.

The master positive development, if correct, will give a print somewhat softer than one intended for projection. It will also, of course, differ from the latter in having a slight veiling over the highlights.

Sufficient Washing

The usual acid hardener fixing bath may be used for fixing, although the hardener tends to set the dye and retard its washing out of the film. Sufficient washing should be given to clear the film, since a very little yellow dye will cut down the printing light and make timing more difficult.

If it is desired to make a duplicate negative that can be printed without light changes, the timing of the master positive must, of course, be accurate. By projecting the master positive, one can readily determine which scenes need more or less printing light than the average, and with a little experience the light change required can be estimated quite closely. The "key" light can be ascertained in the usual way by printing and developing a test tsrip. The scene chosen for the test should be of the most contrasty subject; that is, the scene with the darkest shadows, and the printing exposure should be just sufficient to give a veiling over the deepest shadows. If this precaution be taken, all of the other scenes will automatically be taken care of, and the tone reproduction of the entire length will be satisfactory.

(Continued on Page 20)

*Research Laboratory of the Eastman Kodak Company; this paper was read before the recent meeting of the Society of Motion Picture Engineers.

A Cinematographic Forecast *for* 1927

By Daniel B. Clark, A.S.C.

Anticipates *that* Coming Year Will Be Crammed *with* Motion Picture Advancement

(The following story, written by Daniel B. Clark, president of the American Society of Cinematographers, appeared in a recent issue of the HOLLYWOOD MAGAZINE, by special permission of which it is reprinted here:)

With great and general progress having been attained in the field of motion photography during the twelve months just closed, 1927 promises to be a year unprecedented in the advancement of cinematography.

Great strides undertaken in the calling of the cinematographer during 1926 will come to fruition within the next several months with the result that this branch of the cinema profession bids fair to be nothing short of revolutionized before the new year becomes gray and hoary.

Inasmuch as cinematography always sets the pace for the film business in general, we may safely assume that the coming seasons will be epochal in the annals of the photoplay.

Last year saw the advent of faster lenses; 1927, it is predicted, will see even more speedy lenses put on the market. The cinematographer alone realizes just what this means to the finished film production. Photography under light conditions which heretofore would have defied "exposures" has now become possible. These possibilities, in turn, will be even more widened within the next several months, if developments, now in the course of perfection, arrive at successful consummation.

Probably the greatest improvements in cinematography will come through the widespread and general use of panchromatic film, now considered the great element of magic by all those who are real students of the motion picture industry. Before the past year, panchromatic was something of a novelty, rarely if ever used. By the time 1926 had spent itself, however, it had come to pass that several important productions had been filmed not partially, but entirely on panchromatic stock. Alfred Gilks, a member of the American Society of Cinematographers, employed panchromatic exclusively in the filming of Paramount's "Old Ironsides," a James Cruze production, on which Gilks was chief cinematographer. His cinematographic results are now winning the resounding praises of the film critics in New York City, where the feature recently was given its world-premiere. George Barnes, another member of the American Society of Cinematographers, likewise photographed "The Winning of Barbara Worth" in its entirety on panchromatic negative.

The ramifications of this new form of film stock are truly revolutionary in their scope. When it is considered that in "Old Ironsides," this type of film made it possible for the entire cast to go through the story without the use of make-up, which has become nothing short of a permanent institution in the studios, the foregoing statement is in some measure realized.

The most signal deviation in picture production methods which a wholesale application of panchromatic will bring about will be in the matter of illumination. Methods which have stood the test of time and accepted usage now show signs of tottering, and just how far this collapse will go only the next several months will reveal. The reason for all this is the different kind of sensitivity in panchromatic. It differs in this respect from "par" stock in that light values, visible to the eye, have a different effect in this new creation of the raw stock laboratories. One the other hand, certain portions of the spectrum, amounting to light not visible to the eye, are very forcibly recorded on panchromatic. All of this simmers down to this circumstance: a cinematographer may have more than enough light thrown on an actor when he is apprehensive that he does not have sufficient illumination.

This change of facts will result in the readaption of the various light sources, with incandescent lighting coming into increasing vogue. The American Society of Cinematographers has anticipated all of these changes, and, early in 1926, laid definite plans to reduce affairs to a practical working basis when the time of transition and then ultimately of change did arrive. The total of the research

(Continued on Page 21)

In Camerafornia...

and News Notes of the Month

METRO-Goldwyn-Mayer has been active in availing itself of and continuing the services of A.S.C. members.

John F. Seitz, A.S.C., for the past several years chief cinematographer on Rex Ingram productions, has been signed by the Culver City organization. Seitz has photographed all of Ingram's most successful efforts, including "The Four Horsemen of the Apocalypse." His first picture under his new contract was to have been "Wind," starring Lillian Gish and directed by Clarence Brown, but this schedule was recently changed. Seitz spent two years in Europe filming the Ingram pictures made across the Atlantic, and returned to Hollywood during the past autumn.

John Arnold, A.S.C., has been signed again by Metro-Goldwyn-Mayer. Arnold was chief cinematographer on "The Big Parade." Prior to joining M-G-M, the A.S.C. member, like John Seitz, was for many years identified with the old Metro studios, where he photographed Viola Dana's starring vehicles during a record run of service. Arnold's first picture under his re-newed agreement is "Mr. Wu," starring Lon Chaney and directed by Will Nigh.

Ira Morgan, A.S.C., also has signed a new contract with Metro-Goldwyn-Mayer. He recently finished shooting "Tell It to the Marines," which is now being given its premiere in New York City. Morgan has photographed the outstanding Marion Davies features of the past several years.

* * *

Robert Kurrle, A.S.C., has gone to Truckee for snow scenes in Edwin Carewe's production of "Resurrection," starring Rod La Rocque and Dolores del Rio. Frank B. Good, A.S.C., accompanied Kurrle to the mountain location to aid in the filming of the snow sequences.

* * *

John Stumar, A.S.C., has begun the photographing of "The Claw," a Universal production which is being directed by Sidney Olcott. Norman Kerry and Claire Windsor are featured.

CARL E. Akeley, sculptor, inventor and photographic explorer, died, Nov. 17th in the Kivu district of the Belgian Congo, Africa.

Akeley, who was famous for his motion pictures taken in the jungles and other uncivilized regions, was particularly known in motion picture production quarters as the inventor of the camera which, bearing his name, is widely used in film making.

* * *

Gilbert Warrenton, A.S.C., has rung down the curtain on the cinematographic mysteries of "The Cat and the Canary," in which Universal is starring Laura La Plante with a record cast. Warrenton has started to work on another Universal feature, "Beware of Widows," starring Miss La Plante and directed by Wesley Ruggles.

* * *

Fred W. Jackman and Floyd Jackman, both A.S.C. members, spent the Christmas holidays in the wilds of a Nevada location where Fred is producing, for Hal Roach and Pathe release, the latest production starring "Rex," the "king of wild horses." Floyd is chief cinematographer.

* * *

HERFORD Tynes Cowling, A.S.C., has just experienced a banner month. Besides joining the cinematographic forces of the Eastman Kodak Company in Rochester, N. Y., he was elected a fellow of the Royal Photographic Society of Great Britain. This is an honorary degree bestowed only for exceptional researches and accomplishments in photography.

* * *

Ned Van Buren, A.S.C., likewise affiliated with Eastman's motion picture activities, has returned to the kodak city from a trip to the Panama Canal zone where he filmed subjects designed for educational use.

* * *

Arthur Edeson, A.S.C., will photograph Richard Barthelmess' first vehicle as a First National star. The feature is "The Patent Leather Kid." Alfred Santell is directing, with Al Rockett as the supervising producer.

HERBERT Sylvester, of Creco, Inc., has had several lighting tests made during the past few months to ascertain the light flux values of the 10 K.W. and 5 K.W., 10,000 and 5,000 watts respectively, nitrogen gas filled incandescent lamps, co-operating with Peter Mole, of Creco; F. E. James of the General Electric Company and Arthur Shadur, Universal executive and members of his technical staff.

These tests were conducted on the several grades of Eastman, Agfa, Goerz and Dupont film stock, as advocated on the present film market.

Mole has had previous experience in this connection, having been a member of the General Electric Research staff, at Schenectady, New York, during the Maud Adams experiments with incandescent lamps as a photographic lighting medium.

* * *

Joseph A. Dubray, A.S.C., has finished shooting "Husband Hunters," a Tiffany production directed by Jack Adolfi. Stephen S. Norton, A.S.C., was associated with Dubray in the the filming. The cast included Mae Busch, Walter Hiers, Jean Arthur, Charles Delaney, James Harrison, Duane Thompson, Robert Cain, Mildred Harris and Otto Lederer.

* * *

Charles J. Van Enger, A.S.C., has completed the photographing of "The Runaway Enchantress," a First National production, starring Milton Sills and directed by John Francis Dillon. The cast included Alice White, Arthur Stone and Mary Astor.

* * *

Charles Stumar, A.S.C., has returned from a location trip down South where he journeyed for the filming of Universal's production of "Uncle Tom's Cabin," which is being directed by Harry Pollard.

* * *

Gaetano Gaudio, A.S.C., has finished the filming of First National's "Three in Love," directed by Millard Webb and featuring Lewis Stone, Billie Dove and Lloyd Hughes.

A.S.C. Member In Many Travels

By Ben Allah

Herford Tynes Cowling Covers Thousands *of* Miles *in* Every Part *of* Globe's Surfaces

IF there is a title of "most traveled American," it has probably changed hands in the last two years because of the determination of a gentleman from Virginia. Herford Tynes Cowling, moving picture photographer and traveler extraordinary, has slept beneath the flags of all nations and has reached spots in his wanderings where few white men have been before.

Though but thirty-six years old, he has accomplished much, traveled more than a million miles and has seen the strangest things on earth. To Cowling the earth has no far corners. He has rounded them out, gone over the hill and found what the other side had to offer. He voices but one regret, that he has to part with the many friends he has made in so many lands.

Three Years

In his last trip which took him around the world and lasted three years, he succeeded in entering the forbidden country of Tibet. But few white men have actually gone into this land of religious mystery and dizzy heights. Cowling has even successfully reached the inner sanctuaries of the Lamas in their strange Tibetan monasteries who call their portals "forbidden," and are deserving of the name.

Rumored City

Many rumors reached this world-traveling cinematographer of a city that was inaccessible to anyone except natives. He hung around the court of the Maharaja of Kashmir until he could gain his favor and assistance to cross the forbidden border. Then with trusted servants and food supplies to last months he headed across the Himalayes for Leh, the capital of Western Tibet. Then came the long overland trip. He was warned that white men who had tried the feat from time to time were never seen again. He came to the city of Leh after a trip which rivals Arabian yarns of old and entered, cameras and all, made friends with the Skushok, their reincarnated "man God" leader, and came out with the first pictures of the Lama devil dances and ceremonies.

No Barriers Recognized

The determination which made a world traveler of him made him a successful one in that he goes where he wants to go to make pictures and stops but for one reason: that there is no possible means of continuing.

For seven years he was chief photographer of the U. S. Interior Department and won an enviable record in this position. It was in his travels in the United States, Mexico and Canada that he first decided that he would see the world. Not half of it, nor most of it, but *all* of it.

Starting out in 1917 he headed successively expeditions into the South Sea Islands, Australia, New Zealand, Tasmania, the Philippines, Indo China, Siam, China, Japan, Formosa, Dutch East Indies where educational pictures of a heretofore unknown nature were made. It was on these trips he made a name for himself in the world of travelers and as an explorer. Natives who showed him their ways of living respected him as a white man they could understand and one who understood them.

Character at a Glance

With the natural trait of being able to read character, he seems to see through the superficial coverings of flesh and read native souls beneath. He knows the right time to approach anyone of the numerous tribes of the far-flung points. He studies their customs and lives them, in so far as it is possible for a white man to do, when he is among them. He has been taken into many tribes as an adopted member and likes all the strange brown and black men, yellow men and olive hued ones who boast this American citizen as theirs also.

Abounds with Energy

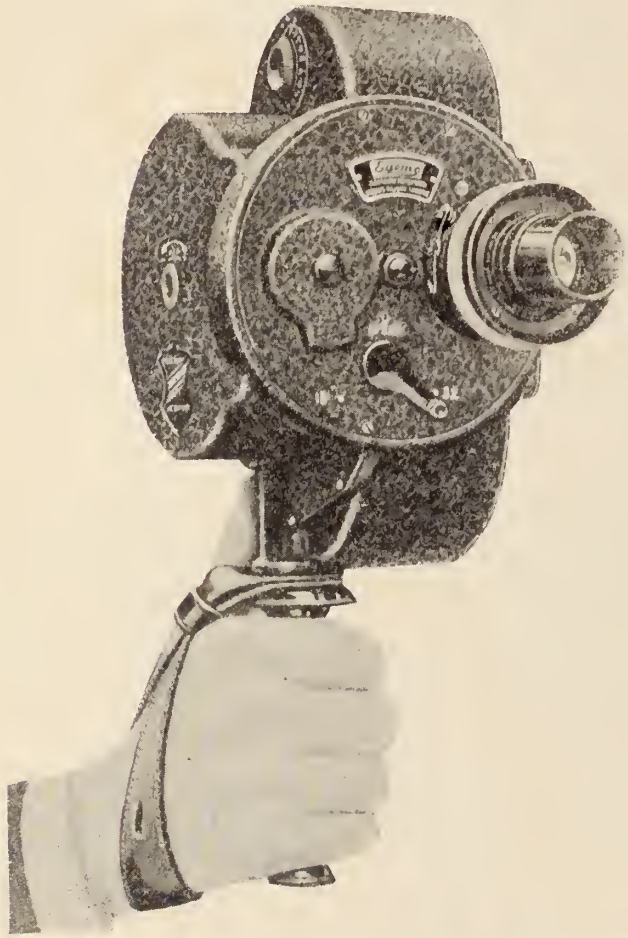
While determination and study coupled with a natural faculty for understanding have gone far toward making the work of this young American a success, nonpariel, probably the greatest single factor contributing toward this success is the dynamic personality of the man himself. No human being ever came closer to being a dynamo in the flesh. He is active and going all the time he is awake and he is awake most of the time. He keeps busy and he keeps his men busy and whoever happens to be near just naturally falls into the pace and gets busy. Friends standing around Cowling "hit the stride" of the leader

(Continued on Page 16)

HUNDREDS OF THOU

AT STAKE IN ONE C

—and Bell & Howell Cameras Are Cl



MAKES MOVIES AS THE EYE SEES

Eyemo

—REGISTERED—

Standard Automatic Professional Camera for Field and Stunt Use

Eyemo is the handy light-weight camera you see on nearly every lot these days—getting shots from heretofore undreamed of angles. It's worth its weight in diamonds for special effects, stunt shots, fast news reel work, locations, and anywhere extreme mobility and speed are desired.

Eyemo matches the work done by the best Bell & Howell Cameras. Weighs but 7 pounds. Operates in the hand. Sights from the eye like a spy glass. Works automatically. Touch a button and away it goes. Uses 100 ft. rolls standard daylight loading film—or 120 feet dark-room load.

Write for descriptive literature.

Cecil B. De Mille using a Bell & Howell Eyemo Camera in filming some of the "shots" in "The King of Kings."

Your Productions can be n in ma

WE all know that the greatest film-productions are first staged and acted for the *camera alone*. Unless the camera faithfully records all that is enacted before it, all the hundreds of thousands of dollars invested in settings, transportation and salaries will have been thrown away.

The best cameras you can buy are the best production *insurance* you can buy. That is the meaning of BELL & HOWELL CAMERAS to the motion picture industry.

BELL & HO

1805 Larchmont A

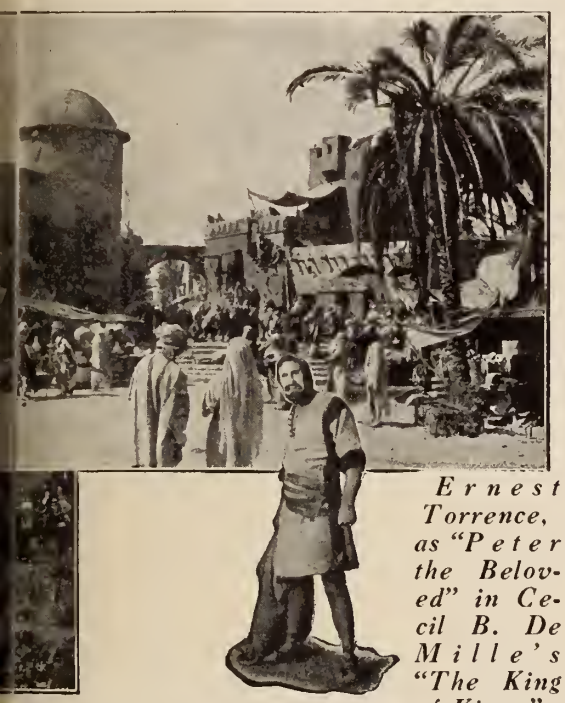
New York
220 W. 42nd St.

Ho
6324 San
Estab

SANDS OF DOLLARS

LOSSAL PRODUCTION

;en to Guarantee Perfect Photography



Ernest Torrence, as "Peter the Beloved" in Cecil B. De Mille's "The King of Kings."

eter than the Camera Used g them

n the past 20 years millions and millions of lollars worth of productions have been staged efore Bell & Howell Cameras—and Bell & Howell Cameras have kept the faith. The hotography delivered has, in effect, *guaranteed* he huge investments made in an endless pro-ession of productions.

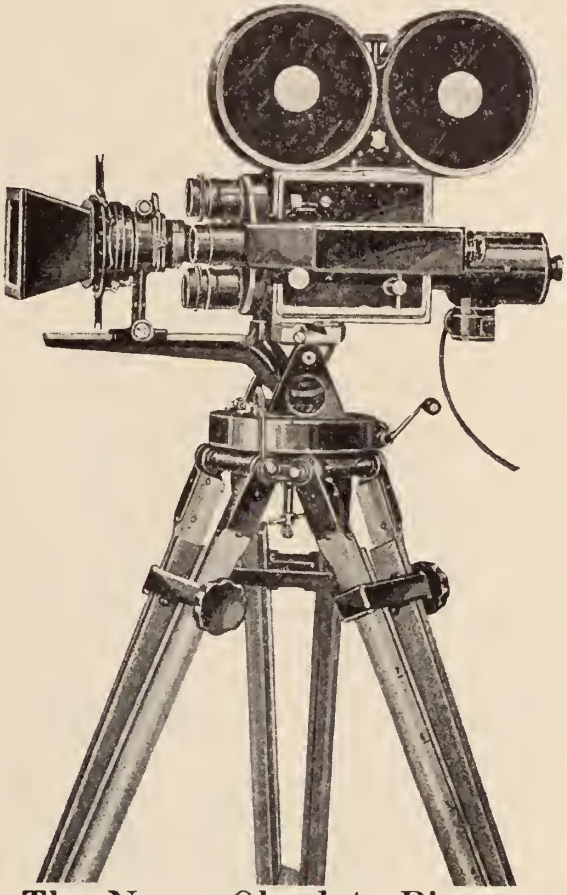
As a result, nearly every worth-while producer *n the world* uses Bell & Howell Cameras. Such atronage has inspired many improvements. Our laboratory work never ceases.

Write the address below for illustrated litera-ure or any specific camera information.

ELL COMPANY

ue, Chicago, Illinois

od London (B & H Co., Ltd.)
onica Blvd. 320 Regent St.
d 1907



The Never Obsolete Pioneer Bell & Howell *Professional Standard*

For 20 years the Bell & Howell Professional Standard Camera has been a familiar "property" to those who have reached the heights of filmdom. This is the camera assuring perfect photography for practically every feature production filmed throughout the world.

The Bell & Howell Standard Cinematograph Camera is always up-to-date. Interchangeability of parts allows for the addition of any improvement time may bring.

It embodies—

- Basically patented Pilot Register Movement
- Interchangeable Detail Parts
- Universal Finder
- Interchangeable Ultra Speed Movement
- Variable Speed Motor Control (Cinemotor)

As an original investment, this camera safeguards many a future investment.

On display at New York, Hollywood, Chicago and London offices of the Bell & Howell Company. Write nearest office for descriptive literature.

A. S. C. MEMBER IN MANY TRAVELS

[Continued from Page 12]

and in short order find themselves busy at something. He radiates energy.

He is not the Napolenic concentrated type of machine but is more the Theodore Roosevelt model since he is just six feet tall and weighs around one hundred seventy pounds. Tropical suns, changes of food or whatever hardships he must endure seem to leave no lasting effects on the remarkable store of vitality that goes into his makeup. It is truly a remarkable constitution that can weather the July equatorial sun and then suddenly move over into the Himalaya Mountains' altitude as fast as available transportation will take care of the movement. The shock of change has apparently left no mark on him. He weathers the cold as well as he does the heat, though in a moment of confidence he made the confession that since he was born and reared in the South of the United States, he felt it would be disloyal of him not to say that the warmer lands have more appeal.

Boiled Water

Health is a big factor in successful travel and, while blessed with a robust body, there is one point on which Cowling insists while in foreign lands. All water he drinks must be boiled first. He has by this means escaped the fevers and other maladies so common to the new arrivals anywhere. One case of a lost job is on record because of the laziness of a native boy who did not boil the water the night before for the following day's drinking. The substitution of unboiled water was found out and there was one less native boy in the employ of the man who would safeguard his health by this most effective means.

In Singapore

It was the pleasure of this writer to be in Singapore on one occasion and to meet Herford Cowling. The boys about Raffels Hotel were buzzing early in the day, having news of the reservation made by Cowling saying that he would arrive on the steamer from Batavia about noon. Upon inquiring at the desk for Mr. Cowling, the information was given out that he would be in later in the day. The bell boy knew that he was returning and looked forward to it; the clerk knew it, the

manager knew it, the room boy knew it (they use room boys instead of maids in Singapore); in fact, every one connected with the hotel seemed to be busy that day, looking forward to the arrival of this one American who on previous visits had infused the spirit of action into their usual latent working spirits.

Virginian

Thousands of foreigners visit this cosmopolitan hotel each year from many climes and lands, but it is the distinction of this one young traveling American to be the one guest whose arrival is looked forward to with pleasure. They have Sultans from nearby realms, they have dignitaries from the locale, they have all the good spending millionaires from the golden land of America and none receives the acclaim that the boy from Virginia inspires.

It chanced that the boat was late on arriving at Singapore (as boats usually are) but when the set hour passed and the looked-for guest was not yet at the hotel, the boys began to fidget, the manager became annoyed that boats should inconvenience anyone, and the smile did not return to his face until the smiling Cowling stepped from a "rickshaw" at the door. Everybody in the hotel stopped work for a few minutes to greet the picture man. Later information given out in answer to a question revealed the fact that he had been at the hotel several times before and always stopped there on his way through Singapore—"the gateway to the East."

It is apparent that he is not beloved of the natives and the hotel folk because he is classed as a rich American spender, for he is not that. Having traveled as much as he has, long since the lesson of getting his money's worth has been learned. As long as it is possible to get a big figure for anything done, the native, especially in the Orient, will try to place exorbitant prices on his wares or work. Once he finds he cannot get more than what is fair, he is much easier to deal with. Cowling is well liked in spite of the reputation he enjoys of being able to get value for his dollars. This is a distinction not to be laughed at, since most Americans who travel in the Orient and fail to scatter their money to the four winds are considered very cheap customers. It is an art to be able to get for one's dollar the value of a dollar, and still be respected.

A Rickshaw Ruse

An amusing story is told of how Cowling managed to get full value for his dollar from

a "rickshaw" puller, than whom there is no harder to handle in this matter. The trusty Malay servant solved the problem for him. They reached a city up the peninsula where they had been many times before. The distance from the station to the hotel was just two blocks. The "rickshaw" fee for this distance is not established by law but twenty cents is the usual price; however, on reaching the hotel the coolie insisted on being paid one dollar for the full legal hour rate, saying that he worked only on the full hour rate. Argument was of no avail. The human horse had decided to steal a dollar and was sticking to his guns. About this time, the Malay servant, who had been looking after the baggage, came into view, found out what the trouble was about and told his master he would settle the account. The wily servant then climbed into the rickshaw vacated by Cowling, ordered the boy to pull him to a nearby hill and to go up an down that hill until the hour was up. On the third trip the coolie decided to take the "usual" fee given him for short pulls and not climb that hill again. Cowling admits it was the ingenuity of his servant which saved him from being the usual tourist sucker on this occasion.

Acclimation

While this life of travel and adventure is a fascinating one, it is also one of great danger as evidenced by recent deaths of British explorers in the ascent of Mt. Everest. Though establishing no record for mountain climbing, it was the pleasure of this gentleman to scale great passes over 18,000 feet and go up the pale sides of the highest mountain range in the world. It is only the white man who is not acclimated who suffers severely in these climbs, according to Cowling, and it is well to know just where to stop.

The natives of Tibet go to great heights and can stand much physical endurance. To express it in his own words:

"While my camera and equipment were being carried up with about forty pounds of weight to the back of each native, when I reached the spot where I wanted to 'shoot,' I was gasping for breath and wasn't sure just how long I could stand to remain at this level. The natives always came up smiling, their re-

(Continued on Page 21)

(Continued from Page 8)

ferent density, and also that *"a certain relation always exists between the proportional difference of magnitude of the angles of incidence and the angle of refraction, in reference to the nature of the medium."*

This fact brings about the necessity of having recourse to angle measurements.

Trigonometry is that branch of mathematics that comes to our assistance.

WE consider opportune to divert for a while from our subject, in order to give a brief description of the three trigonometric functions, the knowledge of which is indispensable for the the clear understanding of the optical phenomena we are about to describe.

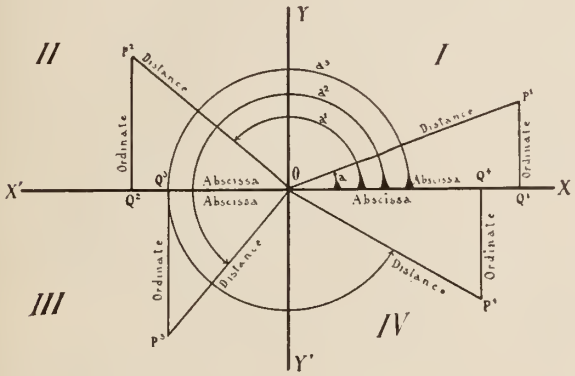


FIGURE 7.

Draw two lines perpendicular to each other at the point O (Fig. 7) and call the line X′ X, the X-*axis,* and the line Y Y′, the Y-*axis.*

The two intersecting axes divide thus the plane of the paper into four parts, called *quadrants,* and distinguished from each other, by the Roman figures I; II; III; and IV.

The quadrants serve to determine the position of the angle taken into consideration, according to the terminal side of the angle itself. Thus:—

The Angle X O P^1 is in the *first quadrant;* the Angle X O P^2 is in the *second quadrant;* the Angle X O P^3 is in the *third quadrant,* and the Angle X O P^4 is in the *fourth quadrant.*

Furthermore:

The *lines* O P^1; O P^2; O P^3, and O P^4 are called *distances.*

The *lines* O X′ and O X are called *abscissae* and are reckoned as *positive* if extending to the *right* of O, and *negative* if extending to its *left.* Positive values are optionally preceded by the sign —|— (Plus); Negative values are *always* preceded by the sign — (Minus).

The *lines* perpendicular to the Abscissae, are called *ordinates* and are reckoned as *positive* if extending above the X-*axis,* and as *negative* if below it. The same rule of signs given for the Abscissae prevails for the Ordinates.

The RATIOS for any of the angles a; a^1; a^2, or a^3 are:

$\frac{\text{ORDINATE}}{\text{DISTANCE}}$ equals *SINE* a; a^1; a^2, *or* a^3.

Usually written *sin* a, etc.

$\frac{\text{ABSCISSA}}{\text{DISTANCE}}$ equals *COSINE* a; a^1; a^2, *or* a^3. Usually written *cos* a, etc.

$\frac{\text{ORDINATE}}{\text{ABSCISSA}}$ equals *TANGENT* a; a^1; a^2, or a^3. Usually written *tan* a, etc.

It is evident that these ratios will never change for each of the functions, no matter at what distance from O, the Ordinates may be drawn. It is also obvious that they give *a measureable and perfect definition of any angle,* as well as its *positive* or *negative value.*

THE relation existing between the angles of Incidence and Refraction, and the Density of the Media, has brought forth the following *law,* known as the "Snell Law," from the name of its discoverer:

1. *"Whatever the obliquity of the incident ray, the ratio which the sine of the incident angle bears to the sine of the angle of refraction, is constant for the same two media, but varies with different media.*

2. *"The incident and the refracted ray, are in the same plane, which is perpendicular to the surface separating the two media."*

(Continued on Page 24)

DUPLICATION *of* MOTION PICTURE NEGATIVES

(Continued from Page 9)

How to Gauge

In order to learn if the duplicate negative will require a longer or shorter development than that given to the master positive, superimpose one of the scenes in the master positive on the corresponding scene in the original negative. If the registered positive and negative images exactly obliterate each other, then the duplicate negative should be given the same development as the master positive received. A faint residual negative indicates that a somewhat longer development must be given to the duplicate negative; if, on the other hand, a faint positive image be seen, the negative should be developed for a shorter time than that given to the master positive.

If the various steps in the preparation of the duplicate negative are carried out correctly, it will stand the test of direct comparison with the original under a low power magnifier.

Examination under a higher power lens, however, will probably show some loss in definition and an appreciable increase in graininess. The definition loss arises, for the greater part, from poor contact in the printer. Too much emphasis cannot be laid on the necessity for intimate and uniform adjustment at the printing aperture.

Prints Kept Soft

Some increase in graininess over the original negative appears to be inevitable, but that obtainable on the Eastman Duplicating emulsion is, as has been stated, considerably less than is given by any of the regular emulsions. To keep the graininess of the final prints at a minimum, the prints should be kept as soft as is consistent with good projection quality.

Filters

In the foregoing procedure it has been assumed that any modifications required in contrast would be secured in the usual way by slightly varying the amount of development. The Eastman Duplicating Film, however, has a unique property not mentioned hitherto which can be made use of in practical work. The contrast or gamma of the image can be varied within wide limits merely by altering the color of the printing lights; in other words, a contrasty, medium, or soft master positive can be made at will with the same amount of development. A yellow filter placed between the printing light and the film will give a high contrast image, white light will give a medium contrast, while a deep violet filter will give a low contrast. By taking advantage of this fact it becomes quite practicable to print onto the same length of film from contrasty and soft negatives and to compensate for the variation in negative quality by printing through suitable filters. In practice it is found that three violet filters of different dye densities will give the range of control necessary on average commercial work.

A precaution not to be overlooked is that the printing light should always be run at a standard voltage because of the color change that occurs with voltage changes. If the brightness of the printing light is changed by a rheostat from scene to scene, the scenes printed at low voltage will tend to be of higher contrast than those printed at high voltage. This is true whether or not filters are used. It is advisable to run the lamp at constant voltage and to use the diaphragm method of changing brightness.

In conclusion, it may also be pointed out that the highest grade of work on the new emulsion is produced when advantage is taken of its contrast control property, because this permits of complete development for every scene with the consequent avoidance of all development irregularities.

Junior Cameramen's Club Elect Officers *for* Next Twelve Months

At the annual election of the Junior Cameramen's Club the following members were elected as officers:

Burnett Guffey, Goldwyn Studio, president; David Ragin, Fox Studio, vice-president; Max Cohen, Fox Studio, secretary; Hatto Tappenbeck, Fox Studio, treasurer; Ira Hoke, First National Studio, director; John Schmitz, Fox Studio, director; William Margulies, Fox Studio, director, and Clifford Shirpser, Paramount Studio, director.

(Continued from Page 18)

spiration and heart action apparently normal."

Probably the best X-ray view of the inner soul of this adventurer is to be found in his attitude as a hunter. He is fond of animals, has shot many of them for food but does not care to shoot for sport, preferring rather to film them alive. He was invited to a tiger hunt by one of India's Rajas. He had never shot a tiger and, while he wanted to film a hunt, did not want to kill an animal uselessly. He explained his feelings to the native hunters and was taken to a nearby burial ground and shown the graves of eight people who had been killed by tigers. That was enough justification. He killed a tiger that day, and hunting these felines is about as dangerous as hunting any big game.

On the entire trip through Africa where he accompanied noted hunters, he shot only when it was necessary for protection, or that specimens useful for scientific study might be brought back. The rest of the "shots" were made with a movie camera. Many times the back of an elephant, guided by two natives, furnished the stage for setting up the camera.

A CINEMATOGRAPHIC FORECAST FOR 1927

[Continued rom Page 10]

made by the A.S.C. will be ready for announcement shortly after the first of the new year.

Cinematographers long since have come to the realization that nothing is stable within their profession. The greatest efforts of a given time become infinitesemal a short time later. But no artist of the camera objects to such a condition. In fact, such amounts to the life-blood of all his strivings. Within his heart he knows that he sets the pace for the upward trend of films at large. He is the limit beyond which the motion picture may or may not go artistically. If he marks time, there is no progress. That he has never marked time, the history of the art itself testifies.

Superinduced by the newly-discovered qualities of panchromatic, make-up for motion picture actors may likely undergo considerable revision. As already noted, no make-up whatsoever was used on "Old Ironsides." As a matter of fact, a great many cinematographers and directors frown upon the use of

make-up wherever it can be avoided, on the ground that it covers up a true rendition of the facial expressions and of the emotions—and to correctly portray these, of course, is one of the prime designs of all film acting. A problem that is presented and which the researches of the American Society of Cinematographers are working out, occurs where the majority of the cast is appearing without make-up, and it becomes necessary to use cosmetics and the like to give character to certain of the heavier actors. A solution will be at hand for this, however, so that when the photoplay is projected no incongruities will be apparent.

Officers of the American Society of Cinematographers believe that there is no point of saturation in cinematography. It is a profession that can draw upon the untapped wells of not only literature and art, but upon chemistry and physics to an unfathomable degree. For this reason, researches of the A. S.C. will continue to be directed toward the end of discovering and encouraging new photographic methods and treatments. Exhaustive study of the American Society of Cinematographers convinces the writer that true universal usage of films has merely been approximated. This seems manifest when the on-rushing popularity of "home movies" is contemplated. Hundreds and hundreds of cameras and projectors using the 16 mm. film —about one-half the professional size—have already been sold, and as yet this outlet of the cinema has been merely scratched. In truth, many people hav not as yet segregated, in their minds, this new kind of home motion picture from the old magic lantern of a generation back. If it can be imagined that these new discoveries may place a small motion picture projector in as many homes as there are phonographs, radios or at least cameras, then the magnitude of this new form of entertainment may become evident. It is the writer's belief that 1927 will crystalize the usage of the 16 mm. film—with a resultant healthful condition for Hollywood, where films are made, because all of these small projectors must employ "moving pictures."

Amateur Cinematography

(Continued from Page 6)

to 16 mm. size. This reduced image, in turn, strikes the sensitized emulsion of the 16 mm. raw stock, which by means of perfect synchronization is drawn from a light-proof supply reel at the same speed as the standard negative. After the small size film is so exposed it is wound in a light-proof take-up magazine. The reduction process preserves all the detail of the original, standard size negative, and combined with the use of 16 mm. positive stock, with its slower emulsion speed and smaller grain, gives a perfect print.

Intensity Regulated

By regulating the intensity of the printing light, each scene is matched with the preceding and succeeding scenes. This regulation of the printing light is made by an automatic control board which is synchronized with the reducer, and which increases or decreases the light. The 16 mm. positive stock is available in several tints, so that the usual one color effects obtained on standard film may also be had on the small film. Light amber tinted stock improves the reductions and presents such a perfect picture on the screen that Mr. Horsley is using it for most all reduction films.

After the 16 mm. exposed film is taken from the optical reducer and unloaded in the darkroom, it is fed on the developing machine, going through the usual developing process and then wound on the drying drums. When the film has dried, it is then wound on a projection reel. Having been reduced and printed at the same time, it is naturally a positive, and is ready for projection in one of the "rush" rooms. During the inspection run every detail is carefully noted for correct development, detail, freeness from scratches, etc.

Editing

When the film is taken from the "rush" room, it is edited, eliminating, during this operation, any overexposed frames which occasionally appear. To facilitate this work, Mr. Horsley has converted a standard film viewing machine to 16 mm. size. This machine is of small size with a magnifying lens with a light behind it. By running the film through it, the individual frames are ob-

served, and in consequence of the magnifying lens, the frames are enlarged for convenient viewing of the small image. In this operation the amateur cinematographer can appreciate the usefulness of this little mchine, for it saves the human eye a great deal of strain as is undoubtedly the case with normal viewing when editing one's films. It is to be hoped that some enterprising concern will make available a small size film viewing machine for the amateur cinematographer in the near future.

Splicing

The film has been viewed and marked for proper cutting and splicing. To facilitate splicing and assure neatness thereof, a standard Bell & Howell splicing machine has been converted for 16 mm. use, incorporating the lateral type of splice used with the amateur splicer made by the same company. This machine, too, is automatic, with the result that all splices are made with neatness and dispatch.

With the last operation completed in making the reduction films, they are then again put on projection reels and taken for showing in the completed picture projection room, after which they are packed in small cartons and are ready to be shipped.

B. & H. Distribution

Arrangements have been effected whereby the Bell & Howell Company will be the sole distributors of the reduction films which will be known as "The Filmo Library" subjects. Mr. Horsley predicts a wide-spread interest in these films, and pointed out to the writer that at the present time there are approximately twenty thousand amateur cinematographers using the Filmo projectors while there are an equally large number using the Kodascopes and Victor Cine-projectors.

The "Filmo Library" films are available in 100-foot, 16 mm., lengths, each a complete subject in itself. However, there are a few subjects which may be spliced together, making the usual 400-foot film of sixteen minutes projection time.

At the present time there are eight subjects already on the market. Among the first subjects there are: "Metro-Goldwyn-Mayer Studio and Stars," in two parts, containing views around this large studio and short excerpts of the M-G-M stars from their latest productions; a similar reel of the Christie Studios and stars; the world-famous Hollywood Bowl; and a number of subjects in the vaudeville series which include such acts as "Albert's Polar Bears," Spanuth's "Trained Baby Elephants," "Pickert's Seals," and the "Mikado's Royal Japanese Acrobats."

Additional subjects will be added to the library every month. Among those to be released for this month are: "Catching Big Fish in Pacific Waters"; "Whaling in the South Pacific"; "California Alligator Farm"; "Cawston Ostrich Farm"; "The Great Volcano Act"; "Fischer's Animal Circus"; "Cycling Girls", and further reels of the Hollywood movie studios of Universal and Warner Brothers.

(Continued from Page 19)

THE physical explanation of the phenomena of Refraction, through the Undulatory Theory of Light, is given by Huyghens as follows:

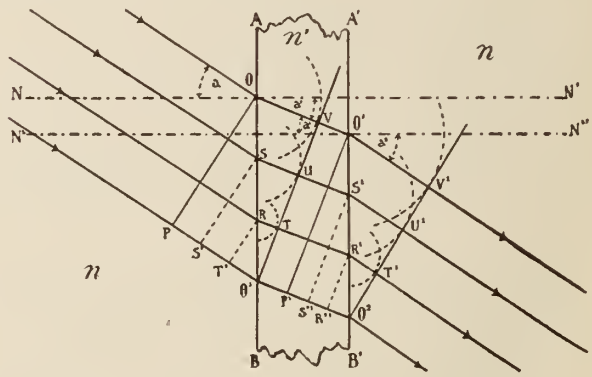


FIGURE 8. Huyghen's physical explanation of Refraction.

Let us suppose the source of light so distant, that the wave front is a spherical surface of such exceedingly great radius, that it may be considered a plane (traced by O P in the fig.) and the incident rays, parallel to each other.

Let the first medium be *air* and be designed by the letter *n*, and the second medium let it be *glass* and be designated by the letter *n'* and let the refracted ray emerge again from the glass into the medium air.

At the very instant the extreme ray of the front-wave impinges upon the refracting surface at the point O, it becomes at that point, the origin of a new disturbance, originating secondary waves, which proceed within the

(Continued on Page 26)

CLASSIFIED ADVERTISING

RATES: *Four cents a word. Minimum charge one dollar per insertion.*

All copy must be prepaid and must reach us before the fifteenth of the month preceding publication.

CLASSIFIED ADVERTISING
AMERICAN CINEMATOGRAPHER,
1222 GUARANTY BUILDING,
HOLLYWOOD, CALIFORNIA

WANTED—MOTION PICTURE CAMERA

WILL PUT you in touch with buyers for Bell & Howell cameras and equipment. Phone or write the A. S. C., 1222 Guaranty Bldg. Granite 4274, Hollywood, California.

BELL & HOWELL or Mitchell Camera outfit; Projection Printer; Cinex timer; Straight Line Processing Machine; Nutting Reflectometer; Polishing Machine; State price, Equipment. Fred Jeffery, Giles Street, Rose Park, South Australia.

FOR SALE—CAMERAS

WILART camera, latest model, complete with tripod and carrying cases and retort case and magazines. John L. Russel, 1643 North Gardner St., Hollywood. HEmpstead 9554.

BELL & HOWELL. Eyemo Camera—3.5 lens; Color Filter; Case; Six 100-ft. reels; Daylight Negative; Cost $400.00; Price $275.00. All Brand New. Cameron, Manhattan Beach, N. Y.

FOR SALE—LENSES

ONE three-inch Dahlmeyer F. 1:9, mounted for Mitchell; one two-inch Bausch & Lomb F.2:7; one Dahlmeyer Pentac 37 mm. F.2:9. Georges Benoit, 3306 North Knoll Drive, North Hollywood.

CARL ZEISS, F. 2.7, 50 mm. in Bell & Howell mount. Dan Clark, care American Society of Cinematographers.

NEW 40 mm. Goerz Hypar f. 3. 5. lens in Bell & Howell mount; price $50.00. Write Charles Clarke, 1222 Guaranty Building, Hollywood, California.

FOR RENT—CAMERAS

FOR RENT—Bell & Howell studio equipment complete. 170-Degree Shutter. Liberal commission to cameramen. Call Mr. Smith, Metropolitan 4686. Evenings call Main 0947. (Los Angeles.)

NEW Eyemo camera, fully equipped; rent by day or longer. Joe La Shelle, 9038 Dorrington Ave., Hollywood; Phone OXford 5840.

AKELEY and Bell & Howell cameras for rent. John Boyle, 1207 Milton Ave. Phone Granite 2213, Hollywood, California.

BELL & HOWELL. Victor Milner, 2221 Observatory Ave., Los Angeles, California. 596-944.

MITCHELL, and Bell & Howell Cameras. F.2:3; F.2:7; F.3:5 Lenses—40-50-75 mm. Complete equipment. J. R. Lockwood, 523 North Orange St., Glendale, California. Glendale 3361-W, or HOlly 0764.

F. BURTON STEENE, Bell & Howell, and Akeley. Complete Camera Equipment. Latest models. Address American Society of Cinematographers, Hollywood, California.

BELL & HOWELL. 170, with 30, 40, 50 and 75 lens equipment. Baby Tripod. Also B. & H. Cine Motor. Charles Stumar. GRanite 9845. 1201 Vista Street, Hollywood.

FOR RENT—One Eyemo camera, complete with all accessories. Bert Glennon, 5905 Carlton Way, Hollywood, California. Phone Hempstead 2743.

TWO Bell & Howells. Large finders. Also Eyemo for rent. Lenses—F 2.5; 2.3; 2.7 Frank M. Cotner, 6273 Selma Ave., Hollywood. HOllywood 5046.

SPEED CAMERA: Bell & Howell, fully equipped for miniature and slow motion work 40, 50, 75 mm. and 6-inch lenses. Alvin V. Knechtel, 1179 North Kenmore. 597-054.

FOR RENT—STILL CAMERAS

WILL RENT still camera to local parties. Special arrangements to A. S. C. members. Geo. Meehan, Ph. GRanite 3830, 744 Curson Ave., Hollywood, California.

FOR RENT—One 4x5 Graflex Camera and one 4x5 Grafic. Bert Glennon, 5950 Carlton Way, Hollywood, California. Phone Hempstead 2743.

FOR RENT—AIRPLANES

AIRPLANES equipped to carry cameras, facilitating the photographing of stunts or other unusual action, for rent by the hour, day or week. Jerry Phillips, Professional Pilot, Clover Field, Santa Monica, California.

FOR RENT OR FOR SALE

WILL lease for long period at very low rent or will sell, Bell and Howell camera No. 461, fully equipped, excellent condition. Call W. J. Van Rossem 6049 Hollywood Blvd. or write E. H. Rumer, 3764 Arizona St., San Diego.

(Continued from Page 24)

medium n' at a velocity disminished, according to the density of the medium itself.

At the moment that the point P of the ray at the other extremiy of the beam of light, reaches the point O^1, the disturbance created by the ray first considered, will have reached the secondary wave-front, having a radius O V.

In the meantime, at all the intermediate points of the surface A B between O and O^1, and of which we shall take the points S and R as examples, similar disturbances as the one that has been created at O will have reached the wave-front having a radius S U, at the time at which P, reaches O^1. Similarly the disturbance created at R will have reached a wave-front having R T for radius.

Now, as according to Huyghens principle: "The resultant effects of the newly formed waves are produced only at the points of the surface which at any given instant touches all the secondary wave-fronts," the new wave front will be traced by the line O^1 V, which is tangent to all the secondary wave-fronts and as light always covers the shortest distance in its travelling, the rays within the medium glass, will herefore travel in the directions O O′; S S^1; R R^1, and O^1 O^2, making with the normals to the refracting surface at the points of incidence, *angles of refraction smaller than the angles of incidence*, as illustrated in the figure by the ray incident at O, which makes with the normal N N′, an angle of incidence a and an angle of refraction a'.

Let us, now, consider the rays travelling in *the medium n′*. The points O; S; R, and O^1, have become centers of disturbances and the Rays O O′; S S^1; R R^1, and O^1 O^2, travel within the glass with the same speed, as if they were actually originated at the incident points.

At the very instant that the Ray O O′ reaches the surface A′ B′ at the point O′, it becomes, at that point, the origin of another disturbance, originating secondary waves which proceed within the medium n, at an *increased velocity*, because the Medium n or AIR is less dense than the Medium n' GLASS, and at the time the Ray O^1 O^2 will have reached the point O^2, the new disturbances created at O′, will have formed a secondary wave-front, having for radius the distance O′ V^1.

Repeating the same reasoning and construction as above, we find the new wave-front to be traced by O^2 V^1 and the Rays emerging into *air*, to take a direction *parallel* to the Rays incident to the first surface of the glass. The ray O O′, is found to make with the normal N^1 $N^{2\prime}$, an angle of incidence, a^1 *smaller* than the angle of refraction a^2.

From the figure, we can easily deduce that:

$$\frac{\text{Angle of Incidence}}{\text{Angle of Refraction}} \text{ equals } \frac{P\,O^1}{O\,V}$$

and as P O and O V are the distances covered *at the same time* by an incident and a refracted ray in the two different media respectively, we have

$$\frac{P\,O^1}{O\,V} \text{ equals } \frac{\text{Velocity of Light in Medium } n}{\text{Velocity of Light in Medium } n'}$$

and representing the Velocity of Light in Medium n by the sign Vn and its Velocity in Medium n', by the sign Vn' and using the sine values for the angles of incidence and refraction, we have

$$\frac{\sin a}{\sin a'} \text{ equals } \frac{Vn}{Vn'}$$

which is a *constant* for any pair of media, and is called the *"refracting* index" of the medium n'.

Calling n the refracting index of the first medium and n' the refracting index of the second medium, we have $\sin a . n$ equals $\sin a . n'$

$$\text{equals } \frac{\sin a}{\sin a'} \text{ equals } \frac{n'}{n}$$ which constant is called the *"relative refractive index"* of the two Media in question.

If the first Medium is *vacuo*, n is taken as *unity* and we have

$$\frac{\sin a}{\sin a'} \text{ equals } \frac{n'}{n} \text{ equals } \frac{n'}{1} \text{ equals } n'$$ which is termed the *"absolute refractive index"* of a Medium. It is evident that the Absolute Refractive Index of all transparent bodies, from the rarest of gases to the densest of solids, is always greater than one.

THE discovery of the laws of Reflection and Refraction can be classed among the greatest of the achievements of human intellect. The conception and construction of all optical instruments, from the simple spectacle lens to the most intricate apparatus, used in scientific and industrial enterprises, have been made possible by the knowledge of these laws, and mankind derives from them incalculable profits of knowledge, security and comfort.

(*To be continued next month.*)

How to Locate Members of the

American Society *of* Cinematographers

Telephone: GRanite 4274

OFFICERS

Daniel B. Clark	*President*
L. Guy Wilky	*First Vice President*
Frank B. Good	*Second Vice President*
Ira H. Morgan	*Third Vice President*
George Schneiderman	*Treasurer*
Charles G. Clarke	*Secretary*

BOARD OF GOVERNORS

Victor Milner	Alfred Gilks	Fred W. Jackman
Daniel B. Clark	Charles G. Clarke	Georges Benoit
George Schneiderman	Glen MacWilliams	E. Burton Steene
L. Guy Wilky	John F. Seitz	Ira H. Morgan
Frank B. Good	King D. Gray	Floyd Jackman

Abel, David—with Warner Brothers.
Arnold, John—with Metro-Goldwyn-Mayer Studios.

Barnes, George S.—with Samuel Goldwyn Prod.
Beckway, Wm.—
Benoit, Georges—with Metropolitan Productions, Metropolitan Studios.
Boyle, John W.—
Brodin, Norbert F.—with Frank Lloyd Productions, Famous Players-Lasky.
Broening, H. Lyman—with F.B.O. Studios.
Brotherton, Joseph—

Clark, Dan—with Tom Mix, Fox Studios.
Clarke, Chas G.—
Cowling, Herford T.—with Eastman Kodak Co., Rochester, N. Y.
Cotner, Frank M.—
Crockett, Ernest—
Cronjager, Henry—

Davis, Chas. J.—with Warner Bros., "Vitaphone," New York City.
Dean, Faxon M.—with Famous Players-Lasky, San Antonio.
Doran, Robert V.—
Dored, John—Riga, Latvia.
Du Par, E. B.—with Warner Bros.
DuPont, Max B.—
Dubray, Joseph A.—

Edeson, Arthur—with First National, Burbank.
Evans, Perry—

Fildew, Wm.—
Fischbeck, Harry A.—with Famous Players-Lasky New York City.
Fisher, Ross G.—with Fred Thomson, F. B. O. Studios.
Fried, Abe—with Fox Studios.

Gaudio, Gaetano—with First National, Burbank.
Gilks, Alfred—with Famous Players-Lasky
Good, Frank B.—
Gray, King D.—with Fox Studios.
Griffin, Walter L.—with David Hartford Productions.
Guissart, Rene—Paris, France.

Haller, Ernest—with Robert Kane Productions, New York City.
Heimerl, Alois G.—

Jackman, Floyd—with Fred W. Jackman Productions.
Jackman, Fred W.—directing Fred W. Jackman Productions.
Jennings, J. D.—with Buster Keaton.

Knechtel, Alvin V.—with First National, Burbank.
Koenekamp, Hans F.—
Kurrle, Robert—with Edwin Carewe, Inspiration Prod., Tec-Art Studios.

Landers, Sam—
Lockwood, J. R.—
Lundin, Walter—with Harold Lloyd Productions, Metropolitan Studios.
Lyons, Reginald—with Fox Studios.

Marshall, Wm.—with Raymond Griffith, Famous Players-Lasky.
McCord, T. D.—
McGill, Barney—with Famous Players-Lasky
MacLean, Kenneth G.—
Mac Williams, Glen—with Fox Studios.
Meehan, George—with Fox Studios.
Milner, Victor—with Famous Players-Lasky.
Morgan, Ira H.—with Metro-Goldwyn-Mayer Studios.
Musuraca, Nicholas—

Norton, Stephen S.—

Palmer, Ernest S.—with Fox, Europe.
Perry, Harry—with Famous Players-Lasky, San Antonio.
Perry, Paul P.—with Famous Players-Lasky, San Antonio.
Polito, Sol—with Ken Maynard, First National.

Ries, Park J.—
Roos, Len H.—Sydney, Australia.
Rose, Jackson J.—with Universal.
Rosher, Charles—with F. W. Murnau, Fox Studios.

Schneiderman, George—with Fox Studios.
Scott, Homer A.—
Seitz, John F.—with Metro-Goldwyn-Mayer Studios.
Sharp, Henry—with Metro-Goldwyn-Mayer Studios.
Snyder, Edward V.—with Pathe, Fine Arts Studio.
Smith, Steve, Jr.—
Steene, E. Burton—with Famous Players-Lasky, San Antonio.
Stumar, Charles—with Universal.
Stumar, John—with Universal.

Tolhurst, Louis H.—producing microscopic pictures, for Pathe.
Totheroh, Rollie H.—with Charlie Chaplin, Chaplin Studios.
Turner, J. Robert—with Fox Studios.

Van Buren, Ned—with Eastman Kodak Co., Rochester, N. Y.
Van Enger, Charles—with First National, Burbank.
Van Trees, James C.—with First National, Burbank.

Warrenton, Gilbert—with Universal.
Wenstrom, Harold—
Whitman, Philip H.—with Fox Studios.
Wilky, L. Guy—

Edison, Thomas A.—Honorary Member.
Webb, Arthur C.—Attorney

Meetings of the American Society of Cinematographers are held as called on Monday evenings in the A. S. C. assembly rooms—
1219-20-21-22 GUARANTY BUILDING
Hollywood Boulevard and Ivar Avenue
HOLLYWOOD, CALIFORNIA

LOYALTY PROGRESS ART

METRO-GOLDWYN-MAYER
STUDIOS
CULVER CITY CALIFORNIA

December 15th, 1925

Mr. H. F. Boeger,
Mitchell Camera Corporation,
Hollywood, California.

Dear Sir:-

Continued experience with your camera since writing you last Spring has prompted me to express again my heartiest congratulations on your consistent development of its features.

Its ability to catch and register the finest subtleties of the artist's emotion at the psychological moment is only another one of the splendid qualities which stamp it as the outstanding achievement in motion picture camera development.

In "THE BIG PARADE" it served me most admirably in catching the wistfulness of Renee Adoree and preserving its appeal for the millions who are seeing this picture every day.

The ease with which it may be shifted is the director's insurance against failure to catch some special composition or emotion which may arise in an emergency. Its presence enables me to enjoy a feeling of perpetual security.

Please accept this as my second expression of gratitude for the development you have made in the photographic field.

With best wishes for a Merry Christmas and a New Year of continued success for your splendid camera.

Believe me to be,

Sincerely yours,

King Vidor

NO AGREEMENT OR ORDER WILL BE BINDING ON THIS COMPANY UNLESS IN WRITING AND SIGNED BY AN OFFICER.

Vol. VII. No. 11
25 Cents a Copy

February, 1927

U. S. Postage
2c. Paid
Los Angeles, Calif.
Permit No. 941

6

American Cinematographer

Published in
Hollywood, California

By American Society
of Cinematographers

In the Garden of the Gods, Colorado. Reproduced from the Location Library of the American Society of Cinematographers, Hollywood

THIS MONTH:

Panchromatic Negative for Motion Picture Film—By Loyd A. Jones and J. I. Crabtree; Fresh Details on "Vitaphone" Filming; A Professional's Notes for Amatuers [Part IV]—By Joseph A. Dubray, A.S.C.

Vol. VII FEBRUARY, 1927 No. 11

American Cinematographer

FOSTER GOSS, *Editor and General Manager*

Contents:

An educational and instructive publication, espousing progress and art in motion picture photography.
Subscription: United States, $3.00 a year; Canada, $3.50 a year; foreign, $4.00 a year; single copies 25c.
Published monthly by THE AMERICAN SOCIETY OF CINEMATOGRAPHERS, *Inc.*
Advertising rates on application.
1219-20-21-22 Guaranty Building, Hollywood, Calif. Telephone GRanite 4274

Reliable Advertisers

ADVERTISERS in the American Cinematographer *are reliable*. In their respective lines, they represent the strongest firms *in the* world. They have built up their reputations by *fair dealing*. They give service. They, like their products, *are dependable*.

He who deals with those whom the American Cinematographer is proud to number among its family of advertisers, does business with the world's best.

The EDITOR'S LENS • • focused by FOSTER GOSS

George Eastman Made Honorary Member *of* A.S.C.

FOR the second time in eight years, an honorary membership in the American Society of Cinematographers has been bestowed.

¶ The recipient of the honor is George Eastman, founder and head of the world-famous institution that bears his name. Announcement that Mr. Eastman had been made an honorary member of the A.S.C. was given by Daniel B. Clark, president of the American Society of Cinematographers, at the panchromatic dinner and lecture recently held at the Writers' Club, Hollywood. The only other person accorded honorary membership in the Society is Thomas A. Edison, who was extended his invitation in 1922.

¶ As in the case of Mr. Edison, the multitude of Mr. Eastman's activities may serve to obscure, in the popular mind, just what his contributions to the motion picture industry have been. When the business was in its mechanically embryonic stage, it was Mr. Eastman and his organization who made a new industry possible when they produced a type of film and emulsion that would meet the unprecedented need for rapid and continuous exposure as demanded by the motion picture camera.

A Change *in the* Offing?

¶ With a film on the market to duplicate motion picture negatives, a change is seen by some in the present practice of making foreign negatives. They believe that such will be duplicated from the negative taken primarily for the American market, instead of being photographed separately.

Spanning *the* World

¶ Film manufactured for 16 mm. cameras last year was of sufficient footage to encircle the world, it is reported. Some day all of us are going to wake up to the fact that there is an economic future among those to whom the 16 mm. products go.

Not *a* Catch-all

ONE salient fact brought out by the series of lectures on panchromatic recently given in Hollywood by representatives of the research laboratories of the Eastman Kodak Company is that, while this new type of negative opens an entirely new field for cinematographic thoroughness and sincerity, it cannot be expected to serve as a panacea for all photographic evils.

¶ Panchromatic film is a scientific creation—not a medium of magic which may be called upon to conjure whatever impossibilities that may jump into the mind of the uninformed director or star.

¶ There is the example of the picture comedian who had come to renown on the legitimate. His physiognomy, if it were his fortune, certainly was not such because of its beautific proportions. In fact, one of the initial obstacles, that stood in the way of his cinema career, amounted to whether his facial blemishes could be covered up to the degree that would preclude his being howled off the screen. One day this man demanded panchromatic film for his picture *because he had heard that it would relieve him of the necessity of using make-up!* And that was his only reason for insisting on the kind of film whose chief merit is the faithful reproduction of the minutest details!

¶ Of course, the elimination of the need for make-up in reasonable instances is reckoned as one of the advantages of panchromatic. Even when make-up can be safely dispensed with, vanity would have it applied—as witness the leading lady who, during the course of a picture, repeatedly tried to put it on surreptitiously to hide a sprinkling of freckles about her nose. And it was these very natural marks that the director wanted to be visible to add character to his heroine!

¶ Proper use of filters in conjunction with panchromatic is another subject that will bear careful study. Indiscriminately combining the wrong type of filter with panchromatic may serve to cut out the reproduction of the very colors which the new film allows to register on the negative.

¶ The many advantageous uses of panchromatic may best be served by being familiar with its abuses —and then by avoiding the latter.

Record Lectures Held *on* New Film Subjects

Eastman *and* American Society *of* Cinematographers Co-operate *on* Historic Affair.

Dr. K. C. D. Hickman *and* John I. Crabtree, *in* Hollywood *from* Rochester, Are Speakers.

Signalizing the increasing popularity of panchromatic film in motion picture production, three important meetings and lectures on panchromatic were staged in Hollywood during the past month.

Presented by the Eastman Kodak Company in co-operation with the American Society of Cinematographers, a dinner, followed by an illustrated lecture, was given at the Writers Club, Hollywood, Monday, January 31st. The lecture, dealing in an extensive manner with the general phases of panchromatic, was delivered by Dr. K. C. D. Hickman, of the Eastman Research Laboratories.

Illustrated

Dr. Hickman's lecture was illustrated by slides, and was followed by the projection of a reel of panchromatic experiments photographed under Eastman Research auspices by Ned Van Buren, A.S.C., now connected with the Eastman organization as a consulting cinematographer on panchromatic subjects. Following the exhibition of the reel, Dr. Hickman replied to queries put from the floor of the assemblage.

Record Attendance

The occasion was admitted to be one of the most notable in the history of cinematography. More than two hundred guests including A.S.C. members, laboratory officials and other cinematographers were present. After the dinner had been served, the meeting was opened by George A. Blair, motion picture film sales manager for Eastman and well-known in film quarters. Mr. Blair introduced members of the Eastman staff, including Dr. Hickman, the speaker of the evening; John I. Crabtree, of the Eastman Research Laboratories; Ned Van Buren, A.S.C., who will be permanently located at the Hollywood Eastman headquarters; Perry Conner, representative of the Eastman organization in Hollywood, and Edward O. Blackburn, representative of J. E. Brulatour, Inc., distributors of Eastman motion picture films.

Clark Presides

Mr. Blair then turned the meeting over to Daniel B. Clark, president of the American Society of Cinematographers, as toastmaster and master of ceremonies. Mr. Clark stressed the importance of a thorough understanding of panchromatic practices. He declared that the occasion had brought together probably more cinematographers than had ever been assembled under one roof at one time. This, the A.S.C. president declared, was sufficient evidence of the interest of the cinematographers in the new form of film.

Before presenting Dr. Hickman, Mr. Clark announced that George Eastman, head of the institution bearing his name, had been made an honorary member of the American Society of Cinematographers, and read a telegram from Mr. Eastman accepting the honor.

Crabtree's Lecture

A second lecture was held at the Writers Club, on Tuesday, February 1st, at which time John I. Crabtree, from the Eastman Research Laboratories, spoke.

Mr. Crabtree's talk, which was illustrated by slides, dealt with first, graininess in motion picture film; second, development of panchromatic film and its practical handling in the laboratory; and third, duplication of negatives by a new film just placed on the market.

After concluding his lecture, Mr. Crabtree answered questions from those present.

Lectures on Filters

The third lecture was given by Dr. K. C. D. Hickman at the open meeting of the American Society of Cinematographers on the following Monday night in the A.S.C. assembly rooms in the Guaranty Building.

Dr. Hickman spoke on the use of filters in conjunction with panchromatic. He explained the tonal values of the different colors of the spectrum and their photographic reproduction on panchromatic, with or without filters.

An open forum of questions was held following the lecture.

L. Guy Wilky, first vice president of the A.S.C., presided at the meeting in the absence of Daniel B. Clark, who was in Palm Springs on location.

(Continued on Page 21)

Panchromatic Motion Picture Film Negative

First Installment *of* Timely Communication *from* Eastman Research Laboratories.

By Loyd A. Jones, and J. I. Crabtree

Visual Sensitivity, *and* Radiation *and* Light Are Given Introductory Consideration.

PHOTOGRAPHIC materials, from the standpoint of their sensitivity to light of different color, may be divided into three classes: *ordinary, orthochromatic, and panchromatic.* Those belonging to the class designated as *ordinary,* or *blue sensitive,* are sensitive only to blue and blue-green and do not respond appreciably to green, yellow, or red. As typical of this class may be mentioned Eastman Commercial Film and Eastman 40 Plates. By the use of suitable sensitizing dyes photographic materials can be made which, in addition to the blue sensitivity of the *ordinary* type, are sensitive also to green. They are usually referred to as *orthochromatic* and the Par and Super Speed Motion Picture Negative film fall in this class. The use of additional dye sensitizers gives a material which is sensitive also to yellow, orange, and red, thus providing photographic film which responds to the entire visible spectrum. These materials are designated as *panchromatic* and of this class Eastman Panchromatic Motion Picture Negative is a typical example. All of these materials in addition to their sensitivity to visible light are sensitive to those invisible radiations commonly referred to as the ultraviolet. By the use of certain sensitizing dyes the sensitivity can also be extended into the region of longer wave-lengths known as the infrared. For a more complete discussion of this question of the color sensitivity of various types of photographic materials reference should be made to a paper by Dr. C. E. K. Mees[1].

Correct Tonal Relation

It is clearly impossible to hope to render in correct tonal relation a scene containing a wide variety of colors by the use of materials totally insensitive to some of these colors. Thus if a material of ordinary type is used red, orange, and yellow will be rendered as black; and green, which usually has a relatively high visual brillance, will be rendered much darker than blue and blue-green which visually are relatively low in brightness. Some improvement is obtained by using an orthochromatic material since this renders green more nearly in its true position on the tone scale. It is only by the use of *panchromatic* material, however, that correct tonal rendition of all colors can be obtained.

Visual Tonal Values

It is usually desirable in motion picture work to reproduce as truly as possible the visual tonal values of the scene being photographed. Since practically all objects are colored to a greater or lesser degree it follows that the good reproduction of tone values can only be achieved by the use of panchromatic film. The rapidly increasing use of this material in motion picture work indicates that many workers are realizing its value. In the following pages the characteristics of this material will be discussed and attention called to some applications which are of particular importance.

A complete understanding of the principles involved in obtaining any desired reproduction of tone values by the photographic process requires a thorough knowledge of many factors, such as the nature of light and radiation, the sensitivity of the eye and of the photographic materials to radiations of different wave-lengths, the quality of radiation emitted by various light sources used for illuminating the set, the reflection characteristics of objects, etc. Before attempting to discuss the radiation of colored objects by photographic materials differing in color sensitivity it will be necessary to devote considerable attention to these fundamental principles underlying the photography of colored objects.

Radiation and Light

When a solid body such as a piece of carbon or a tungsten wire is raised to a high temperature it emits radiation which travels through surrounding space in the form of wave motion in the ether, a hypothetical medium supposed to pervade all space. This mave motion is of the transverse form and travels in a straight line at the enormous velocity of 186,000 miles per second. The frequency of vibration in this wave motion may vary enormously and since the velocity of pro-

1. Mees, C.E.K., The Color Sensitivity of Photographic Materials, J. Franklin Institute, May 1926, p. 525.

pogation in any particular medium is independent of the frequency it follows that the length of the waves vary inversely as the frequency. Thus *radiant energy* or *radiation* of high frequency has a shorter wave-length than that of low frequency, the *wave-length* being defined as the distance between two successive wave crests.

When radiation of certain wave-lengths falls upon the retina of the eye a sensation is produced which we call *light*. Thus radiant energy, a purely physical or objective phenomenon, when allowed to inpinge on a sense organ, the retina, serves as a *stimulus* producing a subjective sensation or *response* which is designated in general as *light*. The nature of this sensation will be discussed briefly in a later section.

Correct Usage

It may be well to point out at this time that the word *light* is commonly used in more than one sense. It is frequently used as designating the radiation itself and while such usage may be convenient it frequently leads to confusion. The usage of the word light in reference to radiation which does produce the sensation of light is to a certain extent allowable. Further extension of the usage in referring to radiation which does not produce a sensation of light is unfortunate and should be discouraged. Thus the terms ultraviolet light and infrared light are objectionable. It is just as easy to speak of infrared radiation and ultraviolet radiation and this usage is less likely to result in confusion.

Radiant energy being a purely physical or objective phenomenon can be measured and specified in physical units. A radiation consisting of a single wave-length (homogeneous radiation) can be completely defined by two terms, one referring to its quality (wave-length or frequency) and the other to its quantity (energy expressed in *ergs*). As stated previously the radiant energy emitted by a body at a high temperature contains wave trains of many different frequencies or wave-lengths. Such composite radiation may be analyzed into its component parts by use of a prism or diffraction grating. Thus if a beam of sunlight be passed through a prism and allowed to fall on a white surface a band of light varying in color from one end to the other will be seen. This we call a spectrum and its formation depends on the fact that the prism refracts or bends the rays of different vibration, instead of being examined visually, is examined by means of some sensitive receiving instrument (such as a thermopile) which responds to all radiation irrespective of its wave-length, the presence of radiant energy beyond the limits of the visible spectrum will be detected.

Having thus separated such composite radiation into its component parts the intensity and wave-length of each can be measured and in this way a complete and definite physical specification of the radiation obtained. The unit used to measure wave-length is the milli micron (mu) which is equal to one millionth (.000001) of a millimeter. The shortest wave-length which produces the sensation of light is 400 mu, this giving rise to the color which we term violet. The longest wave-length which is visible is 700 mu corresponding to the color which we call red. It should be understood that those limits of visibility are not sharply defined. They vary to a certain extent for different observers and depend very much upon the condition of the observer's eye and the intensity of the observed radiation. Radiation of wave-length shorter than 400 is referred to as ultraviolet, while that longer than 700 is termed infrared. The diagram in Fig. 1 shows approximately the relation be-

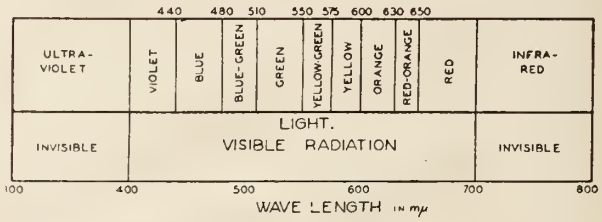


Figure One

tween wavelength of radiation and the color of the resulting sensation. As a matter of fact the complete physical spectrum extends into regions of much longer and shorter wave-length than shown in Fig. 1. But since in motion picture work certain limitations are set by the sensitivity of the eye and the photographic material and the absorbing characteristics of materials used (lens, objects photographed, etc.) it is not necessary in this discussion to consider radiation of wave-length shorter or longer than those included in the diagram.

From the physical standpoint the heterogeneous radiation emitted by various sources of light may be satisfactorily defined in terms of wave-length and the relative amount of energy emitted at each wave-length. Such data are usually expressed in graphic form by plotting energy as a function of wave-length. Curves thus obtained are called curves of spec-

(Continued on Page 21)

Amateur Cinematography

A Professional's Notes *for* Amateurs

Part IV
By Jos. A. Dubray, A.S.C.

Principles *of* Reflection *and* Refraction Are Explained *in* Fourth *of* Series *of* Articles

JOSEPH A. DUBRAY
A.S.C.

We have seen in the preceding chapter that a ray of light is *refracted* when passing from one medium into another of different density, and that the angle of *refraction* is smaller than the angle of *incidence,* when the second medium is denser than the first, and *viceversa,* it is greater when the ray passes from the denser medium into the rarer one.

Let us consider a ray of light, whose origin is within a medium denser than the medium into which it emerges at the points of the surface A B. (Fig. 9).

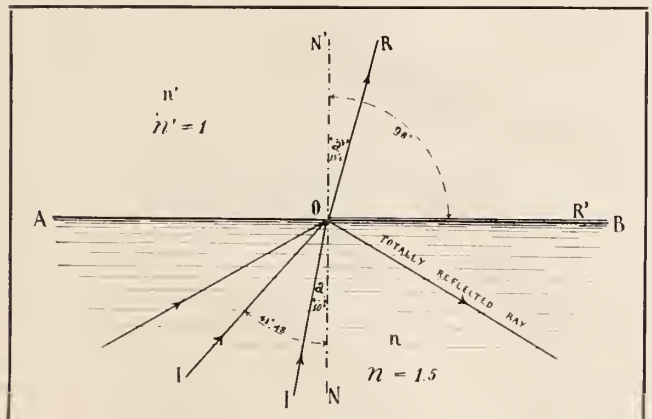


Figure 9

If the original disturbance creating the *incident* ray takes place at the point N' and the ray strikes the surface A B perpendicularly at O, it will emerge without *refraction,* following the direction O N, and its path N' N will mark the *normal* to the surface A B.

But if the disturbance is placed at a distance from the *normal,* at the point I for instance, the ray I O will be refracted into the less dense medium, making an *angle of refraction a'* greater than the *angle of incidence a.*

Critical Angle

Now, it is evident that if we gradually increase the magnitude of the angle of *incidence,* a certain position of the *incident* ray will be reached, where the *refracted* ray will emerge, following a path parallel to the refracting surface. In other words, a certain angle of incidence will be found, whose corresponding angle of refraction will have a magnitude of 90°. This particular angle of incidence is called the *critical angle* of the substance of which the denser medium is composed.

In Figure 9, the ray I' O, forms with the normal the *critical angle* of the medium n, and the refracted ray O R', forms with the normal N N', an angle of refraction equal to 90°.

If the angle of incidence is still increased, and becomes then *greater* than the *critical angle,* as the angle of incidence made by the ray I^2 O in the Figure, the ray *cannot emerge* into the rarer medium, and is *totally reflected* back into the denser medium, following the Laws of Regular Reflection, i.e., making with the *normal, an angle of reflection,* equal to the *angle of incidence.*

Now, according to the Laws of Refraction:

$$\frac{\sin a}{\sin a'} \text{ equals } \frac{n'}{n}$$

(in which a and a' are respectively the angles of incidence and refraction, n the index of the medium into which lies the incident ray, and n' the index of the medium into which lies the *refracted ray*), therefore,

$$n \text{ equals } \frac{\sin a' \,.\, n'}{\sin a}$$

and as in the case in which the *incident ray* makes with the *normal* the so-termed *critical angle,* the value of the angle a' is known to be 90°, whose sine value is 1.000, we have

$$n \text{ equals } \frac{1.000 \,.\, n'}{\sin a}, \text{ or, } n \text{ equals } \frac{n'}{\sin a}$$

Now, let the medium n' in Fig. 9, be Vacuo, whose index of refraction is 1.000 and let n,

be the index of a denser medium totally reflecting an incident ray, that makes with the normal at its surface of separation an angle of incidence of, say, 45°.

Substituting the known values in the above formula:

$$n \text{ equals } \frac{n'}{\sin a}, \text{ we have,}$$

$$n \text{ equals } \frac{1}{\sin 45^\circ}, \text{ or } n \text{ equals } \frac{1}{0{,}7071}, = 1{,}414$$

It results that, *a medium whose surface of emergence is in contact with Vacuo, must have an index of refraction greater than 1.414, in order to totally reflect a ray incident to that surface, at an angle of 45°.*

All glasses answer to this requirement

If we suppose the medium n of Fig. 9 to be Crown Glass, having an index of 1.5, its critical angle when in contact with Vacuo is easily found thus:

$$\frac{\sin a}{\sin 90^\circ} \text{ equals } \frac{1.5}{1}, \text{or, } \sin a \text{ equals } \frac{\sin 90^\circ \,.\, 1}{1.5}$$

and as the sin value of 90° is 1, we obtain

$$\sin a \text{ equals } \frac{1}{1.5} \text{ equal } 0.6666 \text{ or approximately}$$

41° 48′.

The *critical angle* of Crown Glass, having an index of 1.5, is then an angle having a magnitude of 41° 48′.

IT IS evident, that the *critical angle* of a medium varies with its density, and it is *greater*, the *rarer* is the medium: so, as the critical angle of Crown Glass, as stated, is 41° 48′, the critical angle from *water* to *Vacuo* is approximately 48° 45′, while from *diamond* to *Vacuo* is only about 20°, which small value greatly accounts for the brillancy of this medium, because all the light that strikes a diamond at an angle greater than 20°, is *totally reflected* when it strikes its bottom surface. A diamond is always mounted by jewelers in an open, or bottomless setting, as proof that its sparkle is due to its own density and not to any reflecting surface placed underneath it.

IN *total reflection*, there is *no loss of light* by absorption or transmission as is the case in regular reflection, and this valuable property is taken advantage of in making optical instruments in which perfect reflection is desired.

The most important application of this phenomena, in optical instruments, is the use of *right angled prisms.*

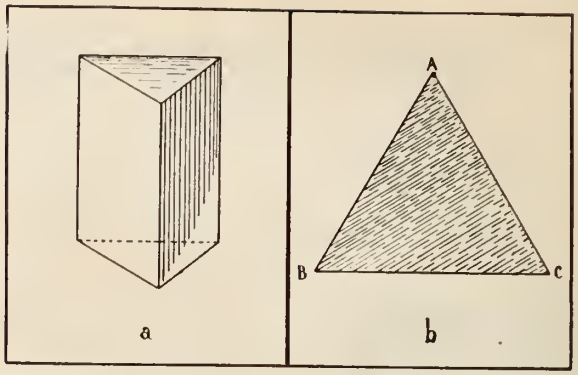


Figure 10

IN optics, a prism is any *transparent medium*, bounded by two plane surfaces, inclined to each other (Fig. 10a).
and whose principal Section (Fig. 10 b.), perpendicular to the *edge* A A′ is a triangle.

In the section, A is called the *summit;* B C the *base* and the angle B A C, the *refracting angle.*

A right angle prism, is a prism, whose refracting angle is a *right angle*, or an angle of 45°.

LET us suppose such a prism A B C, made of Crown Glass (Fig. 11).

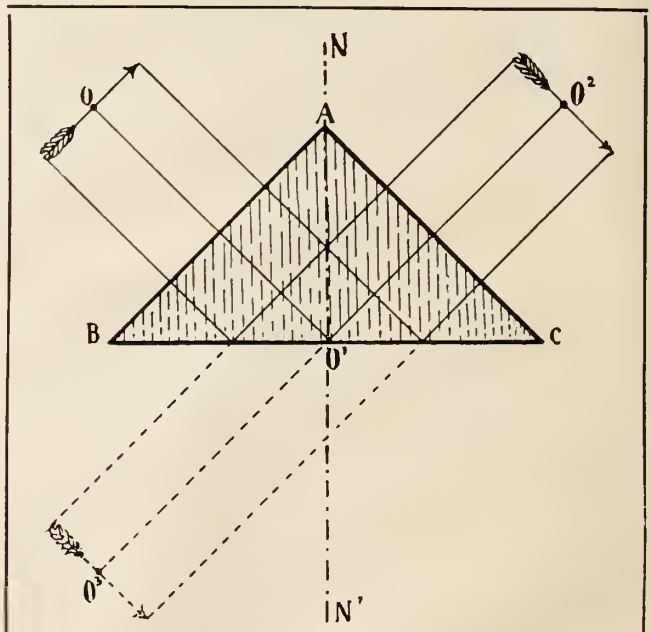


Figure 11

A ray from O, falling perpendicularly on the face A B, enters the prism without being refracted and strikes the hypothenuse B C at O′, making with the normal N N′, an angle O O′ N, of 45°.

As the critical angle of Crown Glass, is of less magnitude, (41° 48′) the incident ray, is

(Continued on Page 16)

Fresh Details *on* "Vitaphone" Filming

Different Noiseless Method *of* Lighting Devised *to* Escape Recording Sensitivity

Additional details concerning the photographing of subjects for Warner Brother's "Vitaphone," the medium of "talking motion pictures" now enjoying wide application, are given by E. B. Du Par, who, a member of the American Society of Cinematographers, has been in charge of the cinematographic end of the device.

"One of the things," Du Par states, "that made Vitaphone possible was the 'synchronus' motor. Instead of using one motor and driving the camera and the recording machine from opposite ends, which at first was thought to be the simplest way, we now have from two to four motors all going at the same time and electrically interlocked so that they are all in perfect synchronization. An electrical gearing device holds them at exactly the same speed. The motors are interlocked electrically by tapping at three symmetrical points on each armature and by interconnecting the different motors through slip rings. Thus the motor driving the recording machine and the motors driving the different cameras are independently supplied with electrical energy, but through the slip ring circuit there is enough interchange of power between their armatures to produce synchronization. While starting and when they reach the desired speed they are converted into synchronous motors and continue to run as independent synchronous motors, the speed being determined by the frequency of the power supply which can't vary one-tenth of one per cent.

Noise

"One of the first problems," the A.S.C. member continued, "which I had to overcome when I arrived in New York was to cut down the camera noise. By putting a special clutch on the magazine take-up—and, by the way, we had this feature patented—changing the intermittent movement in the camera, using a special belt and shooting from a sound-proof camera booth, the operation of the camera was made so quiet that you could get within ten feet of the microphone, where before it was impossible to get closer than 25 feet.

Quiet Light

"The next problem was to get the light quiet enough to work with. After a number of experiments and tests, I decided to use the G.E. high intensity arc light in conjunction with special spot lights and Cooper Hewitts. But before they could be used at all, they had to be re-made with all gears and moving parts constructed of fiber. It is a very severe test that these lights have to undergo. They have to burn from 11 to 15 minutes at a time and be absolutely noiseless, because a little flicker of the arc or carbon sounds like a pistol shot on the finished record.

Side Arcs

"After working with these lights for a while, I decided that I would like to use some side arcs, or broadsides, as they are called in the studio. Remembering the different light troubles which I had to overcome while working for Warner Bros. in Hollywood, I naturally thought of Frank N. Murphy, the chief electrical engineer of the West Coast studio. I wrote to Mr. Murphy, telling him what I wanted. He conferred with Harry Brown, another wizard of electricity, and they evolved a noiseless broadside. Believe me, I was glad to get these lights. I received a shipment of them just before I left New York, and they proved even better than I expected. Before that, I had to use all spots or G.E.'s, and it took a man for each spot. Now I can put broads around where I want them.

"The reason, of course," Du Par continued, "that we need the noiseless lights is because the microphone is so sensitive that everything has to be absolutely quiet while photographing, as the recording machine gathers the different sounds by a special microphone which translates them into voltage fluctuations—the vibrations caused by the sounds striking the diaphragm. The minute fluctuations are in turn amplified by a vacuum tube amplifier until they have sufficient power to operate the device or stylus which cuts the minute lines in the record of soft wax. This wax is 16 inches across, and runs for approximately 11 minutes, or equal to 1,000 ft. of film when projected at the speed of 90 feet per minute. Incidentally, that is the speed at which we have to take pictures with our camera—24 pictures per second, which is one-half again as fast as the natural speed of 16 pictures per second.

(Continued on Page 15)

In Camerafornia...

and News Notes of the Month

REGINALD LYONS, A.S.C., has finished photographing "Whispering Sage," a Fox production starring Buck Jones. Scotty Dunlap directed. Reggie will go on location to Sonora, Calif., for the filming of the next Jones vehicle, "The Holy Terror," which will be directed by Lambert Hillyer.

* * *

Walter Griffin, A.S.C., is photographing an all-star production, "Justice of the Damned." David Hartford is director and producer.

* * *

Charles Van Enger, A.S.C., shares honors with John Francis Dillon, director; Carey Wilson, scenarist, and other members of the staff and cast of First National's "The Sea Tiger," which, starring Milton Sills, was completed and sent to the cutting room without the necessity of a single retake or additional scene. Van Enger was chief cinematographer on the production.

* * *

Frank Cotner, A.S.C., is filming "A Ghostly Affair." Hallam Cooley is starred.

* * *

Robert Kurrle, A.S.C., has concluded the cinematography on Inspiration's and Edwin Carewe's production of "Resurrection," and has begun his duties as chief cinematographer on First National's "The Tender Hour," in which, directed by George Fitzmaurice, Ben Lyon and Billie Dove head the cast.

* * *

James Van Trees, A.S.C., is chief cinematographer on First National's "Big Bertha," a feature comedy of the war. Del Lord is directing.

* * *

Arthur Edeson, A.S.C., is still busy with "The Patent Leather Kid," a First National production starring Richard Barthelmess.

IN the January issue of *American Cinematographer*, it was chronicled that Herford Tynes Cowling, A.S.C., had passed through a banner month during the weeks just then closing. It comes to pass that the past month continued big events in Cowling's life as, on January 14th, in New York City, he was united in the bonds of matrimony to Virginia Ramsay Hardin. Congratulations!

* * *

Glen MacWilliams, A.S.C., is photographing Alma Rubens in "Heart of Salome," at the Fox Studios. Victor Schertzinger is directing.

* * *

Jackson J. Rose, A.S.C., is filming Universal's production of "Cheating Cheaters," which is based on the famous stage play of the same name.

* * *

Ira Morgan, A.S.C., is having the aerial antics of army balloons to film in Metro-Goldwyn-Mayer's "Red, White and Blue." Sam Wood is the director.

* * *

Gilbert Warrenton, A.S.C., is in the final stages of the cinematography on Universal's "Beware of Widows," starring Laura La Plante. Wesley Ruggles is directing.

* * *

Henry Sharp, A.S.C., is chief cinematographer on King Vidor's production, from his own original story of "The Mob" at the M-G-M studios. Eleanor Boardman is starred.

* * *

E. B. Du Par, A.S.C., having returned to Hollywood from New York City where he filmed Warner Brothers' Vitaphone presentations, is serving as chief cinematographer on Warner's "White Flannels." Lloyd Bacon is directing. Du Par is one of the veteran cinematographers on the Warner Bros. staff, being affiliated with that organization for the past five years.

HARRY PERRY, A.S.C., and Paul P. Perry, A.S.C., have returned to Hollywood from San Antonio, Texas, where they have been for the past five months photographing Paramount's "Wings," on which Harry is chief cinematographer. They are concluding the filming of the picture at the studios of Famous Players-Lasky.

E. Burton Steene, A.S.C., is the last of the cinematographers on the feature to remain in San Antonio. He is staying at the Texas location to capture Akeley shots of cloud effects.

* * *

Henry Cronjager, A.S.C., is to film the Metropolitan production, "The Heart Thief," starring Joseph Schildkraut.

* * *

Victor Milner, A.S.C., has been assigned as chief cinematographer on Paramount's "The Man Who Forgot God," which will be Emil Janning's first American starring photoplay.

* * *

Barney McGill, A.S.C., is filming "Two Arabian Knights," a Caddo production for United Artists release. William Boyd is starred; Lewis Milestone is directing.

* * *

Al Gilks, A.S.C., is filming James Cruze's production of "Looie the Fourteenth," starring Wallace Beery.

* * *

Ernest Palmer, A.S.C., has returned from an extensive trip across the Atlantic where he was cinematographer on a film expedition by the Fox Film Corporation.

* * *

Sol Polito, A.S.C., is shooting Ken Maynard in "The Land Beyond the Law" for First National release.

Charles J. Davis Elected *to* A.S.C.

New A.S.C. Member Began Career *with* Old Vitagraph Company; Now *with* Vitaphone

Charles J. Davis has been elected a member of the American Society of Cinematographers, according to an announcement of the A.S.C. Board of Governors.

Davis, who is now connected with the Vitaphone Corporation for whom he has been associated with E. B. Du Par, A.S.C., in the filming of the Vitaphone programs to date, began his career as a cinematographer with the old Vitagraph company in New York City, in November, 1915. Since that time he has been chief cinematographer on innumerable important productions.

CHAS. J. DAVIS, A.S.C.

With Vitagraph

Among the vehicles which he filmed for Vitagraph were: "The Man Behind the Curtain," "The Chattel," "The Man of Mystery," "An Enemy to the King," "Mystery in the North Case," "Missing," "Marked Stamps," "Strictly Business," "Sixteenth Wife," "A Service of Love," "Vanity and Sables," "The Menace" and "The Girl of Today."

During 1918, Davis went with E. A. Neuman to Europe and made a series of E. A. Neuman productions, which, based on the war, were titled as follows: "War Time in England," "London, 1918," "War-time France," "Paris, 1918" and "War-time Italy."

On returning to the United States, the new A.S.C. member worked on the following productions: "Wolves of Culture," a Pathe serial; "Fighting Roosevelt," a Warner Bros. production; "Soul of a Nation" and "The Collar Line," H. E. Hancock productions. He then became connected with Vitagraph again, filming "The Friendly Call," "Slaves of Pride," "Sporting Duchess," "Captain Swift," "Whisper Market" and "The Broadway Bubble."

Back to England

In 1920, Davis went to London, England, as chief cinematographer of "On the Road to London," a Bryant Washburn production, which was finished in California.

With Vitaphone Again

When the Washburn feature was finished, Davis journeyed to New York where he again became affiliated with Vitagraph, for whom he photographed "Moral Fibre," "Single Track" and "The Prodigal Judge."

He then filmed a series of Burton King productions including "The Mad Dancer," "The Truth About Women," "Those Who Judge" and "Playthings of Desire."

Concluding this series, he was in charge of the cinematography on two Sam Sax productions, "A Little Girl in a Big City" and "Police Patrol."

Following this pair of releases, he was chief cinematographer on a series of features produced by the McFadden Publishing Co., numbering "Broken Homes," "The Joke," "False Pride," "Things Wives Tell" and "Men, Women, Love." Succeeding the McFadden engagement, he became identified with the Vitaphone organization, his present affiliation.

Nick Musuraca, A.S.C., is to film "Cyclone of the Range," an F.B.O. feature, starring Tom Tyler and directed by Bob De Lacy.

* * *

Charles Rosher, A.S.C., has concluded the cinematography on "Sunrise," F. W. Murnau's production for Fox. George O'Brien and Janet Gaynor are starred.

* * *

John F. Seitz, A.S.C., is making preparations to withstand the winter rigors of Colorado where he will go on location as chief cinematographer on Metro-Goldwyn-Mayer's production of Robert W. Service's "The Trail of '98," which Clarence Brown will direct.

* * *

Joseph Dubray, A.S.C., has recently finished the cinematography on the Tiffany production, "The Broken Gate." Stephen Norton, another member of the A.S.C., was associated with Dubray on this production which featured Dorothy Phillips, Florence Turner, Jean Arthur, Buster Collier, Phillip Smalley and Charles "Buddy" Post.

* * *

Philip H. Whitman, A.S.C., has re-joined the scenario forces of the Mack Sennett studios, where, it is understood, he has written a story based on the swimming of the Catalina channel.

"VITAPHONE" FILMING

(Continued from Page 11)

No Fluctuations

"When reproducing," the A.S.C. member explained, "the film and the record are placed in their respective machines with a given mark indicating the starting point. They are coupled to opposite ends of the same motor, the speed of which is held constant by means of a vacuum tube regulator. It is essential that the mechanical gearing be so designed that mechanical vibrations and irregularities of load in the projector should not cause fluctuations in the speed of the record or film. To avoid this, a flywheel and flexible connection are placed between the last gear-driven shaft and the turntable, which iron out the ripples in the speed.

Vibrations

"The sound is brought to the audience by an electrical reproducer that converts the delicate movements of the needle in the grooves of the disc into electrical vibrations—which pass through an adaptation of the Western Electrical public address system.

"But to return to the camera end of it: We have from two to four cameras going at one time. The long-shot camera, which is in charge of C. J. Davis, is what we call the master camera. It takes the master film and is interlocked with the recording machine. Once it starts, it keeps going till the end. The close-up camera, operated by myself, has a synchronous motor and can be started and stopped at will. I have taken as many as ten close-ups during one number, or in the space of 11 minutes. I have four lenses on the camera, ranging from a 40 mm. to a six-inch. They are all focused in advance. All I have to do is to change them, and panoram the camera to the next object to be photographed. I often wish for an extra set of hands as I am as busy as a one-armed paper-hanger, and the booth is too small to permit my assistant to come in with me. As the booth is sound proof, I have to depend on light signals given me by Mr. Heller, the director. He is both music and picture director. If you have ever watched a director, who, when anything goes wrong with the action, begins to tear his hair and yell at the actors, you can realize that Mr. Heller's is some job. He has to be as quiet as a deaf mute. Of course, he has the privilege of pulling his hair if he wants—just as long as he does it in a silent manner, so that the microphone won't pick up any spurious sounds. After the record starts, all his talking must be done with his hands or by means of other signs. At times I wonder how he keeps his patience.

"We have just finished a program for 'Manon Lescaut,' the latest Warner production starring John Barrymore. Some of the artists used are Charles Hackett, grand opera singer; Schuman-Heinck, Van and Shenk, Harry Lauder, Whispering Smith, Mary Lewis and another number by Mischa Elman."

Junior Cameramen's Club *to* Hold Dance, Saturday, March 12

The Junior Cameramen's Club is to hold its first annual dance and entertainment in the ballroom of the Hollywood Masonic Temple on Saturday evening, March 12.

Final plans have been made to make this an elaborate and brilliant affair. Hank Mann will be master of ceremonies. To assist him in entertaining he will have such screen artists as Sammy Blum, Arthur Lake, Sammy Cohen, Nick Stuart, Carol Lombard, George Blandford and Barbara Luddy. Several skits are being arranged by the boys in the club.

The ticket sales are going on very satisfactorily. Each member of the club is on the committee in charge of selling tickets which may be secured from them.

Joseph Brotherton, A.S.C., is in charge of the photography in "Keith of Scotland Yards," starring Hayden Stevenson. Production is under way at Universal with Robert Hill directing. Many unusual fog shots are being incorporated in the picture.

Amateur Cinematography

(Continued from Page 10)

totally reflected in the direction O′ O², and its *virtual image* will be seen at O³ by an eye placed at O².

Totally Reflected

It is evident that all rays emanated by a luminous source or object placed at O, which fall perpendicular to A B, will be totally reflected at their striking the hypothenuse B C, and a virtual image of the source or object will be seen at O³.

Thus the surface B C, acts as a mirror and as in total reflection there is no *loss of light,* this surface acts as *the most perfect plane mirror.*

In optical instruments, right-angled prisms are most frequently used instead of metallic mirrors, which tarnish very easily, and demand the greatest of care in their manipulation.

IN giving the physical explanation of the phenomena of refraction, we have considered the rays of light, to be refracted from *air* into *glass* and again from *glass* into *air,* and the two refracting surfaces were considered parallel to each other.

As, in the case of a prism, the two refracting surfaces are inclined to each other, it is evident that the ray of light refracted within the prism, cannot emerge from it into air, in a direction parallel to the original incident ray, as it was the case with parallel refracting surfaces.

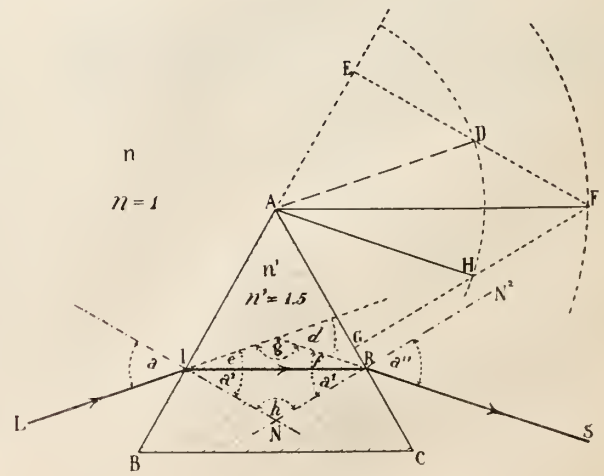


Figure 12

Let us consider a *prism* A B C, made of *glass,* and placed in the medium *air* and let L, be the luminous source, that emits the monochromatic ray L I, incident to the surface A B at I at an angle of incidence ***a***.

Law of Refraction

As the Law of Refraction expresses a definite relation between the angles of incidence and refraction for a given refracting medium, it is evident that if the path of the incident ray and the indices of the two media are known, it is possible to trace a geometrical construction giving the paths of the refracted rays at the entrance and at the emergence from the prism.

In Fig. 12, let the glass prism have a refracting index equal to 1.5 and, for sake of simplicity, let us call 1. the refracting index of the sourrounding medium air.

(The actual refracting index of *air* at the standard pressure of 760 millimeters and a temperature of 0° centigrades is 1.000294) and let the incident ray strike the surface A B, at an angle of incidence ***a***.

Using the vertex A of the prism as center, draw an arc having a radius of any convenient length A F, and another concentric are having a radius equal to $\frac{n}{n'}$. r: in our case, equal to $\frac{1}{1.5}$ .45 mm. or equal to 30 millimiters.

Trace the line A D parallel to the known incident ray, and from D, the line D E, perpendicular to the first refracting surface of the prism. Prolong this line until it will meet the first arc at F. The line I R, drawn parallel to A F, will represent the path of the refracted ray within the prism.

To find the path of the ray emerging from the prism into air, trace the line F G, perpendicular to the second arc at H. The line R S, parallel to A H, will then represent the path of the ray refracted from the prism into air.

The proof of this construction is as follows:

The sin values of the angles A D E and A F E are:

sin. A D E equals $\frac{A\ E}{A\ D}$ and sin. A F E equals $\frac{A\ E}{A\ F}$, and consequently, $\frac{\sin.\ A\ D\ E}{\sin.\ A\ F\ E}$ $\frac{\frac{A\ E}{A\ D}}{\frac{A\ E}{A\ F}}$ equals $\frac{A\ F}{A\ D}$ and as the lines A F and A D, have been traced in the ratio $\frac{n'}{n}$, we have $\frac{\sin.\ A\ D\ E}{\sin.\ A\ F\ E}$ equals $\frac{n'}{n}$.

But the angle A D E and a (angle of incidence) are equals, because formed by the junction of lines parallel by pairs, and similarly, the angle A F E, is equal to the angle a', (angle of refraction); then,

$$\frac{\sin a}{\sin a'} \text{ equals } \frac{n'}{n}$$

which is the formula expressed by Snell's Law.

In like manner, the correctness of the path of the emergent ray R S can be proven.

BY prolonging the rays L I and R S within the prism, we find that they form at their junction an angle d which is called the *angle of deviation* of the prism, because it represents the total deviation of the ray of light, caused by its passage through the prism.

WE shall now consider different rays of monochromatic light, striking the surface A B of a prism, at different angles of incidence, and for the sake of clearness we will draw three separate figures of the same prism as in Fig. 13.

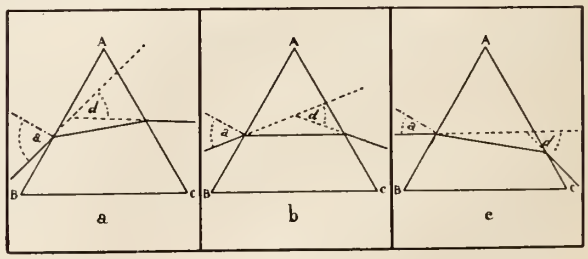


Figure 13

The prism A B C being of *glass,* index equal 1.5 and the sorrounding medium being air, we notice that, if the angles of incidence are *decreased in magnitude,* the corresponding *angles of deviation do not decrease proportionally.* In fact the angles of deviation in Fig. a and c, are *both greater than the angle of deviation in Fig. b.*

In any prism, there is then a certain *deviation, less than any other* and it can be mathematically proven, that this *angle of minimum deviation* occurs when the angle of incidence to the surface A B and the angle of refraction from the surface A C, are *equals* and that the ray within the prism, follows a path *parallel* to the base of the prism itself.

Angle of Minimum Deviation

The angle of minimum deviation can be experimentally shown by letting a pencil of light, in a dark chamber to be refracted by a prism, vertically placed, so as to make a large angle of incidence.

A disc of light can be seen on a screen placed at a certain distance from the prism. If the prism is gradually turned so as to decrease the magnitude of the angle of incidence, we notice that the disc of light on the screen displaces itself to a certain position, from which it returns towards its original one, though the prism, is still rotated in the same direction.

THE angle of *minimum deviation* permits the determination of the index of refraction of any substance, from Fraunhofer formula:

$$n = \frac{\sin.\frac{A+d}{2}}{\sin.\frac{A}{2}}$$

in which, A, is the refracting angle of the prism and d, the deviation, both of which angles are easily determined by the use of a spectrometer.

The correctness of Fraunhofer formula can be deduced from Fig. 12, in which the prism is placed so as to obtain the angle of minimum deviation of the incident ray L I.

It is evident from the figure, that the angles a', a^1, e and f, are equals to each other. In the quadrilater A R N I, the angles A I N and A R N, are both right angles, therefore $A+h$ is equal to two right angles, and the sum of the angle a', a^1 and h also equals two right angles. From this, we deduce that $A+h$ equals $a'+a^1+h$, and A equals $a'+a^1$. But the angle a' is equal to the angle a^1, therefore a' equals a^1, equals $\frac{A}{2}$ and as a' is the angle of refraction

at the surface A B, it results that sin. $\frac{A}{2}$ equals sin. a'.

Furthermore, the sum of the angle $e+g+f$, equal two right angles and so, the sum of the angles $g+d$. Thus, $e+f$ equals d and as e and f are equals, e equals f, equals $\frac{d}{2}$.

Again, the angle a equals $e+a'$, and therefore e equals $a-a'$ but as e equals $\frac{d}{2}$, a equals $a'+\frac{d}{2}$. Now, as seen previously, a' equals $\frac{A}{2}$ and therefore a equals $\frac{A+d}{2}$ and as a is the angle of incidence to the surface A B, it results that sin $\frac{A+d}{2}$, equals sin a.

We obtain thus the equation:

$$\frac{\sin \frac{A+d}{2}}{\sin \frac{A}{2}} \text{ equals } \frac{\sin a}{\sin a'}$$

And as by Snell's Lew, the formula $\frac{\sin a}{\sin a'}$ gives the value of the refracting index of the medium, we have proven that the Fraunhofer formula:

$$\frac{\sin \frac{A+d}{2}}{\sin \frac{A}{2}}$$ equals the refracting Index of the prism A B C.

The value of this equation is great indeed, because, as stated previously, it permits an easy and exact determination of the *index of* refraction of any substance, which value represents the point of departure for all calculations necessary for the adaptations of substances to the requirements of optical instruments.

(To be Continued Next Month)

LECTURES

(Continued from Page 6)

In addition to members of the A.S.C., the following were among the guests present: George A. Blair, John I. Crabtree and Perry Conner of the Eastman Kodak Company; E. O. Blackburn of J. E. Brulatour, Inc.; Dwight Warren, Leonard M. Smith, Jules Cronjager, W. T. Crespinel, Allan B. Nicklin, Harry G. Mason, William W. Nobles and George Spear.

Dr. Hickman and Mr. Crabtree, who delivered the series of lectures, are members of the Eastman Research Laboratories, Rochester, N. Y., where they returned following the A.S.C. open meeting. Both are well-known authorities in photographic scientific circles, having made many important contributions to the profession in the way of treatises on the various phases of motion photography. Mr. Crabtree is chairman of the committee on papers of the Society of Motion Picture Engineers, of which he is a prominent member.

Van Buren in Hollywood

Ned Van Buren, A.S.C., who will be stationed at the Hollywood offices of Eastman in an advisory capacity to co-operate with cinematographers on panchromatic film, has spent the past several months in Rochester working with the laboratories there in preparation for his new position.

PANCHROMATIC NEGATIVE

(Continued from Page 8)

tral energy distribution. Data of this type for the light sources used extensively in motion picture work will be given in a later section.

VISUAL SENSITIVITY

The sensation produced when radiation falls upon the retina has three attributes: brilliance, hue, and saturation.

Brilliance is that attribute of any color in respect to which it may be classed as equivalent to some member of the series of grays ranging between black and white.

Hue is that attribute of certain colors in respect to which they differ characteristically

(Continued on Page 24)

PROJECTION • *Conducted by* EARL J. DENISON

More Projectors Bring Advantage

By Daniel B. Clark, A.S.C.

WORD comes from the East of the rising popularity of the idea of installing three projectors in theatres where heretofore two have been the maximum.

Three as Minimum

It is my firm belief that three should be the minimum number of projectors in any motion picture house. There is little or no luxury in having two projectors in a theatre. They are nothing more than a necessity. When one reel of film is completed on one projector, the second projector must be ready to flash on the next reel immediately.

Mishaps

What happens if something goes wrong on the second projector? Necessarily there must be that delay, reminiscent of the days when "Next Reel Will Follow at Once" was a part of every cinema performance.

No Loss of Time

It is obvious that if a third projector is standing by for any possible emergency, the second reel of film can be threaded in it, and the show will continue without the unwelcome and ancient interruptions.

Increased Efficiency

Again, with the projection load being distributed among three machines, the strain is lessened by one third—and it is my personal belief that this is conducive to mechanical longevity. We may take a homely instance of a pair of shoes or a couple of suits of clothes which are worn day in and day out without relief. In appearance, they never perform their best and their lives are short.

Protection

In film production, we have long since learned the inadvisability of relying on a single camera. The second, or protecting camera, made its debut many years ago. Besides the second instrument, the practice has become, principally among the larger companies, to have one or more auxiliary and additional cameras.

Why It Pays

The money expended on extra cameras is soon repaid by production security and the improved quality of product.

So I believe it would be with projectors. The initial outlay would soon come back in presentation security and improved quality of exhibition.

Auxiliary Instruments Insure Best Presentation, A.S.C. President Believes

Creco Organization Busy *with* Cinema Exhibition Exhibits

Herbert Sylvester, president of Creco Inc., recently chosen consulting engineer to the first annual Motion Picture Exposition to be held in the Ambassador Auditorium, March 7 to 12 inclusive, announces that one of the interesting exhibits will be the latest type radio transmitter, operating under government license and constructed by C. A. Riggs, A. M. I. R. E. of the Creco organization.

This transmitter has an effective range of 200 miles using radiophone transmission and 500 miles using telegraphic for straight communication.

These working distances are the minimum, under favorable conditions, double the distances can be covered.

This is the type of Radio apparatus that was used successfully during the filming of "Old Ironsides."

In process of construction at this time is the intercommunicating or two way radio broadcast portable station, weighing approximately 250 pounds and so arranged that it can be taken on any location.

This surprising feature of the set is that the director or studio executive can keep in constant touch with the studios while on location, or vice-versa according to conditions.

Panchromatic Tests

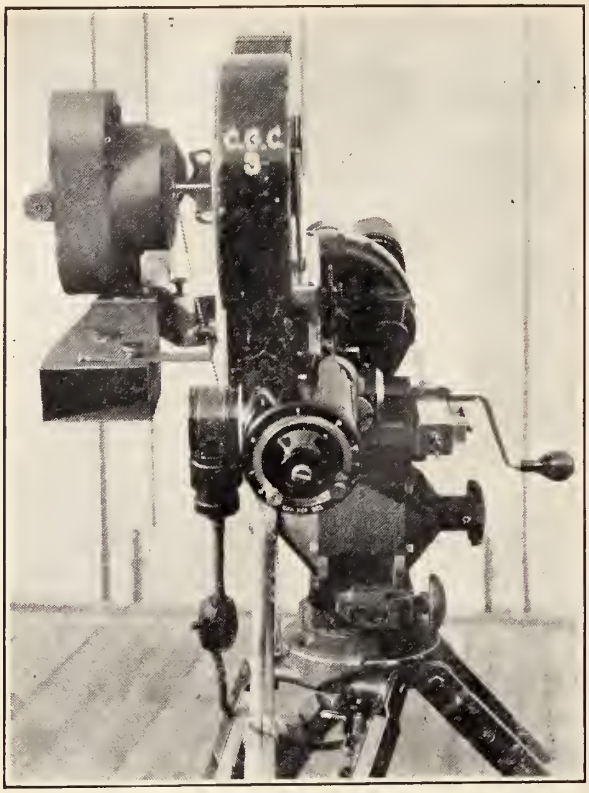
Spectrographic film tests will be on view in the Creco booths during the first annual Motion Picture Exposition, March 7 to 12, at the Ambassador Auditorium.

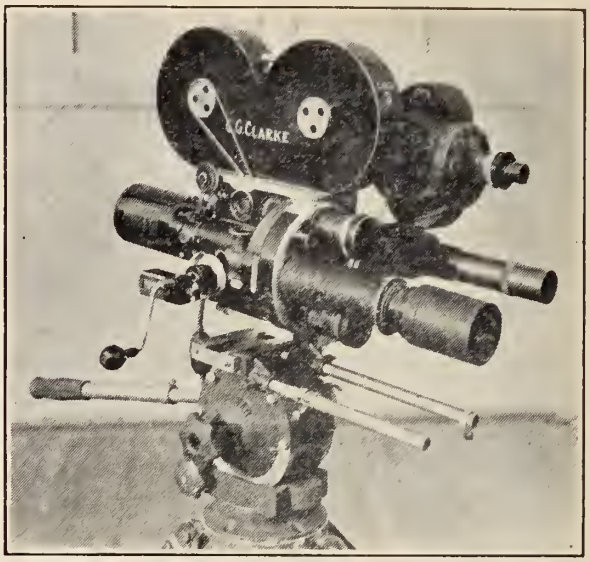
These tests pertain to color values and sensitivity of incandescent lighting on several grades of film stock, being carried out by Glen Gano, panchromatic film expert.

Charles Rosher, A.S.C., is in Hollywood again from a location trip to Lake Arrowhead, and is filming studio scenes for the Fox feature which is being directed by F. W. Murnau, noted German director.

* * * *

Abe Fried, A.S.C., is filming "Bertha, the Sewing Machine Girl," a Fox production, starring Madge Bellamy and directed by Irving Cummings.





Left: Rear view, showing Eyemo mounted on finder of standard Bell and Howell camera.

Above: Front and side view, showing entire combination Eyemo and standard Bell and Howell camera, mounted on Hoefner True Ball tripod head.

Combining an Eyemo and standard Bell and Howell camera, fitted to a Hoefner true ball tripod head, Charles G. Clarke, A.S.C., has an outfit which enables him to get close-ups and long shots simultaneously.

The Eyemo, being mounted in line with the large finder of the standard Bell and Howell, obtains the long shots.

The standard Bell and Howell, fitted with telephoto lens photographs the close-ups.

Both cameras being run with spring and motor power, Clarke can cover any difficult shots, aided by the free-moving true ball tripod head, without the necessity of hand cranking.

The mount for the Eyemo is so arranged that the finder can be swung aside, allowing easy accessibility for winding the spring of the small camera.

(Continued from Page 21)

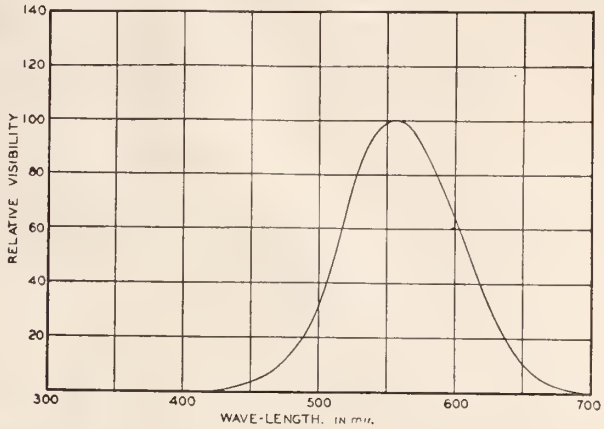
from a gray of the same brilliance and which permits them to be classed as reddish, yellowish, greenish, or bluish, etc.

Saturation is that attribute of all colors possessing a hue which determines the degree of difference from a gray of the same brilliance.

An object in the visual field is visible by virtue of the contrast between it and its immediate surroundings or background. This contrast may be due to a difference in hue (hue contrast), to a difference in saturation (saturation contrast), or to a difference in brilliance (brilliance contrast). In the case of a photographic reproduction such as a print or image projected onto a screen, since all hue and consequently all saturation contrast is absent, visibility of object detail depends entirely on the existence of a brilliance contrast. It follows therefore that the reproduction of detail by the photographic process must be accomplished by reproducing as a *brilliance contrast* that contrast which in the object may be due either to a contrast of *hue, saturation,* or *brilliance.* This being the case the visual function giving the relation between the wavelength of radiation and the brilliance of the resulting sensation is of prime importance. This relationship is known as the visibility function and its form is obtained by measuring the magnitude of the brilliance attribute of the sensation produced when the same radiation intensity of various wave-lengths acts upon the retina. In Fig. 2 this visibility curve is shown. This is obtained by plotting as ordinates the magnitude of the brilliance sen-

(Continued on Page 25)

(Continued from Page 24)



sation produced by the action of *constant energy* intensity of wave-lengths as indicated along the bottom of the figure. It will be noted that the maximum effect (sensation) is produced by radiation of wave-length 556 mu. The effect diminishes for shorter and longer wave-lengths so that at 430 mu and 690 mu the brilliance sensation for the same energy is only one per cent of that for wave-length 556 mu.

The wave-length at which maximum visibility occurs and to some extent the shape of the curve depends vitally upon the energy intensity level used in its determination. The curve in Fig. 2 was obtained at intensity levels such as exist in well illuminated interiors and out-door daylight conditions. At lower intensities the maximum of the curve shifts toward the shorter wave-lengths and if it is desired to apply such data to safelight and dark-room illumination problems the curve as given in Fig. 2 is not applicable.

The visibility curve is of fundamental importance in all problems dealing with the reproduction of visual tone values by the photographic process. Used in conjunction with the data relating to the distribution of energy in the spectrum of the various light sources and curves showing the spectral distribution of light reflected from objects, it provides a means of computing or estimating the relative visual brightness of variously colored objects.

(To be Continued Next Month)

How to Locate Members of the

American Society *of* Cinematographers

Telephone: GRanite 4274

OFFICERS

DANIEL B. CLARK	*President*
L. GUY WILKY	*First Vice President*
FRANK B. GOOD	*Second Vice President*
IRA H. MORGAN	*Third Vice President*
GEORGE SCHNEIDERMAN	*Treasurer*
CHARLES G. CLARKE	*Secretary*

BOARD OF GOVERNORS

Victor Milner	Alfred Gilks	Fred W. Jackman
Daniel B. Clark	Charles G. Clarke	Georges Benoit
George Schneiderman	Glen MacWilliams	E. Burton Steene
L. Guy Wilky	John F. Seitz	Ira H. Morgan
Frank B. Good	King D. Gray	Floyd Jackman

Abel, David—with Warner Brothers.
Arnold, John—with Metro-Goldwyn-Mayer Studios.

Barnes, George S.—with Samuel Goldwyn Prod.
Beckway, Wm.—
Benoit, George—
Boyle, John W.—with Famous Players-Lasky.
Brodin, Norbert F.—with Columbia Studios.
Broening, H. Lyman—with F.B.O. Studios.
Brotherton, Joseph—with Universal.

Clark, Dan—with Tom Mix, Fox Studios.
Clarke, Chas G.—
Cowling, Herford T.—with Eastman Kodak Co., Rochester, N. Y.
Cotner, Frank M.—
Crockett, Ernest—
Cronjager, Henry—

Davis, Chas. J.—with Warner Bros., "Vitaphone," New York City.
Brotherton, Joseph—with Universal.
Doran, Robert V.—
Dored, John—Riga, Latvia.
Du Par, E. B.—with Warner Bros.
DuPont, Max B.—
Dubray, Joseph A.—with Tiffany Prod.

Edeson, Arthur—with First National, Burbank.
Evans, Perry—

Fildew, Wm.—
Fischbeck, Harry A.—with Famous Players-Lasky New York City.
Fisher, Ross G.—with First National, Burbank.
Fried, Abe—with Fox Studios.

Gaudio, Gaetano—with First National, Burbank.
Gilks, Alfred—with Famous Players-Lasky
Good, Frank B.—
Gray, King D.—with Fox Studios.
Griffin, Walter L.—with David Hartford Productions.
Guissart, Rene—Paris, France.

Haller, Ernest—with Robert Kane Productions, New York City.
Heimerl, Alois G.—

Jackman, Floyd—with Fred W. Jackman Productions.
Jackman, Fred W.—directing Fred W. Jackman Productions.
Jennings, J. D.—with Buster Keaton.

Knechtel, Alvin V.—with First National, Burbank.
Koenekamp, Hans F.—
Kurrle, Robert—with First National, Burbank.

Lockwood, J. R.—
Lundin, Walter—with Harold Lloyd Productions, Metropolitan Studios.
Lyons, Reginald—with Fox Studios.

McCord, T. D.—
McGill, Barney—with United Artists, Pickford-Fairbanks Studio.
MacWilliams, Glen—with Fox Studios.
Meehan, George—with Fox Studios.
Milner, Victor—with Famous Players-Lasky.
Morgan, Ira H.—with Metro-Goldwyn-Mayer Studios.
Musuraca, Nicholas—

Norton, Stephen S.—with Tiffany Prod.

Palmer, Ernest S.—with Fox Studios.
Perry, Harry—with Famous Players-Lasky.
Perry, Paul P.—with Famous Players-Lasky.
Polito, Sol—with Ken Maynard, First National.

Ries, Park J.—
Roos, Len H.—Sydney, Australia.
Rose, Jackson J.—with Universal.
Rosher, Charles—with F. W. Murnau, Fox Studios.

Schneiderman, George—with Fox Studios.
Scott, Homer A.—
Seitz, John F.—with Metro-Goldwyn-Mayer Studios.
Sharp, Henry—with Metro-Goldwyn-Mayer Studios.
Snyder, Edward V.—with Pathe, Fine Arts Studio.
Smith, Steve, Jr.—
Steene, E. Burton—with Famous Players-Lasky, San Antonio.
Stumar, Chas.—with Universal.

Tolhurst, Louis H.—producing microscopic pictures, for Pathe.

Van Buren, Ned—with Eastman Kodak Co., Hollywood.
Van Enger, Charles—with First National, Burbank.
Van Trees, James C.—with First National, Burbank.

Warrenton, Gilbert—with Universal.
Wenstrom, Harold—
Whitman, Philip H.—with Scenario Dept., Mack Sennett Studios.
Wilky, L. Guy—

Eastman, George—Honorary Member.
Edison, Thomas A.—Honorary Member.
Webb, Arthur C.—Attorney

Meetings of the American Society of Cinematographers are held as called on Monday evenings in the A. S. C. assembly rooms—
1219-20-21-22 GUARANTY BUILDING
Hollywood Boulevard and Ivar Avenue
HOLLYWOOD, CALIFORNIA

LOYALTY PROGRESS ART

JOHN C. FLINN
PRESIDENT

F. C. MONROE
VICE PRES

WM SISTROM
GENERAL MANAGER

RAYMOND PAWLEY
TREASURER

WM S. HOLMAN
SECRETARY

Metropolitan Pictures Corporation
OF CALIFORNIA
Metropolitan Studios
1040 LAS PALMAS AVENUE
Hollywood
(HO 1431)

December 14
1925

Mitchell Camera Company
6025 Santa Monica Blvd
Hollywood, California.

Gentlemen.

In filming our new Metropolitan Picture "The Million Dollar Handicap", running inserts and road shots played an extremely important part.

The Mitchell #25 shown in the accompanying still lined up with exceptional quickness on the jumping, leaping thoroughbreds used in the many race scenes.

We attribute much of the success of the unusual shots in "The Million Dollar Handicap" to the Mitchell Camera.

Very truly yours

Scott Sidney

SCOTT SIDNEY
DIRECTOR, "THE MILLION DOLLAR HANDICAP"

Vol. VII. No. 12
25 Cents a Copy

March, 1927

American Cinematographer

Published in
Hollywood, California

By American Society
of Cinematographers

Seven Falls Canyon, Colorado. Reproduced from the Location Library of the American Society of Cinematographers, Hollywood.

IN THIS ISSUE:

A.S.C. Closes Banner Year; Panchromatic Negative for Motion Picture Film—By Loyd A. Jones and J. I. Crabtree; A Professional's Notes for Amatuers (Part V)—By Joseph A. Dubray, A.S.C.

Vol. VII MARCH, 1927 No. 12

American Cinematographer

FOSTER GOSS, *Editor and General Manager*

Contents:

An educational and instructive publication, espousing progress and art in motion picture photography.
Subscription: United States, $3.00 a year; Canada, $3.50 a year; foreign, $4.00 a year; single copies 25c.
Published monthly by THE AMERICAN SOCIETY OF CINEMATOGRAPHERS, *Inc.*
Advertising rates on application.
1219-20-21-22 Guaranty Building, Hollywood, Calif. Telephone GRanite 4274

Reliable Advertisers

ADVERTISERS in the American Cinematographer *are reliable.* In their respective lines, they represent the strongest firms *in the* world. They have built up their reputations by *fair dealing.* They give service. They, like their products, *are dependable.*

He who deals with those whom the American Cinematographer is proud to number among its fami y of advertisers, does business with the world's best.

The EDITOR'S LENS • • focused by FOSTER GOSS

New Directors

APPROPOS of the observations of Daniel B. Clark, A.S.C. (printed in another part of this issue) concerning an interview with Jesse L. Lasky appearing in a national fan magazine relative to the fact that no cinematographers have been imported along with foreign directors, the supremacy of the American cinematographer in the world of cinema production once more is demonstrated.

¶ While there may have been any number of reasons as to why foreign directors and stars have been brought to this country, it may truthfully be said that the more prominent of these artists have been induced to come to the United States because they were without peers in their respective lines.

¶ Comparisons are odious, so instead of venturing that such directors were more able their American brethern who might have done the same type of work, let it be said that the newcomers have mastered a directorial field which had not existed in this country. If this premise be sound, can the same thing be said concerning the American cinematographer and his foreign counterpart? Mr. Lasky says no, and he is right. There is nothing in the cinematographic line of which the American camera artist is not the master. Unlike the directors, the foreign cinematographer has not arrived at something which had not existed in this country.

¶ Hence, foreign directors coming to Hollywood studios have American cinematographers. As Mr. Lasky points out, those with whom they worked beyond the seas have been left behind.

¶ Singularly enough, foreign directors, who have been imported because they "had something" not possessed in American production, are those who may be said to have a "cinematographer's mind." Consult the work of Murnau in "The Last Laugh," of Dupont in "Variety" and so on, and we believe that this truth will reveal itself.

¶ This brings us to the conclusion that if it takes some one with a "cinematographer's mind" to introduce new treatment and ideas into American made productions, why not turn to American cinematographers—admittedly the best in the world—for fresh directorial blood?

¶ There is a substantial number of well-known cinematographers who on this very day could step to the directorial chair and become outstanding entities. They are men who have been leaders in their own branch of the profession for many years. Not a few of them have been prominent at the camera since the earliest days of the business. There is not a one of them who, if the producer would give him the necessary freedom in the exercise of his own ideas, but who could turn out a picture as artistically startling and as commercially successful as anything produced in European studios to date. There is no better place to become thoroughly imbued with all that is good in direction than at the camera. The cinematographer is always at the side of the director—where the assistant director may be busy with the mobs; the scenarist, involved with his next script; and the cutter, in the midst of his preceding picture.

¶ It is needless to point out the former cinematographers who have made their mark as directors. Nor need it be said that there are some cinematographers who, in spite of the present-day emphasis which is laid on direction, would never desert the camera for any director's job. In fact, the latter is the attitude of too many cinematographers. Leaders in their own line, they have been forced to the conclusion that, if they did put up the required fight to get their hands on a megaphone in their own right, they would not be given the sway of their own ideas of directorial expression, but would be obliged to produce their material in established studio fashion.

¶ But our conclusion is the same—if some far-sighted producer wants to surprise himself and the rest of the picture universe, let him select some of the cinematographers who have served him so well and give them the opportunity to direct according to their own ideas.

"Talking Pictures"

DURING the barrage of questions fired at him on the occasion of the eightieth anniversary of his birth, Thomas A. Edison is quoted to have said that the future of motion pictures is "onward and upward," and, more specifically, that the current interest in talking films is something of a fad which will pass by in a time.

¶ Although Mr. Edison is not so actively interested in the cinema as he once was, it is safe to assume that the great inventor still knows whereof he speaks on a subject such as this. His own organization had ample experience with talking pictures, and doubtless he draws his answer from his own experiments in this direction.

¶ We believe that the contemporary interest in the talking motion picture is a wholesome thing, and certainly is a medium of good rather than harm. Likewise with the interest in colored motion pictures, which, with the advent again of the auditory film, is not occupying the center of the cinematographically curious stage. We, however, are inclined to agree with Mr. Edison that the theatre-going public is well satisfied, as a general thing, with motion pictures in their now established form. There will and must be improvements, but these can well come without radically altering this form.

¶ Making successful presentations of pictures accompanied by reproductions of the human voice in metropolitan cities and staging similar performances in hamlets and towns present a quite different situation. We do not say that such cannot be effectively

(Continued on Page 24)

PROJECTION • *Conducted by* EARL J. DENISON

Studios Need Good Projection

By Daniel B. Clark, A.S.C.

President *of* A.S.C. Says Studios, *as well as* Theatres Require Best Equipment

IN the January issue of the *American Cinematographer,* the writer recounted some of his experiences encountered when, during location trips, he visited small-town theatres and found, in many of them, worn-out systems of projection still in use.

Since writing the January article, it has dawned on him that the small-town amusement places are not the only ones which house antiquated projection apparatus.

In Hollywood

Strange as it may seem, the condition exists in Hollywood itself as well as in some of the meanest cow towns. And not in the theatres of Hollywood particularly—but in the *studios themselves!*

Projectors for Production

Perhaps it does not occur to many, outside the motion picture capital, just how many projectors are in use in Hollywood. Not so many theatres there as in New York City to be sure, but just pause a moment and think of the dozens of projectors which are a necessary part of the studios, laboratories and the private projection rooms, all of which are located in the motion picture city.

Passable Projection

It behooves me that in some of these Hollywood production quarters—studios included—that acute slip-shod projection is allowed to pass. The attitude, as nearly as I have been able to sift it down, is that the small audiences which view such projection is composed of experts and professionals in the cinema business, and that they, as such, are interested solely in action, direction, etc., all of which they are able to discern without too much regard to the projection.

Cinematographer's Interest

But right here is where the cinematographer comes in—most emphatically.

How many times hasn't he sat in the studio projection room, and heard aspersions cast, forcibly and otherwise, on the quality of the cinematography when the same grade of work was praised in one of the other projection rooms on the same lot?

Recipient of Blame

In the studio, when there is anything wrong with the kind of picture that is being thrown on the screen, there is, of course, only one person to blame—and that is the cinematographer! It is a fortunate knight of the camera indeed that has never had to undergo these tribulations!

Best Is Needed

In all seriousness, it seems to me that facilities in every projection room in the studios should be just as fine and as up-to-date as in the best theatres. Certainly, the studios, of all places, can afford to maintain such equipment. Unlike the small exhibitor, it is not in keeping for them to plead poverty in this respect. And many of them certainly do not, for their projection systems would be a credit any place. But, alas, what worn-out and sorely abused equipment is being imposed on in some quarters! No wonder that, in such places, a fair criterion can never be arrived at on the exhibition of their pictures. The solution is to have a fair testing ground in this respect so that the studio projection will be parallel with that which is attained when the finished picture goes ultimately into the better theatres.

A Testing Point

Thereupon the whole production staff can govern their work accordingly, the laboratory included. If an unsuitable kind of make-up is being applied, it can be changed to the type best suited to get a maximum appearance when the theatre print is finally exhibited before the public, and so on.

Yes, even more than theatres, studios need the best there is in projection.

In Camerafornia...

and News Notes of the Month

JOHN W. BOYLE, A.S.C., is photographing "Topsy and Eva," a Schenck production, starring Vivian and Rosetta Duncan. Del Lord is directing. The cast includes Gibson Gowland, Nils Aster, Imogene Robertson and Noble Johnston. Boyle will go to Lake Tahoe, California, for location scenes.

* * *

George Meehan, A.S.C., is filming "The Midnight Kangaroo" at the Fox studios.

King Gray, A.S.C., is shooting "Not the Type" at the Fox studios.

* * *

Georges Benoit, A.S.C., in association with Nicholas Musuraca, A.S.C., is filming "Belgrano," a feature production based on the fight for independence in the Argentine. Francis X. Bushman and Jacqueline Logan are starred. Al Kelley is directing.

* * *

Robert B. Kurrle, A.S.C., is hard at work on the cinematography in "The Tender Hour," a First National production, which, starring Ben Lyon and Billie Dove, is being directed by George Fitzmaurice.

* * *

David Abel, A.S.C., is filming "The First Auto" at the Warner Bros. studio. Roy Del Ruth is directing. Patsy Ruth Miller is starred.

* * *

Dan Clark, A.S.C., has reached the mid-point in the photography of "The Outlaw of Red River," starring Tom Mix. Lou Seiler is directing the Fox feature.

* * *

Victor Milner, A.S.C., is chief cinematographer on the first American production to star Emil Jannings, German star. Victor Fleming is directing the feature.

* * *

George Schneiderman, A.S.C., is photographing George O'Brien and Edmund Lowe in "Is Zat So?" the Fox production of the stage success.

* * *

Dev Jennings, A.S.C., is in the midst of the photographing of Buster Keaton's latest comedy.

* * *

Gaetano Gaudio, A.S.C., is chief cinematographer on "His Son,' a Sam Rork production for First National. Lewis Stone is starred. John Francis Dillon is directing.

* * *

Joseph Brotherton, A.S.C., is finishing shooting "Blake of Scotland Yard" at Universal City.

* * *

Ross Fisher, A.S.C., is shooting "The Sunset Derby," a First National production, featuring Mary Astor and Buster Collier.

Charles G. Clarke, A.S.C., is shooting "The Motor Maniac," starring Red Grange at the F.B.O. studios. Sam Wood is directing from an original story by Byron Morgan, who is remembered as the author of the Saturday Evening Post automobile racing stories which served as starring vehicles for Wallace Reid. This is the same director-author-star-cinematographer combination which made the successful "One Minute to Play"—Grange's debut into motion pictures.

* * *

Norbert Brodin, A.S.C., is filming "The Clown," a Columbia production.

George Barnes, A.S.C., is chief cinematographer on the Samuel Goldwyn production, "King Harlequin." Ronald Colman and Vilmy Banky are co-starred.

* * *

Charles Rosher, A.S.C., has concluded the cinematography on "Sunrise," F. W. Murnau's first American directorial effort. Critics who saw the preview of the Fox production featured the photography of Rosher in their reviews.

Charles Van Enger, A.S.C., is filming the First National production, "Diamonds in the Rough," starring Milton Sills with a cast numbering Natli Barr, Charles Gerrard, Edward Peil and John Miljan. Charles Brabin is directing, with Ray Rockett in charge of the production management.

* * *

Frank B. Good, A.S.C., has completed shooting of "The Bugle Call," starring Jackie Coogan at the Metro-Goldwyn-Mayer studios.

* * *

Gilbert Warrenton, A.S.C., will leave shortly on a location-hunting trip preparatory to the filming of Universal's "Lea Lyon," on which, starring Conrad Veidt, the A.S.C. member will be chief cinematographer.

* * *

*ReginaldLyons, A.S.C., has finished the cinematog*raphy *on "The Holy Terror," a William Fox production starring Buck Jones.*

* * *

Harry Perry and Paul P. Perry, both A.S.C. members, are photographing studio sequences of "Wings," on which the former is chief cinematographer.

E. Burton Steene, A.S.C., is still occupied with Akeley sequences on the production.

* * *

Edward J. Snyder, A.S.C., is making preparations for the filming of the next Pathe serial to star Walter Miller and Allene Ray.

* * *

Charles Stumar, A.S.C., is still busy with the cinematography on Universal's production of "Uncle Tom's Cabin," which Harry Pollard is directing.

A.S.C. Closes Banner Year

Coming Fiscal Year *to* Be Bigger *than* Past, However, Says Chief *of* Cinematographers

(The following interview, written by the editor of this publication appears in a current number of EXHIBITORS HERALD*).*

At the close of what probably has been the most successful year in the history of the American Society of Cinematographers, Daniel B. Clark, president of the A.S.C., predicts an even more eventful period for the cinematographic branch of the industry in the twelve months that are to come. The A.S.C. fiscal year of 1927-28 begins during the first week in April.

"The photographic side of the motion picture business," Clark states, "has made monumental strides during the twelve months that is coming to a close. We have seen the advent and general acceptance of new film products and practices such as panchromatic film, faster lenses, more expressive camera effects and so on. Anticipating and encouraging these progressive steps has been the American Society of Cinematographers, so that when the time came for their adoption into practical production, every A.S.C. member had been theoretically and practically grounded in their use and application—all of which has meant a saving of thousands of dollars to producers in needless experimentation and the attendant waste.

Future Is Greater

"But as great," the A.S.C. president continued, "as the achievements indicated in the foregoing have been, they merely stand as the foundation for newer and greater accomplishments that are to be brought about during the coming fiscal year of the A.S.C. It is the policy of this Society to look ahead for and to anticipate the improvements in the cinematographic phases of the art, and when the time is ripe for the introduction of such improvements it is our policy to be ready to deal with them in the most efficient manner possible.

Have No Peers

"That the thoroughness of the American cinematographer is appreciated more than ever before is shown in some measure in an interview with Jesse L. Lasky appearing in a current issue of a national fan publication. The gist of the interview is that while dozens of foreign directors and artists have been brought to this country to inject new ideas into film productions, no such importation of cinematographers, who worked with these people, has been made. The answer is that the preeminence of American cinematographers generally is inapproachable, and that nothing which the most complex European directorial mind could want visualized cinematographically is beyond the ken of our camera artists. We were more than glad to see the producers recognize this fact. And I say all of this with the utmost respect for the photographic efforts of the cinematographers across the Atlantic. Following the unproductive period during and immediately after the war, the results which they have been able to attain can only be a subject for admiration.

"Some idea," Clark concluded, "of what the coming seasons will bring in cinematography may be gained from 'Sunrise,' directed by the eminent German director, F. W. Murnau, when it is released. Charles Rosher, a member of the A.S.C., was chief cinematographer on the feature, and those who have seen the preview state that, photographically it is Rosher's masterpiece to date—and that means a great deal to those who are familiar with cinematographic history!"

Martin J. Quigley Addresses Cinematographers *at* Meeting

Martin J. Quigley, editor and publisher of *Exhibitors Herald,* was the guest of honor and principle speaker at the open meeting of the American Society of Cinematographers, held in the A.S.C. assembly rooms, Monday night, February 28th.

Quigley emphasized the importance of cinematographic and scientific progress in the motion picture industry, praising the A.S.C. for the prominent part it has played therein. He pledged the support of himself and of his publications to the A.S.C. program for aiding in continuing such progress. Quigley was accompanied at the meeting by Ray Murray, manager of the West Coast offices of *Exhibitors Herald,* and by Harry Nichols, special representative of that publication.

Following Quigley's talk, Gustav Brock, of New York City, exhibited a sample reel of colored photography.

Panchromatic Motion Picture Film Negative

Second Number *of* Series Based *on* Communication *of* Eastman Research Laboratories.

By Loyd A. Jones, and J. I. Crabtree

Consider Spectral Composition *of* Radiation *from* Different Light Sources.

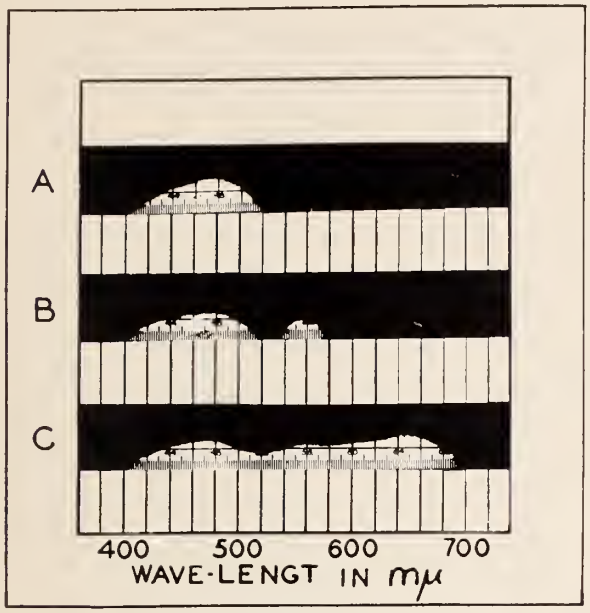


Figure 3

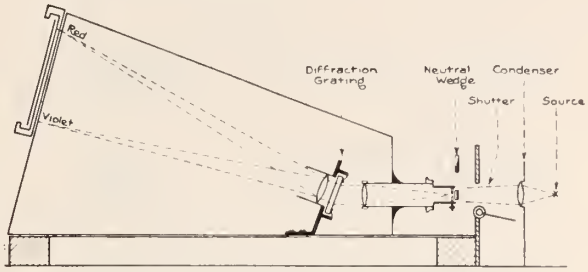


Figure 4

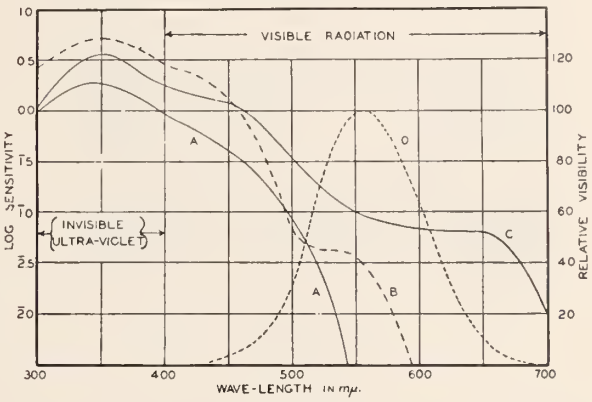


Figure 5

(Continued from last month)

AS STATED in the introduction, photographic materials vary enormously in their sensitivity to radiation of different wave-lengths. In Fig. 3 are reproduced three spectrograms which show qualitatively the spectral sensitivity for three typical classes of photographic materials. These spectrograms are obtained by use of small spectrograph designed especially to test the color sensitivity of photographic materials. A source is imaged on the slit of the instrument by means of a condenser lens. The dispersing element is a diffraction grating, thus giving a normal spectrum, that is one in which equal wave-length intervals are represented by equal intervals on the photographic plate.

Ruled Scale Plate

The plate holder is provided with a ruled scale plate so that a scale of wave-lengths is automatically impressed upon a photographic plate when the exposure is made. A wedge of neutral gray glass is placed over the slit of the instrument so that the exposure incident on the photographic materials being tested decreases across the spectrum. In this way an indication of the variation in sensitivity throughout the spectrum is automatically obtained. The light source used is an unscreened acetylene flame. Since the amount of energy radiated by the acetylene flame at different wave-lengths is not constant but increases rapidly with increasing wave-length (see Fig. 8) it is evident that the curve obtained by outlining the light portion of these spectrograms is not the true spectral sensitivity curve for the material but the resultant obtained by compounding the spectral distribution of energy for the source with the spectral sensitivity of the photographic materials.

However, since the same light is used for all three materials they do show relative color sensitivity. It will be noted in case of the ordinary non-color sensitive material (A, Fig. 3) that the sensitivity becomes practically zero at 530 mu. It follows therefore that any object reflecting radiation of wave-length longer than this value no matter how bright it may appear visually will be rendered as a very dark or black object by such materials. The band or green sensitivity conferred by the sensitizer used in making the orthochromatic material, (B, Fig. 3) has a maximum at 560 mu and ends at approximately 580 mu. It is evident therefore that this material since it responds to green light will reproduce green objects more nearly in their true position on the visual tone scale. In case of the panchromatic material (C, Fig. 3), however, the sensitivity extends beyond 700 mu. the limit of the visible spectrum. This material is sensitive therefore to all wave-lengths of radiation which produce the visual sensation of light and it is only by the use of material such as this that a scene containing colored objects can be rendered in correct visual tone value.

Selective Absorption

The apparent decrease of sensitivity of all of these materials on the short wave-length side of 480 mu. is due

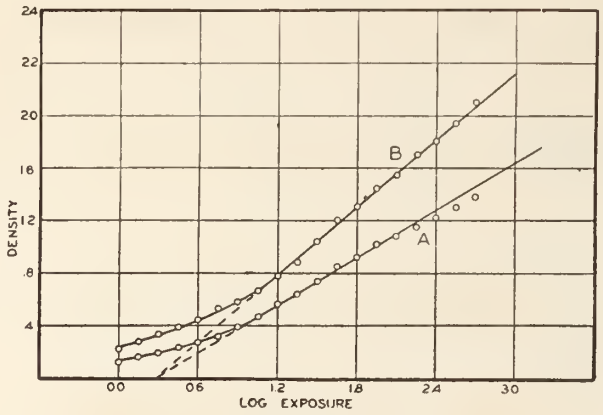


Figure 6

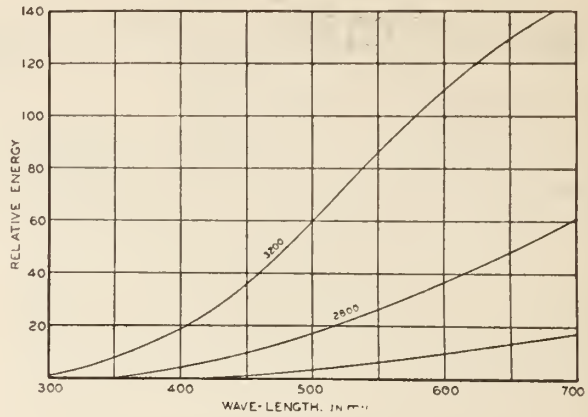


Figure 8

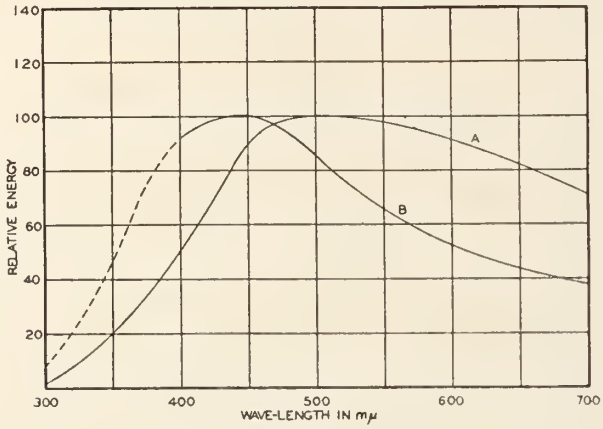


Figure 7

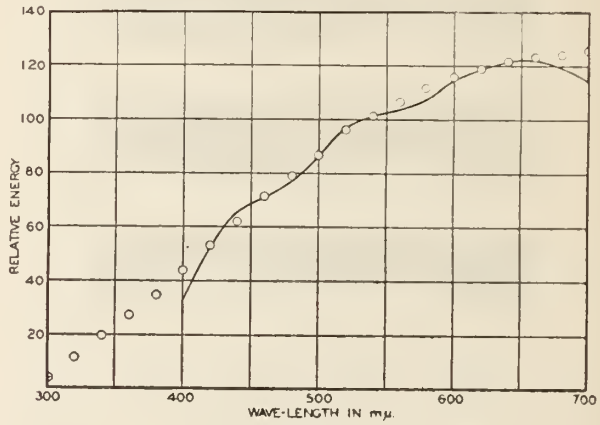


Figure 9

to the selective absorption in the gray glass wedge used over the slit of the spectrograph. Actually this sensitivity does not decrease but rather increases in all cases, at least to 350 mu. Since the glass used in making photographic objectives absorbs practically all radiation less than 350 mu. it is not important from the standpoint of motion picture work to know the wave-length sensitivity relation beyond this point.

For Quantitative Purposes

While spectrograms such as are shown in Fig. 3 are useful in judging relative sensitivity they are not satisfactory for quantitative purposes. For such requirements a curve showing the relation between sensitivity, defined in some suitable terms, and wave-length of radiation is necessary. Unfortunately satisfactory data relative to materials used in motion picture work are not at present available. Work on these materials is in progress at present and it is hoped to be able to publish precise data of this nature in the near future. Some data, in the reliability of which we feel great confidence, relative to materials of very similiar spectral sensitivity are, however, available and in Fig. 5 they are given in graphic form. The measurements were made with great care using a monochromatic sensitometer[2] especially designed for this purpose.

Sensitometric Method

The sensitometric method of measuring the characteristics of the photographic material is illustrated by the curves shown in Fig. 6. The samples of the material to be tested are exposed in a sensitometer which is an instrument designed to impress on different areas of the material exposures of different magnitudes. It is customary to use a series of exposures increasing according to a logarithmic scale (1, 2, 4, 8, 16, etc.). Upon the development this exposed strip yields a series of silver deposits differing in density. The density, that is the light absorbing power, of the various deposits are then determined measuring the amount of light transmitted by them. If the intensity of the light incident upon such a deposit be represented by I_0 and the intensity of that transmitted by the deposit by I_1 then:

T (transmission) $= I_1/I_0$
O (opacity) $= I/T = I_0/I_1$
D (density) $=$ log o $=$ log I/T.

The characteristic curve of the material (illustrated by the curves in Fig. 6) is obtained by plotting density as ordinates against the logarithms of the corresponding exposures. If the series of exposures given in the sensitometer be of the logarithmic type then the logarithms of these numbers fall at equally spaced intervals on the X axis.

A curve connecting the points thus established gives the relation between density and log exposure for the particular time of development used in developing the test strip. These curves in Fig. 6 were obtained on Eastman Panchromatic Negative Film. Development was carried out in MQ 80 at a temperature of 20°C, curve A being developed for 4 minutes and curve *B* for 8 minutes. It will be noted that a large portion of these curves are represented to within the limits of experimental error by

2. Jones, L. A. and Sanvik, Otto. Spectral Distribution of Sensitivity of photographic materials. J. O. S. A., 12, Apr. 1926, P. 401.

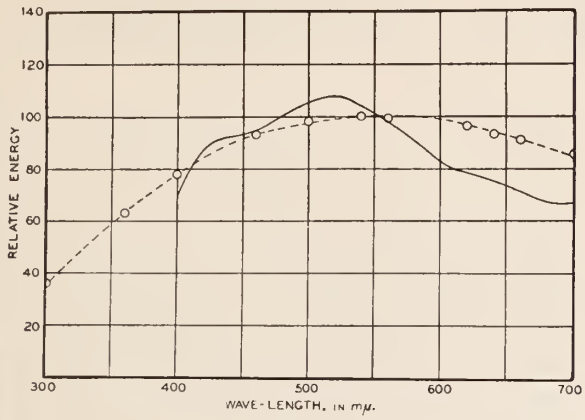


Figure 10

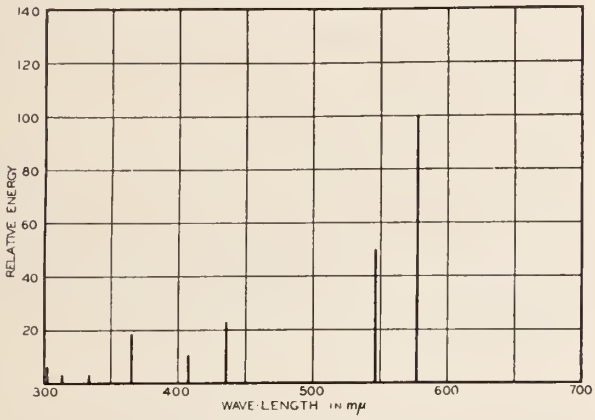


Figure 12

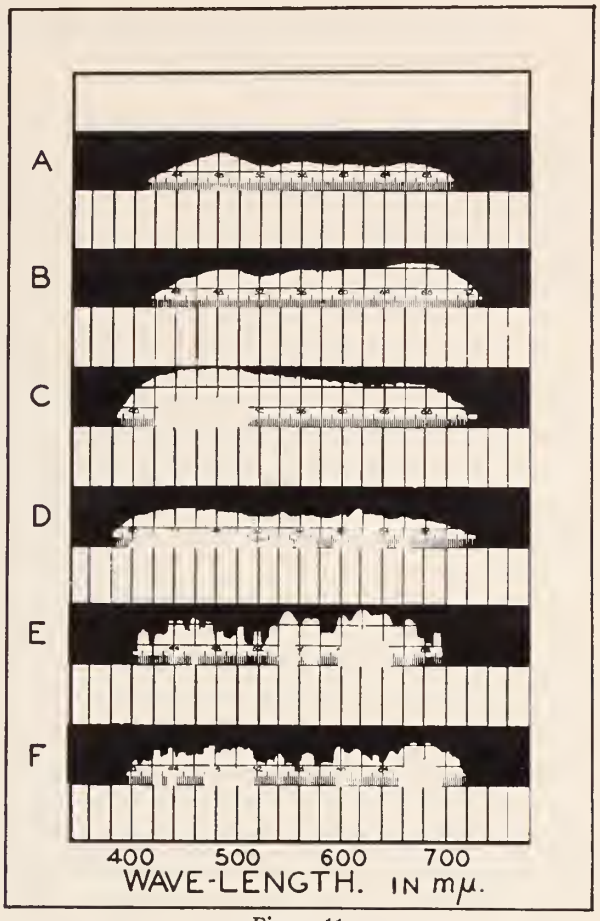


Figure 11

straight lines. The angle which the straight line makes with the log Exp. axis depends upon the time of development as shown by the curves. It is evident that any given exposure may result in a density of variable magnitude depending upon the time of development. In specifying the sensitivity of the material it is not satisfactory therefore to express this in terms of a density produced by a given exposure without defining the extent to which development is carried. It is customary to specify the speed or sensitivity of a photographic material in terms of the exposure value at the point where the straight line portion of the curve extended cuts the long Exp. axis. It has been found in the case of many photographic materials when developed in solutions containing relatively small amounts of bromide, that this exposure value(which is termed the inertia) is independent of the extent of development. The inertia value therefore is in these cases independent of development and serves very satisfactorily as a means of specifying sensitivity. Since the value of inertia decreases as the speed of the material increases it is necessary to define sensitivity as the reciprocal of the inertia. In practical sensitometry it is desirable to specify the sensitivity of a material in terms of exposure expressed in visual unity. The sensitometric exposures are therefore defined in terms of visual candle meter seconds of light of some definite reproducible spectral composition. The most suitable standard of light quality for sensitometric purposes is noon sunlight.

Absolute Energy Units

Due to the difficulties involved in measuring the brilliance factor of the sensation excited by the action of a monochromatic radiation on the retina, it is more satisfactory for the purposes of specifying the spectral sensitivity of a photographic material to express the exposure in terms of absolute energy units. In the monochromatic sensitometer referred to, the material under test is exposed to extremely narrow wave-length bands of radiation. By means of a suitable energy measuring device such as the thermopile the energy incident on the plate is determined. Exposure may be expressed therefore in terms of ergs per sq. cm. It has been found that the slope of the characteristic curves obtained with a fixed time of development depends upon the wave-length of the radiation to which the photographic material was exposed. Hence if the sensitivity for different wave-lengths of radiation be experssed in terms of the inertia, that is the exposure value at which the straight line extended cuts the log Exp. axis, the result obtained is not a true indication of the relative density producing power of the different wave-lengths. In order to eliminate this objection it is necessary therefore to develop the strips exposed at various wave-lengths for different times so as to obtain characteristic curves of the same slope. If now the exposure be determined at which each wave-length gives a fixed density (such as D=1.0) a satisfactory specification of spectral sensitivity is ob-

(Continued on Page 21)

Suggests Unique Crediting Method

Cinematographers Should Sign Print *at* Start *or* Finish, Says T. O. Service

Under the heading, "It's Time Cameramen Were Signing Their Stuff," T. O. Service, in the current studio section of Exhibitors Herald, advances a novel suggestion for accrediting cinematographers in productions which they photograph. Service illustrates his idea with two stills. However, his article is self-explanatory, and reads in part as follows:

It is some time since I have written anything for this section of the HERALD—which is another way of saying it is some time since I have had anything of seeming importance to say to the residents of Hollywood—but I believe that at least one of the several suggestions I am about to offer without charge or assessment of any character is worthy of the space it will occupy and the minute or two of your time required to read it. Therefore I shall place that suggestion first and shall address it principally to the American Society of Cinematographers.

I have watched with considerable interest the campaign of this organization to obtain for cameramen a proper recognition, a recognition effected by suitable identification of each individual with the work that he does. As I have heard of no violent opposition to this campaign from anyone with a defensible basis for the same, I conclude that the real reason for lack of such recognition is lack of a practical and standardized means of making the identification desired. I believe I am about to describe such a means.

Should Sign Closing Scene

The commercial photographer, the maker of portraits, assures himself of proper credit by signing his work in white in the lower right or left hand corner of the portrait. My suggestion is that motion picture photographers do likewise, signing their pictures as the artist signs his canvas. I believe such a signature should appear on the closing scene of the production, where it will be seen after the cinematographer's work has been viewed and the viewer can form a definite opinion of his work. It might appear, otherwise, upon the first scene of the picture or upon the main title, in the latter case the white signature being faded in and brought up to white as the main title is darkened out. It has been my experience, however, that identities learnd after the picture has been seen are remembered much better than those learned (rather scanned) before.

To clarify this suggestion, the art department has reproduced two stills from "The Last Trail," a Fox picture starring Tom Mix, upon which has been written the name of Daniel B. Clark, the cinematographer, in the manner it would appear on the screen if this means of identification were in use. One of these stills is supposed to be the opening scene, the other the closing one. If the signature were used on the opening scene, it would fade out after a few seconds; if on the closing scene, as I believe best, it would fade in after the clinch had gone to a draw and while the central figures were inactive.

This suggestion is advanced on its merits and I make no further plea for its adoption. Should it become necessary, however, I shall be pleased to refute any and all arguments against it to the satisfaction of whoever may be concerned.

Cowling Writes Article *for* *N. Y. Times* Magazine *on* Kashmir

Herford Tynes Cowling, A.S.C., blossoms forth once more as a big-league author with the article, "A Modern Ruler in the Vale of Kashmir," which appeared in the February 27th edition of the *New York Times Magazine.*

In the article, the A.S.C. member deals with the new regime in the state of Kashmir, where, it will be recalled, he sojourned for many months, first, prior to his expedition into Tibet where he was the first white man to take a motion picture camera and, second, when he returned to Kashmir at the request of Sir Hari Singh to film the coronation of the latter as ruler of the Indian principality. This assignment stands as one of the most unique in film annals, inasmuch as the films which resulted therefrom were intended solely for the private archives of the famous Sir Hari, who paid Cowling a record retainer to execute the commission.

Cowling is now connected with the Eastman Kodak Company, Rochester, N. Y.

Amateur Cinematography

A Professional's Notes *for* Amateurs

Part V

By Jos. A. Dubray, A.S.C.

Cites Discoveries *and* Experiments Revealing Secrets *of* Colors *of the* Spectrum

IN the explanation of the phenomena of refraction, we have considered only rays of *monochromatic light.* This phenomena is much more complex, if we study the behavior of a pencil of composite light.

To Sir Isaac Newton, we owe the portentous discovery of the composite nature of white light, such as the light of the sun.

By letting a pencil of sunlight be refracted by a glass prism, we notice that, besides the change of direction that the ray suffers according to Snell's Law, the pencil is decomposed in several kinds of light and form on a receiving screen a band of different colors, which most harmoniously blend into each other, forming thus an innumerable variation of tints, out of which, Newton has selected the seven most predominant ones, viz: *Violet, Indigo, Blue, Green, Yellow, Orange and Red.*

The colored band thus obtained is called the *solar spectrum,* and the phenomena itself was given the name of *dispersion.*

Simple

Each and every one of the colors of the spectrum, if isolated and forced to pass through a glass prism, follows the law of refraction, but *is not decomposed into any other kind of light,* from which fact, the conclusion is reached that the colors of the spectrum are *simple.*

Furthermore, if all the colors of the spectra are reflected with the aid of mirrors so as to force them to meet at a certain one point, *white light* is obtained, this experiment proving conclusively the composite nature of white light.

Sunlight

Now, let us consider a pencil sunlight, traveling towards the earth, at the original speed of 186.000 miles per second.

All the colored rays forming this beam of light will travel in a straight line, from their origin, until they reach the earth's atmosphere.

In entering the medium *air,* they will be refracted and this refraction will be gradually more pronounced the closer they come to the earth surface, because of the gradual increase of the density of the medium *air,* from its upper to its lower layers.

Apparently, the density of *air,* even at its maximum, does not produce sufficient dispersion to be noticeable, but, if we permit this pencil of sunlight to enter a denser medium, such as a glass prism, the velocity of each colored ray suffers a retardation, which is more pronounced, the smaller is the wave-length of the ray.

This difference of retardation creates, at the surface of the incident surface of the prism, an infinite number of disturbances, each corresponding to a ray of a particular color. Each colored ray, is thus refracted by the medium of the prism, following a certain direction according to its wave-length, thus departing from the other rays of different wave-length.

Refracting Index

In other words each one of the colored rays forming the pencil of white light, possesses its own refracting index, the *violet* being the most, and the *red* the less refrangible rays.

These different colored rays travel then within the prism, each following a straight line, but a different direction, the *violet* being deflected towards the *base* of the prism, more than the *red.*

At the surface of emergence, the rays are again refracted into the less denser medium *air* creating as many points of disturbance as there are rays and as these points of disturbance are definitely separated from each other, they emerge according to their new position, and when collected on a screen, they form the colored band called *spectrum.*

Mixing Colors

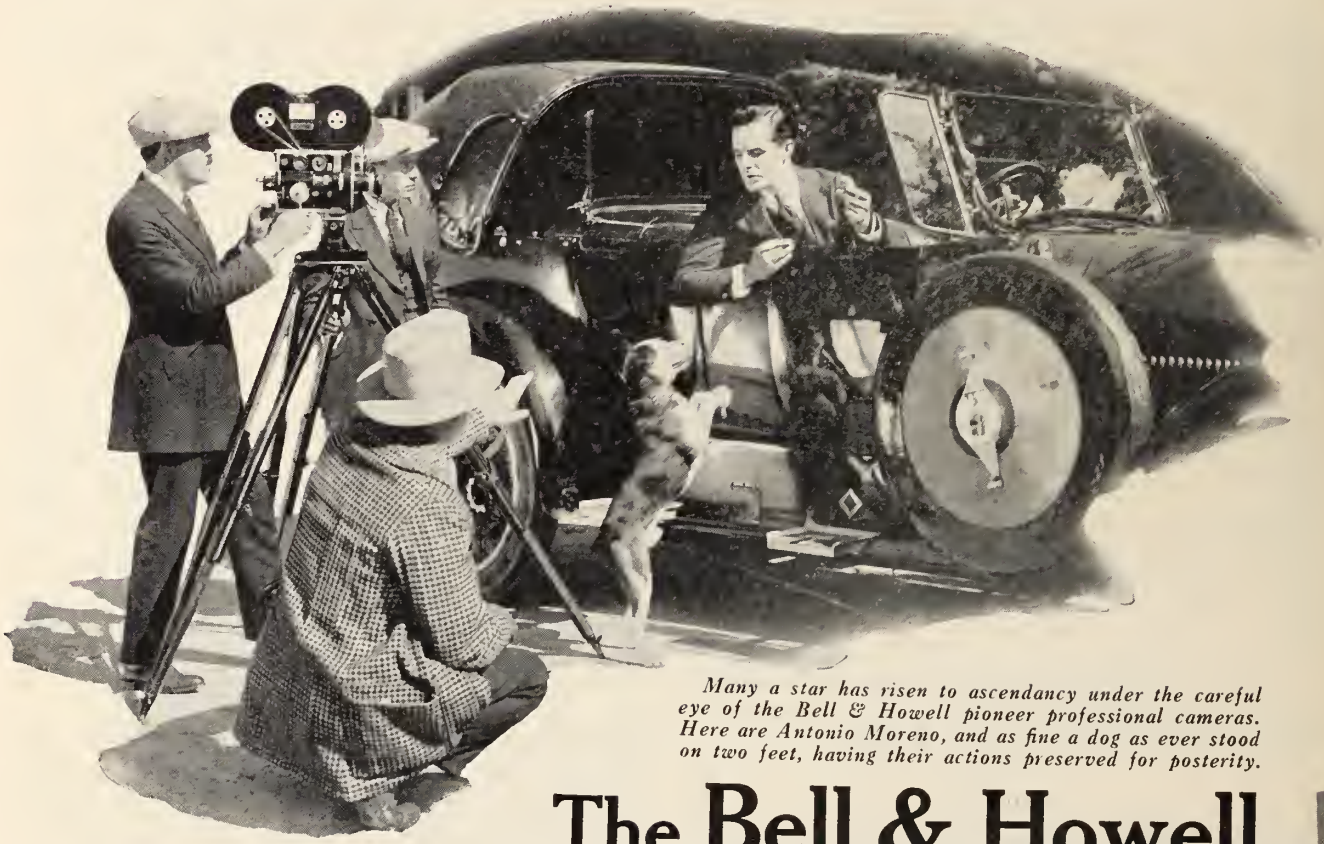
IT is evident that the different colors forming the Spectrum, can be collected separately, and mixed, by pairs, independently to the position they occupy in the spectrum.

It has been found that *white* can always be obtained by mixing *two* of the *spectral colors*

(Continued on Page 16)

Bell & Howell Came

They have grown up with the motion picture indu



Many a star has risen to ascendancy under the careful eye of the Bell & Howell pioneer professional cameras. Here are Antonio Moreno, and as fine a dog as ever stood on two feet, having their actions preserved for posterity.

The Bell & Howell Pioneer Standard

IN the past 20 years, millions and millions of dollars worth of first-water film productions have been photographed by Bell & Howell cameras.

Colossal investments in settings, fortune-per-minute casts and story masterpieces have been, in effect, guaranteed and insured by the use of these cameras of proven dependability.

Bell & Howell have consistently appreciated that unless the camera faithfully records all that is enacted before it, the hundreds of thousands of dollars invested in the film production will have been thrown away.

This consistency has been recognized by the industry, and evidenced in its patronage. Nearly every worth-while producer, the world over, uses Bell & Howell cameras.

Bell & Howell Standard Cameras never become obsolete, no matter how old. Basically patented Pilot Register Movement and interchangeable detail parts keep them constantly up to date. Thus the newest improvement can be quickly incorporated in the oldest Bell & Howell Camera. Here is an original investment that will require no duplication. For complete description and particulars write address below.

STANDARD BELL & HOWELL COMPANY CINEMACHINERY

BELL & HOWELL

1805 LARCHMONT AVENUE

New York—220 West Forty-Second Street Hollywood—6324 San

as Know Your Needs

y. They can be relied upon for the years to come

A handsome little professional camera.

MAKES MOVIES AS THE EYE SEES

Eyemo

REGISTERED

Standard Automatic

Professional Camera

for Field and Stunt Use.

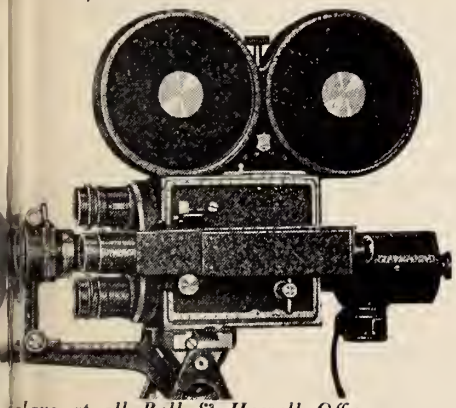
AROUND the big studios never a pet has been so popular as this Bell & Howell 7-pound automatic professional camera—EYEMO. It gets to be a habit—like a watch or a pocket handerchief.

Cecil B. DeMille used it for special effects in "The King of Kings." In "One Minute to Play" it brought out some new football angles. It is used in productions by Famous Players-Lasky, Universal, Warner Brothers, Metro-Goldwyn-Mayer, Chaplin, Christie and many others.

Pathe, International, Fox, Kinograms, Universal and others use it for the fast scoops in news reel work.

EYEMO (the model illustrated) works at either normal speed or double speed. Takes 100 foot daylight loading rolls, or 120 feet darkroom load, standard film. Works automatically and is professional in every respect.

When you want to catch some fast-breaking action in a hurry, shoot from some break-neck angle, record locations, or take some private movies of your own, you'll get just what you want with an EYEMO in your hand. Write for fully descriptive circular.



ıslays at all Bell & Howell Offices

"Now just what do you call this?" asks Wallace Beery.

"Here's the idea," explains Charley Chase—"up to your eye, press a button, and you get standard pictures in an instant."

"Well, well!" says Wallace. "Ain't that something!"

L COMPANY

ESTABLISHED 1907

CHICAGO, ILLINOIS

Monica Blvd. London—(B.&H. Co. Ltd.)—320 Regent Street

Amateur Cinematography

(Continued from Page 13)

and two such colors that give *white,* are called *complementary* to each other.

Thus: *red and greenish blue* are complementary as *blue* and *yellow, orange* and *deep blue* (Prussian Blue), *greenish yellow* and *violet,* etc.

It must be borne in mind that, in mixing *spectral colors,* we add one tint to another. The case is entirely different when mixing *pigmentary colors.*

A substance appears of a certain color, because it *absorbs* a portion of the colored rays, and transmits or reflects the remainder. Suppose, for instance, a yellow substance. This particular substance appears yellow to the eye because it absorbs all of the red rays, partially the orange, partially the greens, and *all* of the *blues, indigo* and *violet.* The predominant rays that it transmits or reflect being yellow, the substance appears of this color and of such graduation that corresponds to the amount of other colors that it transmits or reflect in less quantity. Similarly, a substance will appear *blue* if it absorbs *all* of the *yellow* and *red* and *violet.*

Now if we mix a yellow substance and a blue one, each will absorb the predominant color of the other, and the result will be a *substraction* of rays, the ones being finally transmitted or reflected being the colors only partially transmitted or reflected by both substances before the mixture.

Thus:

Pigmentary—*Blue* and *yellow* form *green* by *substraction* of colored light.

Spectral—*Blue* and *yellow* form *white,* by *addition* of colored light.

Science of Spectroscopy

NEWTON'S great discovery led the way to a thorough study of the Solar Spectrum, and to Fraunhofer, is due the greatest advance in the Science of Spectroscopy.

Fraunhofer

Fraunhofer improved greatly Newton's apparatus by collecting the sun rays through a narrow slit in the wall of a dark chamber and by placing a convergent lens between the slit and the prism. He thus obtained a spectrum of great clarity and definition.

In the course of his studies, Fraunhofer discovered that the solar spectrum, is not *con-*

tinuous, but intermingled by *black lines* and that the position of these lines is always the same, even if the refracting medium of which the prism is made is different.

Through patient and savant investigation, Fraunhofer discovered the existence of over *seven hundred* such lines and named the *eight* most decidedly marked ones, by the letters of th alphabet A, B, C, D, E, F, G, H; the line A being the line found in the red portion of the spectrum; the line H, the one found in the violet; and the other lines belonging to the intermediate spectral colors.

Kirchoff

Although Fraunhofer devoted considerable and fruitful work to the study of the spectral lines, their real significance was discovered by Kirchoff. This eminent physicist, while experimenting with the brilliant monochromatic yellow light produced by burning sodium in a colorless flame, permitted the white light originated by incandescent lime to pass through the yellow sodium light.

He produced thus a spectrum in which a dark line corresponding to the D line of the solar spectrum was plainly visible.

Completing his experiment, Kirchoff found that this dark line corresponded exactly to the *bright* line formed by the sodium flame, and the conclusion of this remarkable fact is that *the vapor of any element has the power of absorbing rays of the same refrangibility as that which it emits; and the ratio between the powers of absorption and emission, is constant.*

The constancy of this ratio permitted Kirchoff to detect the presence of an element even in the most minute quantities.

One two hundred millionth of a grain of sodium is sufficient to provoke the appearance of the D line in the spectrum.

This phenomena is not confined to the sodium flame alone. All elements when volatilized by a non-luminous flame produce a *bright* line in a certain region of the spectrum and if the white light of glowing lime is allowed to pass through the light of the element, a *dark* line takes the place of the bright one.

The co-incidence of such lines permitted Kirchoff to emit a theory of the constitution of the Sun.

Kirchoff's work gave great impulse to the science of spectroscopic analysis, through which several elements have been discovered such as Rubidium, Coesium, Thallium, Indium, Gallium and the new gases Argon, Hellium, Kripton, Neon and Xenon.

SPECTROSCOPE

WITH the aid of the *spectroscope,* which is the name given to the apparatus used for spectroscopic analysis, the spectrum of all substances have been studied and mapped out with extreme care.

The light emitted by an incandescent solid gives a *continuous* spectrum; that is, a spectrum in which the colors blend into each other, without any interruption nor any dark lines.

Ignited liquids also give a continuous spectrum, while gases, give a *discontinuous* one.

This phase of his work, which has proven light emitted by the incandescent gases that constitute the envelope of the Sun.

If the slit of the spectroscope is illuminated by *white light,* such as the light of the Sun, or such light as those produced by incandescent magnesium or lime or acetylene, etc., and a colored glass or liquid is placed between the slit and the prism, and absorption spectrum is obtained, so called because it is the spectrum given only by the lights not absorbed from the white light by the colored glass of liquid.

WAVE-LENGTH OF LIGHTS

AFTER he had amplified and improved Newton's experiments, Fraunhofer devoted himself, as a natural sequence to his work, to the measurement of the wave-length of the different lights composing the spectrum.

This prase of his work, which has proven of tremendous importance, is related to investigations and experiment previously made by other scientists, namely by Grimaldi, first, and Fresnel and Young, later.

Diffraction

Grimaldi was the first to notice and name a phenomena of light, called *diffraction.* Fresnel and Young explained it, through the principle of *interference.*

If two sources of monochromatic light are produced at a very small distance from each other, and their rays are made to meet each other under a very narrow angle, a *discontinuous* patch of light may be seen on a screen placed a little beyond the point of meeting. If one of the sources of light is extinguished, the other source will illuminate the screen homogeneously, but when the two lights are permitted to function, there appear a series of dark bands of fringes, very well defined.

Grimaldi, who first noticed this phenomena, drew the conclusion that light, added to light, produces darkness. It was only when Fresnel and Young undertook to explain this phenomenon that its full importance was recognized.

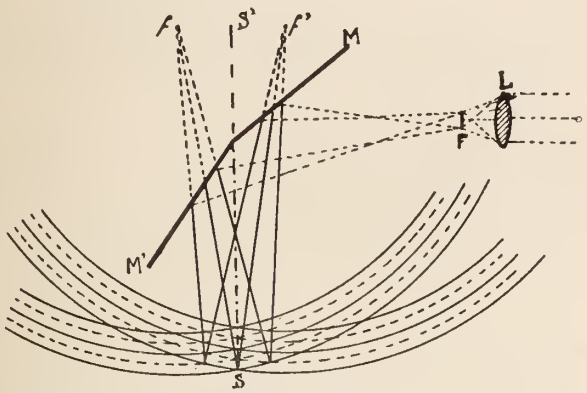


Figure 14

Fresnel's Experiment

Fresnel permitted a beam of sunlight to enter a dark room through a narrow slit and rendered this beam monochromatic by forcing it through a plate of red glass.

With the aid of a cylindrical lens L, he reduced the pencil of light into a narrow line at F of the figure.

The two mirrors M and M', placed at a very obtuse angle, both reflect the light of the line F as if proceeding from two distinct sources f and f'. (For the sake of clearness, the figure exaggerates the distances between these two points).

The points f and ' become thus centers of disturbance, and the rays they emit meet thus under an extremely small angle.

The wave fronts produced according to the undulatory theory of light meet then as illustrated. Let each one of the fully drawn arcs be at one wave-length from the next, and the dotted arcs mark half of a wave-length.

If a screen is placed at S, perpendicular to S S', it will be noticed that *light* will appear wherever two full arcs meet, while a dark fringe will happen wherever a full arc meets a dotted one. In other words, the lights emitted by the two sources f and f' will *interfere* with each other and extinguish each other wherever the distance from f and f' differ by half a wave-length.

Wherever the full lines meet, there is a coincidence of phases and the two lights, strengthen each other, but wherever a full line is crossed by a dotted one, their phases differ by half a wave-length; they neutralize each other and darkness is the result.

Any other monochromatic light besides red will give the same phenomenon, *but the distance between the lines will differ, according to the wave-length of the light.*

It results that if *white light* is used, as white light is formed by the mixture of colored lights of different wave-length, the bright area of one color will overlap the dark area of another and instead of dark fringes, a succession of colored bands will be formed.

It is evident that if the distance between two dark fringes, separated by a bright line and the sources of light f and f′ can be measured, it will be possible to determine the length of the wave of the monochromatic light submitted to *interference.*

Young and Fresnel were lead to investigations that resulted in the remarkable theory of *interferenc,* by another phenomenon noticed by Grimaldi and called *diffraction* of light.

Grimaldi noticed that if a pencil monochromatic light admitted into a dark chamber and collected on a screen is partially intercepted by a very sharp edged instrument such as a razor blade, part of the light seem to bend into the geometrical shadow produced by the edge and above it, where the illumination of the screen should apparently be homogenous, dark band or fringes make their appearance very distinct at the margin of the shadow, and gradually diminishing in distinctness until they finally disappear.

As in the phenomenon of interference, if *white light* is thus intercepted, colored bands will take the place of the dark lines.

Diffraction and interference occur then; th first actual bending of rays occur, while the second takes place through the action of two rays of light, meeting each other under certain specified conditions.

Fraunhofer applied the phenomena of diffraction in his investigation of the spectrum and succeeded in obtaining remarkably accurate measurements of the length of the light-waves.

(To be Continued Next Month)

PANCHROMATIC NEGATIVE

(Continued from Page 11)

tained. The sensitivity values as shown by the curve in Fig. 5 are defined in this manner, sensitivity being the reciprocal of the energy (expressed in ergs per unit area) which is required to produce a density of unity (D=1.0) when the slope of the characteristic curves for the various wave-lengths is also unity.

Curve *A* is for Eastman 33 plates which is typical of the medium speed non-color sensitive class of materials. Curve *C* is for Wratten and Wainwright panchromatic plates. A comparison of a wedge spectrogram made on this material with one made on panchromatic motion picture film indicated that the two are practically identical as regards color sensitivity. Very little error will be involved in assuming that curve C defines the color sensitivity of panchromatic motion picture film. Curve *B* is estimated by comparing a wedge spectrograph made on Par Speed motion picture negative film with one made on Eastman D. C. Ortho plate for which precise data are available. This curve may be subject to some error but it is probably sufficiently precise for all practical purposes.

Light Sources

THE spectral composition of the radiation emitted by different light sources used in motion picture work varies enormously. These sources may for convenience be divided into two classes, (a) those having a continuous spectrum and (b) those having a discontinuous or line spectrum. Of the former the incandescent lamp is typical and of the latter the Cooper Hewit mercury vapor lamp is a well known example. As stated previously it is customary to show graphically the date relating to the spectral composition of radiation. These curves (spectral energy distribution curves) are obtained by plotting energy as a function of wave-length. Since in the discussion of the rendition of colored objects by means of photographic materials of different color sensitivity a knowledge of the spectral quality of the illuminating radiation is necessary, data relative to some of the sources commonly used in motion picture work will be given.

Black Body

If a completely closed cavity be raised to a high temperature the spectral composition of the radiation emerging from the cavity through an aperture which is small relative to the size of the cavity follows a definite fundamental law and the spectral distribution of energy in this radiation can be computed precisely. Such a source is commonly referred to as a *black body* or a *complete radiator*. While this source is not of practical importance for illuminating purposes it serves as a very useful standard in terms of which to express the spectral composition of certain sources of practical importance. For instance it has been found that the color of light emitted by a heated tungsten filament is the same as that emitted by a black body at some definite temperature. The black body temperature at which the colder match occurs is designated as the *color temperature* of the tungsten filament and it is quite customary to specify the quality of

light emitted by a tungsten lamp and the efficiency at which this lamp is operating in terms of its *color temperature.* The radiation from a *black body* at a temperature of 5400°C has been found to match in color that of noon sunlight. Hence the black body serves also as a useful standard for establishing precisely a definite standard of white. The spectrum of black body radiation is continuous and can be satisfactorily defined by a smooth curve the ordinates of which are energy and the abscissae wave-lengths. In describing the sources in motion picture studios it frequently will be found convenient to describe qualitatively at least the composition of the emitted radiation in terms of its color temperature.

Sunlight

The spectrum of sunlight is of the continuous type crossed by many fine dark lines, Praunhofer lines These lines have little influence upon the distribution of energy in radiation from the sun and for all practical purposes the spectral distribution may be represented by a smooth curve, curve *A*. Fig. 7. The maximum occurs at wave-length 510 mu. The rapid decrease in energy between 400 and 300 mu. is due to absorption in the earth's atmosphere.

Skylight

Consists of radiation from the sun which has been scattered in various ways by the earth's atmosphere, air, dust, water vapor, etc. It is distinctly blue in color. The distribution of energy in light from a clear north sky is shown in curve B Fig. 7.

Incandescent Tungsten

While this source is used but little at present since it is relatively deficient in radiations of wave-lengths to which the par and superspeed motion picture negative film is most sensitive (350 to 550 mu.) it is probable that with the increasing use of panchromatic film it will become more widely used. The relatively large proportion of energy radiation in the region of longer wave-lengths (500 to 700 mu.) to which panchromatic film is sensitive makes it especially valuable for use with this material. In Fig. 8 are given three spectral energy distribution curves for tungsten. Curve *A* applies to the modern high efficiency high wattage gas filled lamps used in motion picture studios. Curve *B* is for a gas filled lamp operated at medium efficiency. Curve *C* shows the distribution of energy in the spectrum of a vacuum type lamp. These curves illustrate the way in which the energy radiated at any wave-length increases as the operating temperature is raised. Lamps of the type represented by curve *A* are now available in sizes from 1 to 30 KW. Of these the 3 and 10 KW. units have proved most practical in motion picture studio work[3], the 3 KW. unit for general lighting and the 10 KW. mounted in front of a parabolic reflector for spotting purposes. These lamps offer many advantages for studio use among which may be mentioned cleanliness, freedom from objectionable fumes, ease of manipulation, and the fact that when they have once been placed in position the attention of an operator is not needed. One man at the switch board can control all lamps on one or even several sets.

Carbon Arc—D. C., Hard Cored Carbons

The great preponderance of energy in the radiation from this source comes from the positive crater which is at a color temperature of approximately 4000°C. The spectral distribution of energy is of the continuous type and is practically identical with that of a black body at 4000°. The spectrum of the radiation from the arc stream is of the line or band type but the total energy due to this radiation is negligible in comparison with that from the crater. The distribution of energy is shown by curve *A* in Fig. .9

The High Intensity Arc—Sun Arcs

The carbons used consist of an extremely hard shell of carbon inside of which is a softer core impregnated with the fluorides of cerium thorium. The spectrum of this source consists of a relatively low intensity continuous background due to radiation from the carbon walls on which is superposed a large number of bright lines due to the core material. These lines are so numerous that for all practical purposes the spectrum is continuous. The color of the radiation emitted by the sources as a whole matches fairly well that emitted by a black body at 5400°K. Noon sunlight also matches in color quite closely the radiation from a black body at this temperature. It will be seen therefore that the light emitted by this light source is very near to our standard of white. In Fig. 10 the solid curve shows the spectral distribution of energy emitted by the high intensity arc as determined by Benford[4]. The points designated by small circles show the distribution of energy in the radiation emitted by a black body at 5400° abs. It will be seen that the distribution of energy in the radiation from the arc is not identical with that from the black body at the temperature mentioned. The color match which exists is therefore only subjective.

Flame Arcs

The carbon used in these arcs have cores which have been impregnated with various metallic solids. The spectrum consists of a large number of bright lines, due to the volatilization at high temperatures of these metallic salts, superposed on a continuous spectrum due to the incandescence of carbons. It is practically impossible to show the spectral distribution of energy by a curve on account of the presence of these numerous lines of variable width and intensity. Carbons of many different types are available on the market giving white, yellow, red, and blue flame arcs. The white and yellow varieties are most commonly used in motion picture work. The spectrograms in Fig. 11 show qualitatively the distribution of energy in several different flame arcs.

Mercury Vapor—Cooper Hewitt

The source of radiation is a column of mercury vapor enclosed in a glass tube. This vapor is excited by the passage through it of an electrical current which causes it to emit radiation at certain wave-lengths. Obviously such discontinuous radiation can not be represented by a continuous curve. The heavy vertical lines in Fig. 12 show the wave-lengths at which emission occurs. The height of each line is proportional to the amount of energy radiated at those wave-lengths.

Mercury Vapor—Quartz Tube

In this source the mercury vapor is enclosed in a tube of fused quartz which due to its heat resisting properties permits the use of a higher operating temperature and gas pressure than can be used in case of the glass tube. This results in a marked enhancement in the amount of energy

3. Jones, L. A. Incandescent Tungsten Lamp Installation for Illuminating Color Motion Picture Studio. Trans. S. M. P. E., No. 22, 1925 P. 25.

4. Benford, Frank. The High Intensity Arc. Trans. S. M. P. E., No. 24. 1925, P. 71.

radiated at certain wave-lengths. Furthermore since quartz is very transparent to all wave-lengths down to 180 mu. (ordinary glass absorbs all radiation of wave-length shorter than 350 mu.) a large amount of ultraviolet radiation is emitted. While this radiation is very active photographically and the source is useful for certain photographic purposes it is of little value in the motion picture studio. Very few natural objects reflect ultraviolet radiation. Moreover the glass lens used in the camera does not transmit radiation of wave-length less than 350 mu. It is possible of course to make lenses of quartz which do transmit this radiation but its use is of doubtful value since it would certainly produce a further departure from correct visual tone reproduction. It has been proved conclusively that radiation of wave-length shorter than 305 mu. is highly injurious to the eye. It is necessary therefore to enclose these quartz lamps in glass globes which absorb this injurious radiation. All things being considered, it does not appear that this source is suitable for studio use and so far as the authors know it is not used at present to any great extent.

(To be Continued Next Month)

Pete Harrod Resigns *from* Paramount *to* Join Creco, Inc.

Pete Harrod, well known Hollywood electrical expert, has resigned as head of the electrical department at the Famous Players-Lasky studios, Hollywood, to become associated with Creco, Inc., in an executive and advisory capacity.

Harrod is one of the best known and most popular members in studio illuminating engineers circles, and has supervised the electrical arrangements for countless large productions made at the Paramount plant. He is a pioneer in the business.

Geo. A. Blair *and* Eastman Workers Return *to* Rochester

George A. Blair, motion picture film sales manager for the Eastman Kodak Company, has returned to Rochester from his recent trip to Hollywood.

Blair was preceded in his return to Rochester by J. I. Crabtree and Dr. K. A. Hickman, who left shortly after they had completed their lectures on panchromatic and kindred subjects before Hollywood cinematographers and laboratory officials.

"TALKING PICTURES"

(Continued from Page 5)

done. But it is a far cry before it can be done commercially effective. If it is thought that the small-town audience will be less discriminating, it might be remembered that the efficacy of the "black and white" motion picture will preclude such an uncritical mood. The exhibition must be just as "slick" for the hinterland as it is for Broadway. We do not think, either, that the exhibitor at this time is ready to accept the talking picture generally. We believe that he regards it as something of a curiosity which is practically removed from his ken of things. The problem of those organizations which are interested in the talking film resolves itself to one of exploitation. Not only the exhibitor must be made to want the human voice with his films, but the public at large must be educated to the point where it demands it or will accept it fifty-two weeks in the year.

¶ Meanwhile, we wish all prosperity to those who are behind this type of motion picture, and we do hope that their efforts will be sufficiently rewarded so as to make it worth-while enough for them to continue their experiments and research.

John Ford Made President *of* Directors Association

John Ford has been elected president of the Motion Picture Directors Association, Hollywood, for the coming year.

Other officers elected include Albert Rogell, vice president, and Reeves Eason, treasurer. The board of directors numbers William Beaudine, George Irving, Phil Rosen, Reginald Barker, Norval MacGregor and Roy Clements. Barker is the retiring president of the M.P.D.A.

Panchromatic (color-sensitive) film is being used by Tony Gaudio, A. S. C., in "shooting" First National's "Three In Love," originally entitled "Here Y' Are Brother," now in production under Al Rockett's management.

It's done partly because of superior artistic effects that may be attained, and partly because Billie, who is co-featured with Lewis Stone and Lloyd Hughes in the picture, is the real "rainbow girl" of the movies.

Billie has beautiful eyes on any sort of film. But it happens that she has two separate screen personalities, depending on whether black-and-white or color photography is used, according to George Landy of the First National publicity department.

CLASSIFIED ADVERTISING

RATES: *Four cents a word. Minimum charge one dollar per insertion.*

All copy must be prepaid and must reach us before the fifteenth of the month preceding publication.

CLASSIFIED ADVERTISING
AMERICAN CINEMATOGRAPHER,
1222 GUARANTY BUILDING,
HOLLYWOOD, CALIFORNIA

WANTED—MOTION PICTURE CAMERA

WILL PUT you in touch with buyers for Bell & Howell cameras and equipment. Phone or write the A. S. C., 1222 Guaranty Bldg. Granite 4274, Hollywood, California.

BELL & HOWELL or Mitchell Camera outfit; Projection Printer; Cinex timer; Straight Line Processing Machine; Nutting Reflectometer; Polishing Machine; State price, Equipment. Fred Jeffery, Giles Street, Rose Park, South Australia.

16 mm. Eastman Cine-Kodak, Model A, with F 3.5 or F 1.9 lense. Must have top and back built-in finders. State serial number, equipment, price. Hamilton Riddel, 1622 North Wilcox Ave., Hollywood.

FOR SALE—CAMERAS

WILART camera, latest model, complete with tripod and carrying cases and retort case and magazines. John L. Russel, 1643 North Gardner St., Hollywood. HEmpstead 9554.

BELL & HOWELL Eyemo, carrying case, four one hundred feet daylight loading Eastman negative, guaranteed perfect. First $225.00 gets it—cost $385.00. Cameron, Manhattan Beach, N. Y.

$75—Angeles 400-feet Carl Zeiss 3.5, case, tripod. Want 4 by 5 Graflex or f 1.9 to fit De Vry. 2590 Midlothian Dr., Altadena, Calif. Colorado 0342.

BELL & HOWELL EYEMO, case and 5 spools. Brand new—$255, C.O.D. No. B-1702. Roscoe Wright, 800 Dayton St., Cincinnati, Ohio.

FOR RENT—CAMERAS

FOR RENT—Bell & Howell studio equipment complete. 170-Degree Shutter. Liberal commission to cameramen. Call Mr. Smith, Metropolitan 4686. Evenings call Main 0947. (Los Angeles.)

NEW Eyemo camera, fully equipped; rent by day or longer. Joe La Shelle, 9038 Dorrington Ave., Hollywood; Phone OXford 5840.

AKELEY, Bell & Howell and Mitchell Cameras for rent, all latest equipment. Phone GRanite 2213 or Granite 1914. John W. Boyle, 1207 North Milton Ave, Hollywood.

BELL & HOWELL. Victor Milner, 2221 Observatory Ave., Los Angeles, California. 596-944.

MITCHELL, and Bell & Howell Cameras. F.2:3; F.2:7; F.3:5 Lenses—40-50-75 mm. Complete equipment. J. R. Lockwood, 523 North Orange St., Glendale, California. Glendale 3361-W, or HOlly 0764.

E. BURTON STEENE, Bell & Howell, and Akeley. Complete Camera Equipment. Latest models. Address American Society of Cinematographers, Hollywood, California.

BELL & HOWELL, No. 627, for rent, fully equipped. Five lenses—32, 40 (f.2.7), 50 (f.2.7.), 75, 100 mm. Phone GLadstone 0033.

BELL & HOWELL, 170, with 30, 40, 50 and 75 lens equipment. Baby Tripod. Also B. & H. Cine Motor. Charles Stumar. GRanite 9845. 7501 Lexington Ave., Hollywood.

FOR RENT—One Eyemo camera, complete with all accessories. Bert Glennon, 6936 Woodrow Wilson Dr., Hollywood, Calif. Phone HEmpstead 2743.

BELL & HOWELL, 170. Five lenses: 32, 40 (f.2.7), 50 (f.2.7), 75, 100 mm. Phone GLadstone 0033 before 9:30 A. M., or between 6:00-7:00 P. M.

TWO Bell & Howells. Large finders. Also Eyemo for rent. Lenses—F 2.5; 2.3; 2.7 Frank M. Cotner, 6273 Selma Ave., Hollywood. HOllywood 5046.

SPEED CAMERA: Bell & Howell, fully equipped for miniature and slow motion work 40, 50, 75 mm. and 6-inch lenses. Alvin V. Knechtel, 1179 North Kenmore. 597-054.

BELL & HOWELL cameras Akeleys and other makes—portable lights, special lenses by the day, week or month. We sell everything that any cameraman might ever need—new or used—at a big saving. Keep us in touch with your wants. Ruby Camera Exchange, Ruby Building, 727 Seventh Ave., N. Y. Bryant 0631 or 8457.

FOR TRADE—CAMERAS

WILL trade practically new Model K.5 late model Eastman Aero Camera, complete with venturi tube and anti-vibration suspension mount (Gimbal) for good second-hand Mitchell or Bell & Howell camera. Cecil M. Thomson, 510½ Travis St., Houston, Texas.

TWO 170 shutter Bell & Howell cameras, fully equipped. One with superspeed attachment. ORegon 3726, 407 N. Milton Ave., Hollywood.

FOR RENT—AIRPLANES

AIRPLANES equipped to carry cameras, facilitating the photographing of stunts or other unusual action, for rent by the hour, day or week. Jerry Phillips, Professional Pilot, Clover Field, Santa Monica, California.

FOR RENT—STILL CAMERAS

WILL RENT still camera to local parties. Special arrangements to A. S. C. members. Geo. Meehan, Ph. GRanite 3830, 744 Curson Ave., Hollywood, California.

FOR RENT—One 4x5 Graflex Camera and one 4x5 Grafic. Bert Glennon, 5950 Carlton Way, Hollywood, California. Phone Hempstead 2743.

FOR SALE—LENSES

ONE three-inch Dahlmeyer F. 1:9, mounted for Mitchell; one two-inch Bausch & Lomb F.2:7; one Dahlmeyer Pentac 37 mm. F.2:9. Georges Benoit, 3306 North Knoll Drive, North Hollywood.

CARL ZEISS, F. 2.7, 50 mm. in Bell & Howell mount. Dan Clark, care American Society of Cinematographers.

NEW 40 m.m. Goerz Hypar f. 3. 5. lens in Bell & Howell mount; price $50.00. Write Charles Clarke, 1222 Guaranty Building, Hollywood, California.

How to Locate Members of the

American Society *of* Cinematographers

Telephone: GRanite 4274

OFFICERS

Daniel B. Clark	*President*
L. Guy Wilky	*First Vice President*
Frank B. Good	*Second Vice President*
Ira H. Morgan	*Third Vice President*
George Schneiderman	*Treasurer*
Charles G. Clarke	*Secretary*

BOARD OF GOVERNORS

Victor Milner	Alfred Gilks	Fred W. Jackman
Daniel B. Clark	Charles G. Clarke	Georges Benoit
George Schneiderman	Glen MacWilliams	E. Burton Steene
L. Guy Wilky	John F. Seitz	Ira H. Morgan
Frank B. Good	King D. Gray	Floyd Jackman

Abel, David—with Warner Brothers.
Arnold, John—with Metro-Goldwyn-Mayer Studios.

Barnes, George S.—with Samuel Goldwyn Prod.
Beckway, Wm.—
Benoit, Georges—with Ajuria Sociedad Prod., Tec-Art Studios.
Boyle, John W.—with Feature Prod., United Artists.
Brodin, Norbert F.—with Columbia Studios.
Broening, H. Lyman—with F.B.O. Studios.
Brotherton, Joseph—with Universal.

Clark, Dan—with Tom Mix, Fox Studios.
Clarke, Chas. G.—with Red Grange, F.B.O. Studios.
Cowling, Herford T.—with Eastman Kodak Co., Rochester, N. Y.
Cotner, Frank M.—
Crockett, Ernest—
Cronjager, Henry—

Davis, Chas. J.—with Warner Bros., "Vitaphone," New York City.
Doran, Robert V.—
Dored, John—Riga, Latvia.
Du Par, E. B.—with Warner Bros.
DuPont, Max B.—
Dubray, Joseph A.—with Tiffany Prod.

Edeson, Arthur—with First National, Burbank .
Evans, Perry—with Warner Bros.

Fildew, Wm.—
Fischbeck, Harry A.—with Famous Players-Lasky.
Fisher, Ross G.—with First National, Burbank.
Fried, Abe—with Warner Bros.

Gaudio, Gaetano—with First National, Burbank.
Gilks, Alfred—with Famous Players-Lasky
Good, Frank B.—with Metro-Goldwyn-Mayer Studios.
Gray, King D.—with Fox Studios.
Griffin, Walter L.—with David Hartford Productions.
Guissart, Rene—Paris, France.

Haller, Ernest—with Robert Kane Productions, New York City.
Heimerl, Alois G.—

Jackman, Floyd—with Fred W. Jackman Productions.
Jackman, Fred W.—directing Fred W. Jackman Productions.
Jennings, J. D.—with Buster Keaton.

Knechtel, Alvin V.—with First National, Burbank.
Koenekamp, Hans F.—
Kurrle, Robert—with First National, Burbank.

Lockwood, J. R.—
Lundin, Walter—with Harold Lloyd Productions, Metropolitan Studios.
Lyons, Reginald—with Fox Studios.

McCord, T. D.—
McGill, Barney—
Mac Williams, Glen—with Fox Studios.
Meehan, George—with Fox Studios.
Milner, Victor—with Famous Players-Lasky.
Morgan, Ira H.—with Metro-Goldwyn-Mayer Studios.
Musuraca, Nicholas—with Ajuria-Sociedad Prod., Tec-Art Studios.

Norton, Stephen S.—with Tiffany Prod.

Palmer, Ernest S.—with Fox Studios.
Perry, Harry—with Famous Players-Lasky.
Perry, Paul P.—with Famous Players-Lasky.
Polito, Sol—with Ken Maynard, First National.

Ries, Park J.—
Roos, Len H.—Sydney, Australia.
Rose, Jackson J.—with Universal.
Rosher, Charles—with F. W. Murnau, Fox Studios.

Schneiderman, George—with Fox Studios.
Scott, Homer A.—
Seitz, John F.—with Metro-Goldwyn-Mayer Studios.
Sharp, Henry—with Metro-Goldwyn-Mayer Studios.
Snyder, Edward V.—with Pathe, Fine Arts Studio.
Smith, Steve, Jr.—
Steene, E. Burton—with Famous Players-Lasky, San Antonio.
Stumar, Chas.—with Universal.

Tolhurst, Louis H.—producing microscopic pictures, for Pathe.

Van Buren, Ned—with Eastman Kodak Co., Hollywood.
Van Enger, Charles—with First National, Burbank.
Van Trees, James C.—with First National, Burbank.

Warrenton, Gilbert—with Universal.
Wenstrom, Harold—
Whitman, Philip H.—with Scenario Dept., Mack Sennett Studios.
Wilky, L. Guy—

Eastman, George—Honorary Member.
Edison, Thomas A.—Honorary Member.
Webb, Arthur C.—Attorney

Meetings of the American Society of Cinematographers are held as called on Monday evenings in the A. S. C. assembly rooms—
1219-20-21-22 GUARANTY BUILDING
Hollywood Boulevard and Ivar Avenue
HOLLYWOOD, CALIFORNIA

LOYALTY PROGRESS ART

WILLIAM FOX STUDIO
HOLLYWOOD CALIFORNIA

Mr. H. F. Boeger,
Mitchell Camera Corporation,
Los Angeles, Calif.

November 12th, 1926.

My dear Mr. Boeger:

I wish to congratulate you upon the perfection which the Mitchell camera has developed.

I have used the Mitchell on my last three productions, "The Lily", "Return of Peter Grimm" and "Stage Madness", and both Mr. MacWilliams, my cinematographer, and myself are highly pleased with the results. Owing to its wonderful equipment and mechanical arrangements, we are able to photograph at nearly twice the speed we formerly used, thereby saving a lot of time in production.

Hoping that you will keep Mr. MacWilliams and me informed of any possible changes or improvements on the camera, I remain

Yours very truly,

Victor Schertzinger

VS:H

Vol. VIII. No. 1
25 Cents a Copy

APRIL, 1927

American Cinematographer

Published in
Hollywood, California

By American Society
of Cinematographers

SPRING IN THE MOUNTAINS

A vista from Timberline Ridge with Mount Adams beyond in Ranier National Park country.

Blossoms in the foreground are those of "squaw grass." Reproduced from location Library of American Society of Cinematograpers, Hollywood.

A. S. C. Officers for 1927-28 Elected; A Professional's Notes for Amatuers (Part VI)—By Joseph A. Dubray, A. S. C.; Motion Picture Club of the Oranges.

Vol. VIII APRIL, 1927 No. 1

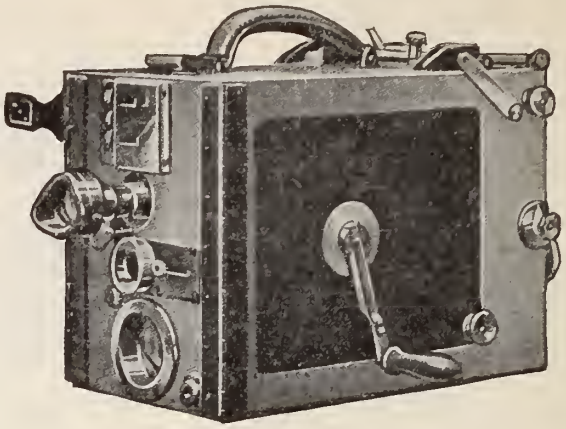
American Cinematographer

FOSTER GOSS, *Editor and General Manager*

Contents:

An educational and instructive publication, espousing progress and art in motion picture photography.
Subscription: United States, $3.00 a year; Canada, $3.50 a year; foreign, $4.00 a year; single copies 25c.
Published monthly by THE AMERICAN SOCIETY OF CINEMATOGRAPHERS, Inc.
Advertising rates on application.
1219-20-21-22 Guaranty Building, Hollywood, Calif. Telephone GRanite 4274

The New
DEBRIE-PARVO
Model "L"
Does Everything!



3
New Features

1—Direct focussing on ground glass, without prism, and full size of frame. The only apparatus with this feature.

2—Pilot register pins, located under frame, assuring absolute steadiness, and the perfect stoppage of film at any point for super-imposition (double exposure, etc.)

3—Gate which automatically releases the film, after every exposure, preventing friction marks, scratches, etc.

The first-named feature permits you to focus with absolute accuracy on ground glass by the simple movement of a conveniently located lever. This movement automatically moves the film in such a way that it is out of the exposure field. Upon returning the lever, you are at once ready to continue turning. It is never necessary to move either lens or camera, and all adjustments may be made in your usual position behind the camera.

POSITION DURING EXPOSURE

POSITION DURING FOCUSSING ON GROUND GLASS

Now, more than ever before, with the many new features and improvements of the Debrie, it is the most adaptable apparatus for studio work on productions of every variety.

Here are a few other features of this marvelous new Model L:

Direct focussing ON FILM while turning and when stopped, without prism.
Instantaneous indication of diaphragm in use.

Automatic dissolve by shutter—always of same duration no matter at what opening shutter is set.

Automatic stop of crank at end of fade-out and fade-in.

Any lens may be used, regardless of focus or aperture.

Veeder counter, with dual indicator.

Electric equipment allowing control at a distance. (Additional cost.)
All operations visible and controllable from the back.

It is the lightest in weight and most compact 400 foot professional camera on the market.

Outfit complete with 2″ F3.5 Krauss Tessar lens, 8 magazines, case for camera, case for magazines, sunshade, 2 sets masks, rewinder, and Precision Ball Bearing Tripod—$1,250

WILLOUGHBYS
110 WEST 32ND ST., NEW YORK, N. Y.

The EDITOR'S LENS focused by FOSTER GOSS

These New Directors

WE are told that no little interest was aroused by our comment last month anent the possibilities of cinematographers as directors. Much of this interest fortunately has manifested itself in production quarters, where it lies within the hands of the powers that be to create new directors.

¶ And this is the age of new directors. The old order is passing when the first qualification of a director was a prolonged and previous experience in what was believed to be the similar capacity of stage director. The newer generation of American megaphone wielders emanates from the ranks of the studios themselves. These men have grown up professionally with the cinema, and have not been recruited from the legitimate. The lines of endeavor, which they pursued prior to their entry in films, have had little to do with theatricals. They have been, like Monta Bell, newspapermen; or like Mal St. Clair, they have served their apprenticeship on the studio set.

¶ The break for new directors began several seasons ago when Ernst Lubitsch was the first of several capable foreign artists to be brought to these shores. This importation is continuing, the chief desire of some of the studios apparently being to have as many more foreign directors than their production rivals as possible. We hold no brief for those who would condemn these European directors merely as a matter of patriotism. Nor, as we have remarked before, we had no sympathy for the misguided souls who tossed cabbages, over-ripe eggs and similar missiles at the premiere of the German film, "The Cabinet of Dr. Caligari," in Los Angeles several years ago. At the same time, we do not hold sympathy nor admiration for the type of motion picture executive whose better judgment is warped to the extent, when he requires new directorial blood, of following the now established path of getting any director just so long as he comes from beyond the Atlantic. Verily, things do change! The poison of 1921 is the meat of 1927.

¶ The fact remains that America makes the best motion pictures in the world. There have been many superlative photoplays made on the other side, but their ratio to those turned out in the United States would show the latter to be decidedly in the lead. If we make, as a general run, the best motion pictures in the world, surely our studios should rank as the best training ground of those who build screen efforts. Physical facilities here alone are conducive of a more thorough education of the "comers" in the profession.

¶ The time is coming, if it has not already arrived, when there will be or is such a drain on the supply of possible directors on the Continent that not a few other than first-raters will be engulfed in the eager domestic demand for directors of their kind. And this condition is imminent, or at hand, when so many potential directors are drawing salaries on the inside of studios today—as they have for many years previously!

¶ As we have observed in the past, we believe that the camera is one of the best media of education for those who aspire to be directors. While many cinematographers would never desert their pictorial posts, so closely are they wedded to their art, there are, at the same time, many who have the natural ambition to enter a field that is more lucrative, having long since reached "top" in their own corner of the industry. These men are able men—men with long years of brilliant experience behind them in the realm of the silent drama. They deserve their chance to direct now more than ever before.

¶ And let no producer say that he would not know where to look for them. He probably has his quota working in his own studio. We know of a dozen such men whom we could name off-hand!

Merit Rewarded

A PRECEDENT of five years' standing has been broken by the A.S.C. in the re-election of of a president. Daniel B. Clark is the first chief to be re-elected in five years. Only two times previously has such an honor been bestowed. In fact, the entire personnel of the officers and of the Board of Governors is practically identical with that of last year. But one new face appears among the entire fifteen on the Board. This, in some measure, indicates how highly the A.S.C. members at large regard the accomplishments of their officers during the past year.

¶ President Clark has proved a conscientious, hard worker with a liberal share of foresight and the necessary tenacity to put his plans and projects in operation. And the plans and projects of the A.S.C. during President Clark's administration have been of the most constructive sort—bringing good not only for the A.S.C. and its members, but for the industry as a whole.

Where Executives Train

THE Fox lot appears to be an ideal training ground for executives of motion picture organizations. President Clark of the A.S.C. is chief cinematographer for Tom Mix at Fox; John Ford, newly elected president of the Motion Picture Directors' Association, is a star director with the same studio. Every one of the present officers of the A.S.C., with the exception of Victor Milner, has been identified with Fox at one time or other, George Schneiderman, like Clark, being there now.

In Camerafornia . . .

and News Notes of the Month

JOSEPH A. DUBRAY, A.S.C., has completed the filming of "A Beauty Shop," a Tiffany production, which Louis Gasnier directed. The cast included Mae Busch, Doris Hill, Nick Stuart, Ward Crane, Cissy Fitzgerald, Leo White and James Marcus.

Stephen S. Norton, A.S.C., has been associated with Dubray in the filming of Tiffany productions.

* * *

Harry Perry and Paul Perry, both A.S.C. members, are still working on the cinematographic intricacies involved in Paramount's "Wings," a story of the air service during the war.

* * *

Reginald Lyons, A.S.C., has returned to Hollywood from Grand Canyon, Arizona, where he went to film location scenes for a forthcoming Fox feature, starring Buck Jones. Scotty Dunlap directed.

* * *

Harry Fischbeck, A.S.C., has trekked to Hollywood with the Paramount Long Island studio forces, and henceforth will be located at the Paramount West Coast plant. His first picture is scheduled to be "The World at Her Feet," starring Florence Vidor and directed by Luther Reed.

* * *

Arthur Edeson, A.S.C., is on location at Camp Lewis, Washington, for the filming of war sequences for First National's "The Patent Leather Kid," starring Richard Barthelmess.

* * *

Victor Milner, A.S.C., is filming Paramount's "Rolled Stockings." Richard Rosson is directing. James Hall and Louise Brooks head the cast.

* * *

Georges Benoit, A.S.C., has finished shooting "Belgrano," a story of the fight for independence in Argentina. The film was photographed at the Tec-Art studios, Hollywood.

Nicholas Musuraca, A.S.C., was associated with Benoit in the filming of the feature. The cast included Francis X. Bushman, Jacqueline Logan and others of note.

* * *

Walter Lundin, A.S.C., is shooting the current Edward Everett Horton comedy at the Metropolitan studios.

* * *

Jackson J. Rose, A.S.C., is shooting "Eternal Silence," starring Hoot Gibson, at Universal. Ernest Laemmle is directing.

Ernest Palmer, A.S.C., was one of the guests of honor at a recent meeting of the "Wampas," an organization of the motion picture and theatrical publicity men in Hollywood and Los Angeles. Palmer attended as one of the principals on the staff of the Fox production, "Seventh Heaven," which Frank Borzage directed.

* * *

Charles Stumar, A.S.C., expects to be finished with the cinematography on Universal's "Uncle Tom's Cabin" within a month. More than a year has passed since the picture was started. Harry Pollard is directing the feature. On completion of the production, Stumar will be chief cinematographer on "Show Boat," based on Edna Ferber's novel. Pollard will direct.

* * *

John Seitz, A.S.C., is safe again in the balmy breezes of Southern California after a location trip amid mountain blizzards in Colorado for "The Trail of '98," which Clarence Brown is directing for M-G-M.

H. Lyman Broening, A.S.C., was among the cinematographers who went along to capture extra angles on the location.

* * *

John W. Boyle, A.S.C., has returned from Lake Tahoe, California, where he photographed snow sequences on United Artist's "Topsy and Eva," in which the Duncan sisters are starred. Del Lord is directing.

* * *

John Arnold, A.S.C., is filming "Wind," starring Lillian Gish, at the Metro-Goldwyn-Mayer studios.

* * *

Gilbert Warrenton, A.S.C., is filming "The Crimson Hour" at Universal. Edward Sloman is directing. Sloman and Warrenton went on an extensive location-hunting trip prior to the beginning of the picture.

* * *

Robert Kurrle, A.S.C., has finished the filming of "The Tender Hour," a George Fitzmaurice production, at the First National studios, and will next photograph "The Stolen Bride," with Lloyd Hughes and Billie Dove. Alexander Korda is directing. Kurrle is being hailed for the artistry of his cinematography in Edwin Carewe's production of Tolstoy's "Resurrection," which stars Rod La Rocque and Dolores del Rio.

* * *

Ira H. Morgan, A.S.C., is photographing "The Callahans and the Murphys" at the Metro-Goldwyn studios. George Hill is directing.

A.S.C. Officers for 1927-28 Are Elected

Daniel B. Clark, Schneiderman and Charles G. Clarke Are Given Same Posts Again

Daniel B. Clark, President.

John W. Boyle, First Vice-President.

Victor Milner, Second Vice-President.

DANIEL B. CLARK was re-elected president of the American Society of Cinematographers to head the activities of the A.S.C. during the 1927-28 fiscal year.

This is the first time in five years and the third occasion in the history of the Society that a president has been re-elected, the first two presidents of the A.S.C.—Philip E. Rosen and Fred W. Jackman—both having been chosen for a second term.

John W. Boyle was picked as first vice president; Victor Milner, as second vice president; and Frank B. Good, as third vice president. George Schneiderman and Charles G. Clarke respectively were re-elected as treasurer and secretary. All of the new officers, with the exception of Boyle and Milner, were officers during the past year.

Board of Governors

The A.S.C. officers were selected at the first meeting of the year of the new Board of Governors, which was designated by the members at large. The Board for 1927-28 amounts to a re-election of last year's Board, John W. Boyle being the only new member among the fifteen. The personnel of the Board is as follows: Daniel B. Clark, Victor Milner, George Schneiderman, Alfred Gilks, Charles G. Clarke, John F. Seitz, Ira H. Morgan, Floyd Jackman, John W. Boyle, Fred W. Jackman, Frank B. Good, King Gray, L. Guy Wilky, Georges Benoit and E. Burton Steene.

Clark, who continues as president, is chief cinematographer for William Fox productions starring Tom Mix. He has been identified with Mix during the length of his cinematographic career, having risen through various stages as still photographer, assistant and second cinematographer, until he eventually was awarded the first camera. Clark's cinematographic staff on the Mix pictures is one of the largest in the industry. He has served as chief cinematographer on all of Mix's pictures during the past several years, and during this time has not missed a day's work with the exception of a brief period last summer when he was kept from his duties for a brief period because of a minor surgical operation.

First Vice President

John W. Boyle, the first vice president, is one of the veterans of the camera calling. Although still young in years, Boyle entered the profession in the early era in New York City, having first become initiated in the mysteries of the motion picture camera in his home city, New Orleans. He was identified with the Fox studios in New York, and continued that connection on coming to Hollywood. He photographed many Theda Bara vehicles, as well as "The Queen of Sheba," and other contemporaneously important features for that producing organization. Since that time, he has served as chief cinematographer on innumerable big productions, for Goldwyn, F.B.O., Metro-Goldwyn-Mayer, First National and other studios. He was chief cinematographer on an expedition to the South Sea Islands, and was responsible for the photography in "The Isle of Vanishing

Geo. Schneiderman, Treasurer.

Frank B. Good, Third Vice-President.

Chas. G. Clarke, Secretary.

Men," which caused a sensation in the trade several seasons ago. At Metro-Goldwyn-Mayer, he photographed "Wild Oranges," King Vidor's first outstanding film with M-G-M. Among his subjects at First National were "The Vienesse Medley" and "The Far Cry." At present he is chief cinematographer on "Topsy and Eva," a feature production for United Artists, starring the Duncan sisters. During 1925-26, Boyle was secretary of the A.S.C.

Second Vice President

Victor Milner, the second vice president, counts his cinematographic moons back to the pioneer days in New York also. His experience began in the camera establishment of Eberhard Schneider, an eminent figure in the first days of motion photography. Some of the screen's worthiest contributions have been filmed by Milner. They number, at various periods, Universal's "Human Hearts;" Fred Niblo's "Thy Name Is Woman" and "The Red Lily;" "Learning to Love," starring Constance Talmadge, and so on. For some time he has been under contract to Paramount Famous Lasky Corporation, for whom he has filmed, among other features, "East of Suez," starring Pola Negri; "The Spaniard" and "The Wanderer." He recently completed the initial Paramount production featuring Emil Jannings, the German star. Milner has officiated in various A.S.C. offices in the past. He is one of the fifteen original members of the Society.

Third Vice President

Frank B. Good, third vice president, came to the profession during the days of glory of D. W. Griffith at the old Fine Arts Studios, Hollywood. This was the era of the making of "The Birth of the Nation," "Intolerance," and other productions which made and maintained the reputation of Griffith. Good has presided at the camera on the occasion of the elementary ventures of many players now noted in the screen world. After his connection with the Griffith forces, he joined Fox, where he filmed the Tom Mix features which were setting up Mix's reputation as the premiere Western performer. He preceded Dan Clark with Mix; Good also photographed many Buck Jones vehicles. For the past several years, Good has been known as chief cinematographer of Jackie Coogan productions, having been the guiding hand of the youthful star in all his appearances. Like Milner, Good has given service to the A.S.C. in many capacities.

Treasurer

George Schneiderman, re-elected as treasurer, was among the first cinematographers of Fox productions. Besides his camera duties, he was for many years in charge of the Fox laboratories. He has photographed some of the most successful Fox productions which have been made in California. They include "The Iron Horse," "The Johnstown Flood," "Thank You," "Three Bad Men," and many others. He recently concluded "Is Zat So?", featuring George O'Brien and Edmund Lowe.

Secretary

Charles G. Clarke, re-elected secretary, is the youngest of the officers, but is a veteran in the quantity and quality of pictures which he has turned out. They number many Paramount features directed by George Melford—"Salomy Jane," "The Light That Failed," "Tiger Love" and others. At the Metropolitan studios he was chief cinematographer on "Without Mercy," "Simon the Jester" and "Rocking Moon." For some time past he has been freelancing at Fox, F.B.O., Paramount and other studios. He shot "One Minute to Play," which marked Red Grange's bow as a film actor, and at present is at work on "The Motor Manic" with the same star.

Asks Exhibitors to Criticize Cinematography

A. S. C. President Asks Theater Owners to Watch Efforts of Cinematographers

Requests Constructive Criticism from Theater Staff on Motion Photography

(The following story was written by the editor of this publication for the Studio Section of Exhibitors Herald.)

An invitation to the army of exhibitors, whose contributions make up the department, "What the Picture Did for Me," in the *Exhibitors Herald,* to appraise and criticise the cinematography in productions, which they show at their theaters, is extended by Daniel B. Clark, re-elected president of the American Society of Cinematographers.

Practical and Artistic

"The A.S.C. is interested," Clark states, "not only in raising the artistic standards of motion pictures, but is also decidedly interested in giving exhibitors that type of cinematography which most pleases their patrons. By doing this, we believe that we are satisfying the public's inherent desire for true works of art and, in addition, we are at the same time working for a boon that concerns the exhibitor and those in Hollywood the most—namely, the box-office. The members of the American Society of Cinematographers want to make practical pictures as well as beautiful pictures. I don't think that there is any question that the efficient cinematographer is the means of saving his producer hundreds of dollars by the proper handling of cinematographic apparatus and methods in the production of a given picture. Being money saved, this is money that is made. Even though the connection may be more remote, we are just as interested in making the exhibitor money.

Constructive Criticism Invited

"Hence," the A.S.C. president continued, "we invite constructive criticism from exhibitors concerning our cinematography. It is difficult for us to keep our fingers on the pulse of the public throughout the country. The exhibitor feels that pulse every day in the year. And no doubt that pulse has its cinematographic throbs as well as its reactions to acting, direction and story merit. We want to know just how this pulse beats, and the exhibitor can tell us. With the exhibitor appraising the cinematography and passing on word to us as to how our work can be improved from the theater's and the patron's viewpoint, we will have a definite and practical course charted, along which we can direct our efforts for progress in cinematography. Need I add that we members of the A.S.C. realize that the progress of the industry generally largely rests within our hands, and consequently we aim to improve our product as much as we possibly can on every picture which we photograph.

Direct Communication

"We would be glad," Clark invites, "to have any exhibitor's views or reviews on our efforts sent to us at our headquarters in Hollywood. We appreciate that what a theater owner may have in the way of suggestion in some instances could not be embodied in the reports in 'What the Picture Did for Me,' where brevity is the keynote. Therefore, we would welcome such communications from exhibitors, and I assure you that they will be given every possible bit of attention."

Walter Griffin, A.S.C., is filming "Rose of the Bowery," a David Hartford production, at the Fine Arts Studio.

* * *

E. B. Du Par, A.S.C., is back in Hollywood from Yuma, Arizona, where he filmed scenes for a Warner Bros. production starring Rin-Tin-Tin. The cast includes Virginia Brown Faire, Jason Robards, Tom Santschi and Theodore Lorch. Raymond Enright directed. Du Par was in Arizona during the rainy siege in Southern California, and, during this period, experienced only one day of rain. The rain farther north came to the company's pictorial rescue, however, as the water flowing over the Colorado River dam at Yuma increased from a few inches to five feet within a week's time; the dam is a mile wide.

Du Par will photograph the next Warner feature starring Syd Chaplin. Chuck Reisner will direct. Helene Costello and Clara Horton will be included in the cast.

* * *

Charles Van Enger, A.S.C., has completed the cinematography in "Diamonds in the Rough," a First National production starring Milton Sills. Charles Brabin directed.

* * *

George Scheibe, manufacturer of filters for the photographic trade, has removed to a new location at 1927 West Seventy-eighth street, Los Angeles. The new location is near St. Andrews place. Scheibe will have enlarged quarters and an experimental laboratory on the premises.

* * *

Charles G. Clarke, A.S.C., is finishing shooting "The Motor Maniac," starring Red Grange. Sam Wood is directing from Byron Morgan's story.

Amateur Cinematography

Motion Picture Club of the Oranges

Production Committee of Motion Picture Club of the Oranges.

(The following account from Russell T. Ervin, Jr., of South Orange, N. J., describes the activities of the Motion Picture Club of the Oranges, of which Mr. Ervin is a member.)

THE writer is an amateur cinematographer and takes much interest in the articles which have appeared in your paper under both the amateur and professional heads. I thought your amateur department might be interested in knowing what we are doing in our local club, Motion Picture Club of the Oranges (N. J.).

Awaken Interest

This club was formed in 1925 and we believe it is the pioneer in the field. After about a year's work a three-reel photoplay was produced on 16 mm. film. Last summer we decided that it would be best to make our pictures on standard film as the interest aroused by the first picture seemed to warrant making a picture which could be exhibited in local theaters.

I have been taking pictures on standard film for about thirteen years merely as a hobby and as a consequence I have been shooting all our later work.

Members Are Amateurs

The membership comprises young men and women who are interested in producing photoplays on a purely amateur basis and receives only financial assistance from its members, so you can realize we all have a job on our hands making pictures on standard film. Every duty connected with producing a picture excepting laboratory work, is performed by various members of the club—story, scenario, continuity, photography, lighting, make-up, properties, location, publicity, editing and other duties which must be attended to.

New Production

We are at present working on our two-reel picture, "Hey-Hay!" All the interiors have been shot and most of the exteriors, and the results we consider quite good. Interiors were taken using two 20 ampere twin arcs as 40 amps was the maximum current which could be drawn. One of these lights was designed and built by the writer. I have a Debrie Interview camera with 2, 3 and 6-inch lenses and Bell & Howell tripod. We are using Du Pont superspeed film on all interiors for this picture and the results were much better than I expected with the limited light available. Mr. Eugene Ragsdale, who is also one of your readers, has made a thorough study of make-up and from the results we have obtained we think he does his work very well. Mr. Ragsdale photographed the first picture the club produced on 16 mm. film. The writer has charge of most of the technical work in connection with the present picture.

The Motion Picture Club feels quite proud of the fact that we were the only amateurs who had any film in the recent showing of "Thirty Years of Motion Pictures" which was assembled by the National Board of Review and shown in Carnegie Hall, New York City, on February 28th, 1927. These pictures were those interiors which we shot early in February.

Our picture will probably be completed for exhibition by April 15th and I hope we will be able to arrange some way in which those interested in seeing what amateur photoplay makers can produce, may be able to view a print of it outside the local theaters.

A Professional's Notes for Amateurs

Part VI Discoveries of della Porta and Others in Primitive Photographic Research Related

By Jos. A. Dubray, A. S. C.

Jos. A. Dubray

In the preceding chapters we have dealt with the phenomena provoked by *light* traveling in different media.

The expressed *theories* or *laws,* accepted or proven to be true, bring to us an understanding of the possibilities that man has at his disposal for harnessing *light,* so to speak, for setting it to work, for his benefit and convenience, and thus take advantage of the unlimited opportunities offered to him.

We shall, from now on, depart from generalities and enter the practical field of the adaptation of these phenomena, to the *art of photography.*

For the sake of clearness and for a better understanding of the modern, almost perfect optical apparatus and instruments, used in photography, we will briefly retrace the steps of time, and follow the work of scientists and artisans and consider the results obtained by their combined efforts, in the field that is of interest to us.

The Image

LET us state at first that *photography entirely depends upon the formation of real images.*

An image is the representation of a person, object or thing, and the most perfect image is, geometrically speaking, the one that corresponds point by point with the object or person, as viewed by the eye. In other words, every point of the *object space* must have its corresponding point in the *image space.*

Images may be *real* or *virtual* and the easiest definition of the difference between them may be stated thus: Images are real when they can be collected on a screen (as the image formed by a photographic lens) and virtual when they cannot be collected on a screen (as the images formed by plane mirrors).

Della Porta

ON a certain sunny day of the year 1553, the Italian, Gianbattista della Porta, an officer of fortune, a philosopher, a scholar and a keen observer, was lying on a camp-bed in his tent resting from the fatigues of soldiering, when his attention was attracted by an interesting sight.

On one of the walls of the tent he could distinctly perceive a small and inverted image of the landscape without, as well as the movements of men and animals, which were wandering in proximity and at a distance from the tent.

This image he remarked to be a perfect rendering of the scene on the outside, with all its coloring, its perspective and its maze of details.

The air was perhaps charged with dust particles, and the discoverer was able to perceive a cone of *rays of light, apparently* emerging from the image on the wall, and converging to a small opening, a tiny tear perhaps, that was in the canvas of the tent, in the wall opposite to the one that flourished the image.

On covering the small opening, the image would disappear, but instantly reappear as soon as the opening was kept clear from obstruction.

The prototype of photographic cameras was thus discovered.

Truly, the phenomena had been remarked and described by the great Leonardo da Vinci, more than fifty years previously, but it remained for Porta to find an application for it, and to name *camera obscura* (dark chamber) the simple apparatus that he conceived and constructed. It was a mere box, with a small round opening drilled in one of its walls, and a translucent screen, perhaps a piece of canvas, in place of the opposite wall.

It was in this manner rendered easy for anyone even ignorant of the art of design, to *draw* a faithful reproduction of any landscape or object presented to the camera.

Formation of Image

THE principle of the formation of an image in the camera obscura, is as follows:

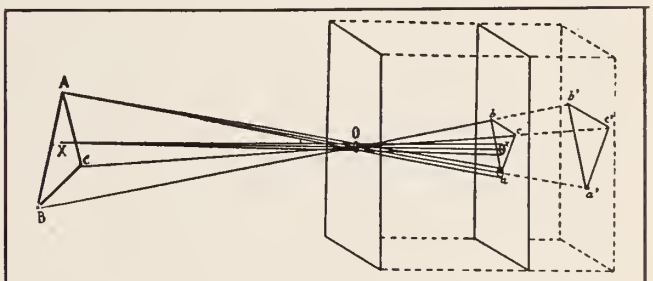


Figure 15

Suppose ABC to be an object presented to a camera obscura, of which O is the pinhole orifice.

Each one of the extreme points, A, B and C, can be considered as a source of disturbance, emitting rays of light in all directions.

The particular ray emitted by the point A, and passing through the pinhole, will be intercepted by the screen, and form *da,* another source of disturbance, similar to the original source A. Similarly the rays emitted by the object points B and C, will create sources of disturbance at *b* and *c.* Now if we consider the object ABC, as formed by a conglomeration of points, it is easily understood that each one of these points will emit a

(Continued on Page 19)

Panchromatic Motion Picture Film Negative

Third Number in Series Founded on Communications from Eastman Research Laboratories.

By Loyd A. Jones and J. I. Crabtree

Continue Discussion of Details Concerning Standard Illumination Sources in Studio Work.

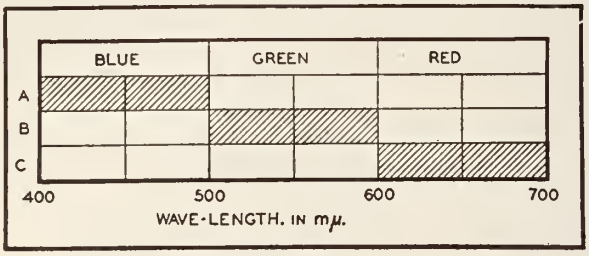


Figure 13

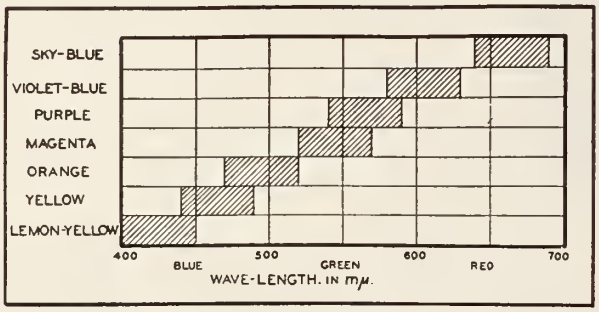


Figure 14

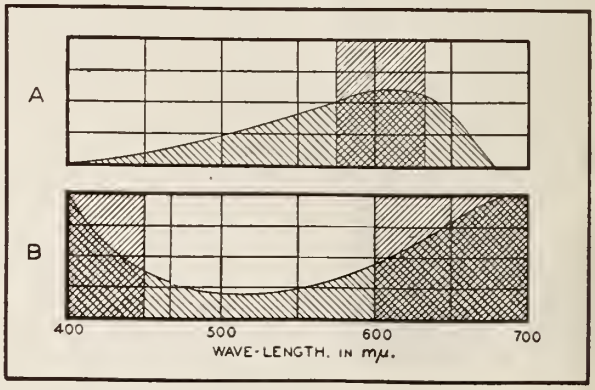


Figure 15

(Continued from last month.)

The Nature of Color

As STATED previously the sensation produced when radiant energy falls upon the retina has three fundamental attributes: brilliance, hue, and saturation. If, however, the relative proportions of the various wave-lengths present in the stimulating radiation are properly adjusted the hue, and consequently the saturation, attributes are entirely absent. In such cases the sensation is described as *white* or gray and can be expressed in terms of a single factor, its brilliance. Any radiation of such spectral composition as to give rise to a hueless sensation is spoken of as *white light*. While it is difficult to define precisely and absolutely a standard of white light it has been found experimentally that the radiation received at the earth's surface at noon on a clear day approximates closely the required spectral composition. For all practical purposes noon sunlight may therefore be adopted as a standard of white light.

Brilliance being an attribute of sensation can be expressed quantitatively only in terms of some sensation unit. The capacity of the stimulus, that is radiant energy, to produce the brilliance factor of sensation is denoted by its *luminous intensity* or *brightness*. These are physical quantities measurable by purely physical methods and expressible in definite physical units. In the case of reflecting surfaces brightness is the physical characteristic of interest in tone reproduction problems since it is the only factor which is reproducible by the photographic process. From the photographic standpoint therefore the perfection with which brightness distribution of the object photographed is reproduced in the print or screen image is a measure of the quality of reproduction.

Gray Sensation

The *gray* sensation differs from white only in the brilliance factor. The entire series of colors designated as grays (of which black and white are the limiting members) are due to spectral compositions of radiation capable of exciting hueless sensations. Any radiation differing in spectral composition from that required to produce a hueless sensation gives rise to a sensation which has a definite hue and which exhibits saturation in increasing magnitude as the difference between the spectral composition of the radiation and that of gray increases. Radiation of such wave-length as to excite sensation of which the hue is red, we speak of as red light, or it is called a green light if the hue be green, etc. Thus the hue or color is spoken of in common terminology as if it were an attribute of the radiation itself.

Non-luminous Objects

Non-luminous objects are visible by virtue of the radiation which they transmit or reflect. In case an object transmits or reflects all wave-lengths of visible radiations in equal proportions the spectral composition of the radiation which reaches the eye is precisely the same as that which illuminates the object. Such objects

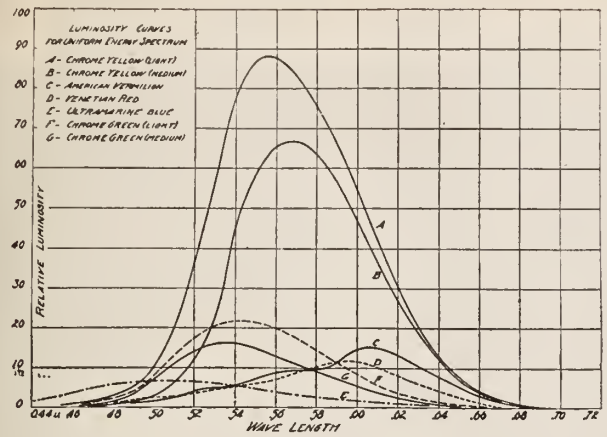


Figure 16

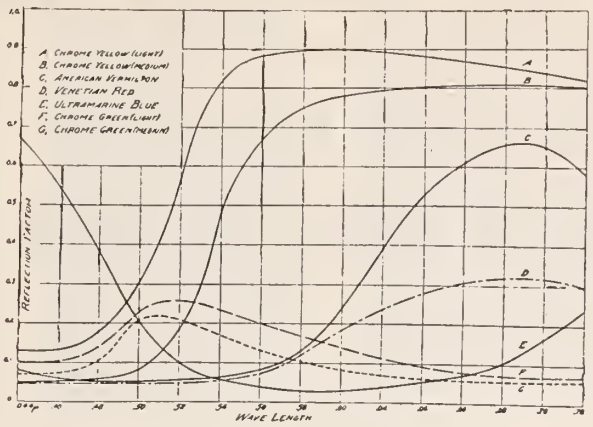


Figure 17

are said to be gray, black, or white depending upon the extent to which they reflect or absorb the incident radiation. The terms *non-selective* and *neutral* are also frequently used in referring to the reflecting or absorbing characteristics of such objects indicating that they absorb to equal extents all visible incident radiation regardless of wave-length. Objects which absorb some wave-lengths to a greater extent than others are referred to as *selective* absorbers. Radiation which has been reflected by such objects differs in spectral composition from that which was incident thereon. If the radiation incident on such an object is of such quality as to excite a hueless sensation (that is white) that which is reflected is so modified by *selective absorption* that it now excites a sensation having hue. Therefore we see an object possessing hue and consequently saturation. Hence we call it a colored object. Color in non-luminous objects is due therefore to *selective absorption.*

Two Objects

A gray object illuminated by colored light appears to be colored, while a colored object illuminated by colored light may appear either gray or of a different color. It is evident therefore that the color which an object appears to have at any time depends on two factors, its absorbing characteristics and the spectral composition of the light with which it is illuminated.

Keeping in mind now that the color which an object exhibits is due to its spectral absorbing characteristics, let us consider briefly the colors produced by various types of absorption. This subject is treated at length in "The Photography of Colored Objects," by Dr. C. E. K. Mees. To this reference should be made for more complete information on the subject.

In Fig. 13 is shown a diagram in which the upper section represents the visible spectrum. This is divided into three equal portions representing approximately the three primary colors: red, green, and blue, the divisional points being indicated by the wave-length scale at the bottom of the figure. It is assumed that this spectrum represents that of white light, for instance light from the noon-day sun. In the spectrum designated as *A* absorption of blue is indicated by the shaded area. The remaining light consists of red and green which added together give a yellow color. Thus the absorption of blue results in yellow. Complementary colors are defined as those which when added together result in white. It is evident therefore that blue and yellow are complementary to *each other.* Since the absorption of blue results in yellow the converse must be true that the absorption of yellow, that is the red and green components of white light, will result in blue. In the spectrum designated as *B* green has been absorbed. The remaining radiation consists of red and blue which when mixed together produce magenta. This brings to our attention for the first time a group of colors which are not present in the spectrum. They are commonly referred to as the purples and consist of mixtures, in various proportions, of red and blue. In the spectrum designated as C at the bottom of the diagram the shaded area indicates that red has been absorbed. The remaining light is blue-green in color and conversely it follows that if blue and green are absorbed the residual will be red. The absorption bands shown in Fig. 13 are relatively wide, each one including one-third of the visible spectrum. The colors produced by such absorption are of high saturation. Narrow absorption bands produce colors of lower saturation as illustrated in Fig. 14. In this figure a relatively narrow absorption band is indicated by the shaded area. This is moved into different positions in the spectrum, the residual color remaining after the absorption of the narrow band being indicated by the color names at the side of the diagram.

Dyes and Pigments

All of the illustrations given thus far are based on the assumption that certain wave-lengths of radiation are absorbed completely as indicated by the vertical boundaries of the various absorption bands. This is only an ideal condition and is never encountered in the case of pigments and dyes with which we have to deal in practical work. The diagram in Fig. 15 illustrates the type of spectral absorption met with in the case of dyes and pigments. In *A* the narrow sharply defined shaded area lying between wave-lengths 570 and 620 mu repre-

(Continued on Page 15)

The World's Leading Producers

Standardize with

Bell & Howell CAMERAS

WHEN the great producer undertakes a production he assumes a tremendous responsibility. Enormous labors and fabulous expenditures are involved in getting the story, the locations, properties and players. Yet, when all these are ready for capable direction, final success depends exclusively upon one thing—**perfect photography.**

No wonder, then, that leading producers, the world over, use the camera whose dependability under all conditions has been proved thru 20 years of gruelling test. That is the BELL & HOWELL Pioneer Standard, shown here. B. & H. Cameras built in 1907 (20 years ago) are still in use. Basically patented pilot register movement and interchangeable detail parts keep them constantly up to date. Keep every link in your production chain as **strong** as the Bell & Howell Standard Camera is in cinema photography, and the world will acclaim you.

The

Bell & Howell

MAKES MOVIES AS THE EYE SEES

Eyemo

Automatic

A thoroughly professional standard camera for field and stunt use.

The Eyemo Camera, shown above, has proved its professional worth in many a feature picture. For stunt shots, news reels and comedy use, you can't beat it. Few studios are without it—and none **should** be.

Eyemo evidences all the niceties of BELL & HOWELL workmanship. A 47 mm. F2.5 Taylor-Hobson Cooke lens in micrometer mount is regularly furnished. Other lenses up to 20′ telephoto are regularly stocked. Quickly interchanged because of micrometer focusing mounts employed. You have your choice of two speed mechanisms—one adjustable to 16 and 8 exposures per second—the other to 16 and 32. Takes 100 feet standard 35 mm. daylight loading film, or 120′ darkroom load. Write for fully descriptive circular.

BELL & HOWELL CO.

1805 Larchmont Ave., Chicago, Ill.
New York, Hollywood, London (B. & H. Co., Ltd.)
Established 1907

MACK SENNETT

The King of Comedy Producers appreciates that personal beauty becomes screen beauty only thru perfect photography. All the cameras in use at the Mack Sennett Studios are Bell & Howells.

Figure 18

Figure 19

sents a theoretical absorption band which produces a violet color. As a matter of fact violet can be produced in this way by inserting an opaque absorbing material in a spectrum formed by dispersion of white light. Recombinations of the unabsorbed portions of the spectrum then result in light of violet color. Dyes and pigments, however, do not exhibit such sharp absorption characteristics. The shaded portion under the curve in diagram *A,* Fig. 15, represents the spectral absorption of a violet dye. It will be noted that it has a maximum absorption at approximately 600 mu decreasing rather sharply on the long wave-length side to zero at approximately 700 and decreasing more gradually on the short wave-length side to zero at approximately 400 mu. In diagram *B* the difference between a spectrum and pigment green is shown. The spectral absorption of the pigment green which is designated by the shaded area under the curve shows two maxima, one at the red end of the visible spectrum and the other at the violet with a minimum of absorption at approximately 550 mu. Practically all pigments and dyes have absorption characteristics of the general type illustrated by the curves in Fig. 15, although in some cases the absorption may be somewhat sharper than shown. Quantitative data relative to the spectral absorption characteristics of colored materials are usually given in graphic form by plotting absorption or reflection as a function of wave-lengths. In Figs. 16 and 17 are given a group of curves showing the spectral reflection characteristics of a few typical pigments. These are taken from a publication by M. Luckiesh[5] who also gives a large amount of data relative to other colored materials such as dyes, inks, etc.

An inspection of the curves in Figs. 16 and 17 reveals some facts of interest. The materials represented by these curves may be taken as representative in a general way of the coloring materials available for producing color in paints, fabrics, wall paper, etc. It will be noted that the curves for the red, orange, and yellow pigments have relatively very high reflection factors in the spectral region which they reflect most copiously. While the greens, blue-greens, and blues, even for those wave-lengths which they reflect to the greatest extent, have relatively low reflection factors. Even if the eye were of equal sensitivity to all wave-lengths of radiation red, orange, and yellow pigment would in general be much brighter visually than the green, blue-greens, and violets. When it is remembered that the maximum of visibility lies at 556 mu and that the visibility for longer and especially for shorter wave-lengths decreases very rapidly, it is evident that we should expect the reds and yellows to be colors of much greater brilliance in general than those in the shorter wave-length region of the spectrum. By multiplying the ordinates of the visibility curve by those of the spectral reflection curve for any given pigment a curve is obtained designated as the *luminosity* curve of the pigment. The area enclosed by this curve indicates the relative brightness of the pigment when illuminated by white light. Likewise the ordinates of the spectral sensitivity for the photographic material when multiplied by the ordinates of the spectral reflection curve give a curve known as the *photicity* curve. The area enclosed by this is proportional to what we may term the *photographic brightness* of the color considered. Applying this method of analysis to the various colored materials represented by the curves in the last two figures it is evident that colors of the green-blue-violet class will be relatively very bright as seen by a photographic material of ordinary type, while the colors of the red-orange-yellow group will have relatively low photographic brightness. This relation being the reverse of the visual brightness of these colors explains the enormous distortion of tone values obtained when photographing colored objects on ordinary blue-sensitive film. If now we substitute panchromatic film it is apparent at once that the red-orange-yellow colors will be photographically relatively brighter than when rendered on ordinary film.

The spectral reflection characteristics of the colors which predominate in motion picture work has an important bearing on the effective or practical speed of the photographic film used.

In measuring the speed of photographic materials by sensitometric methods it is customary to expose them to

5. Luckiesh, M.

white light, in which approximately the same amount of energy is radiated at all wave-lengths. On this basis the speed of panchromatic motion picture negative is approximately the same as that of Superspeed orthochromatic negative film. A careful study of the color of materials used in interiors, including such things as wall papers, draperies, upholstering, furniture, wood trim, costumes, rugs, etc., shows that the so-called warm colors (those having a hue lying on the long wave-length side of 550 mu) very greatly predominate, the cold colors (those having the hue lying on the short wave-length side of 550 mu) being used in much smaller total quantity. Assuming that this preponderance of colors reflecting the longer wave-lengths exists, there is no doubt that the panchromatic motion picture negative is effectively appreciably faster than the orthochromatic.

Thus far very little has been said relating to the transmitting type. These are of considerable importance since they provide a means whereby certain portions of the radiation reflected by the objects being photographed may be selectively absorbed. This may be accomplished of course by placing the colored glass or gelatine in front of the lens of the camera or between the light source and object illuminated. Colored glass in wide variety is available for the use in the studio. This class of materials has been described at some length by Dr. Gage[6] in these Transactions, wedge spectograms being given which show the selective absorption characteristics of a large number of samples. Colored filters made by incorporating dyes in gelatine are particularly adapted to photographic purposes. Due to the large number of dyes available a much greater range in types of selective absorption can be obtained in this way than it is possible to manufacture in the form of glass. A very complete line of filters of this type are commercially available and are described in detail in "Wratten Light Filters." In this booklet spectral absorption curves are given for approximately one hundred different absorbing filters suitable for use in various fields of photographic work.

To deal completely with the subject of using light filters with panchromatic film under all possible conditions of light source, object, and desired result would in itself constitute a lengthy discussion. This subject has been treated exhaustively in the book mentioned previously, "The Photography of Colored Objects," and for further information the reader is referred thereto.

Rendition of Colored Objects by Orthochromatic and Panchromatic Film

FROM a consideration of the spectral sensitivity of orthochromatic and panchromatic film, the spectral reflection curves of various colored objects, and the distribution of energy in the radiation emitted by light sources it is evident that a marked difference in the photographic rendition of variously colored objects should be obtained. A few actual examples of such differences will now be given. In Fig. 18 are reproduced two photographs of a white vase on which is a design in blue. The flowers are two varieties of narcissus, the upper ones being bright yellow and the lower having

6. Gage, H. P. Colored Glasses for Stage Illumination. Trans. S. M. P. E. No. 18, 1924, p. 37.

Figure 20

white outer petals with a yellow central cup. The reproduction on the orthochromatic plate renders the yellow as very dark, only slightly lighter than the black background. The superior rendition of visual brightness is obvious in the reproduction on the panchromatic material, the yellow being rendered almost as bright as the white, thus corresponding to the visual impression.

In Fig. 19 are shown two reproductions of a poster. The sky in the original is dark blue, while the moon is represented by a bright orange disc. It will be noted that the orthochromatic material renders the moon as much darker than the sky background, this being the inverse of the visual relationship. On panchromatic film the brightness ratio between sky and moon is reversed and corresponds with the visual ratio.

In Fig. 20 is shown a photograph of a painting. The dress is a brilliant scarlet while the background is very dark. The orthochromatic material reproduces this so that the scarlet dress, which is visually many times brighter than the black background, is just perceptibly lighter than the background. In case of the reproduction on panchromatic material the brightness ratio is as it should be, the scarlet dress being rendered as an area of much higher brightness than the black background. Illustrations of the improvement in tone reproduction by use of panchromatic material could be multiplied indefinitely. These three, however, serve as sufficient illustration.

Uses of Panchromatic Film

THE application of panchromatic motion picture film to practical problems may for convenience be classified in two main divisions: (a) to obtain correct reproduction of the visual brightnesses in a scene containing variously colored objects and (b) to obtain desired distortion of brightness in a scene consisting of variously colored objects.

Correct Reproduction

The first of these purposes may be referred to as the *normal* usage of such film. The curves showing the relation between sensitivity and wave-length for this material indicate that it is sensitive to all wave-lengths of visible radiation. There is, however, an appreciable preponder-

ance of sensitivity to radiations of shorter wave-length. The required spectral distribution of sensitivity in a photographic material in order to obtain *under all conditions* precise reproduction of visual brightness is that the curve of spectral sensitivity of the material shall be identical in shape with that of the visibility curve of the eye. A comparison of the visibility curve with that of spectral sensitivity of panchromatic film shows that there is still an appreciable discrepancy. By placing over the lens a filter which absorbs radiation selectively it is possible to modify the *effective spectral sensitivity* of the photographic material. Thus by using a yellow filter which absorbs radiation of shorter wave-lengths the *effective* sensitivity of the film at those wave-lengths can be reduced. If the spectral absorption characteristic of this filter is properly adjusted to that of the photographic material the spectral sensitivity can be made for all practical purposes identical with the visibility function of the eye. It is obvious that the absorbing characteristics of the filter which is used for this purpose will depend directly upon the spectral distribution of energy in the radiation of the light source used for illuminating the object. When panchromatic motion picture negative is used outdoors, the object being illuminated by sun and sky light, it is necessary to use a yellow filter such as the W. & W. No. 8 (K-2) in order to obtain correct reproduction of visual tone values. When this material is used in the studio with such sources as the high intensity, sun arc, or white flame arc, the same filter is approximately correct. A set illuminated by light from the ordinary hard cored carbon arc, operating at a color temperature of approximately 4000°, requires a slightly lighter yellow, filter K-1½ being approximately correct. If high efficiency tungsten lamps are used no filter is required. The relatively small quantity of short wave radiation and the relatively large quantity of long wave radiation compensates approximately for the excess of blue and violet sensitivity.

The use of a photographic material which will give correct reproduction of visual brightness values has many advantages. Under such conditions the distribution of the tone values (brightness) in the set is seen by the scenic artist, cinematographer, director, and the actors themselves just as it will be reproduced on the screen. There is little doubt that this is of great value since it enables those responsible for the composition of the picture to judge more precisely when the various elements of light and shade bear the proper relation to each other. Flesh tones and quality are rendered as seen by the eye. Problems of make-up very largely vanish when panchromatic film is used. It is only necessary to instruct the actors to make up as they wish to be seen. There seems to be little doubt that this simplification of the make-up problem is of considerable *value*. Both cinematographer and director should be able to detect any faulty or objectionable make-up much more readily than under conditions which exist at present where the make-up must necessarily be incorrect visually in order to produce a pleasing result on the screen. The rendition of flesh color by the non-color sensitive material is notoriously

(Continued on Page 24)

Amateur Cinematography

(Continued from Page 11)

certain ray of light that will pass through the pinhole, and the whole *image space, abc,* will become a conglomeration of sources of disturbance, which, by the law of propagation of light, will produce the phenomena of vision when striking the eye. An image of ABC is then formed at *abc,* and by viewing the figure we can readily see that this image is *inverted* and *real.*

Each point of the object will have a corresponding point in the image, and this geometrical similarity is called *collinearity of object and image spaces.*

Diffraction

At first thought, it seems that we would be justified in concluding that the rendering of the image should be perfect, if the orifice is of such small size as to admit only *one* of the rays of light emitted by each one of the points forming the objects, but facts prove that such is not the case.

Firstly, the amplitude of *one ray* of light is a non-measurable entity, resulting to the physical impossibility of drilling an opening of such size.

Secondly, experimentations have proved that, although the image increases in sharpness by reducing the size of the opening, a certain point is found, which marks *a maximum of sharpness,* which cannot be surpassed. In fact, by reducing further the size of the opening, a lack of sharpness sets again in the image and a limit of smallness would be found at which no image would be visible.

This is due to phenomena of *diffraction* that take place when light passes through small orifices or narrow slits in the same manner as when it is partially intercepted by a sharp edge, as we have mentioned in the preceding chapter.

Such being the case, it is evident that as the orifice of the camera obscura is larger than the size of a single ray of light, more than one of the rays emitted by the point A, for instance, of Fig. 15, will enter the pinhole, and the image of such a point will be an area whose surface is limited by the size and shape of the orifice.

It is evident that to each point of the object space there corresponds an idea in the image space, so that the image is formed by a conglomeration of such areas instead of a conglomeration of points. It is also evident that the size of these areas controls the *definition* or *sharpness* of the image.

The shape of the opening has no influence whatever on the formation of the image, but as it is customary to consider a round opening, the image area of one object point is called the *circle,* or *disc of confusion.*

Now, if we consider again Fig. 15, it will appear clearly to us that the rays emitted by the point X of the object will form at *x* a disc of confusion perfectly circular (providing that the opening O is a circle) while the rays emitted by the point A will form in the image space a circle of confusion of eliptical form and we will therefore find a greater sharpness in the center of the image space than at its outside boundary.

The human eye is still able to distinguish at a distance of one foot, two separate points, 0.004 inches apart. If the two points are nearer to each other, they blend into one.

This limit of visibility determines an extreme maximum of sharpness that it is useless to surpass in an image that is to be viewed with the naked eye. In fact this extreme degree of sharpness is seldom sought nor obtained.

Scale of Magnification

LET us suppose now that we hold the object and the pinhole stationary but we move the screen so as to place it in a position further away from the orifice. Suppose the position illustrated by dotted lines in Fig. 15.

We can readily see that the size of the object remaining unchanged, *the size of the image varies,* and the new image *a'b'c'* is *greater* than the size of the former image *abc.*

Furthermore, if we keep pinhole and screen stationary and we move the object, the size of its image will *increase* if the object is approached to the pinhole, and will *decrease* if the object is set further away from it.

There is then a certain geometrical relation between the *distance of the object* and the *distance of the screen* from the pinhole.

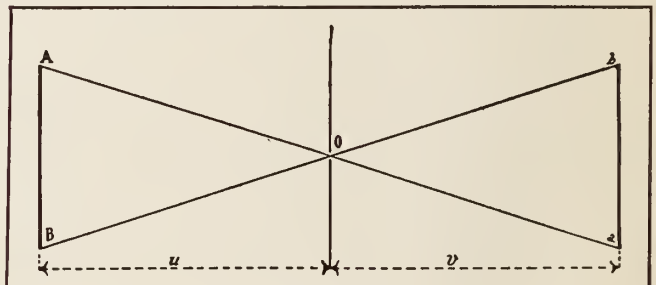


Figure 16

Supposing AB to be the object, *ab* to be the image, O the pinhole, *u* the distance from the object to the pinhole and *v* the distance from the pinhole to the image, we have the equation:

$$\frac{AB}{ab} \text{ equals } \frac{u}{v}$$

This ratio is the *scale of magnification* of the image, and we can easily conclude that the image will be of the same size of the object, if object and image are at the same distance from the pinhole and that the size of the image is inversely porportional to the distance of the object from the pinhole.

The distances *u* and *v* determine thus the ratio of magnification, and have no bearing on the sharpness of the image. It results from this that in a pinhole camera, objects placed at any distance from it, always give a sharp image, within the limits of the circle of confusion.

Thus, the image of a landscape given by such a camera will present the extreme foreground as sharp as the extreme background and t hrough the constant ratio A divided by B equals *c* divided by *b* the proportions of the size of close-by and far-away objects in the object

and image spaces will render a perfect perspective of the landscape.

In other words, a pinhole camera will form an image presenting the following features:

I. *Exact similarity* of object and image;
II. *Depth of field;*
III. *Sufficient definition or sharpness all over the image space.*

This complete rendering of an image by an optical instrument is called *orthoscopy.*

The lack of orthoscopy in an image is called *distortion.*

Daguerre

FROM what we have stated above, it results that the pinhole camera is the *ideal orthoscopic* camera, and would be the ideal photographic camera, if the admission of light through the pinhole opening would be sufficient to permit a rapid exposure on the sensitive emulsion of plate or film.

Unfortunately, the disc of confusion's size required to obtain a sufficiently sharp image is so minute that a very small amount of the light emitted by the object enters the camera, and a very prolonged exposure is needed to obtain the photographic results desired.

This deficiency of illumination was felt even by Porta, in his applications of the "camera obscura" either for exhibition, or for reproduction purposes, and, in the course of his experiments, he also discovered that the pinhole could be considerably enlarged, providing that *a converging lens was placed at the orifice itself.*

He found thus that he could enormously increase the admission of light into the camera, and produce an image not *orthoscopic,* but with sufficient definition to serve its purpose.

Porta's fame grew by leaps and bounds, and it is said that upon his return to his native town Naples, his home was constantly besieged by friends and admirers who would wonder over the marvelous pictures on the wall.

It was only too natural for the human mind, the production of images once discovered, to attempt to *fix* these images in some mechanical way, but it was only over three hundred years later, in 1814, that the Frenchman Niepce obtained a *permanent* image on a plate of glass coated with bitumen, and in 1839 another Frenchman, *Daguerre,* discovered the way of fixing the image on a silver plate upon which a coating of silver iodide was former.

Daguerrotypes, the name given to such pictures, in honor of the inventor, are still in existence today, and it is quite often that one may have the opportunity of admiring the delicacy of these images that have so wonderfully withstood the action of *time.*

By Daguerre's invention, the "camera obscura" ceased to be a *toy* and became an *instrument,* and we all know the remarkable strides made during the past century by the new *art* of *photography,* as an *art* and as an *industry.*

(To be continued next month.)

PROJECTION-Conducted by Earl J. Denison

True Film House Is Yet to Come

By Daniel B. Clark, A.S.C.

President of A.S.C. Suggests Originality in Construction of Theatres

THE writer has another bone to pick with motion picture theatre architects. But first let him say that he has the utmost respect for the men who have designed the beautiful buildings which have displaced the nickelodeons of fifteen years ago. He believes that some of the edifices, which they have laid out, rank as architectural masterpieces which even other types of public buildings might be patterned after.

Because he has respect for the theatre architects, he believes that he is not prejudiced in offering them, in good faith, a couple more suggestions.

Example

By way of example, let us point to the practices of the early automobile manufacturers. Truly, they were making horseless carriages—a carriage with a motor in it, instead of a horse for motivation. For many years, an automobile was nothing more than an animated buggy. Then, the designers of bodies must have awakened to the fact that they were not merely dealing with a new kind of carriage, but that they were doing business with an entirely new creation. So automobiles began to have an appearance of their own, and were something more than imitation shays.

Influence of Legitimate

Now to get back to film theatres: It has appeared to the writer that many of our costly cinema houses have been fashioned in such a way to be in reality a legitimate theatre with the addition of a screen and a projection system—thus making it a "movie" palace. The other night the writer had this supposition again substantiated when he went to view a performance of Metro-Goldwyn-Mayer's "Tell It to the Marines." It so happened that the production was being presented in a neighborhood theatre which, on the first exhibition since the downtown run at top prices, was playing to a capacity house. The result was that the available seats were in the second row on the left side of the lower floor. Once seated, our first impression was that Lon Chaney wasn't out of make-up, as had been announced, and was not appearing in "straight" character after all—for his face was never more distorted and elongated than he appeared that night on the screen before us. We knew, of course, that it was not a matter of photography, and, moreover, we had been reliably informed that Ira Morgan, a fellow member of the A.S.C., had done some of his best work in this production. When we were beginning to suspect the projection, the first show ended, enabling us to get seats in the center of the house. When the feature was screened again, the projection and the presentation in general were perfect.

Periscope Needed

The whole trouble, of course, was the unbelievable angle of those front seats on the side of the house. Why an architect or a theatre owner should place seats in such a section of the house is beyond reason, and this is said with full knowledge of the fact that the thing is being done all the time. People, let us note again, go to the picture theatre to be entertained and for relaxation. They certainly don't get what they paid for when they have to strain their eyes to view a lot of grotesque, unhuman figures on the screen.

Legitimate Imitated

Now the reason that those seats were placed in that particular theatre was because seats had been in a similar location in every theater which the architect and owner had ever seen. Theatres always had had seats there! Naturally—and the precedent of the whole thing is the type of structure used for the legitimate theatre where, even though the seats were at an awkward angle, that part of the audience which drew them could hear very well; in addition, they were looking at people in flesh instead of moving photographs thrown on a flat screen.

Chance to Be Original

Some day, an architectural genius is going to come along, forget that such a thing as a speaking theatre ever existed, and design a real motion picture house. It will be a theatre which will aid projection rather than hinder it. It will be a theatre where projection will have the right of way and won't be challenged to do everything possible short of turning corners.

As we remarked once before, theatres should be built around the projection system—not projection around the theatres!

Protective Glass to Prevent 'Kleig Eyes'

A new "Kleig eye" preventive is being introduced in Hollywood in the form of Goerz's "Sinuval" which is being marketed by the Fish-Schurman Corporation.

This method employs a glass which is placed over the lights used in the studios for photographing, thereby going directly to the source of the eye maladies which have been perennial since artificial illumination was introduced in picture making.

S. M. P. E. Holds Spring Meeting in Norfolk, Virginia

The spring meeting of the Society of Motion Picture Engineers will be held at the Monticello Hotel, Norfolk, Virginia, April 25th to 28th.

Herford Tynes Cowling, A.S.C., will act as delegate of the American Society of Cinematographers at the meeting.

The meeting's preliminary program, subject to change, was announced as follows:

Monday, April 25

9:30—Registration.

10:30—Presidential Address by W. B. Cook, Kodascope Libraries, Inc., New York, N. Y. New Business. Report of Arrangements, Publications, Papers, Publicity and Advertising, and Membership Committees. "Report of Progress in the Motion Picture Industry" by Carl E. Egeler, National Lamp Works, Cleveland, Ohio. "Hollywood and the Motion Picture Engineers" by K. C. D. Hickman, Research Laboratory, Eastman Kodak Company.

1:00—Luncheon.

2:00—Papers: "Radio Movies and the Theatre" by C. F. Jenkins. "Some Technical Aspects of the Vitaphone" by J. B. Harlow, Development Manager, Western Electric Co. "The Conservation Program of the Motion Picture Producers and Distributors of America" by Hickman Price, Motion Picture Producers and Distributors of America, Inc., New York, N. Y. "Motion Photomicrography with a Cine-Kodak" by C. F. Tuttle, Research Laboratory, Eastman Kodak Company.

7:00—Get-Together Dinner.

8:00—Motion Picture Entertainment in the Banquet Hall. Ladies and friends are cordially invited. "To the Roof of the World in Thibet" by H. T. Cowling, Eastman Kodak Company. "The Scientific Motion Picture" by L. F. Goldman, Carpenter-Goldman Labs., New York, N. Y. Cards and dancing afterward.

Tuesday, April 26

9:30—Papers: "Some Facts about Projection Lenses" by W. B. Rayton, Director of Research, Bausch & Lomb Optical Co., Rochester, N. Y. Report of Standards and Nomenclature Committee. "An Improved Type of Arc Illumination and Condenser System for Motion Picture Projection" by L. M. Townsend, Supervisor of Projection, Eastman Theatre, Rochester, N. Y. "Effect Lighting in Theatres" by J. H. Kurlander, Brenkert Light Projection Co., Detroit, Mich. "A New Light Source for Mazda Projection Lamps" by H. I. Wood, National Lamp Works, Cleveland, Ohio.

1:00—Luncheon.

2:00—Automobile trip to Virginia Beach for Oyster Roast at the Cavalier Hotel. Golf, swimming, etc. Dancing afterward.

Wednesday, April 27

9:30—Papers: "The Mercury Arc" by F. Benford, General Electric Co., Schenectady, N. Y. "The Physiological Effect of Radiations from Various Light Sources" by M. J. Dorcas, National Carbon Co., Cleveland, Ohio. "Why is Make-Up Compulsory in the Movies?" by V. A. Stewart, Fox Film Corp., New York, N. Y. "Illusions in Cinematography" by F. Waller, Famous Players Lasky Corp., Long Island City, N. Y. "Trick Photography Patents" by E. J. Wall.

1:00—Luncheon.

2:00—Papers: "A Film Developing Process for Acoustic Records" by Dr. Engl. " Progress in Color Cinematography" by F. E. Ives. "Some Faults Demanding Attention" by F. H. Richardson, Moving Picture World, New York, N. Y. "The Use and Care of Motion Picture Film in Exploration Photography" by H. T. Cowling, Eastman Kodak Company. "Air Conditioning in Laboratories and Theatres" by D. C. Lindsay, Carrier Engineering Co., Newark, N. J.

7:00—Banquet. Motion Pictures and Vitaphone entertainment. Dancing afterward.

Thursday, April 28

9:30—Papers: "The Tungsten Lamp Situation in the Studio" by P. Mole, Creco Corp., Hollywood, Calif. "The Use of Filters with Panchromatic Film" by L. A. Jones, Research Laboratory, Eastman Kodak Co. "Trick Photography" by J. A. Ball, Technicolor Corp., Hollywood, Calif. (a) "A Pneumatic Film Squeegee"; (b) "Film Cleaning Liquids" by J. I. Crabtree, Research Laboratory, Eastman Kodak Company. "The Importance of Research Work to the Producer" by Leigh M. Griffith, Famous Players Lasky Corp., Hollywood, Calif. "A New Camera Pull-Down Mechanism" by George A. Mitchell, Mitchell Camera Co., Hollywood, Calif. "A Shutter Dissolving Mechanism" by D. L. Mistry, Bombay, India. "Examination of Film by Projection on a Continuous Processing Machine" by W. V. D. Kelley, Kelley Color Films, Inc., Hollywood, Calif.

(Continued from Page 18)

bad. Normal skin being a tissue filled more or less with blood vessels has a yellow or red dominant hue which on orthochromatic film at present used necessarily renders much darker on the tone scale than it appears visually. Lips in particular render as almost black. The sensitivity of the panchromatic material to the wave-lengths of radiation reflected by flesh entirely eliminates this trouble. Skin imperfections such as freckles, enlarged blood vessels, etc., are practically invisible when panchromatic film is used. The rendition of various types of hair on panchromatic film is much more satisfactory. For instance, auburn hair which visually is of high brightness, is rendered on ordinary film as very dark. On panchromatic film this assumes its true position on the visual tone scale. Yellow hair also renders much too dark on orthochromatic film but on panchromatic is correctly reproduced.

(To be continued next month.)

Panchromatic Stock Is Added to Company's Line

Dupont-Pathe is introducing panchromatic film as a part of their line this month, according to J. Wesley Smith, of Smith and Aller, Inc., Pacific Coast distributors of Dupont-Pathe Film Manufacturing Company.

This addition to the Dupont-Pathe line has been anticipated for some time, and its sponsors state that indications point to its immediate success among Hollywood studios.

CLASSIFIED ADVERTISING

RATES: *Four cents a word. Minimum charge one dollar per insertion.*

All copy must be prepaid and must reach us before the fifteenth of the month preceding publication.

CLASSIFIED ADVERTISING
AMERICAN CINEMATOGRAPHER,
1222 GUARANTY BUILDING
HOLLYWOOD, CALIFORNIA

WANTED—MOTION PICTURE CAMERA

WILL PUT you in touch with buyers for Bell & Howell cameras and equipment. Phone or write the A. S. C., 1222 Guaranty Bldg. GRanite 4274, Hollywood, California.

BELL & HOWELL or Mitchell Camera outfit; Projection Printer; Cinex timer; Straight Line Processing Machine; Nutting Reflectometer; Polishing Machine; State price, Equipment. Fred Jeffery, Giles Street, Rose Park, South Australia.

16 mm. Eastman Cine-Kodak, Model A, with F 3.5 or F 1.9 lens. Must have top and back built-in finders. State serial number, equipment, price. Hamilton Riddel, 1622 North Wilcox Ave., Hollywood.

FOR SALE—CAMERAS

DEBRIE, aluminum box, dissolving shutter, 8 magazines, Mitchell tripod, 40, 50, 75 mm. Carl Zeiss lenses. Thalhammer iris. Veeder footage recorder, ¼-way mat box. Glen MacWilliams, c/o A. S. C., Hollywood.

WILART camera, latest model, complete with tripod and carrying cases and retort case and magazines. John L. Russel, 1643 North Gardner St., Hollywood. HEmpstead 9554.

BELL & HOWELL Eyemo, carrying case, four one hundred feet daylight loading Eastman negative, guaranteed perfect. First $225.00 gets it—cost $385.00. Cameron, Manhattan Beach, N. Y.

$75—Angeles 400-feet Carl Zeiss 3.5, case, tripod. Want 4 by 5 Graflex or f 1.9 to fit De Vry. 2590 Midlothian Dr., Altadena, Calif. Colorado 0342.

BELL & HOWELL Eyemo, brand new, B-1702, with carrying case and five spools, $225.00, C. O. D. Guaranteed. Roscoe Wright, 2223 Clifton Ave., Cincinnati. O.

FOR RENT—CAMERAS

FOR RENT—Bell & Howell studio equipment complete. 170-Degree Shutter. Liberal commission to cameramen. Call Mr. Smith, MEtropolitan 4686. Evenings call MAin 0947. (Los Angeles.)

NEW Eyemo camera, fully equipped; rent by day or longer. Joe La Shelle, 9038 Dorrington Ave., Hollywood; Phone OXford 5840.

AKELEY, Bell & Howell and Mitchell Cameras for rent, all latest equipment. Phone GRanite 2213 or GRanite 1914. John W. Boyle, 1207 North Milton Ave., Hollywood.

BELL & HOWELL. Victor Milner, 2221 Observatory Ave., Los Angeles, California. 596-944.

MITCHELL, and Bell & Howell Cameras. F.2:3; F.2:7; F.3:5 lenses—40-50-75 mm. Complete equipment. J. R. Lockwood, 523 North Orange St., Glendale, California. Glendale 3361-W, or HOlly 0764.

E. BURTON STEENE, Bell & Howell, and Akeley. Complete Camera Equipment. Latest models. Address American Society of Cinematographers, Hollywood, California.

BELL & HOWELL, 170, with 30, 40, 50 and 75 lens equipment. Baby Tripod. Also B. & H. Cine Motor. Charles Stumar. GRanite 9845. 7501 Lexington Ave., Hollywood.

FOR RENT—Oue Eyemo camera, complete with all accessories. Bert Glennon, 6936 Woodrow Wilson Dr., Hollywood. Calif. Phone HEmpstead 2743.

BELL & HOWELL No. 627. Five lenses: 32, 40 (f.2.7), 50 (f.2.7), 75, 100 mm. Complete studio equipment: gauzes, filters, etc. GLadstone 0033.

TWO Bell & Howells. Large finders. Also Eyemo for rent. Lenses: F 2.5; 2.3; 2.7. Frank M. Cotner, 6273 Selma Ave., Hollywood. HOllywood 5046.

SPEED CAMERA: Bell & Howell, fully equipped for miniature and slow motion work 40, 50, 75 mm. and 6-inch lenses. Alvin V. Knechtel, 1179 North Kenmore. 597-054.

BELL & HOWELL cameras, Akeleys and other makes—portable lights, special lenses by the day, week or month. We sell everything that any cameraman might ever need—new or used—at a big saving. Keep us in touch with your wants. Ruby Camera Exchange, Ruby Building, 727 Seventh Ave., N. Y. Bryant 0631 or 8457.

FOR TRADE—CAMERAS

WILL trade practically new Model K.5 late model Eastman Aero Camera, complete with venturi tube and anti-vibration suspension mount (Gimbal) for good second-hand Mitchell or Bell & Howell camera. Cecil M. Thomson, 510½ Travis St., Houston, Texas.

TWO 170 shutter Bell & Howell cameras, fully equipped. One with super-speed attachment. ORegon 3726, 407 N. Milton Ave., Hollywood.

FOR TRADE—MANUSCRIPTS

WILL trade manuscript, "The Coward's Awakening," suitable for movie production, for good movie camera and tripod. Story original and never produced. Lorenz, Box 156, Madison, Indiana.

FOR RENT—AIRPLANES

AIRPLANES equipped to carry cameras, facilitating the photographing of stunts or other unusual action, for rent by the hour, day or week. Jerry Phillips, Professional Pilot, Clover Field, Santa Monica, California.

FOR RENT—STILL CAMERAS

WILL RENT still camera to local parties. Special arrangements to A. S. C. members. Geo. Meehan, Ph. GRanite 3830, 744 Curson Ave., Hollywood, California.

FOR RENT—One 4x5 Graflex Camera and one 4x5 Grafic. Bert Glennon. Phone HEmpstead 2743.

FOR SALE—LENSES

ONE three-inch Dahlmeyer F. 1:9, mounted for Mitchell; one two-inch Bausch & Lomb F.2:7; one Dahlmeyer Pentac 37 mm. F.2:9. Georges Benoit, 3306 North Knoll Drive, North Hollywood.

CARL ZEISS, F. 2.7, 50 mm. in Bell & Howell mount. Dan Clark, care American Society of Cinematographers.

NEW 40 mm. Goerz Hypar f. 3. 5. lens in Bell & Howell mount; price $50.00. Write Charles Clarke, 1222 Guaranty Building, Hollywood, California.

HOW TO LOCATE MEMBERS OF THE

American Society of Cinematographers

Telephone GRanite 4274

OFFICERS

Daniel B. Clark	*President*
John W. Boyle	*First Vice President*
Victor Milner	*Second Vice President*
Frank B. Good	*Third Vice President*
George Schneiderman	*Treasurer*
Charles G. Clarke	*Secretary*

BOARD OF GOVERNORS

Victor Milner	Alfred Gilks	Fred W. Jackman
Daniel B. Clark	Charles G. Clarke	Georges Benoit
George Schneiderman	John W. Boyle	E. Burton Steene
L. Guy Wilky	John F. Seitz	Ira H. Morgan
Frank B. Good	King D. Gray	Floyd Jackman

Abel, David—with Warner Brothers.
Arnold, John—with Metro-Goldwyn-Mayer Studios.

Barnes, George S.—with Samuel Goldwyn Prod.
Beckway, Wm.—
Benoit, Georges—
Boyle, John W.—with Feature Prod., United Artists.
Brodin, Norbert F.—with Columbia Studios.
Broening, H. Lyman—
Brotherton, Joseph—with Universal.

Clark, Dan—with Tom Mix, Fox Studios.
Clarke, Chas. G.—with Red Grange, F.B.O. Studios.
Cowling, Herford T.—with Eastman Kodak Co., Rochester, N. Y.
Cotner, Frank M.—
Crockett, Ernest—
Cronjager, Henry—

Davis, Chas. J.—with Warner Bros., "Vitaphone," New York City.
Doran, Robert V.—
Dored, John—Riga, Latvia.
Du Par, E. B.—with Warner Bros.
DuPont, Max B.—
Dubray, Joseph A.—with Tiffany Prod.

Edeson, Arthur—with First National, Burbank.
Evans, Perry—with Warner Bros.

Fildew, Wm.—
Fischbeck, Harry A.—with Famous Players-Lasky.
Fisher, Ross G.—with First National, Burbank.
Fried, Abe—with Warner Bros.

Gaudio, Gaetano—with First National, Burbank.
Gilks, Alfred—with Famous Players-Lasky.
Good, Frank B.—
Gray, King D.—with Fox Studios.
Griffin, Walter L.—with David Hartford Productions.
Guissart, Rene—Paris, France.

Haller, Ernest—with Robert Kane Productions, New York City.
Heimerl, Alois G.—

Jackman, Floyd—with Fred W. Jackman Productions.
Jackman, Fred W.—directing Fred W. Jackman Productions.
Jennings, J. D.—with Buster Keaton.

Knechtel, Alvin V.—with First National, Burbank.
Koenekamp, Hans F.—
Kurrle, Robert—with First National, Burbank.

Lockwood, J. R.—
Lundin, Walter—with Harold Lloyd Productions, Metropolitan Studios.
Lyons, Reginald—with Fox Studios.

McCord, T. D.—
McGill, Barney—
MacWilliams, Glen—with Fox Studios.
Meehan, George—with Fox Studios.
Milner, Victor—with Famous Players-Lasky.
Morgan, Ira H.—with Metro-Goldwyn-Mayer Studios.
Musuraca, Nicholas—

Norton, Stephen S.—with Tiffany Prod.

Palmer, Ernest S.—with Fox Studios.
Parrish, Fred A.—with Fox Varieties, Australia.
Perry, Harry—with Famous Players-Lasky.
Perry, Paul P.—with Famous Players-Lasky.
Polito, Sol—with Ken Maynard, First National.

Ries, Park J.—
Roos, Len H.—Sydney, Australia.
Rose, Jackson J.—with Universal.
Rosher, Charles—with F. W. Murnau, Fox Studios.

Schneiderman, George—with Fox Studios.
Scott, Homer A.—
Seitz, John F.—with Metro-Goldwyn-Mayer Studios.
Sharp, Henry—with Metro-Goldwyn-Mayer Studios.
Snyder, Edward V.—with Pathe, Fine Arts Studio.
Smith, Steve, Jr.—
Steene, E. Burton—with Famous Players-Lasky.
Stumar, Chas.—with Universal.

Tolhurst, Louis H.—producing microscopic pictures, for Pathe.

Van Buren, Ned—with Eastman Kodak Co., Hollywood.
Van Enger, Charles—with First National, Burbank.
Van Trees, James C.—with First National, Burbank.

Warrenton, Gilbert—with Universal.
Wenstrom, Harold—
Whitman, Philip H.—with Scenario Dept., Mack Sennett Studios.
Wilky, L. Guy—

Eastman George—Honorary Member.
Edison, Thomas A.—Honorary Member.
Webb, Arthur C.—Attorney

Meetings of the American Society of Cinematographers are held as called on Monday evenings in the A. S. C. assembly rooms—
1219-20-21-22 GUARANTY BUILDING
Hollywood Boulevard and Ivar Avenue
HOLLYWOOD, CALIFORNIA

LOYALTY PROGRESS ART

Albert Rogell

Los Angeles, California,
October 20, 1926.

Mitchell Camera Corporation,
6025 Santa Monica Boulevard,
Los Angeles, California.

Gentlemen:

The Mitchell is the "Graflex" of motion picture cameras. We had this impressed on us while we were making "The Overland Stage" for Chas. R. Rogers and First National, at Deadwood, South Dakota, and using a great band of Indians in battle scenes. For temperament there isn't a star in Hollywood like a camera-wild Sioux. You never know when he is going to work. When you're set up for his action, he may not be in the mood, and when you're least expecting it, he may get and obey the impulse to act. So shooting "The Overland Stage" was a matter of watchful waiting - and using a Mitchell. In that way we caught all the good stuff and it's going to work into a great picture, they say.

Thanks and best wishes to the Mitchell and the organization that handles it.

Sincerely,

Albert Rogell

Vol. VIII. No. 2
25 Cents a Copy

MAY, 1927

U. S. Postage
2c Paid
Los Angeles, Calif.
Permit No. 941

American Cinematographer

Published in
Hollywood, California

By American Society
of Cinematographers

View of Yellowstone Lake, Yellowstone National Park. Reproduced from Location Library of American Society of Cinematographers, Hollywood.

Cleaning Liquids for Motion Picture Film—By J. I. Crabtree and H. C. Carlton; Traveling—for Pleasure!—By Len H. Roos, A.S.C.; In Camerafornia.

Vol. VIII MAY, 1927 No. 2

American Cinematographer

FOSTER GOSS, *Editor and General Manager*

Contents:

An educational and instructive publication, espousing progress and art in motion picture photography.

Subscription: United States, $3.00 a year; Canada, $3.50 a year; foreign, $4.00 a year; single copies 25c.

Published monthly by THE AMERICAN SOCIETY OF CINEMATOGRAPHERS, Inc.

Advertising rates on application.

1219-20-21-22 Guaranty Building, Hollywood, Calif. Telephone GRanite 4274

Amateur Cinematography

A Professional's Notes for Amateurs

Part VII

By Jos. A. Dubray, A. S. C.

Discoveries of della Porta and Others in Primitive Photographic Research Related

(Continued From Last Month)

Jos. A. Dubray

The main shortcoming of a pin-hole image is its lack of illumination, i.e., its faintness, which renders it impractical for either viewing it or for forcing it to make an impression on a substance sensitive to light.

Della Porta himself, tried to correct this sole deficiency of the image obtained in his apparatus.

Once establishing the impossibility of admitting a greater volume of light in the camera obscura by enlarging the size of the pinhole, he discovered that by forcing the rays of light emanated by the object, to be refracted by a converging *lens,* he would obtain an image, not orthoscopic in the full meaning of the word, but possessing sufficient definition to justify its use, taking into consideration the tremendous increase of illumination of the image.

A *LENS* can be defined as *"any transparent medium bounded by regularly curved refracting surfaces* (one of the surfaces may be plane.") The curvatures of the refracting surfaces are calculated so as to force all of the incident rays to meet at a certain point, which may be *behind* the lens (convergent lenses) or *in front of it,* on the imaginary prolongation of the refracted rays (divergent lenses.)

It is evident that any transparent and isotropic substance may be used for the making of lenses, and that each surface of a lens may be shaped as a portion of a curved solid, of well defined size and of regular geometrical form.

LENSES are named according to their shape, so if their surfaces are portions of spheres, they will be called "spherical," the same appellation applying when one of their surfaces is plane.

If the surfaces are portions of cylinders, the lens is called cylindrical.

If one of the surfaces is a portion of a sphere and the other portion of a cylinder, the lens will be called "spherocylindrical" and so on. Lenses may be parabolical, toroidal, etc., according to the shape of their bounding surfaces.

IN photography, only *spherical* lenses made of *glass* are used.

The spherical form has been chosen because of the relative easiness in which such shapes may be obtained with the extreme exactness that is required, and *glass* is the material used, because of its transparency, its resistance to extraneous influences and its chemical stability.

Generally speaking, *glass* is a compound of silica with metallic oxides and two main divisions are derived from such combination.

Crown glass is a compound of silica and *lead,* with soda or potash, or both.

During the latest years, new elements have been incorporated in glass in order to change its molecular composition and adapt it to the exact requirements of modern optical instruments. We shall in the course of this study anaylze the tremendous improvements thus incorporated in the manufacture of optical glass. It will suffice in this article to give a synopsis of Schott's account of the process for the manufacture of ordinary optical silicate glass, as employed at Jena in 1888. This synopsis will give the reader a fair idea of the extreme care that is exercised in such process.

IT IS very difficult to produce glass without *stress,* or the formation of irregular veins which form during the solidification of the melted ingredients. *"Fine annealing"* is the remedy for this, and consists in cooling the glass from an approximate temperature of 465° Centigrade to the lowest hardening one of 370° Centigrade, very gradually, during a period of weeks.

A melting pot is heated for four or five days, at red-hot temperature, and placed in a melting furnace for five or six hours until it reaches the melting temperature of glass. Some of the glass left over from other meltings is poured in, and the crucible is glazed with an iron ladle. The pot is then ready to receive the glass mixture.

The filled pot is left at a high and very even temperature for from six to eight hours, at the end of which time the fire is moderated, the scum formed on the surface of the melted mixture is removed, and a red-hot stirrer of fire-clay is placed in it and left for one hour.

Then the stirring begins, using as handle to the stirrer, a long iron tube kept cool by a current of water.

The mixture is tested from time to time by blowing small flasks with a glass-blower pipe. Stirring will be complete in from three to four hours, during which time the mass has been allowed to gradually decrease somewhat in temperature.

(Continued on Page 20)

The EDITOR'S LENS focused by FOSTER GOSS

Studio Promotions

AN INTERESTING item, by Charles M. Steele, appears in the current number of "Film Boards of Trade Bulletin," as follows: "One of our present managers started with First National as a shipping clerk. He was first promoted to the booker's desk because he was a top-notch shipper and kept everything in apple pie order. Then he was made salesman because as a booker he put into practice the slogan that 'The best is none too good.' As a salesman, he always put his best foot foremost. And now he manages a branch, every department of which appears in its 'Sunday Best' every day in the week."

¶ All of which shows the fact that the sequence of promotion in the distribution end of the film industry is much the same as it is in other lines of business. But is it so in motion picture production?

¶ Occasionally, there is reported a "rags to riches" yarn concerning the phenomenal rise of some individual from an humble to a mighty position in a studio. Thus, the making of motion pictures is generally believed to present opportunities such as might only be obtained through the possession of an Alladin's lamp. That there are great opportunities within studios, there can be little question.

¶ The point of our observations here, however, is that these opportunities very often do not fall in the hands which deserve them most. With stability and efficiency having become the watchword of studio heads, there has arisen the natural desire—political situations excepted—to keep a man in the job with which he has become successfully identified. Hence, once a man has become known as an efficient publicity man, he remains a publicity man. The ultimate of his advancement is the head of his studio's publicity department. This is abundantly and specifically illustrated in a number of Hollywood instances. That many of these men have the natural ambition to enter the writing division of production, that by previous training and by long experience within their particular studio, they are fitted for this promotion concerns not their superiors. They have proven themselves successful press agents in which capacity they are no longer unknown quantities—and experiments are costly! Therefore, the vacancies in the scenario departments are passed on to comparative newcomers with a minimum of experience in the actual lore of the studios. The seeming result is that, instead of having two new men in two new positions, there is only one in a strange environment while the other remains cataloged as theretofore. As an idea of super-efficiency this all may seem well enough, but it does not squarely reckon with a thing so thoroughly human as ambition. Past occurrences seem to point to the fact that the publicity man, in our hypothetical case, would not only have the ambition to make good in the higher step in the studio, but would likewise be fortified with the necessary pre-requisites in the way of training—which the stranger, despite incidental success in the theatre or kindred lines would not possess. So the press agent goes along with his old job—or, if he becomes sufficiently worked up, resigns to take his chances at getting to do what he really wants to.

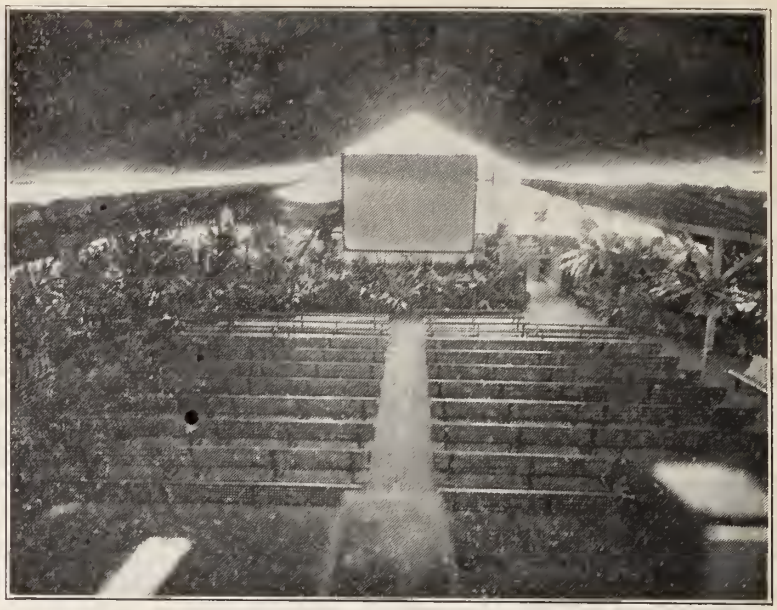
¶ So it is with the cinematographer. Thoroughly capable to direct, on account of his unparalleled opportunities to study directorial methods, of all that he has absorbed concerning the handling of players, and of his intimate knowledge of the camera, he is told that as a prospective director, he is a good cinematographer. (Besides, what would the new and green directors do if they did not have a seasoned cinematographer at their sides?)

¶ The moral seems to be, in this peculiar cross-section of production, is not to become too good at any particular calling, or one will never do anything but that. This is simply another way of prescribing the limits of a man's professional growth. Executive imagination is not required to observe that a man is making good in his job. Imagination is required, however, to see where a man could be more efficient—and brilliant, if you please—in a higher post, both for himself and for his company. When, then, will it become the rule, rather than the exception, that cinematographers are given their deserved chances to direct?

Traveling=for Pleasure!

What Camera Globetrotters Must Contend With

By Len H. Roos, A.S.C.



The Rink Pictures, Casino, N.S.W., Australia.

This semi-tropical theatre has a canvas roof and tropical plants are placed along the sides. All the best American releases are screened here—often simultaneously with the showings in Sydney. (Credit titles are left in the prints at this theatre). Two features, a comedy, a scenic and a news reel usually make up the program. Average admission price is about 25c. Best seats are 'way back under the projection room. T. J. Dorgan, owner.

THE scene may be laid in the smoking lounge of a trans-Pacific liner, or in a compartment in a railway carriage. The formula is always the same. I may be comfortably seated with a book when some passenger with a cap a couple of sizes too small, a flowing mustache and a painfully new checked suit will remark: "Nice boat, this."

This calls for an answer and, duly given, the pest then tenders the information that he has left his hardware business in Duluth to the tender mercies of his son-in-law and is "taking a trip—for pleasure."

Nature of Beast

Every time someone tells me he is traveling for pleasure I feel I must get a thorough look at the informant. I have been tempted to argue with these ubiquitous "pleasure travelers" at times, with the idea of finding out what pleasure they can derive from traveling.

It's no use. They don't know themselves. They are real Sherlock Holmes' in finding out one's business, and, after being told, they come to the conclusion "that it must be a great job."

They won't be told that passing cameras through customs in foreign countries is a job that calls for all the ability and tact of a high grade diplomat.

Stay on Beaten Path

They get a lot of fun out of kicking about terrible hotels, because they don't have to stay in them. They stop where they can get cool drinks and good beds—but where it is impossible to get interesting pictures. They don't go to out-of-the-way places where the heat, flies, mosquitoes and a hundred other pests would drive a person crazy. They see "the sights" from a comfortable motor car and don't have to pack a heavy camera around. They find fault with everything. They kick about exorbitant charges, poor service, and maintain that they wouldn't put up with this for a moment at home; and yet they will leave a comfortable home, where they can unpack all their belongings and have everything they want right handy, to travel—*for pleasure!*

Exhibitors

I meet exhibitors in out-of-the-way places and usually have to spend an evening with them answering questions about theatres at home; their methods of presentation.

"Do I think he paid too much for 'The Missing Fish Bowl'"; "What's Tom Mix like?"; "What do I think of his program?"; could he "do better with Geewhiz productions?"—and I am supposed to be the oracle that can answer all these questions after a hard day with the camera in the heat and flies. And when I say "good-bye," he says: "You certainly have a great life."

And when I have just unpacked at my base all my belongings, I get word to pack them up again and continue to Singapore. When I get there, I'll have to go through the same thing. The customs will pull my trunks to pieces; they'll want to take my cameras apart, and, after looking over everything, they'll look up the highest tariff in the book and I'll have to pay it and "get a refund when I leave the country"—maybe.

Some day I'm going to get a house; unpack everything; throw books and things around; have cushions, ashtrays and a real refrigerator with ice in it, and a good cook. Then I'll take off my shoes,

(Continued on Page 7)

O'Connell, Zucker Elected to A.S.C.

Pair of Cinematographers with Enviable Records Awarded Membership in Society

L. WILLIAM O'CONNELL and Frank C. Zucker have been elected members of the American Society of Cinematographers, according to an announcement from the A.S.C. Board of Governors.

O'Connell, who at present is identified with the William Fox studios, has been a cinematographer for the past nine years, prior to which he served for one year in the Rothacker-Aller laboratories, Chicago.

To Siberia

In 1918, he photographed J. Stuart Blackton's production, "Missing," for Famous Players-Lasky, but shortly thereafter entered the United States army and spent a year in the photographic service in Siberia.

Back to Camera

He resumed his cinematographic career in 1920 when he filmed "Peg O' My Heart," a William de Mille production for Paramount. In 1921, he did "The Skywayman" and "The Little Gray Mouse" for Fox; and "The Sky Pilot" and "A Broken Doll" for King Vidor. In 1922, he filmed "Come On Over" for Goldwyn, after which he began a connection with Clara Kimball Young which extended into 1923. Among the productions in which he photographed Miss Young were "The Hands of Nara," "Enter, Madam" and "The Woman of Bronze." His next photoplay was "An Old Sweetheart of Mine" for Harry Garson. He completed his record for 1923 with "The Fourth Musketeer" for F.B.O.

In 1924, O'Connell photographed Cosmopolitan's "Through the Dark"; " The Hill Billy" with Jack Pickford; and Vitagraph's "Behold This Woman," "The Beloved Brute" and "The Clean Heart." He began 1925 with "The Redeeming Sin" for Vitagraph, after which he moved his camera to First National for "My Son," with Nazimova, and "Sundown." He ended the year by doing the Nativity sequence in Metro-Goldwyn-Mayer's "Ben Hur."

Frank C. Zucker

He spent the fore part of 1926 filming three Chadwick productions —"The Bells," with Lionel Barrymore; "The Unchained Woman" and "April Showers." Then followed "The Lunatic at Large," with Leon Errol, for First National; and "Sir Lumberjack" for Harry Garson. Following the latter production, he started his present affiliation with Fox, having lately photographed "Gaby," "Cradle Snatchers," "Slaves of Beauty" and "The Monkey Talks."

Zucker

Zucker, who is stationed in New York City with Robert Kane productions at the Cosmopolitan studios, started camera work with the old World Film company, at the Peerless studio, in 1916.

Among his earlier efforts were two serials with Helen Holmes, "Beware of the Law" and "Darkness and Daylight," all for Warner Brothers. He then was chief cinematographer on "The Silver Lining" for Roland West. There followed two features, "Holdane of the Secret Service" and "The Man from Beyond," starring the late Harry Houdini, whereupon he was chief cinematographer on a pair of features for Chadwick — "Meddling Women" and "The Midnight Girl." A trio for Associated followed—"Camille of the Barbary Coast," "Broken Hearts" and "The Mad Marriage" —after which he did another for Chadwick—"Lying Wives." For Wesley Ruggles he filmed "The Man of Quality" and "The Kick-off." These were succeeded by "Insinuation"; a series of six pictures, "Flying Fists," with Benny Leonard, and "The Lunatic" for Harry Garson.

Also in Siberia

Like O'Connell, Zucker also has seen cinematographic experience in Siberia, having made a trip through its interior in 1922 and photographed 100,000 feet of film for W. K. Zeigfeld.

Traveling--for Pleasure!

(Continued from Page 6)

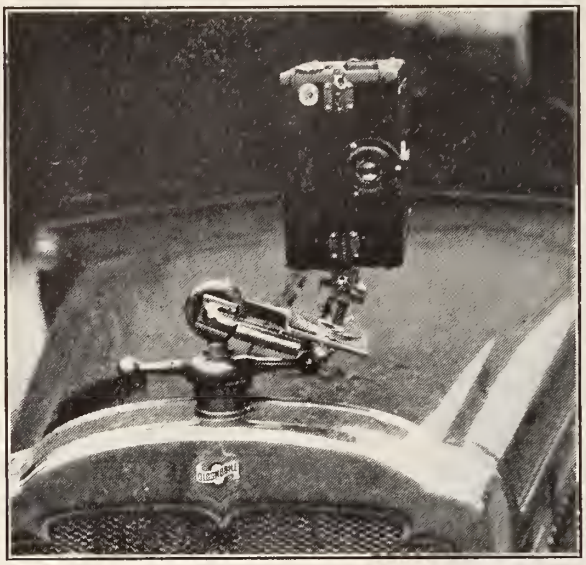
get in the most comfortable chair in the place, pick out a good travel book and—travel for pleasure.

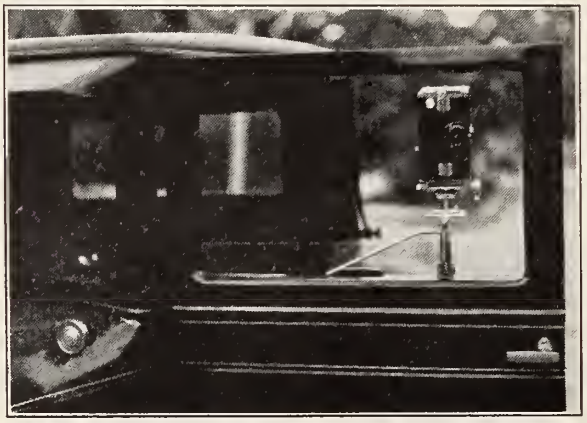
But—after about a week of this, I know that the first symptoms of that dreaded malady (Travelitis Confirmis) will appear. Instead of reading travel books, maps will be studied; ship sailings will be looked; trunks will be varnished and freshly labelled; things will be dispensed with that I know I'll need in a month (and probably will never need); lists of subjects will be compiled and submitted to the buyers of travel material in New York and London.

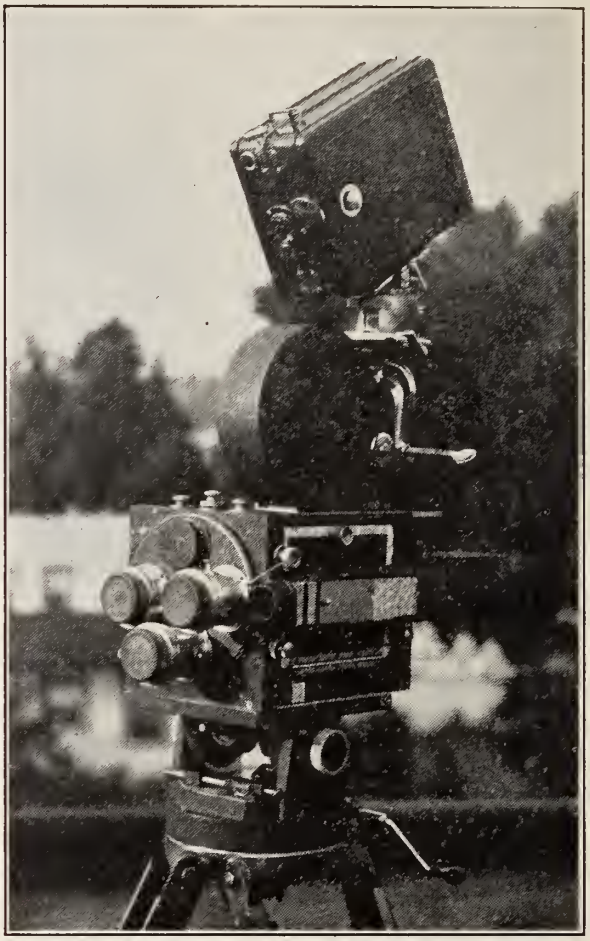
And then the ship will be about two days out of port when some one will interrupt my reading to say: "Nice Boat, this"; and his name will be Jones and he just turned his hardware business over to his son-in-law in Duluth and is *traveling — for pleasure!*

A New Small Camera Head

Tripod Head for Small Cameras Designed to Clamp at All Angles in Different Positions







"All-angle Motion Camera Clamp," devised by John Silver, of Hollywood, for DeVry, Eyemo, Cine-Kodak and similar motion picture cameras. The purpose of the head is to make possible the obtaining of difficult shots from equally difficult angles. Besides unusual angles, Silver claims, for his device, free movement and quick action. Views of the clamp, with DeVry camera mounted in unusual positions, are shown in the accompanying illustrations.

Civil Service Vacancies *for* Blueprint, Photostat Operators

Examinations for under blueprint operator, junior blueprint operator, under photostat operator, junior photostat operator, and junior photostat and blueprint operator, are announced by the United States Civil Service Commission.

Applications for the positions named above must be on file with the Civil Service Commission at Washington, D. C., not later than May 28. The date for assembling of competitors will be stated on their admission cards and will be about ten days after the close of receipt of applications.

The examinations are to fill vacancies in the Departmental Service, Washington, D. C., and in positions requiring similar qualifications.

The entrance salary for the under grade positions is $1,140 a year, and for the junior grade positions $1,320 a year. A probationary period of six months is required; advancement after that depends upon individual efficiency, increased usefulness, and the occurrence of vacancies in higher positions.

Competitors will be rated on practical questions, and their education, training, and experience.

Full information may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the board of U. S. civil service examiners at the post office or customhouse in any city.

Cleaning Liquids for Motion Picture Film

By J. I. Crabtree and H. C. Carlton

First Installment of Treatise on How to Remove Foreign Substance from Cine Stock

(Communication No. 306, from the Research Laboratory of the Eastman Kodak Company, and appearing in Transactions of Society of Motion Picture Engineers.)

IT IS necessary to clean motion picture film at various stages in its progress from the laboratory to the theatre to remove:

1. Dirt on the base side of negative or positive film.

2. Dirt or grease which may accumulate on negative film during printing.

3. Dirt and oil which accumulates on positive film during projection.

1. When proceeding in the laboratory by the reel and tank system, if all excess water is not removed from the film previous to drying, any dissolved salts present in the water supply remain on the film after evaporation of the water. The residual salts are usually only visible on the base side of the film because on the emulsion side they have an opportunity to diffuse within the gelatin coating during drying.

It is necessary to clean the back of the dried film either by wiping with a damp chamois while on the dying reels or by passing the film through a cleaning machine. Such treatment is unnecessary in the case of positive film if all excess water is removed previous to placing on the drying reel by thorough wiping or squeegeeing.

In the case of negative film it is customary to wind it with the emulsion side downward onto a wooden drum covered with cloth when the base side may be cleaned without danger of injuring the image. The cloth should be removed from the drum at frequent intervals for cleaning.

A suitable cleaning liquid for the above purpose should possess the following properties:

(a) It should be capable of dissolving traces of inorganic salts and should also dissolve or emulsify grease and mineral oil.

(b) It should be sufficiently volatile and should not cause the gelatin side of the film to swell in a period of several seconds if it accidentally has access to it.

(c) The liquid should not affect the physical properties of film with safety or nitrate base or remove the color from film with tinted base.

A suitable mixture fulfilling the above conditions is the following:

	Metric	Avoir.
Ammonia (Conc.)	5 cc.	2-3 oz.
Water	95 cc.	12 oz.
Denatured alcohol (see below) to make	1000 cc.	1 gallon

The ammonia serves to emulsify any traces of grease or oil, while the mixture contains sufficient alcohol to prevent dangerous swelling of the gelatin if any of the mixture reaches the emulsion side of the film.

A choice of several alcohols for preparing the above liquid is available as follows:

Grain alcohol (ethyl alcohol)—This is the most satisfactory for the purpose since it has a minimum effect on the film base.

Denatured alcohol—Ethyl alcohol is available containing a variety of denaturants. The most common denaturant is wood alcohol, which dissolves nitrate film base so that this should be avoided if possible.

The most commonly available denatured alcohol is motor alcohol. The "Pyro" brand of the Industrial Alcohol Company is prepared according to the following formula, No. 5 of the U. S. Internal Revenue Bureau:

Ethyl alcohol	100	volumes
Wood alcohol	2	volumes
Pyridin bases	0.25	volumes
Kerosene	0.5	volumes

On diluting this with water the alcohol turns milky owing to the kerosene coming out of solution. Kerosene has no effect on the film base or gelatin coating and serves to dissolve grease. Although pyridin and wood alcohol attack the film base when pure, in the above concentration and when diluted with water in the above formula they have no harmful effect on the film base during the time required for cleaning. The above cleaning liquid prepared with "Pyro" motor alcohol had only a slight tendency to produce curl on film with nitrate or acetate base after complete immersion for 24 hours at 70° F.

Isopropyl alcohol—This is now available commercially and the "practical" grade is satisfactory for the purpose. It does not turn milky on mixing with water and has little or no curling effect on film with either nitrate or acetate bases, even on immersion for several hours. It is non-poisonous,[1] is not decomposed on exposure to light and when used in the above mixtures does not attack the silver image or the gelatin coating.

Tertiary butyl alcohol is also available commercially and has properties similar to those of isopropyl alcohol. Its odor, however, is somewhat objectionable.

All the above alcohols tend to remove more or less of the tint from nitrate or safety tinted base film but the water present in the above cleaning liquid greatly retards this action.

The precise effect of cleaners prepared with the various alcohols on the tinted base is shown in the following table. Samples of film were immersed in the cleaners and the times required for visible signs of removal of the color were observed.

Effect of Film Cleaning Liquids on Tinted Base Film

Formula		Safety base	Nitrate base
Ammonia (conc.)	5 cc.	Liquid slightly colored in 10 minutes.	Same as safety base.
Water	95 cc.		
Motor alcohol to	1000 cc.		
Ammonia (conc.)	5 cc.	No effect in 2 hours.	Liquid slightly colored in 10 minutes.
Water	95 cc.		
Isopropyl alcohol to	1000 cc.		
Ammonia (conc.)	5 cc.	Slight effect in 1 hour.	No effect in 16 hours.
Water	95 cc.		
Tertiary butyl alcohol to	1000 cc.		

The propensity of the cleaner to remove the tint varied with the different colored bases but the above table gives data for the base which was most readily attacked. Since the period of application of the cleaning liquid is very much shorter than that required to visibly affect the tinted case, the cleaners are considered satisfactory.

2. When making positive prints from negative film, the negative accumulates more or less dirt, grease, and loose particles of dust which must be removed at frequent intervals. In any case it is advisable to remove dust after every third or fourth passage through the printer by passing through silk plush (cut on the bias) moistened with a suitable cleaning liquid as the film is being wound on a rewinder. More thorough cleaning of the emulsion side can be effected by winding the film base side downward on a cloth-covered drum as above.

The requirements of a suitable cleaning liquid for this purpose are similar to those for positive films dealt with below.

3. Positive film accumulates more or less dirt and oil during its passage through the projector, which causes spots and patchiness on the screen. In this connection film which has been toned has a greater tendency to show oil spots than untoned film, which is presumably a result of the matte surface produced by certain toning processes. The oil and dirt may be effectively removed from the film by immersing in a suitable oil solvent, with or without scrubbing, and then removing the excess solvent by squeegeeing and buffing. A satisfactory machine for this method of applying the solvent is by means of silk plush as the film is being wound on a rewinder.

Various liquids have been suggested for the above purpose but the precise effect of such liquids on the film base and on the image, so far as is known to the author, has not been investigated. Moreover, in certain cases deterioration of the film image has been definitely traced to the use of unsuitable chemicals. An investigation to determine the most suitable liquids for the above purpose therefore seemed dsirable.

Requirements of a Suitable Film Cleaning Liquid

A suitable film cleaning liquid should possess the following properties:

1. It should readily dissolve fats and mineral oils.

2. It should not affect the gelatin coating or the film base, or remove the color from film with tinted base. Also it should not attack the silver image or a tinted or toned image even on prolonged contact in the presence of moisture, because when cleaning on a rewinder any excess of solvent which does not evaporate is trapped between the convolutions of the film, when it can evaporate only very slowly.

It should also not decompose on exposure to light to give products which are injurious to the film.

3. The boiling point and latest heat of evaporation should be such as to permit of sufficiently rapid drying.

4. It should be non-combustible, non-toxic, and be readily available at a reasonable price.

At the outset a survey was made of all the possible commercially available non-inflammable and inflammable oil solvents, and the most promising of these were investigated as follows:

Non-Inflammable Oil Solvents

The following compounds were selected by virtue of their suitable volatility, solvent action, and price:

Solvent	Formula	Boiling Point
Dichlorethylene	$C_2H_2Cl_2$	56- 60°C.
Trichlorethylene	C_2HCl_3	85- 87°C.
Tetrachlorethylene	C_2Cl_4	119-121°C.
Ethylene dichloride	$C_2H_4Cl_2$	83°C.
Carbon tetrachloride	CCl_4	76°C.

The effect of these compounds on the film was investigated as follows:

Effect of Non-Inflammable Solvents on Motion Picture Film

The effect of the above solvents on film was studied by placing a strip of developed positive motion picture film (nitrate base) in a 100cc. stoppered bottle with 40cc. of the solvent and 3cc. of water at room temperature. The film was thereby subjected both to the liquid and its vapors. Any tendency of the film to curl or of the image to change color was observed after 18 hours with the following results:

Solvent	Condition of Film (Nitrate base) after 18 hrs. at 70°F.
Dichlorethylene (pure E. K. Co.)	Slight curl when wet. Bad curl when dry. No effect on image.
Trichlorethylene (Com. E. K. Co.)	No effect on film base. Emulsion softened and image obliterated.
Trichlorethylene (pure E. K. Co.)	No effect on image or film base.
Tetrachlorethylene (Dow)	Slight curl when dry. No effect on image.
Ethylene dichloride (pure E. K. Co.)	Bad curl. No effect on image.
Carbon tetrachloride (Dow)	No effect on base or emulsion.
Carbon tetrachloride (pure E. K. Co.)	No effect on base of emulsion.

Any curling tendency in the above tests was an indication that the film base had been attacked. The tests show that dichlorethylene and ethylene dichloride exert a sol-

(Continued on Page 20)

Panchromatic Motion Picture Film Negative

Conclusion of Masterful Paper on Widely Used Kind of Motion Picture Stock.

By Loyd A. Jones and J. I. Crabtree

Final Facts Presented in Communication from Eastman Research Laboratories.

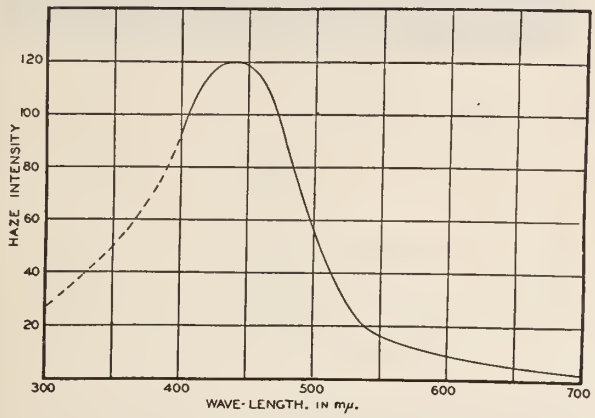


Figure 21

Figure 22

(Continued from Last Month)

THE predominance of *warm* colors in studio work has already been mentioned. At first thought it may seem almost impossible to make any general statements relative to what colors are used predominantly in motion picture sets. It should be remembered, however, that the sets created in the studio merely imitate the homes and surroundings of every-day life. A careful consideration of the subject indicates that the vast majority of the walls, draperies, and objects with which we surround ourselves are characterized by the warm colors. This fact tends to make the effective speed of panchromatic film much greater than that indicated by the values based upon white light measurements. There is little doubt that if panchromatic film is adopted for studio use illumination levels much lower than are at present used will be adequate for obtaining satisfactorily exposed negatives. The preponderance of red, orange, yellow, yellow-green, and green and their related shades and tints in studio work and the relatively high sensitivity of panchromatic film to the red end of the spectrum are very favorable toward the use of high efficiency tungsten lamps for studio illumination. As mentioned before, these sources have many virtues to recommend them. A studio set lighted by tungsten should produce an atmosphere differing less from real life surroundings. It seems reasonable to suppose that the dramatic artists should respond to this condition and be better able to portray their rolls with realism.

Limits of Colors

Attempts have been made in the construction and decoration of studio sets to use only black, white, and grays. Certainly when using non-color sensitive film this offers advantages in enabling the artist, camera man, and director to determine with certainty the composition of the picture in light and shade as it will appear on the screen. No objection to such procedure exists from the standpoint of the audience since they have no means of detecting the absence of color in the sets. Our information is that these attempts were failures because the actors in these sets were so affected by the unnaturalness in the surroundings, due to the absence of color, that they could not do good work. This seems to be good evidence in the support of the contention that naturalness and semblance to reality in studio sets is at least helpful to satisfactory dramatic performance.

Duplicating Color Detail

In the making of many high class pictures every effort is made, frequently at great expense, to duplicate to the last detail the quality and color of the scene to be represented. Perhaps the action takes place in the drawing room in a home of wealth or luxury. The walls are decorated in a carefully balanced color scheme, the window openings are treated with rich fabric of harmonizing colors, oriental rugs are strewn over the floor and the ladies appear gowned in the latest creations, symphonies in color. Now comes a jaring note; the faces and arms must be plastered with a putty colored powder and the set flooded with a light which is harsh and glaring or of a quality such as to impart an extraordinary ghastliness to the scene. The use of panchromatic negative film will help to eliminate some of these objectionable conditions. Make-up can be just the same as would be worn in real life under similar conditions and the set may be satisfactorily illuminated by using light of the same general quality as would be found in such an interior.

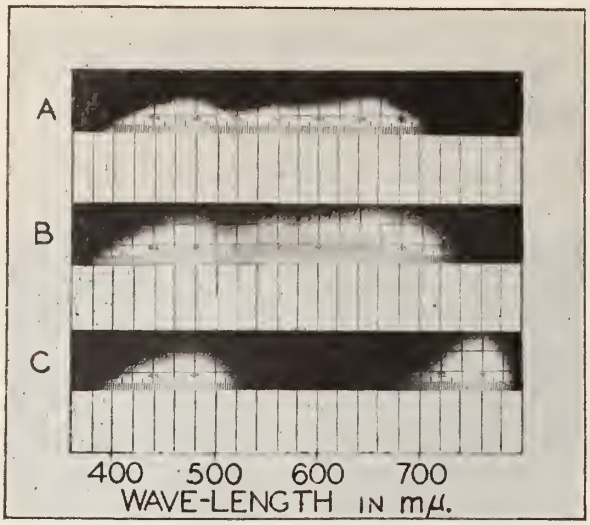


Figure 24

Left—Figure 23

"Color Blind"

After having spent a great deal of thought and money in the construction and embellishment of the set in colors duplicating the original, the scene is photographed on material which is totally blind to one-half of the visible spectrum, and that half the one that includes the colors which predominate in the average interior. It is not an infrequent experience to find that the carefully balanced color scheme is rendered on the screen in such a way as to destroy completely the black and white compositions desired. The use of panchromatic film will eliminate such unfortunate occurrences.

Distorted Reproductions

It may be necessary at times to photograph a scene in which two or more adjacent elements are of different hues and saturations but identical in visual brightness. To the eye such details are visible by virtue of the *hue* or *saturation* contrast. If panchromatic film corrected by a filter designed to give correct reproduction of visual brightness is used such objects will not be differentiated in the negative record. To obtain the desired differentiation it is necessary to disturb the adjustment either by using a filter of different color or by changing the quality of the illumination. In this way distorted rendition of the visual brightness values is obtained. As an illustration of such a case consider a bright green card on which is printed a design in red. It is quite possible to adjust the two colors so that no brightness difference exists between the two colors. Photographed on panchromatic film with a filter adjusted to give correct tone values the design is invisible. Now suppose a green filter is placed over the lens. No red light is transmitted and hence the design in red is rendered in black or very dark against a light background. Or suppose a red filter is used instead of the green. The light reflected by the background (green card) is not absorbed and the design is rendered as light on a dark ground. Thus the distortion in either direction may be obtained. The operator must decide which color should be rendered as lighter than the other. This decision will depend very much upon the circumstances but in general it is best to use a filter which will render a *warm* color (one included in the red, orange, yellow, yellow-green series) as lighter than one of the *cold* group. This follows from the fact that colors belonging to the long wave-length end of the spectrum are usually brighter than those of short wave-length. Moreover it is not advisable in general to use a filter which completely absorbs one of the two colors since the great contrast thus obtained in the reproduction is much greater than the visual contrast due to the hue difference between the two colors. The general principle to be remembered is to use a filter which absorbs one of the colors to a *greater* extent than the other.

Haze Elimination

In making pictures outdoors it is sometimes desirable to obtain rendition of distant details which are partially or entirely obscured by atmospheric haze. Such haze is due to the scattering of light by dust particles or water vapor suspended in the air. In most cases haze is not white but more or less blue in color. By using panchromatic film with a filter which absorbs blue selectively the non-image-forming haze light can be absorbed to a great extent while the minus-blue (that is yellow) light from the distant parts of the scene are transmitted and give satisfactory photographic records. In Fig. 21 the curve shows the spectral distribution of energy in haze light. It will be noted that there is a very great predominance at wave-length 440 mu. The distribution on the short wave-length side of 400 has not been determined experimentally. The dotted part of the curve is an estimated extension. As shown by the curve the amount of energy in the haze light in the longer wave-length region is much less than in the blue.

(Continued on Page 16)

In Camerafornia . . .

and News Notes of the Month

JOSEPH A. DUBRAY, A.S.C., has completed the filming of the Tiffany production, "Backstage." The cast included Barbara Bedford, Alberta Vaughn, Eileen Percy, Jocelyn Lee, Marcia Harris, Shirley O'Hara, William Collier, Jr., Gayne Whitman, Bruce Benedict, Jimmy Harrison, John Batten, Guinn Williams and Lincoln Plummer.

* * *

Nicholas Musuraca, A.S.C., is away on location at Lone Pine, Calif., for the filming of the next F.B.O. production directed by Robert De Lacey.

* * *

John W. Boyle, A.S.C., immediately on the completion of "Topsy and Eva," on which, starring the Duncan Sisters, he was chief cinematographer, left for Louisville, Kentucky, to photograph racing scenes at Churchill Downs, including the 1927 renewal of the Kentucky Derby, America's classic turf event. Boyle is taking his special camera combination of Akeley-Bell and Howell outfits. The scenes which he will photograph are for use in Metro-Goldwyn-Mayer's "In Old Kentucky" which John Stahl will direct.

* * *

Arthur Edeson, A.S.C., has returned from Camp Lewis, Wash., where he filmed tank battle scenes for First National's "The Patent Leather Kid," starring Richard Barthelmess.

Creco Gets Manufacture *and* Distribution Rights *to* Patent

Creco, Inc., manufacturers of motion picture studio lighting apparatus in Hollywood, have secured operative and patent rights to the manufacture, distribution, sale and rentals of the Wallis diverging double doors, according to an announcement from Herbert Sylvester, president of Creco.

According to Sylvester, these double diverging doors are founded on the principle of simplified optics; that of a projected diffused source of light, thereby directing all of the light source on a definite objective, eliminating the fifty per cent loss in high intensity lighting apparatus used in cinematography. A further advantage is claimed in the elimination of Klieg eyes without affecting the actinic rays. These double doors will be ready for motion picture purposes shortly; and will cover 24-, 36-, 50- and 60-inch single and double diverging doors.

Charles Rosher, A.S.C., has begun photographic preparations for Mary Pickford's next production. Next month will mark the anniversary of the tenth year of Rosher's connection with Miss Pickford. During this period, which began at the old Famous Players-Lasky studio, Rosher has been chief cinematographer on every Mary Pickford production. By courtesy of the Pickford organization, Rosher has been, "between pictures" at his home studio, chief cinematographer on several of the largest features made in this country and Europe. He recently completed the cinematographic work on F. W. Murnau's "Sunrise" for Fox, and is at the present time engaged in the inspection of the release prints for this feature. Previously, he spent a year at the Ufa studios in Berlin, and had photographed photoplays in Italy and other European countries.

* * *

George Schneiderman, A.S.C., is filming "Colleen," a Fox production of an Irish racing story. Frank O'Connor is directing.

* * *

E. Burton Steene, A.S.C., freelance Akeley camera expert, has concluded an eight months' engagement with Paramount, which organization retained his exclusive services during this time for Akeley work on "Wings" and other Famous Players-Lasky productions. Much of Steene's engagement was spent in San Antonio on location for "Wings." Among the other pictures to which Steene contributed Akeley shots were those starring Bebe Daniels. A great proportion of his work was on interiors—which marks a transition in application of the Akeley, which in the past was used almost entirely for exteriors.

A.S.C. President Convalesces Following Second Operation

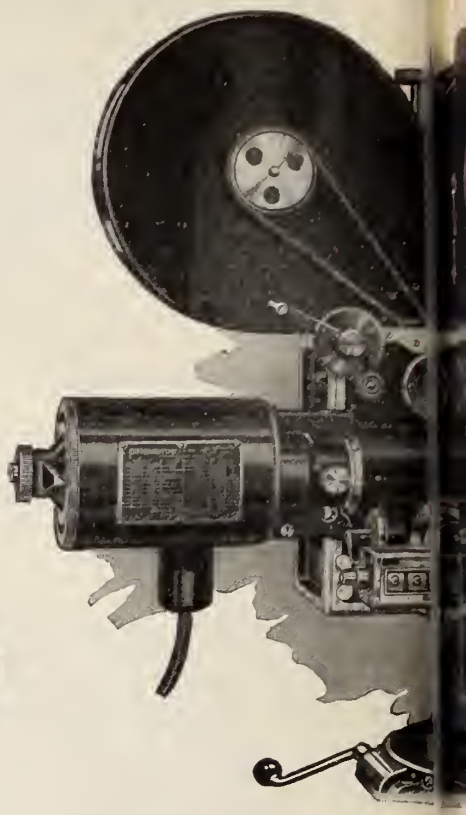
Daniel B. Clark, president of the American Society of Cinematographers, is convalescing at his home from a surgical operation which he recently underwent at the Hollywood Hospital.

The operation was performed because of the reoccurence of a similar trouble which Clark experienced last summer when he likewise underwent an operation. A premature return to work necessitated the second trip to the hospital.

Clark was taken to the hospital on the day following his inauguration for his second term as president of the A.S.C.

How BELL & HOWELL Automat

B. & H.
Cinemotor



B. & H.

MAKES MOVIES AS THE EYE SEES

Eyemo

— REGISTERED —

Standard Automatic
PROFESSIONAL CAMERA

TO the experienced cameraman there is but one light, automatic standard camera which provides the flexibility and precision necessary to meet professional requirements. That is the Bell & Howell EYEMO, shown here.

To operate Eyemo, simply locate scene in the spy-glass viewfinder and press the button. The operator has one hand free to "follow focus" or "dial iris" with camera in operation. Iris stops and focus numbers are plainly visible in viewfinder. A superior lens is furnished with EYEMO—a 47 mm. F 2.5 Taylor-Hobson Cooke anastigmat in micrometer focusing mount.

Fourteen other lenses, each furnished with accurately matched viewfinder pieces are interchangeable with regular lens. Your focusing is quick and accurate. You can panoram from scenes in sunlight to objects hidden in shadowed recesses and get them all. Eyemo film capacity is 100 feet daylight loading rolls or 120 feet darkroom load. Double-speed mechanism is optional. Write for fully descriptive EYEMO circular.

Bell & Howe

for the B. & H. Pione

THE B & H Cinemotor is beautiful piece of equipmer that paints artistry into th production as a master would us palette, brush and delicate colo ings.

By the simple manipulation c a control knob, speeds rangin from 2 to 20 exposures per secon and upward (either direction) ar at the instantaneous command c the cinematographer.

Electricity is the motive powe Either direct or alternating cu rent, 110 volts. The operation i absolutely free from vibratio Hand cranking and the variabilit

A battery of Bell & Howell Cameras u ing "Wings," a

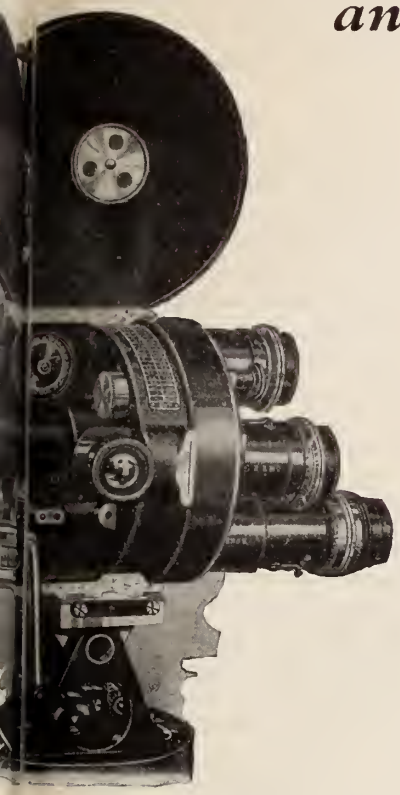
BELL & HOWI

1805 Larchmont A
London (B. & H. C.

New York—220 North 42nd St.

c Features Help the Cameraman

and contribute to making better pictures



TWO of the many features which indicate why Bell & Howell Cameras are used by practically all leading producers the world over are illustrated here:

1. The Cinemotor for giving the Pioneer Standard Camera electric automatic speed control—for painting photographic artistry on the screen.

2. The portable Eyemo Automatic (spring-motor) Camera for stunt shots, news reels and locations. See brief descriptions on this page. Further information on either, or both, upon request.

Head Camera-man Harry Perry, during the filming of Paramount's great story of the American Ace, "Wings." Perry is shown here with one of his mounts, making use of the Bell & Howell Camera and Cinemotor, current for which is generated by the airplane.

Another view of Perry, ready to circle above the five-mile replica of the over-seas battle area in "Wings." The Cinemotor is ready to see that the B & H Camera "Does its stuff" without hand cranking.

l Cinemotor

r Standard Camera

of human operation are entirely eliminated.

By use of the Cinemotor, the camera may be operated by remote control, the distance being imited only by the length of extension cord supplying the curent.

In the hands of a fine workman he Bell & Howell Standard Professional Camera, Cinemotor equipped, offers unlimited possiilities for photographic finesse. booklet containing complete Cinemotor specifications will be ent on request.

the Paramount camera staff in production with a punch.

Richard Arlen preparing for "horseback action" in the filming of "Wings." Note the Cinemotor-equipped Bell & Howell Camera aloft ready to start the film purring at the right speed for the hest effect.

LL COMPANY

u, Chicago, Illinois
td.) 320 Regent St.

Hollywood—6324 Santa Monica Blvd.

Panchromatic Motion Picture Film Negative

(Continued from Page Twelve)

Haze Density

The filter required for this work depends upon the haze density and the distance of the most remote object which it is desired to record. Ordinarily a Wrattan No. 8 (K2) or Wratten No. 12 (minus-blue) will give good results. The picture at the right in Fig. 22 illustrates the elimination of haze by use of panchromatic film with a No. 12 filter. The left hand picture in this figure was made on an ordinary non-color sensitive plate without a filter. It will be noted in this case that a large part of the detail on the ground is obscured by the haze while in the case of the one taken with the filter, this detail is clearly rendered.

In the case of very dense haze or extreme distance it may be necessary to use a red filter, Wratten No. 25 or Wratten No. 29. A film more sensitive to red light than the standard panchromatic motion picture negative is required in such cases and hypersensitized panchromatic film must be used. Standard panchromatic negative film may be hypersensitized by treating with ammonia. The film is bathed 1.5 minutes in 4 per cent ammonia at 50°F. and dried as rapidly as possible. Hypersensitized film does not keep for a very long time but can be relied upon for a week or more. The general sensitivity of the film is increased appreciably by this treatment but the green and especially the red sensitivity is increased in much greater proportion than the blue. The red sensitivity of film hypersensitized in this manner is about four times as great as the standard product. A spectrogram showing quantitatively the spectral sensitivity of hypersensitized panchromatic film is shown at *B* in Fig. 23. Even greater haze cutting can be obtained by using Eastman Panchromatic K film which is very sensitive to infrared radiation (see Fig. 23, *C*) and not at all sensitive to the green, yellow, and orange of the visible spectrum. Any filter which completely absorbs the short wave-lengths to which the film is sensitive (wave-lengths less than 500 mu) is satisfactory for use with the film. The photographs shown in Fig. 24 illustrate the haze elimination obtained by use of Panchromatic K film.

Moonlight Effects

Some years ago Prof. R. W. Wood of John Hopkins University called attention to the fact that landscapes when photographed by infrared light present very peculiar and weird appearances. This is due to the fact that the light from the sky contains no infrared radiation and hence the sky is rendered as totally black, while green foliage is rendered as white. This follows as a consequence of the peculiar spectral reflecting characteristics of green leaves containing the coloring matter known as chlorophyll. *Chlorophyll* reflects quite strongly the extreme red and infrared radiation. Hence in a photograph taken by infrared radiation green leaves are rendered as

white. In a paper published in No. 22 of these Transactions (page 20) Mr. J. A. Ball suggested the use of film sensitized with Kryptocyanine for obtaining moonlight and night effects without the aid of artificial light. Film of this type is now commercially available under the name of Eastman Panchromatic K. In Fig. 23 at *C* the spectrogram given shows qualitatively the spectral sensitivity of this material. It will be noted that in addition to the usual sensitivity of ordinary film in the blue region it shows a band of high sensitivity having a maximum at wave-length 760 mu, this being in the infra-red region the eye is entirely insensitive to radiation of this wave-length. Panchromatic K film as shown by the spectrogram is insensitive to the green, yellow, and orange of the visible spectrum. In using this material for obtaining pictures by infra-red light it is only necessary to use a deep yellow or orange filter which absorbs completely the light of short wave-length to which the film is sensitive.

Night Scenes

Effects which suggest night scenes can be made by using hypersenitized panchromatic film with a deep red filter such as Wratten No. 25 or No. 29. The result is much more striking, however, and approaches the true night or moonlight effect when panchromatic K film is used with a red filter such as No. 25. The sensitivity of this material to the infrared radiation is such that under bright sunlight conditions outdoors motion pictures at standard speed can be made with a lens having an aperture of f.3.5. This applies to the most favorable conditions. In case the sunlight is not of highest intensity it may be necessary to use a lens working at f.1.9. In Fig. 25 is shown the reproduction of a photograph made on Panchromatic K film.

Development of Panchromatic Film

Dark Room Illumination

SINCE panchromatic film is almost equally sensitive to all colors, including red, the film would be fogged if handled in the dark room with the ordinary safelights. With a Wratten Series No. 2 (red)

Figure 25

8x10 safelight containing a 25 watt bulb, if film is exposed 12 inches away from this safelight for 10 seconds a fog density of 1.5 is obtained with normal development, which density is in excess of the average highlight density of a negative. With superspeed motion picture film under the same conditions after exposing for 2 minutes, only a just visible fog is produced.

In selecting safelights for panchromatic film they should be such that they transmit light to which the eye is most sensitive. For low light intensities the eye is most sensitive to light having a wavelength around 520 mu. The Wratten safelights Series Nos. 3 and 4 transmit light in this region of the spectrum, but panchromatic film will be fogged by such light if the intensity and time of exposure exceed a certain critical value. For equal visibilities the light transmitted by the Series 3 safelight has only 1/60 of the photographic effect of the Series 2 safelight.

The problem therefore, of illuminating the dark room is to utilize a minimum quantity of the light transmitted by the Series 3 Wratten safelight to the best advantage.

General Illumination

For each 100 square feet of ceiling area one 8x10 inverted safelight fitted with a 25 watt bulb and Series 3 filter adjusted 2 feet from the ceiling is satisfactory. The walls of the dark room should be painted white or cream so as to reflect as much light as possible and all conspicuous objects should be painted a light color so that they will be more readily visible. In a dark room illuminated in this manner from 10 to 15 minutes are required before the eye accommodates itself to this low intensity level; the time for accommodation depending upon the previous intensity to which the eye was subjected.

With such illumination a rack of film placed anywhere on the dark room floor will not become fogged in less than 25 minutes so that in most cases it is possible to double the wattage and therefore the brightness of the lamp in the safelight when there will still be ample margin of safety. If it is desired to double or triple the brightness of the safelights it is advisable to partition off a portion of the dark room for loading so that the film racks will be exposed as little as possible to the stronger illumination in the dark room.

Film Inspection Lights

With the rack system of development it is customary to examine the film at intervals by means of a safelight illuminator extending across the developing tank. If the illuminator is fitted with a Series 3 safelight and the intensity adjusted either by inserting tissue paper, opal glass, or ground glass between the lamp and the safelight so that the film is not fogged in less than 10 seconds at a distance of 12 inches, this will provide ample time for inspection while the visibility will be satisfactory. The lamps in question should be fitted with a foot switch so that the lamp is illuminated only while inspecting the film.

A simpler method of illuminating the film for inspection is by means of a pocket flash lamp fitted with a Series 3 safelight about 2 inches square. The intensity

should be adjusted so that the film is not appreciably fogged in less than 5 seconds at a distance of 3 inches. This method of inspection has the advantage that if any fog is produced it is only local, and its use eliminates fire hazard.

Use of Desenitizers

Desensitizers have the remarkable property of more or less destroying the light sensitiveness of the unexposed portions of an exposed image while they do not interfere with the progress of development of the exposed portions. Therefore, by bathing the exposed film previous to development in a solution of the desensitizer or by incorporating the desensitizer in the developer, after development has proceeded for one or two minutes the film can be freely examined in a light of such intensity that it would otherwise be fogged. The most satisfactory desensitizer known is Pinakryptol Green, obtainable from H. A. Metz, 122 Hudson Street, New York, N. Y. For use as a preliminary bath dissolve 6 grains of Pinakryptol Green in each gallon of water (0.1 grams per liter) and immerse the film for 2 to 3 minutes before transferring to the developer. When used in the developer dissolve 2½ grains per gallon of developer (0.04 grams per liter). With some developers rich in hydroquinone it is impossible to add the desensitizer directly to the bath because it is precipitated.

After such treatment with a desensitizer, panchromatic film may be inspected with safety with a Series 4 Wratten safelight containing a 25 watt bulb at a distance of 12 inches. This gives ample illumination under all circumstances. When using desensitizers and a correspondingly brighter dark room illumination there is always danger of accidentally fogging an emulsion in the brighter light before the desensitizing solutions have had sufficient time to act. It is preferable to give a preliminary bath in the desensitizer in a separate room and then transfer the racks to the dark room proper rather than to add the desensitizer to the developer.

Processing Solutions

Any developer formula which is satisfactory for superspeed negative is suitable also for panchromatic film. For a given time of development the panchromatic film gives slightly greater contrast than the superspeed but this can be compensated for by developing for a shorter time.

[THE END]

Cinema Machine, Equipment Shop Moves *to* New Place

The L. A. Utility Air Brush Company, formerly well known in film technical circles as the L. A. Motion Picture Company, has removed to new quarters at 5811 West Adams Street, Los Angeles. For many years, the firm occupied a plant on Washington Street, near Main, at one time a pioneer film production center.

As heretofore, the company will continue to do general motion picture machine work, and deal in motion picture equipment and air brush tools, according to an announcement from A. J. Sagon, the proprietor.

AMERICAN CINEMATOGRAPHER,
1219-20-21-22 Guaranty Bldg.,
6331 Hollywood Blvd., Hollywood, Calif.

Gentlemen: Please find enclosed three dollars (foreign rates additional), for one year's subscription to the AMERICAN CINEMATOGRAPHER, to begin with the issue of

....., 192....

Name.....

Address.....

Town.....

State.....

(Note: Camera Craft or Photo-Era will be sent for a slight additional sum. Consult the clubbing offers.)

AMATEUR CINEMATOGRAPHY

(Continued from Page Four)

The stirrer is then removed and the crucible is placed on a fire-brick platform and let cool for half hour.

At the expiration of this time, the mixture is entered into the *"annealing furnace,"* where it is allowed to cool very gradually.

When taken out from the annealing furnace the glass is found broken in many pieces, large and small. Every piece is carefully examined and the defectives ones are discarded.

The chosen portion is then reheated in fire-brick moulds, in a tunnel-shaped oven until almost melting temperature.

The glass will take the shape of the moulds and it is allowed to cool for ten to twelve days in the cooling kilns.

When cool, the plates obtained are polished on both sides and carefully inspected for further defects.

If the plates fit for use amount to one-fifth of the whole melting, the result is considered satisfactory.

The glass thus selected as most perfect is then shaped by skilled workmen into lenses, whose surface curvatures have been calculated with great mathematical exactness.

(To Be Continued Next Month)

CLEANING LIQUIDS

(Continued from Page 10)

vent action on the base, while commercial trichlorethylene affects the gelatin coating and the image; these liquids are therefore unsuitable. Further tests were made with pure trichlorethylene, tetrachlorethylene, and carbon tetrachloride at 95°F. as follows:

Effect of Non-Inflammable Solvents on Motion Picture Film at 95°F.

Solvent	*Condition of Film (Nitrate Base)*
Trichlorethylene (Roessler & Hasslacher)	No effect on base. Image turned slightly brown in four days.
Tetrachlorethylene (Dow)	Image attacked at surface of liquid at end of four days.
Carbon tetrachloride (Dow)	Started to curl at end of six days. No effect on image.
Carbon tetrachloride (pure E. K. Co.)	Started to curl at end of eight days. No effect on image.
Carbon tetrachloride (taken from fire extinguisher)	Film curled at once and turned brown above liquid at end of three days.

Any effect of the above solvents on the image was attributed to decomposition in the presence of water with the liberation of hydrochloric acid. A sample of old tetrachlorethylene which was strongly acid was treated with anhydrous sodium carbonate which would remove any acid present and this sample had no effect on the image. Another acid sample was treated with anhydrous

calcium chloride to remove water, but this affected the image, showing that hydrogen chloride when dissolved in the solvent and in the absence of water will attack the image. To confirm this, dry hydrogen chloride was passed into pure dry carbon tetrachloride. The resulting liquid attacked the silver image, bleaching it to white silver chloride.

The above tests indicated that of the solvents tested, carbon tetrachloride is the most resistant to decomposition by heat and moisture.

Effect of Light on Solvents

Since on storage, solvents are subjected to the action of light, the effect of exposure to light on the rate of decomposition was studied. In order to secure an accelerated effect the solvents were exposed in open bottles in the presence of moisture to a quartz mercury vapor lamp for from five to thirty hours. Strips of film were then immersed in the light-exposed solvents for varying times and any effect on the base or silver image was observed.

The acidity of the samples was also determined by adding an equal volume of water, shaking thoroughly and titrating with decinormal caustic soda. As shown by the following table, the effect on the film image was roughly proportional to the quantity of hydrochloric acid present.

Effect of Light on Solvents at 70 Degrees F.

Nature of Solvent	Time of Exp. to Mercury Vapor Lamp	Acidity (cc. N/10 NaOH)	Remarks
Trichlorethylene (Roessler & Hasslacher)	None	0.12cc.	Slight curl. No effect on image in 10 days.
Trichlorethylene (R. & H.)	5 hrs.	1.10cc.	Film badly curled. Image bleached 2 days.
Tetrachlorethylene (R. & H.)	None	0.12cc.	No effect on film in 10 days.
Tetrachlorethylene (R. & H.)	5 hrs.	0.65cc.	Image destroyed in 2 days.
Carbon tetrachloride (R. & H.)	None	0.09cc.	No effect in 10 days.
Carbon tetrachloride (R. & H.)	31 hrs.	0.09cc.	Image turned brown in 10 days.

The above results show that trichlorethylene and tetrachlorethylene under the influence of violet light and moisture undergo decomposition. The compounds are probably oxidized to phosgene ($COCl_2$) which is decomposed by moisture to form hydrochloric acid and carbon dioxide as represented by the following equations:

$$\underset{\text{Tetrachlorethylene}}{C_2Cl_4} + \underset{\text{Oxygen}}{O_2} = \underset{\text{Phosgene}}{2COCl_2}$$

$$\underset{\text{Phosgene}}{COCl_2} + \underset{\text{Water}}{H_2O} = \underset{\text{Hydrochloric acid}}{2HCl} + \underset{\text{Carbon dioxide}}{CO_2}$$

The hydrochloric acid formed attacks the gelatin, causing it to soften, and likewise converts the image to silver chloride. The extreme toxicity attributed to old or im-

pure samples of compounds of this type is undoubtedly due to the presence of phosgene.

Of the non-inflammable compounds tested, carbon tetrachloride most nearly approaches the ideal film cleaning liquid as outlined under the above list of requirements. It is especially valuable since when pure it does not readily decompose under the influence of light to form compounds which are injurious to the film. However, in order to prevent any possible decomposition on storage, it should be kept in brown bottles or opaque containers.

Inflammable Film-Cleaning Liquids

In addition to non-inflammable solvents, a survey of possible inflammable liquids was also made because it was considered that in the event that an otherwise suitable liquid in this classification was discovered, its objectionable inflammability might be partly overcome by admixture with carbon tetrachloride.

The only promising solvents under this classification were benzene, toluene, xylene, gasoline and allied petroleum distillation products. Tests with these compounds, similar to those made with the non-inflammable compounds above, showed that none of the solvents affected the silver image, but benzene and toluene caused film with nitrate and acetate base to curl after immersion for two days at 70°F. All these solvents evaporate more slowly than carbon tetrachloride, which in some cases may be desirable.

It was considered that possibly these compounds might be considerably less toxic than carbon tetrachloride, in which case it would be desirable to remove danger of explosion.

Toxicity of Benzene, Gasoline and Carbon Tetrachloride

Although no practical toxicity tests were made with the solvents under investigation, adequate information is to be found in the literature. Tests with animals have shown that benzene, gasoline and halogen substitution products of the hydrocarbons such as carbon tetrachloride all produce varying stages of poisoning, resulting in dizziness and unconsciousness, and finally death.

Lehmann[3] found that with cats, air containing 20 to 30 mg. per liter of benzene causes loss of consciousness in a few hours and 42 mg. per liter produced death. Hamilton[4] quotes a large number of cases of benzene poisoning in industry, some of which resulted in death.

Haggard[5] experimented with dogs and found that the toxicity of gasoline was about one-half that of benzene.

Lehmann,[6] working with rabbits, found that 240 mg. per liter of carbon tetrachloride were necessary to produce death in two hours. Although no data were found giving a direct comparison between the toxicity of carbon tetrachloride, benzene and gasoline, a survey of the experiments of Haggard and Lehmann indicates that carbon tetrachloride is less toxic than benzene and slightly more toxic than gasoline, though this depends on its purity. Few cases of industrial poisoning by carbon tetrachloride have been recorded and these deaths were probably due to the use of an impure product which may have contained an excess of phosgene and hydrogen chloride.

Since the presence of 3 to 5 mg. per liter of carbon tetrachloride imparts a strong odor to the air, there is no excuse in practice for the concentration approaching the danger point, which is 10 times this concentration.

The Suitability of Carbon Tetrachloride for Cleaning Motion Picture Film

The above experiments indicate that carbon tetrachloride when pure is quite satisfactory for cleaning motion picture film. It is a good solvent for oils and fats, evaporates readily, is non-combustible and is readily available at a reasonable price. It does not affect the image even on prolonged contact and has a minimum tendency to decompose on exposure to light in the presence of moisture. Although toxic when impure, the pure compound is no more toxic than benzene and if reasonable ventilation is provided, it may be used with relative safety.

Tests also showed that carbon tetrachloride has no curling effect on film with nitrate or safety base after two days and it does not remove the color from either nitrate or safety film with tinted base.

Manufacturers such as the Dow Chemical Co. and the Eastman Kokak Co. supply sulphur-free carbon tetrachloride which is satisfactory for cleaning film. A few years ago many commercial samples of tetrachloride contained sulphur which was formed as a by-product in its manufacture by the action of chlorine on carbon disulphide. On exposure to the aid in the presence of moisture sulphur chloride deposits sulphur which is capable of combining with the silver image to form yellow silver sulphide. Such samples of carbon tetrachloride containing sulphur chloride when left in contact with motion picture film attacks the image, especially in the presence of moisture, and bleached it out to a faint yellowish-white image of silver sulphide. No such commercially impure samples of carbon tetrachloride have been encountered within the past two years.

Mixtures of Carbon Tetrachloride with Inflammable Solvents

In some laboratories and exchanges a mixture of carbon tetrachloride with high-test gasoline is used for film cleaning. This mixture evaporates less readily than pure tetrachloride, which may be an advantage in some cases. Its adoption in the past was a result of the toxicity of impure samples of tetrachloride, a 50 per cent mixture by volume with gasoline reducing this considerably. This mixture burns with great difficulty and is satisfactory from a fire hazard standpoint, although the proportion of the two liquids necessary to give a non-inflammable mixture depends on the nature of the gasoline. It is considered that pure carbon tetrachloride is to be preferred to such a mixture for general purposes.

Film Moistening Liquids

In addition to accumulating oil during projection, both the film base and gelatin coating lose moisture and tend to become brittle, owing to the excessive heat to which the film is subjected. If the film were allowed to cool to room temperature between successive projections, little trouble would be encountered, but in practice the film does not cool off sufficiently between successive projections and the resulting baking process drives out the moisture, which results in brittleness.

If film which has been rendered brittle in this manner is exposed to a moist atmosphere even for only a relatively short time it tends to regain its flexibility. It is not possible to do this by placing the tightly wound reels of film in a humidor or a vessel containing water because the moisture penetrates the convolutions of film very slowly. It would be possible to humidify the film satisfactorily by passing it continuously through a humid chamber or by winding the film in contact with a damp strip of paper or other absorbent ribbon. Such a system, however, is inconvenient in the theatre or exchange.

A satisfactory method of moistening film is to immerse it in a mixture of water and a water miscible volatile liquid such as grain alcohol. The percentage of water to be used in the mixture depends on the degree of brittleness of the film and the time which elapses betwen application and vaporation of the liquid. If an application machine of the Dworsky[2] type is used, this depends on the rate of passage of the film through the machine. During this short period little or no swelling of the gelatin coating occurs, but sufficient moisture is absorbed to restore the flexibility of the dried out gelatin coating. Moreover, when the film is wound up in a roll, the dried out film base can also absorb moisture by virture of being in contact with the moistened emulsion. Film base absorbs moisture relatively slowly so that little or none is absorbed by it in the period of application of the moistening liquid.

At the outset a survey was made of possible water-miscible volatile liquids which could be used for the purpose. The requirements of such a liquid are identical with those for the film base cleaning liquid outlined on page 2. A choice of the following liquids is possible: Grain alcohol, denatured alcohol, isopropyl alcohol, and tertiary butyl alcohol.

The exact quantity of water to be added to the alcohol must be determined by trial. From 15 to 25 per cent water is usually satisfactory and this proportion holds in the case of all the alcohols named above. The condition of the film after treatment will indicate any necessary changes in the proportion of water to be added. If it is too tacky, less water should be used and if too dry and brittle the quantity should be increased.

A mixture of either of the above alcohols with water has little or no solvent action on mineral oil which may be present in film after projection. However, in practice the rubber squeegees in the Dworsky[1] machine tend to emulsify and remove traces of oil. If much oil and dirt is present on the film a moistening liquid which is also capable of dissolving oil must be used.

1. H. C. Fuller, Chem. and Met. Eng. **29**, 538, 1923.

2. Faulkner, Trans, S. W. P. E. **25**, 117, 1926.

3. K. B. Lehmann, Arch. fur Hyg. **75**, 1, 1912.

4. "Industrial Poisoning in the U. S.,, by A. Hamilton (MacMillan.)

5. Haggard, J. Pharmacol and Exp. Theraup. **16**, 401, 1920.

6. H. B. Lehmann, Arch. fur Hyg. **24**, 1, 1911.

(To be continued next month)

PROJECTION-Conducted by Earl J. Denison

Experimenting by Projectionists

By Daniel B. Clark, A.S.C.

President of A.S.C. Commends Move to Experiment With and Solve Problems of Projection

WORD comes from the east that one of the projectionists' locals has set up an experimental department in which their members may make tests concerning their calling.

Final Test

If the experiences of the cinematographers are criterion, this step of the projectionists should prove greatly progressive. As perfect as projection equipment is, its ultimate test is how it performs under actual working conditions, and it is the projectionist who presides over the apparatus while it is in operation. It is he who can best report just what its good points are, and wherein improvement, if any, can best be introduced.

For Own Use

If the projectionist is anything like the cinematographer, ideas for the improvement of his "tools" are bound to occur to him as he becomes more and more immersed in his work. It may be that these inspirations can only be applied to his own particular projection conditions, and certainly he should have the opportunity to work his theories out.

No Sponsors

But how many theatres could maintain such a miniature laboratory for their projectionists? The idea would be regarded as preposterous, and certainly the projectionis should not be expected to fill the void himself.

Organized Effort

Here is where organized effort comes in. Cinematography has advanced by leaps and bounds because cinematographers have found ways and means to carry out their creative thoughts and put them into effect.

If the projectionists throughout the country can do the same thing, their profession should likewise benefit. It is not necessary to have some radical device in mind before an experimental laboratory can prove of value; even the most everyday duties can be improved on if an organization of men give them their concerted attention and exchange ideas concerning them.

Interest in Work

When men assemble to exchange ideas about their life's work, they are helping everybody with whom they come in contact, including their employers. Their job becomes something more than a period of so many hours a day and the pay-check at the end of the week.

Morgan Lauded for Work in "Tell It to the Marines"

Ira H. Morgan, A.S.C., who is receiving the praises of critics of cinematography for his work in Metro-Goldwyn-Mayer's "Tell It to the Marines," on which Morgan was chief cinematographer.

The A.S.C. member is one of the aces on the camera staff at the Culver City studio where he has been holding forth for the past several seasons. Morgan served as chief cinematographer on many of Marion Davies' best remembered productions, including "When Knighthood Was in Flower."

At present, he is engaged on M-G-M's "The Callahans and the Murphys."

DeVry *to* Hold Third Annual Visual Education Instruction

The third annual session of the DeVry Summer School of Visual Education, sponsored by the DeVry Corporation, manufacturers of projectors and cameras, will be held in Chicago, June 27th to July 1st.

A. P. Hollis is director of the session. Teachers and ministers will be given free tuition.

CLASSIFIED ADVERTISING

RATES: *Four cents a word. Minimum charge one dollar per insertion.*

All copy must be prepaid and must reach us before the fifteenth of the month preceding publication.

CLASSIFIED ADVERTISING
AMERICAN CINEMATOGRAPHER,
1222 GUARANTY BUILDING
HOLLYWOOD, CALIFORNIA

WANTED—MOTION PICTURE CAMERA

GOOD USED Motion Picture Camera. State make, condition, price, etc. Saul Schwartz, production manager, Artcraft Studios, Charlotte, N. C.

WILL PUT you in touch with buyers for Bell & Howell cameras and equipment. Phone or write the A. S. C., 1222 Guaranty Bldg. GRanite 4274, Hollywood, California.

BELL & HOWELL or Mitchell Camera outfit; Projection Printer; Cinex timer; Straight Line Processing Machine; Nutting Reflectometer; Polishing Machine; State price, Equipment. Fred Jeffery, Giles Street, Rose Park, South Australia.

16 mm. Eastman Cine-Kodak Model A, with F 3.5 or F 1.9 lens. Must have top and back built-in finders. State serial number, equipment, price. Hamilton Riddel, 1622 North Wilcox Ave., Hollywood.

FOR SALE—CAMERAS

DEBRIE, aluminum box, dissolving shutter, 8 magazines, Mitchell tripod, 40, 50, 75 mm. Carl Zeiss lenses. Thalhammer iris. Veeder footage recorder, ¼-way mat box. Glen MacWilliams, c/o A. S. C., Hollywood.

PATHE CAMERA—(Enclosed magazine like DeBrie); 4 circular magazines; 1 metal tripod with tilt; 1 finder; 1 50 mm. Voigt lens. Box H, American Cinematographer.

LATE MODEL Bell & Howell Camera, 170-degree shutter, case and trunk; 4 magazines and carrying case; 4 lenses, 1 Iris outfit, tripod and finder. Address Box X, American Cinematographer.

WILART camera, latest model, complete with tripod and carrying cases and retort case and magazines. John L. Russel, 1643 North Gardner St., Hollywood. HEmpstead 9554.

BELL & HOWELL Eyemo, carrying case, four one hundred feet daylight loading Eastman negative, guaranteed perfect. First $225.00 gets it—cost $385.00. Cameron, Manhattan Beach, N. Y.

$75—Angeles 400-feet Carl Zeiss 3.5, case, tripod. Want 4 by 5 Graflex or f 1.9 to fit De Vry. 2590 Midlothian Dr., Altadena, Calif. Colorado 0342.

BELL & HOWELL Eyemo, brand new, B-1702, with carrying case and five spools, $225.00, C. O. D. Guaranteed. Roscoe Wright, 2223 Clifton Ave., Cincinnati, O.

FOR RENT—CAMERAS

FOR RENT—Bell & Howell studio equipment complete. 170-Degree Shutter. Liberal commission to cameramen. Call Mr. Smith, MEtropolitan 4686. Evenings call MAin 0947. (Los Angeles.)

NEW Eyemo camera, fully equipped; rent by day or longer. Joe La Shelle, 9038 Dorrington Ave., Hollywood; Phone OXford 5840.

AKELEY, Bell & Howell and Mitchell Cameras for rent, all latest equipment. Phone GRanite 2213 or GRanite 1914. John W. Boyle, 1207 North Milton Ave., Hollywood.

BELL & HOWELL. Victor Milner, 2221 Observatory Ave., Los Angeles, California. 596-944.

MITCHELL, and Bell & Howell Cameras. F.2:3; F.2:7; F.3:5 lenses—40-50-75 mm. Complete equipment. J. R. Lockwood, 523 North Orange St., Glendale, California. Glendale 3361-W, or HOlly 0764.

E. BURTON STEENE, Bell & Howell, and Akeley. Complete Camera Equipment. Latest models. Address American Society of Cinematographers, Hollywood, California.

BELL & HOWELL, 170, with 30, 40, 50 and 75 lens equipment. Baby Tripod. Also B. & H. Cine Motor. Charles Stumar. GRanite 9845. 7501 Lexington Ave., Hollywood.

FOR RENT—One Eyemo camera, complete with all accessories. Bert Glennon, 6936 Woodrow Wilson Dr., Hollywood, Calif. Phone HEmpstead 2743.

BELL & HOWELL No. 627. Five lenses: 32, 40 (f.2.7), 50 (f.2.7), 75, 100 mm. Complete studio equipment: gauzes, filters, etc. GLadstone 0033.

TWO Bell & Howells. Large finders. Also Eyemo for rent. Lenses: F 2.5; 2.3; 2.7. Frank M. Cotner, 6273 Selma Ave., Hollywood. HOllywood 5046.

SPEED CAMERA: Bell & Howell, fully equipped for miniature and slow motion work 40, 50, 75 mm. and 6-inch lenses. Alvin V. Knechtel, 1179 North Kenmore. 597-054.

BELL & HOWELL cameras, Akeleys and other makes—portable lights, special lenses by the day, week or month. We sell everything that any cameraman might ever need—new or used—at a big saving. Keep us in touch with your wants. Ruby Camera Exchange, Ruby Building, 727 Seventh Ave., N. Y. Bryant 0631 or 8457.

FOR TRADE—CAMERAS

WILL trade practically new Model K.5 late model Eastman Aero Camera, complete with venturi tube and anti-vibration suspension mount (Gimbal) for good second-hand Mitchell or Bell & Howell camera. Cecil M. Thomson, 510½ Travis St., Houston, Texas.

TWO 170 shutter Bell & Howell cameras, fully equipped. One with super-speed attachment. ORegon 3726, 407 N. Milton Ave., Hollywood.

FOR RENT—AIRPLANES

AIRPLANES equipped to carry cameras, facilitating the photographing of stunts or other unusual action, for rent by the hour, day or week. Jerry Phillips, Professional Pilot, Clover Field, Santa Monica, California.

FOR RENT—STILL CAMERAS

WILL RENT still camera to local parties. Special arrangements to A. S. C. members. Geo. Meehan, Ph. GRanite 3830, 744 Curson Ave., Hollywood, California.

FOR RENT—One 4x5 Graflex Camera and one 4x5 Grafic. Bert Glennon. Phone HEmpstead 2743.

FOR SALE—LENSES

ONE three-inch Dahlmeyer F. 1:9, mounted for Mitchell; one two-inch Bausch & Lomb F.2:7; one Dahlmeyer Pentac 37 mm. F.2:9. Georges Benoit, 3306 North Knoll Drive, North Hollywood.

CARL ZEISS, F. 2.7, 50 mm. in Bell & Howell mount. Dan Clark, care American Society of Cinematographers.

NEW 40 mm. Goerz Hypar f. 3. 5. lens in Bell & Howell mount; price $50.00. Write Charles Clarke, 1222 Guaranty Building, Hollywood, California.

RUO LENSES—Sole U. S. Agent. Robert Ackerschott, 1575 N. Vine St., Hollywood. 25 mm. to 100 mm.; F. 2. and F 2.5 (Latest type: Telephoto, 10-inch, F. 4.5).

CARL ZEISS, 50 mm., F. 3.5, in Bell & Howell mount, $50; without turret mount sleeve, $41.50. Write Gaylord A. Wood, 1821¾ N. Wilcox Ave., Hollywood, Calif.

WANTED—PROJECTOR

USED SIMPLEX wanted. State model, price, condition, etc. Address Box R, American Cinematographer.

HOW TO LOCATE MEMBERS OF THE

American Society of Cinematographers

Telephone GRanite 4274

OFFICERS

Daniel B. Clark	*President*
John W. Boyle	*First Vice President*
Victor Milner	*Second Vice President*
Frank B. Good	*Third Vice President*
George Schneiderman	*Treasurer*
Charles G. Clarke	*Secretary*

BOARD OF GOVERNORS

Victor Milner	Alfred Gilks	Fred W. Jackman
Daniel B. Clark	Charles G. Clarke	Georges Benoit
George Schneiderman	John W. Boyle	E. Burton Steene
L. Guy Wilky	John F. Seitz	Ira H. Morgan
Frank B. Good	King D. Gray	Floyd Jackman

Abel, David—with Warner Brothers.
Arnold, John—with Metro-Goldwyn-Mayer Studios.

Barnes, George S.—with Samuel Goldwyn Prod.
Beckway, Wm.—
Benoit, Georges—
Boyle, John W.—with Metro-Goldwyn-Mayer Studios.
Brodin, Norbert F.—with Columbia Studios.
Broening, H. Lyman—
Brotherton, Joseph—with Universal.

Clark, Dan—with Tom Mix, Fox Studios.
Clarke, Chas. G.—
Cowling, Herford T.—with Eastman Kodak Co., Rochester, N. Y.
Cotner, Frank M.—
Crockett, Ernest—
Cronjager, Henry—

Davis, Chas. J.—with Warner Bros., "Vitaphone," New York City.
Doran, Robert V.—
Dored, John—Riga, Latvia.
Du Par, E. B.—with Warner Bros.
DuPont, Max B.—
Dubray, Joseph A.—with Tiffany Prod.

Edeson, Arthur—with First National, Burbank.
Evans, Perry—with Warner Bros.

Fildew, Wm.—
Fischheck, Harry A.—with Famous Players-Lasky.
Fisher, Ross G.—with First National, Burbank.
Fried, Abe—with Warner Bros.

Gaudio, Gaetano—with United Artists Studio.
Gilks, Alfred—with Famous Players-Lasky.
Good, Frank B.—
Gray, King D.—with Fox Studios.
Griffin, Walter L.—with David Hartford Productions.
Guissart, Rene—Paris, France.

Haller, Ernest—with Robert Kane Productions, New York City.
Heimerl, Alois G.—

Jackman, Floyd—with Fred W. Jackman Productions.
Jackman, Fred W.—directing Fred W. Jackman Productions.
Jennings, J. D.—with Buster Keaton.

Knechtel, Alvin V.—with First National, Burbank.
Koenekamp, Hans F.—
Kurrle, Robert—with First National, Burbank.

Lockwood, J. R.—
Lundin, Walter—with Harold Lloyd Productions, Metropolitan Studios.
Lyons, Reginald—with Fox Studios.

McCord, T. D.—
McGill, Barney—
MacWilliams, Glen—with Fox Studios.
Meehan, George—with Fox Studios.
Milner, Victor—with Famous Players-Lasky.
Morgan, Ira H.—with Metro-Goldwyn-Mayer Studios.
Musuraca, Nicholas—with F.B.O. Studio.

Norton, Stephen S.—with Tiffany Prod.

O'Connell, L. Wm.—with Fox Studios.

Palmer, Ernest S.—with Fox Studios.
Parrish, Fred A.—with Fox Varieties, Australia.
Perry, Harry—with Famous Players-Lasky.
Perry, Paul P.—with Famous Players-Lasky.
Polito, Sol—with Ken Maynard, First National.

Ries, Park J.—
Roos, Len H.—Sydney, Australia.
Rose, Jackson J.—with Universal.
Rosher, Charles—with Mary Pickford, United Artists Studio.

Schneiderman, George—with Fox Studios.
Scott, Homer A.—
Seitz, John F.—with Metro-Goldwyn-Mayer Studios.
Sharp, Henry—with Metro-Goldwyn-Mayer Studios.
Snyder, Edward V.—with Pathe, Fine Arts Studio.
Smith, Steve, Jr.—
Steene, E. Burton—
Stumar, Chas.—with Universal.

Tolhurst, Louis H.—producing microscopic pictures, for Pathe.

Van Buren, Ned—with Eastman Kodak Co., Hollywood.
Van Enger, Charles—with First National, Burbank.
Van Trees, James C.—with First National, Burbank.

Warrenton, Gilbert—with Universal.
Wenstrom, Harold—
Whitman, Philip H.—with Scenario Dept., Mack Sennett Studios.
Wilky, L. Guy—

Zucker, Frank C.—Robt. Kane Prod., Cosmopolitan Studios, New York City.

Eastman George—Honorary Member.
Edison, Thomas A.—Honorary Member.
Webb, Arthur C.—Attorney

Meetings of the American Society of Cinematographers are held as called on Monday evenings in the A. S. C. assembly rooms—
1219-20-21-22 GUARANTY BUILDING
Hollywood Boulevard and Ivar Avenue
HOLLYWOOD, CALIFORNIA

LOYALTY PROGRESS ART

LONDON
PARIS
PETROGRAD

CABLE ADDRESS
"VITAGRAPH

MOSCOW
BARCELONA
BUENOS AYRES

THE VITAGRAPH COMPANY

OF AMERICA
NEW YORK CITY, N Y

THE VITAGRAPH COMPANY
OF CALIFORNIA
HOLLYWOOD, CALIFORNIA
THE VITAGRAPH COMPANY LTD
LONDON, ENGLAND
THE VITAGRAPH COMPANY
OF FRANCE
PARIS, FRANCE

WESTERN OFFICE
OF THE VICE-PRESIDENT
1708 TALMADGE STREET
HOLLYWOOD CAL

Hollywood, June 14, 1924.

Mitchell Camera Company,
Hollywood,

Gentlemen;-

I want to compliment you for the general all-around excellence of your new camera. It is giving me splendid results.

William O'Connell, my cameraman, and myself are both most enthusiastic over the instrument; a fact readily understood and appreciated by the quality of the photography for my two most recent productions.

Very truly yours

J. Stuart Blackton

Vol. VIII. No. 3
25 Cents a Copy

JUNE, 1927

American Cinematographer

Published in
Hollywood, California

By American Society
of Cinematographers

Trout Fishing in Gunnison River, in Colorado.

Reproduced from the Location Library of American Society of Cinematographers, Hollywood.

IN THIS ISSUE:

Film Care in the Tropics—By Herford Tynes Cowling, A.S.C.; Graininess of Motion Picture Film—By J. I. Crabtree.

Vol. VIII JUNE, 1927 No. 3

American Cinematographer

FOSTER GOSS, *Editor and General Manager*

Contents:

An educational and instructive publication, espousing progress and art in motion picture photography.

Subscription: United States, $3.00 a year; Canada, $3.50 a year; foreign, $4.00 a year; single copies 25c.

Published monthly by THE AMERICAN SOCIETY OF CINEMATOGRAPHERS, Inc.

Advertising rates on application.

1219-20-21-22 Guaranty Building, Hollywood, Calif. Telephone GRanite 4274

Reliable Advertisers

ADVERTISERS in the American Cinematographer are reliable. In their respective lines, they represent the strongest firms in the world. They have built up their reputations by fair dealing. They give service. They, like their products, are dependable.

He who deals with those whom the American Cinematographer is proud to number among its family of advertisers, does business with the world's best.

The EDITOR'S LENS focused by FOSTER GOSS

THE TWO following interviews set forth interesting opinions from Daniel B. Clark, president of the American Society of Cinematographers, concerning a subject which has been under discussion in this department for the past two months. These interviews appeared in the Studio Section of Exhibitors Herald. The first is as follows:

¶ Pointing to the examples of successful directors who began their motion picture careers as cinematographers, Daniel B. Clark, president of the American Society of Cinematographers, is authority for the statement that new directorial material, within the next several seasons, will be taken largely from the ranks of camera artists.

¶ "It is a matter of common knowledge," Clark states, "as to the eminent directors who accumulated their motion picture training as cinematographers. These men have made some of the best pictures in the business. Since they broke the directorial barrier, the calling of the cinematographer has become more expert and inclusive than ever before, until today the ace cinematographer is one of the most highly and completely trained artists in the film studios.

¶ "These cinematographers have had every opportunity to observe, study and absorb all that is best in direction and the handling of players. This training, coupled with the fact that they are steeped in the knowledge of the life's heart of picture making—the camera—provides one of the most ideal training grounds imaginable for a director. This being true, the cinematographer, in this day of emphasis on camera effects and singular treatments of cinematography, is more than ever before logical directorial material.

¶ "Then we must also consider," the A. S. C. president continued, "that among the cinematographers you will find, in the point of continuous production service, the real veterans of the film studios. There are men who have been at the camera for fifteen years or longer; and, as in the early days, are still at the top of their profession. These men have worked along with the best directors and players of each of the various periods in cinema history, and there is little in film technique over which they do not possess complete mastery.

¶ "Of course," Clark conceded, "there are many production executives, who regard their cinematographers as being so valuable to their organization in their capacities at the camera, that they hesitate to give them the merited advance to the director's chair—but past experience proves that, no matter how great these men have been as cinematographers, they surpass even their former prestige once they take the natural step to direction.

¶ "Offhand," Clark concluded, "I can name several cinematographers who have it within their make-up to become sensations as directors, if their companies will only give them the opportunity—which I am sure must be soon forthcoming. Producers realize now, more than ever before, that American cinematographers are the most able in the world. As Jesse L. Lasky pointed out recently in a national fan magazine, countless foreign directors have been brought to American studios, but not one cinematographer has been imported from beyond the Atlantic. In fact, most foreign directors appear to be eager for the privilege to work with an American cinematographer because our cinematographers have the ability to express their unique ideas of story treatment! So you can easily see that the time is ripe to recruit the new directors from among the cinematographers."

¶ *The second interview follows:*

¶ Will the director of today be the director-cinematographer of the future in motion picture production?

¶ This novel query is propounded by Daniel B. Clark, president of the American Society of Cinematographers, in a discussion of things cinematographic in the film industry.

¶ "In the past," Clark states, "the motion picture director was chiefly a hold-over from the stage where he held a similar post as a 'stage director.' The more recent and more successful directors have been those who were not previously prepared with legitimate experience, but who acquired their picture knowledge within the confines of the industry. With the coming of these men, the cinema, as a self-contained art that is not subservient to the stage, began to assert itself. These newer directors have been successful in the degree in which they viewed their productions through the medium of the camera, rather than from the perspective of circumscribed stage limitations.

¶ "While the camera," the A. S. C. president explained, "may have gained 'self-consciousness' in

(Continued on Page 21)

Film Care in the Tropics

By Herford Tynes Cowling, A. S. C.*

Packing, Sealing and Preparing for Shipping Among Precautious to Keep Film

THIS paper describes the use and care of motion picture negative film to be exposed in tropical countries and far away from the home laboratory.

The immediate action of light on sensitive film is the production of a latent image and an invisible picture which can only be made apparent by the process of development. With modern materials the operator knows that a certain exposure in a certain light with the appropriate lens aperture will produce a definitely predictable amount of latent image which when developed, either today or tomorrow or next week will yield a picture of equally predictable intensity. He can rely on the latent image enduring unchanged until he wishes to secure its development.

It is a little realized fact, perhaps, that under abnormal conditions of heat and moisture, especially in those hot countries where bacteria and fungoid moulds abound, the latent image is not quite so permanent as we are wont to believe. Little by little as each week passes in the traveler's journey towards home, the latent image may become weaker until by the time the film reaches the laboratory only a very feeble picture can be revealed by development.

Fading

My own personal experiences in tropical countries, especially during the humid rainy seasons, has shown me that there is generally a pronounced fading of the latent image together with much general fog on development unless certain definite rules are followed. I have found it advisable to treat the problem from two angles. Firstly, it is wise to increase the camera exposure so that there is more latent image to withstand fading; secondly, a scheme of packing must be employed which insures protection against these harmful atmospheric conditions. By adhering to a few common sense rules I have found it quite feasible to keep negative film up to a maximum of nine months between the exposure and the development. One lot of 3,000 feet exposed in Sumatra, under the gruelling heat of the equator, did not arrive home till ten months later, but owing to judgment in exposure and care in packing there was very little which was not of excellent quality.

We may divide the life of a negative film into four periods; that which elapses:

(1) Before opening the sealed unit which comes from the manufacturer.

(2) Between opening the unit and placing the film in the camera.

(3) While the film is in the camera.

(4) Between exposure and development.

*Eastman Kodak Co., Rochester, N. Y.

Paper presented before the Society of Motion Picture Engineers, Norfolk, Va.

Care in Shipping and Before Opening the Original Container

NEGATIVE film is comparatively safe from decay whilst resting in the original metal container in which it comes from the manufacturer. When once this has been opened, even though it be immediately resealed with tape, moisture and bacteria have been admitted and the film's future history becomes a matter of doubt. Experienced travellers and explorers adopt a unit system of packing and avoid opening any of the film as originally packed until required for use. Among the items to be specified when the negative film is ordered from the manufacturer the following are important:

1. Type of camera in use.
2. Length of rolls required.
3. Method of winding peculiar to the particular camera in use.
4. Kind of negative desired (par-speed, super-speed, or panchromatic.)
5. Size of unit packing desired.
6. Number of rolls of adhesive tape and black paper required.

The unit system of packing employs a series of three containers, each larger unit containing a number of smaller, considering these from the inside outwards:

First unit: Should hold the length taken by the camera, whether 50-100-200 or 400 ft. rolls, sealed double taped original metal containers by the manufacturer.

Second unit: Should comprise five first unit rolls placed in a larger metal container and hermetically sealed with a very thin sheet of soft metal to allow for opening with a pocket knife. An additional double taped cover should be provided so that the second unit can be used for repacking the first units after exposure.

Third unit: Metal lined wooden shipping case containing four to six second units. The sealed metal lining can be taken out of the wooden shipping case and put into fiber cases or other carriers for local transport without opening the metal. Maximum weight, not including wooden shipping case is forty pounds.

A supply of one-inch width adhesive tape rolls sufficient to double tape all first and second units after use, also new black photographic wrapping paper in a sealed roll sufficient to rewrap the film, should be included in this unit.

The larger unit may also be used to pack other photographic supplies used on the trip, including plates, film rolls, etc., and which may also be wanted on the unit system. Photographic supplies should be kept separate from any unit containing other supplies.

Cool, Dry Place

Shipments to agents or representatives in foreign coun-

(Continued on Page 13)

Amateur Cinematography

A Professional's Notes for Amateurs

Part VIII
By Jos. A. Dubray, A. S. C.

Lenses, Photographic Objects, Refracting Surfaces Are Discussed This Month

(Continued From Last Month)

Jos. A. Dubray

Prior to entering into a discussion of photographic lenses, a definite distinction must be made between a *lens* and a photographic *objective*.

A photographic objective, which is commonly and erroneously called a lens, is in fact (except for very few exceptions) a *combination of lenses* assembled for specific purposes; while a *lens* is merely one of the elements forming the objective.

In other words, a *lens* is a single piece of transparent material, of homogenous composition, cut and ground in such shape as to present two refracting surfaces, and several lenses combined together, form the optical instrument called an *objective*.

Refracting Surfaces

THE refracting surfaces of lenses used in the making of photographic objectives may be *both spherical,* or *one* may be *spherical* while the other may be plane.

This limitation of form gives rise to *six* different shapes of lenses, which in turn can be divided into two categories.

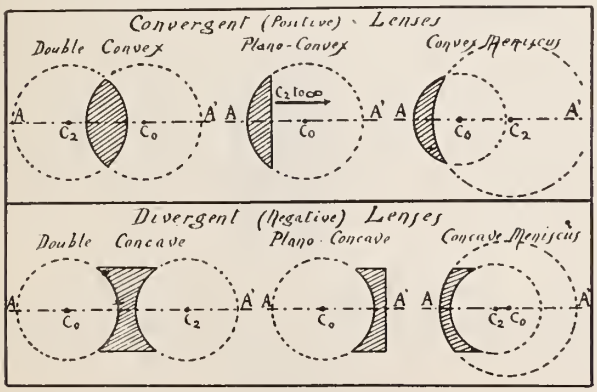


Figure 17

The *curved* surface of each one of these lenses is a portion of a sphere, having a well defined radius length.

The *plane* surfaces may be considered as surfaces of sphere, whose radius extends to *infinity*.

The graphic representation in the figure represents the section of the lenses—the shaded area indicating the body of the lens; the full lines giving the boundaries, and the dotted lines giving the remaining circumference of the sphere of which the lens is a part.

The C points in the figure represent the centers of the spheres, and are called *centers of curvature*. The sign C is always used for indicating such points, and are distinguished by suffixes in order to indicate to which refracting surface they belong.

In the figure, for instance, the points C_0 pertain to the first surface of the lens and the points C_2 pertain to the second surface.

The line A A′, which passes through *both* centers of curvature, in the case in which both surfaces are spherical, and which passes through the center of the curved surface and is perpendicular to the plane one, as in the case of plano-convex and plane-concave lenses, is called the *axis of the lens*.

The face of the lens that is turned *toward* the incident light, is called the *first face of the lens* and consequently the *second face* is the one that is turned from the incident light.

The points of intersection of the axis and the two faces are called the *vertices* of the lens and are denoted by the symbol V, distinguished by suffixes as in the case of the symbols indicating the centers of curvature.

The *radii* of the curved surfaces, or distances between the center of curvature and any point of its surface, are represented by the small italic letter *r*.

Finally the distance between the two vertices of a lens gives the *thickness* of the lens and is represented by the small italic letter *d*.

On First Surface

LET us now consider the behavior of a ray of monochromatic light incident upon any point of the first surface of a lens, and let us follow its path through the lens, and at its emergence from the second face of the lens, and let this lens be a double convex made of *glass*, $n=1.5$; and let it be surrounded by *air*.

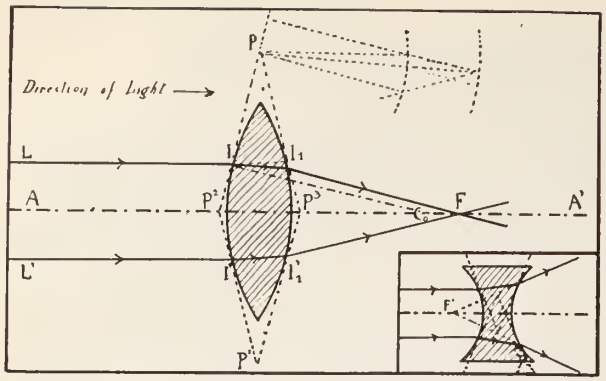


Figure 18

Each surface of the lens may be considered as *composed by an infinite number of plane elements,* and each one of these elements may be supposed to have the same magnitude as an infinitely small bundle of rays, so infinitely small that it may be considered a *single ray* and may be represented on the plane of the paper, by a straight line.

Let the incident ray be the ray L I in Fig 18 and let it strike the first surface of the lens at the point, or *element* I. The *normal* to the surface at this point is the perpendicular to the *tangent* P P^2 which touches the first surface at the point I.

It is a geometrical principle that the perpendicular to a line tangent to any point of the surface of a sphere represents also the *radius* of the sphere. I C_0 is then the radius r_0, and the perpendicular to the infinitely small surface I.

Let us now draw the tangent to the second surface of the lens, at the point I_1, and let I I_1 be parallel to the axis A A'.

It is clear from the figure, that the triangle P P^2 P^3, may be considered as representing the section of a *prism,* and we can easily trace, geometrically, the approximate path of the refracted ray into the medium of the lens and at its emergence from it. (See the February issue of the American Cinematographer, Fig. 12.)

It is evident from the figure that the emergent ray shall meet the *axis,* at a certain point, which will be determined by the *curvature of the surfaces* of the lens and by the *composition* or *n* (Index of Refraction) value of the lens itself.

If we consider now another ray L' I' incident to the first surface *below* the axis and we follow the same geometrical construction as for the ray L I, we find that the prism P^2 P' P^3 is similar to the prism P P^2 P^3, but reversed; and the emergent ray will meet the axis at the point F, or at the *same point* that was created by the meeting with the axis of the refracted ray R F. The rays *converge* to the same point, and the lens in question is then called a *convergent lens.*

If similiar geometrical constructions are drawn for the plano-convex and convex meniscus lenses (Fig. 17) we see that after refraction, all rays passing through these types of lenses *converge* towards the axis. These types of lenses are then called *convergent.*

A simple glimpse at Fig. 18a will show that in this type of lens (double concave), the refracted rays, at their exit from the lens, *diverge* from the axis, and only their imaginary prolongation will meet the axis at the point F', which is situated *in front* of the lens.

The rays refracted by the plano-concave and concave-meniscus lenses (Fig. 17), also *diverge* from the axis and these types of lenses are therefore called *divergent.*

Specifications

IT CAN easily be understood that any lens may be perfectly defined by its specifications, namely: I: The composition of the medium of which it is made i.e. its *n* value or index of refraction; II: By its shape and dimension.

It would be very tedious and it would require unnecessary time and space to call each point, each distance and each angle pertaining to a lens, by its specific name. Hence the need of having recourse to conventional symbols and signs, which, once chosen, shall always refer to the same characteristics of lenses, and which can, at a glance and unmistakably, be referred to such characteristic.

The small italic letter *r,* for instance, shall always refer to the radius of the sphere of which the surface of the lens is part; in like manner, the capital letter C, shall always refer to the position of the center of curvature and so forth.

Although, in later years, a strong tendency has been evident to bring these symbols and signs to uniformity, they are quite arbitrarily used in different countries and also by different physicists. In the course of this study, we will follow the convention adopted by Dr. Adolph Steinheil and expounded (save error) by Dr. Von Rohr.

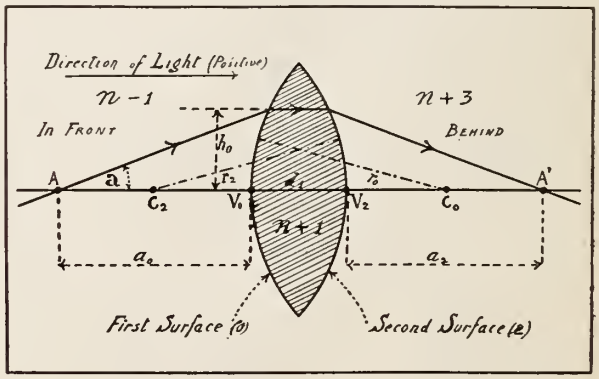


Figure 19

Figure 19 represents a double-convex lens, and a ray of light, incident to the first surface, refracted into the me-

(Continued on Page 15)

Graininess of Motion Picture Film

By J. I. Crabtree

First Installment Cites Factors of Graininess During Exposure and Development

From the Research Laboratory of the Eastman Kodak Company. Presented at the spring convention of the S. M. P. E., Norfolk, Va., 1927.

WHEN a motion picture is viewed at a relatively short distance from the screen the various tones of the image are seen to consist of an agglomeration of small particles which appear to be in a state of boiling or scintillation. This lack of homogeniety of the tones of the picture is known as graininess, and for a given image is more apparent the greater the degree of enlargement and the shorter the distance of the observer from the screen.

The non-homogeniety of the image is due to the fact that a photographic emulsion is composed of small grains of silver halide which on development are changed to grains of metallic silver (see Fig. 1). During manufacture the individual grains in the emulsion tend to congregate in clusters and the silver grains which are visible on the screen consist of such developed clusters. The individual grains of even the coarsest grained emulsions are too small to be visible on the screen.

The apparent boiling effect is due to slight differences in position of the grain clusters as the single frame pictures are projected in rapid succession.

The word graininess is applied both to an undeveloped emulsion and the developed image. An emulsion may have inherent graininess due to the relatively large size of the grains and grain clusters, but the effect of this is only manifest in the developed image. Also, since the screen image is obtained by projection of a positive image which is usually prepared from a fine grained emulsion, it is of interest to study the extent to which the graininess of the negative image is recorded by the positive.

Previous to the investigations of Jones and Deisch[1] and Jones and Hardy,[2] little or no information was available regarding the factors which controlled the graininess of a developed image produced from a given emulsion. Motion picture workers were aware that different scenes from the same roll of film often showed varying degrees of graininess for no apparent reason. It is now possible to explain why this occurs and to indicate some of the conditions which tend to reduce graininess to a minimum.

Factors Affecting Graininess During Exposure and Development

In their investigations Jones and Hardy[2] measured the graininess of areas of uniform density obtained by varying the exposure and processing conditions. Their experiments were made by viewing their findings by preparing continuous lengths of motion picture film under practical working conditions and viewing the results on the screen.

It has been found that graininess is governed by the following factors:

1. *The Density of the Silver Deposit.*

Under any given conditions and with all emulsions the graininess of a silver deposit increases as the density increases up to a maximum at a density of about 0.3 and beyond this graininess decreases. This is as might be expected since a density of 0.3 transmits 50% of the incident light. If a series of parallel lines are ruled on a strip of film, on looking through the film the lines can be seen at the greatest distance when the width of the lines is equal to the space between. From this it is obvious that the various tones in the screen picture will exhibit varying degrees of graininess according to their density. Graininess is always most visible in the lighter tones such as the face and in a uniform area of relatively low density. It is possible therefore to diminish graininess by avoiding large uniform areas whenever possible and when arranging a set by choosing backgrounds which will not render as densities around 0.3 in the final print. This, however, is not a practical solution of the problem.

2. *The Nature of the Emulsion.*

In general, graininess tends to increase with the speed of the emulsion used but this is not an invariable rule, because the inherent graininess of present day high speed emulsions is gradually being diminished by manufacturers without loss of speed. A perfectly grainless medium, however, whose sensitivity to light is of the same order as the present negative motion picture film has still to be made.

There are many occasions when an extremely fine grained material such as positive motion picture film can be used successfully for making negatives such as slide film negatives.[3] Owing to the shorter latitude of this film in comparison with negative motion picture film, the exposure must be more critical and a soft-working developer is necessary to avoid excessive contrast.

3. *The Exposure.*

The experiments of Jones and Hardy[2] indicated that for a given subject and a constant degree of development

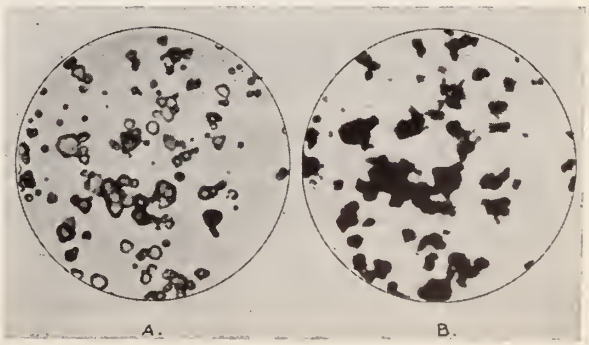


Figure 1

of both negative and positive, the graininess of the positive increased as the camera exposure of the negative was increased. However, projection tests with matched positive prints made from negatives exposed on the same subject at f/11 and f/3·5 and developed for the same time, showed little or no difference in graininess of the prints.

The effect of exposure is dealt with a further length below.

4. *The Time Which Elapses Between Exposure and Development.*

If negative motion picture film with nitrate base is stored after exposure at relatively high temperatures (80°F. or higher) in the presence of moisture, there is a tendency for the latent image to fade, that is, after development the density of the various tones will be less than if the film was developed immediately after exposure..[4]

Experience has shown that negatives returned for development by explorers invariably show excessive graininess whenever any considerable degree of fading of the latent image has occurred. The precise reason for this has not been investigated.

It is advisable therefore to develop film as soon as possible after exposure, but if this is not practical the access of moist air should be prevented because little or no fading occurs even at high temperatures in the absence of moisture. Precautions for handling film after exposure in order to prevent fading of the latent image have been published by the author.[4]

5. *The Nature of the Developer.*

a. The composition of the developing solution. Jones and Hardy[2] observed that little difference in graininess was produced by the developing solutions in common use. Repeated projection tests have shown that for all practical purposes this observation is true. J. G. Capstaff of this laboratory has recently found, however, that a developer with a high sulphite and low alkali content gives negatives of negligible graininess in comparison with that of negatives developed in the commonly used developers. The formula of this developer is given later in this paper. Although this developer contains elon and hydroquinone as the reducing agents, other developing agents may be substituted without affecting its ability to produce fine-grained deposits. The borax merely functions as a weak alkali.

The ability of the developer to produce fine-grained deposits is due undoubtedly to the solvent action of the sulphite on the silver halide emulsion. This not only reduces the size of each individual grain, but serves to prevent clustering or fusion during development of grains which are in close proximity to each other. The reason ofr this is obvious from a study of Fig. 1. Fig. 1A shows a cluster of silver halide grains before development and Fig. 1B the same grains after development. The fusion or overlapping of adjacent grains is clearly shown. Obviously, if the size of each grain is reduced during development by virtue of the solvent action of the sulphite the distance between the surfaces of two adjacent grains is increased and the possibility of fusion is reduced.

The solvent action of the sulphite on the emulsion is revealed by the fact that the developer turns milky with use, due to the presence of coloidal silver in suspension, while the walls of the developer tank become plated with metallic silver. Neither the presence of colloidal silver nor the plating out effect has any harmful effect on the developing solution.

Even with the higher speed emulsions, the graininess of negatives developed with this developer is of such a low order that it is necessary to stand quite close to the screen in order to detect any graininess in the picture whatsoever. Moreover, the improved sharpness of the positive picture resulting from the reduced graininess of the negative greatly improves its general photographic quality.

b. Dilution of the developer. Jones and Hardy[2] showed that contrary to popular belief, dilution of a developer tends to increase graininess slightly when developing to a given contrast. This is undoubtedly a result of the diminished solvent action of the sulphite on the silver grains which takes place to some extent in most developing solutions.[5] Dilution of the borax developer above has the effect of increasing the graininess. It should be used in the concentration given.

6. *The Degree of Development.*

During development, at a constant temperature contrast or gamma increases with time of development until a certain limit is reached. The contrast of the image at any moment compared with the limiting contrast which is possible is a measure of the degree of development at that instant.

It has been shown experimentally that development of any particular grain of an exposed emulsion starts at a point or points within or on the surface of the grain, and as development proceeds these specks of silver grow until the whole grain is reduced to silver.[6] It is obvious, therefore, that if development is arrested at an early stage, only relatively small silver particles remain after removing the residual unexposed emulsion in the fixing bath; whereas if development is carried nearer to completion the size of the developed silver grains is of the same order as that of the original grains.

Since the visibility of the grains and grain clusters, which in turn determines graininess, is proportional to their size, it is apparent that a developed image of any given density obtained in one case by full exposure and low degree of development will in general be composed of smaller grains than one which received a short exposure and a full degree of development.

Projection tests with flashed motion picture film obtained by varying the exposure and degree of development have confirmed this theory.

In practice, however, the degree to which a negative is developed is governed largely by the brightness contrast of the subject. In the case of negative motion picture film the various scenes are developed for a sufficient length of time to produce a definite density contrast or difference in density between the highlights and shadows, although the particular density contrast to be taken as standard is a matter of personal choice. It is obvious, therefore, that negatives of standard density contrast with

(Continued on Page 17)

Cleaning Liquids for Motion Picture Film

By J. I. Crabtree and H. C. Carlton

Effects of Various Formulae for Cleaning and Moistening Cited in Last Number

(Continued from Last Month)

IT IS possible to incorporate a mineral oil solvent such as carbon tetrachloride with any of the above alcohol-water mixtures. The quantity of carbon tetrachloride which can be added depends on the quantity of water present in the alcohol. For example: tertiary butyl alcohol and carbon tetrachloride and water and tertiary butyl alcohol are miscible in all proportions. Water and tetrachloride are immiscible, but if water is gradually added to a mixture of the alcohol and carbon tetrachloride with shaking, a uniform mixture is obtained until a critical quantity of water has been added, beyond which the mixture turns milky and the liquid separates on standing into two phases or separate layers. The quantity of water which a given mixture of the alcohol and carbon tetrachloride will hold depends on the alcohol content and on the temperature, the mixture holding less water at lower temperatures.

A curve showing the limiting quantity of water which can be added to mixtures of tertiary butyl alcohol and carbon tetrachloride in varying proportions is given in Figure 1. Commercial samples of the alcohol are apt to contain varying quantities of water. The data are for a practical grade of tertiary butyl alcohol which was practically anhydrous.

The miscibility curves for grain alcohol, denatured alcohol, isopropyl alcohol, and tertiary butyl alcohol are approximately identical for all practical purposes. For the preliminary experiments the following formula was used as a cleaner:

Water	15 parts by volume
Carbon tetrachloride	20 parts by volume
Alcohol to make	100 parts by volume

Of the cleaning liquids prepared according to the above formula the one containing denatured or grain alcohol had little or no solvent properties for mineral oil so that it had no advantages over a plain alcohol-water mixture. When prepared with isopropyl alcohol the mixture dissolved 1% of light machine oil and with tertiary butyl alcohol about 3% of oil. Since the quantity of oil on dirty film is never such that the concentration of oil in the cleaning fluid would exceed this, the isopropyl and tertiary butyl mixtures were considered promising.

In order to determine the effect of the above mixtures on the film, strips of safety and nitrate motion picture film with plain and tinted bases were immersed in glass bottles containing the various liquids and stored for several days at 70°F. The results obtained were as follows:

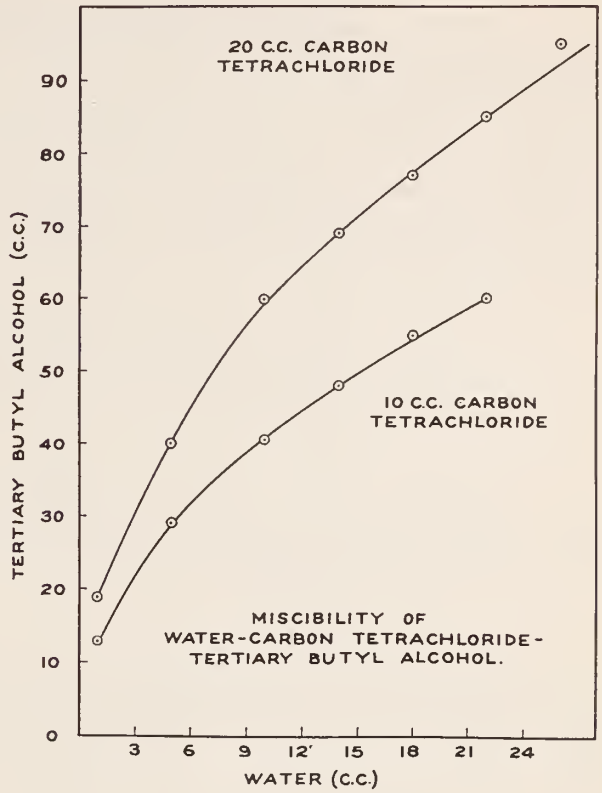


Fig. 1

Photomicrographs of emulsion before and after development.

* * *

Effect of Cleaning and Moistening Liquids on Motion Picture Film at 70°F.

Formula	Effect on Film Base	Effect on Gelatin Coating and Image	Effect on Tinted Base
Water ..... 15cc CC1-4 ..... 20cc Isopropyl alcohol to 100cc	**Acetate** Slight curl **Nitrate** Slight curl in 20 hours	Changed silver image to white silver chloride in 20 hours.	Slight solvent action in 5 minutes.
Water ..... 20cc CC1-4 ..... 10cc CCl ..... 10 c Ter. btyl alcohol to 100cc	**Acetate** Slight curl in 20 hours **Nitrate** No effect in 20 hours	No effect on image.	**Acetate** Slight solvent action in 20 minutes. **Nitrate** No effect in 60 minutes.

In the case of the isopropyl alcohol mixtures an interaction between the alcohol or possibly an oxidation product of this and the tetrachloride occurred, causing the liberation of hydrogen chloride which attacked the silver image, converting it to silver chloride. Although neither isopropyl alcohol nor carbon tetrachloride when used alone attacked the silver image, on mixing the two in the presence of water and adding a little silver nitrate solution, a white precipitate of silver chloride formed within a period of a few minutes. No such action occurred with tertiary butyl alcohol.

The interaction of the alcohols with carbon tetrachloglycerine and ethylene glycol and mixtures of these to the

(Continued on Page 17)

In Camerafornia . . .

and News Notes of the Month

JOHN W. BOYLE, A. S. C., has returned to Hollywood from Louisville, Lexington, and other points in Kentucky and the Bluegrass where he went to photograph the Kentucky Derby and other races for Metro-Goldwyn-Mayer.

"Topsy and Eva," on which, starring the Duncan sisters, Boyle was chief cinematographer, will be given its premiere at Grauman's Egyptian, Hollywood, this month.

* * *

Robert B. Kurrle, A. S. C., will be chief cinematographer on Edwin Carewe's production of "Ramona," starring Dolores Del Rio. Kurrle was chief cinematographer on Carewe's "Resurrection."

* * *

E. Burton Steene, A. S. C., made another trip to San Antonio, Texas, during the past month to photograph Akeley scenes of air maneuvers for Metro-Goldwyn-Mayer.

While in San Antonio, Steene attended, with Lucien Hubbard, production supervisor, and William Wellman, director, the world premiere of "Wings," for which Steene executed many Akeley shots in a previous trip to San Antonio.

During the past month also, Steene spent five days in Pico canyon doing Akeley work for the F. B. O. studios.

* * *

Nicholas Musuraca, A. S. C., has signed a contract with F. B. O., which studio will have the benefit of his camera abilities in the future. Musuraca has been chief cinematographer on several F. B. O. productions of late, and the excellence of his work won the permanent arrangement with the studio.

* * *

Charles G. Clarke, A. S. C., will hold forth henceforth at the Warner Bros. studio as a cinematographer, having just signed a contract with that organization.

* * *

Ernest Haller, A. S. C., is coming in for his share of praise for his cinematography in Robert Kane's First National production, "Convoy," which is being given its initial engagement in the east.

Walter Lundin, A. S. C., is preparing for the filming of the next Harold Lloyd production, many scenes of which, it is said, will be taken in New York city.

* * *

Fred A. Parrish, A. S. C., was in Hollywood last month en route to Colorado Springs, where he is returning following a cinematographic expedition to the South Seas.

* * *

Charles Van Enger, A. S. C., is photographing First National's "The Road to Romance," featuring Jack Mulhall and Dorothy Mackaill, with John Francis Dillon directing.

* * *

Charles Rosher, A. S. C., is at work on Mary Pickford's production at the United Artists' studio.

* * *

H. Lyman Broening, A. S. C., has gone East on the special motion picture train to the Shrine convention in Atlantic City to photograph events of the trip and the assemblage.

* * *

Daniel B. Clark, A. S. C., is in Prescott, Arizona, for location scenes for the latest Tom Mix production.

* * *

L. William O'Connell, A. S. C., is photographing Fox's "Prize Fazil," directed by Howard Hawks, and featuring Charles Farrell and Greta Nisson.

* * *

Reginald Lyons, A. S. C., is shooting Buck Jones in "The Broken Dollar" for Fox. Reggie, before beginning the feature, spent a fortnight's vacation in San Francisco.

* * *

John F. Seitz, A. S. C., is in the midst of the filming of Metro-Goldwyn-Mayer's "The Trail of '98." Clarence Brown is directing.

* * *

E. B. Du Par, A. S. C., is chief cinematographer on Warner Brothers' Vitaphone production of "The Jazz Singer," starring Al Jolson.

FILM CARE IN TROPICS

(Continued from Page 6)

tries should be accompanied by strict instructions to store in a cool, dry place. In this connection it is advisable to call attention to the fact that the medium of transportation known as *Express* in the United States is peculiar to the United States and Canada alone and does not exist in other countries. Consequently goods shipped by *Express* from the United States becomes freight at the port of embarkation and moves as freight upon arrival in and during railway transit through any foreign country, and freight moves extremely slowly. The terms "Goods" is used instead of freight abroad. This is very important when shipping perishable goods.

The best way to supply film for an expedition is to have it shipped to the nearest shipping point by the manufacturer well in advance of need. Otherwise take it as baggage, though there are some complications and important things to know about the latter.

Custom Duty

All film is subject to custom duty charges in every country and custom officers are not everywhere familiar with the sensitive nature of film, resulting in their often opening a few cans to determine the nature of the goods. Also nearly all steamship regulations require that all films go as deck cargo and prohibit their presence in the baggage room or cabins. The best place for cases of film on a steamer, if prohibited in the cabin, is in some sheltered position on the deck where it can be kept cool and dry. It is inadvisable to store film near the engine room where it will be subject to heat and violent vibrations, nor should it be put in the ship refrigerator, as this is entirely unnecessary. It is not necessary to use any hygroscopic chemical for the assumed purpose of maintaining a dry atmosphere within the containers; indeed this is a dangerous and messy procedure.

If negative film is specially packed by the manufacturer for export and care is exercised in transporting, no fear need be maintained for its safe keeping qualities.

Par-speed negative film specially packed for me by the Eastman Kodak company, as described, has kept in perfect condition for over two years and withstood varying changes of temperature and conditions of travel through Central Africa, India and around the world on my various expeditions, without any loss.

Another item to be noted in taking motion picture film as baggage is that all ports of England prohibit any motion picture film being brought into England as baggage and regulations there impose a large fine for offenders. This does not refer to the question of custom duties, but is an arbitrary rule against entering England with motion picture film as any type of baggage, either hand baggage or in trunks. The only way to avoid trouble at an English port is to list the film cases on your steamer as ship's cargo and have it placed on the ship's manifest. The fact that film is "left in bond" in a port does not affect this rule. This rule does not exist in any other country but applies to all ports of the British Isles.

U. S. Duty

All film, whether manufactured in the United States or not, is subject to a custom duty charge upon return to the United States if it has been exposed abroad.

Care should be exercised to avoid taking film through several foreign countries in baggage as custom duties are demanded in each country. Few foreign countries have arrangements for baggage to be checked through transit "inbound," and demand that custom duties be paid on a "refund basis." Such procedure takes months of delay and is decidedly impractical. Films should therefore be shipped direct to the nearest shipping point to destination whenever possible.

Under conditions customarily encountered in local transportation where goods are transported upon backs of coolies, pack animals, etc., they are subjected to considerable jolting as well as changes of temperature and weather.

During the rough travel the third or larger units should be protected by wrapping, with both a straw-matting and a cheap waterproof cloth tied with rope. In the absence of straw-matting it is well to use the cheap red cotton blankets, obtainable in the native bazaars, as an inside wrapping. These coverings serve as protection against vibration, moisture and extreme heat.

In extremely hot climates, like Central Africa, and on long marches in the sun, the waterproof should be wrapped inside and the package kept cool by occasionally wetting the outside straw-matting cover. The rapid evaporation keeps the temperature down. Care should be exercised to see that porters do not leave their loads containing these units directly in the sunshine unnecessarily for long periods during the heat of the day.

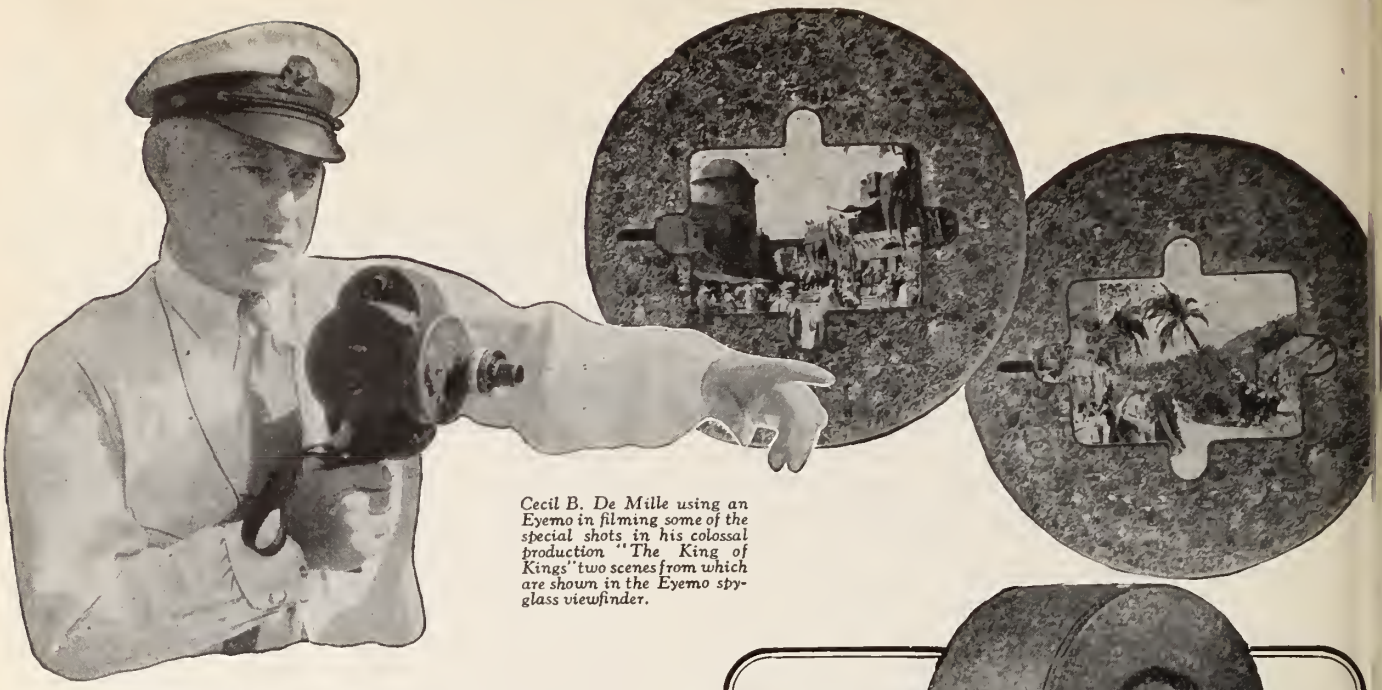
II. After Opening—Before Exposure

NEGATIVE film should not be rewound before using in the camera if it can possibly be avoided, as the emulsion thereby absorbs moisture from the atmosphere during the re-winding. This also allows foreign matter, such as very fine dust to settle and adhere to the surface as a consequence of the electrification of the film during re-winding and this will ultimately cause minute spots of the picture after exposure. Also "static markings" are likely to result from friction that is developed in the re-winding operation.

Open at Night

Open only one of the third or larger unit containers at a time, carefully protecting the contents from moisture. The best time to open these units is at night when it is often cooler than during the day. Heat has considerable effect on the film emulsion in the presence of moisture, so that changing in a moist atmosphere should be avoided whenever possible.

(Continued on Page 19)



Cecil B. De Mille using an Eyemo in filming some of the special shots in his colossal production "The King of Kings" two scenes from which are shown in the Eyemo spy-glass viewfinder.

The HITS

are made with

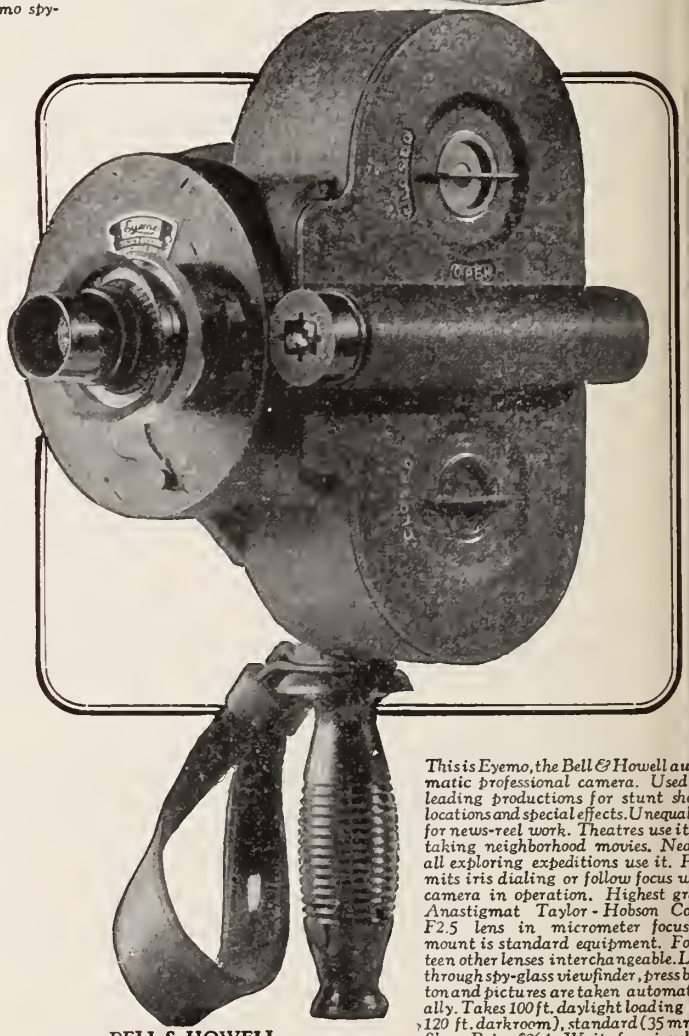
BELL & HOWELL CAMERAS

OF all the requisites of professional picture making, PRECISION is the greatest. No chance can be taken in choosing the camera to record the story, cast and locations which represent outlays of *hundreds of thousands of dollars.*

BELL & HOWELL Cameras are *precision instruments.* Their reliability has been proved in over twenty years of picture making by leading producers all over the world.

Famous Players-Lasky, Paramount, Metro-Goldwyn-Mayer, Associated First National, De Mille, Universal, Vitaphone, Warner Brothers, Fox, Kinograms, International and many other leaders rely on Bell & Howell Cameras to impress the *fullest photographic meaning* of their trade names upon the theatre-going public.

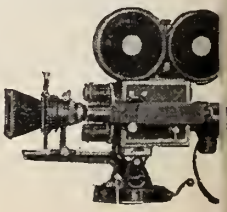
Complete information on the Bell & Howell Cameras shown here will be mailed upon request.



This is Eyemo, the Bell & Howell au matic professional camera. Used leading productions for stunt sh locations and special effects. Unequal for news-reel work. Theatres use it taking neighborhood movies. Nea all exploring expeditions use it. P mits iris dialing or follow focus w camera in operation. Highest gr Anastigmat Taylor-Hobson Co F2.5 lens in micrometer focus mount is standard equipment. Fo teen other lenses interchangeable. L through spy-glass viewfinder, press b ton and pictures are taken automat ally. Takes 100 ft. daylight loading (120 ft. darkroom), standard (35 mm film. Price $264. Write for circul

BELL & HOWELL
MAKES MOVIES AS THE EYE SEES
Eyemo

Standard
AUTOMATIC



The BELL & HOWELL
PIONEER
Professional Standard

Nearly all productions shown at best theatres are made with this camera. For twenty years it has faithfully recorded the thousands of stories staged before it. All detail parts interchangeable—for sample: Normal and Ultra Speed mechanisms. The Cinemotor that eliminates cranking and paints artistry into the production. The camera that never becomes absolete, no matter how old. Particulars on request.

BELL & HOWELL CO.

1805 Larchmont Avenue, Chicago, Illinois
New York, Hollywood, London [B & H Co., Ltd.]
ESTABLISHED 1907

AMATEUR CINEMATOGRAPHY

(Continued from Page 8)

dium glass and emerging into the same medium that lies in front of the lens and which we suppose to be air.

The symbols and signs expressed in the figure correspond to the chosen convention, and the reader is requested to familiarize himself with this mode of reading and expressing optical values.

The Convention is as follows:

I: The point of intersection of the first refracting surface with the axis, is the origin from which the reckoning commences.

II: Media are denoted by odd numbers; surfaces of separation by even numbers.

In Fig. 19 the first medium, air, is distinguished by the sign -1; the medium, glass, by the sign $+1$; the medium, air into which the ray emerges, by the sign $+3$.

The first surface (facing the incident light) is denoted by 0, and the second surface of the lens by 2.

III: The direction which the light travels, is reckoned as positive and the opposite direction as negative, and so are *length* measured along the axis, or parallel to it.

In Fig. 19, the direction $A\ V_0$ is reckoned as *positive,* and the direction $A'\ V_2$ as *negative.*

IV: Lengths perpendicular to the axis, are positive when they lie above the axis, and *negative,* when below it.

In Fig. 19, h_0, is *positive.*

V: Radii of curvature are *positive* when the surface presents its convex face toward the incident light, and *negative* if the surface is concave to the incident light.

In Fig. 19, the radius r_0 is *positive* and the radius r_2, is *negative.*

VI: Thicknesses are regarded as being always *positive.* In Fig. 19, the thickness d_1 is *positive.*

VII: Constants—Constants are indicated by *small italic letters.*

In Fig. 19, the letters n and n' indicate respectively the medium air and the medium glass. When various lenses made of different glasses are combined to form a single optical whole, the letter n is used to indicate the glass of weakest refraction, the letter n' indicates the next stronger, n'', the next, and so on.

The numerical suffixes at the right lower side of the letters indicate the medium to which the letter refer, and if an alphabetical suffix is found at the left lower side, it indicates the corresponding Fraunhofer line.

In Fig. 19, the symbol

$$^{D}\overset{n}{+1},$$

indicates the index of refraction corresponding to the D line (Sodium line) for a first refracting medium.

VIII: Points—The position of *points,* is indicated by *capital* letters, and are distinguished by numerical suffixes, of the corresponding refracting surfaces.

In Fig. 19, V_0 indicates the vertex of the first refracting surface of the lens, and C_2, the center of curvature of the second surface of the lens.

IX: Lengths are indicated by *small italic letters,* and

are distinguished by numerical suffixes, corresponding to the characteristic of the lens, to which they refer.

In Fig. 19, d_1 indicates the thickness of a first refracting medium; a_0, the distance from the point A, to the vertex V_0.

X: Angles are indicated by small *Greek letters.* (Note: In the course of these articles, heavy type, small Roman characters, will be used instead of Greek letters.)

In Fig. 19, the letter a denotes the angle which the incident ray makes with the axis.

The *positive* and *negative* values of angles will be explained as the occasion presents itself.

To summarize let us suppose the following formula:

$$n_{-1} = 0.0092$$
$$n_{+1} = 1.5$$
$$n_{+3} = 0.0092$$
$$r_0 = 60 \text{ millimeters}$$
$$r_2 = 50 \text{ millimeters}$$
$$d_1 = 10 \text{ millimeters}$$

It indicates a double convex lens of crown glass whose index of refraction is 1.5, placed in air (Index 0.0092) the radius of the first face having a length of 60 millimeters and the radius of the second face a radius of 50 millimeters. The thickness of the lens being 10 millimeters.

It is evident that such formula gives all specifications of the lens in question, and all of its characteristics may be found by geometrical construction, or trigonometrical computation.

ERRATA

In "A Professional's Notes for Amateurs" last month (May), paragraph four, column two, page four, should hvae read as follows:

"CROWN GLASS in a compound of Silica and Lime and Soda, or Potash or both.

"FLINT GLASS is a compound of Silica and LEAD, with Soda or Potash or both."

(To be Continued Next Month)

To Transfer Film Library from New York to Hollywood

Walter A. Futter, president of Wafilms, Inc., is in Hollywood for the purpose of making arrangements for the transfer of his film stock from New York city to Hollywood.

Besides maintaining an extensive library, Futter is the producer of a number of short subjects, including "Curiosities.

* * *

Joseph A. Dubray, A. S. C., has completed the photography on "Snowbound," a Tiffany production. The cast included Betty Blythe, Lillian Rich, Robert Agnew, George Williams, Harold Goodwin, Pat Harmon, George Fawcett and Martha Mattox.

* * *

At the open meeting of the American Society of Cinematographers, held on May 16, Glen Gano of the research department of Creco, Inc., spoke on practical phases of panchromatic film. Gano's talk was illustrated by lantern slides.

GRAININESS

(Continued from Page 10)

a minimum of graininess can be produced by employing contrasty lighting for the subject and developing to a low degree of development.

In case the lighting of the object is not subject to control and if development must be forced, the borax developer above will give a minimum of graininess.

REFERENCES

1. L. A. Jones and N. Deisch, "The Measurement of Graininess in Photographic Deposits," J. Frank Inst. 190, 657, (1920).
2. A. C. Hardy and L. A. Jones, "Graininess in Motion Picture Negatives and Positives," Trans. S. M. P. E. No. 14, 107, (1922); see also monograph on "The Physics of the Developed Photographed Image," by F. E. Ross, Chapter II, p. 21, Van Nostrand, N. Y., 1924.
3. R. Rogers, "Why Slide Film?" Trans. S. M. P. E., No. 28, 230, (1926).
4. J. I. Crabtree, "Handling Motion Picture Film at High Temperatures." Trans. S. M. P. E., No. 19, 39, (1924).
5. M. L. Dundon and J. I. Crabtree, "Investigations on Photographic Developers," Trans. S. M. P. E., No. 19, 35, (1924).
6. E. P. Wightman, "The Inside of the Photographic Plate," Amer. Phot. 329, June, 1923.
7. J. G. Capstaff and M. W. Seymour, "The Duplication of Motion Picture Negatives," Trans. S. M. P. E., No. 28, 223, (1926).

(To be Continued Next Month)

CLEANING LIQUIDS

(Continued from Page 11)

above solution but the results indicated that these are usually not necessary.

An alternative method of moistening the film is to first ride in the presence of water was investigated further by exposing mixtures prepared with the different alcohols to ultra violet light. In the case of mixtures of tetrachloride and water with denatured alcohol and isopropyl alcohol, the image was attacked in eight hours. No effect was obtained with a mixture containing tertiary butyl alcohol after exposure for 24 hours.

Of the combined cleaning and moistening liquids tested, the following was the most satisfactory:

Carbon tetrachloride	10 parts by volume
Water	20 parts by volume
Tertiary butyl alcohol to	100 parts by volume

This has no harmful effect on the film, it dissolves a sufficient quantity of mineral oil and it humidifies the gelatin coating. If it is necessary to increase the quantity of water in the formula, the proportion of the ingredients to give a clear solution is indicated by the miscibility curve in Figure 1.

The capacity of the unused liquid for dissolving mineral oil is limited, but with use the liquid will dissolve a greater proportion of oil as a result of dehydration of the liquid by virtue of the absorption of water by the gelatin of the film. Unless the liquid is used for long periods it is usually not necessary to add a further quantity of water to compensate for that absorbed by the film.

If the film to be cleaned is coated with an excess of oil the above solution may not entirely remove all the oil with one treatment and a second treatment may be necessary.

Experiments have been made with the addition of remove the oil with carbon tetrachloride and then give the film a second treatment with a mixture of denatured alcohol or tertiary butyl alcohol and water in the proportions outlined above. This involves more labor but is a very satisfactory procedure.

Practical Recommendations

1. For cleaning the base side of negative and positive film after processing the following solution is recommended:

Ammonia (Conc.)	5 parts by volume
Water	95 parts by volume
Alcohol* to make	1000 parts by volume

*The "Pyro" brand of denatured alcohol of the Industrial Alcohol Company is satisfactory, although isopropyl alcohol or tertiary butyl alcohol are to be preferred.

The solution may be applied to positive film by means of a cleaning machine and to negative film when wound face down onto a cloth covered drum. Negative film may be cleaned with safety on certain types of sprocketless cleaning machines, but it should not be handled on machines with sprockets owing to the possibility of damage to the film.

2. In order to remove dust and finger markings from negative film it should be cleaned before printing by wiping gently with silk plush moistened with carbon tetrachloride (sulphur-free) as it is being wound on a rewinder. An electric fan should be arranged so as to blow a current of air across the film in a direction away from the face of the operator. The cleaning process should be repeated after every third or fourth print has been made.

3. For cleaning film which has accumulated oil and dirt during projection, carbon tetrachloride (sulphur-free) as supplied by the Dow Chemical Co., is recommended. For cleaning brittle film the following solution at the same time removes oil and moistens the film, thus tending to restore its flexibility.

Carbon tetrachloride	10 parts by volume
Water	20 parts by volume
Ter. butyl alc. to make	100 parts by volume

The quantity of water in this formula should be varied according to conditions. If the film is too moist after treatment less water should be used in the formula and if too brittle more water should be added. In this case it will be necessary to increase the quantity of alcohol also so as to retain the water in solution.

The cleaning liquid may be applied to the film in the same manner as outlined under (2) above. This method is not always satisfactory because if the solvent does not evaporate thoroughly before the film is rewound, more or less solvent is retained between the convolutions of the film and in case an impure solvent is used this will be liable to attack the film image on storage. A film cleaning machine of the type recommended by Faulkner[2] is to be preferred.

In the case of very brittle film two successive applications may be necessary. The odor of tertiary butyl alcohol may also be objectionable in hot weather.

An alternative procedure is to first remove oil from the film with pure carbon tetrachloride and then moisten the film by passing through a mixture of denatured alcohol, isopropyl alcohol, or tertiary butyl alcohol with 15% to 25% of water.

Although air which contains sufficient carbon tetrachloride to smell perceptibly, is not dangerously toxic, ample ventilation should be supplied when using this or any other solvent. In the case of a film cleaning machine, a suitable exhaust hood with carry-off pipes should be arranged over the machine.

Carbon tetrachloride as received in drums often contains a small quantity of water in suspension as fine droplets. Unless the water is removed before use, spots will be left on film after cleaning as a result of local swelling of gelatin by the water.

The water can be removed readily by pouring the liquid through a vertical glass tube containing granules of anhydrous calcium chloride. A tube four or five feet long, three or four inches wide, and fitted with an outlet tube above one-half inch in diameter is satisfactory. A wad of absorbent cotton at the bottom of the tube serves to retain the calcium chloride granules.

To use the column the carbon tetrachloride is poured in at the top and allowed to run out at the bottom directly into the dispensing bottle which has been dried previously. Several gallons can be passed through the apparatus in a few minutes. The calcium chloride should be thrown away and replaced occasionally. Usually several hundred gallons can be treated with the quantity described above. Both ends of the tube should be stoppered when the apparatus is not in use, otherwise the calcium chloride will absorb moisture from the atmosphere.

FILM CARE IN TROPICS

(Continued from Page 13)

As soon as the film has been taken from the inner first unit or original container, as it was sealed by the manufacturer, it begins to spoil at a rapid pace and continues to do so until it is exposed and developed. Thus care should be exercised not to load film into the camera magazine any earlier in advance of use than necessary. A good spacious light-tight changing bag such as the "Ingento" is most essential forth is purpose and will allow for quick loading of the film rolls into magazines just prior to use as well as temporary repacking very soon thereafter.

The greatest dangers to be avoided after loading in the magazine are the absorption of moisture from the air and friction from transport vibration. The film is naturally free in the camera magazine and although wound tightly in a roll to exclude all possible air from entering when packed, as soon as the tension of the wrapping is removed it will "loosen up" in the roll. This "loosening up" allows access of atmospheric moisture and heat to the emulsion surface and at the same time the coiled layers of film slide from side to side upon each other, thereby developing minute friction markings. This is, of course, true both before and after exposure.

Film loaded in magazines and transported for some time in motor cars over rough roads and on trains invariably loosens up and develops minute friction or "rain streaks" from vibration.

This trouble can be considerably lessened by stuffing the black paper, in which the film is originally wrapped, inside the camera magazine so as to wedge the film roll tightly and thus prevent "loosening-up," but, of course, the black paper must be removed from the magazine by the use of a light-tight hand changing bag before use in the camera.

It is also advisable to use paper to wrap camera magazines loaded with film, when they are not sure to be used the same day as loaded, to prevent moist air from passing into the magazine both before and after exposure.

When working near salt water additional precautions against exposure to the atmosphere should be taken owing to a more rapid deterioration of the film emulsion from contact with the chemicals which are carried in suspension in the air.

III. Exposure in the Camera

CORRECT exposure in the camera depends, in a large measure, on the approximate time interval that must elapse before development. If the film is to be developed in the field shortly after exposure, say one to two weeks, normal exposure is sufficient and there is no definite rule for an increased exposure ratio in anticipation of delayed development.

Exposure meters are invaluable as a basis for ascertaining the correct exposure for immediate development but no allowance is made for the lapse of time during a delayed development interval.

IV. After Exposure and Before Development

After negative film has been exposed in the camera, it should be repacked with black paper and taped in the original first unit container, as soon as possible without rewinding. Often it is not practicable to do this packing with the necessary thoroughness during field operations. The films must then be placed temporarily in the tins until a dark room is available and a number of exposed rolls have been accumulated; also to wait for a drier condition of the atmosphere.

The thorough final packing of negative film after exposure referred to above, for delayed development and transport, should be conducted in a dark room if possible, although it can be done in a light-proof changing bag. The old black wrapping paper, wooden spool or core, and tape, which came in the original package, should be entirely discarded and fresh black photographic wrapping paper and fresh adhesive tape used. Never use newspaper or any kind of wrapping paper other than black photographic wrapping paper to repack film, as most paper contains chemicals injurious to the sensitive film.

Flame of Candle

The original containers should be well dried out with the flame of a candle to remove all moisture. The film spool must be drawn as tightly as possible without "pulling" and wrapped tightly with the new black paper. After placing the film inside the dried container, the center opening and every possible space available, is filled tightly with dry, fresh, black paper. When the

cover is placed on the container under pressure, it should exclude all possible air from the container, and a double wrapping of new tape should be tightly drawn around the cover edges to seal the container. The tape should then be sealed over with a coating of hot paraffin wax, for which purpose melted candle wax will serve very effectively.

The original container should then be replaced in the inside second unit containers, in the same manner, after which the film is ready for shipment to the laboratory for development.

All of the same precautions as mentioned under "care before exposure" should be even more carefully observed after exposure, as the film is now more susceptible to injury than before exposure.

Field Development

It is more practical to utilize the delayed development method of operation than to attempt field development of motion picture film except at considerable expense, and by expert handling. Developing motion picture negative film by the use of portable equipment in the field requires considerable care and skill, but, whenever possible, it is advisable to develop short test strips to determine the correct exposure; which exposure can then be increased for delayed development.

**See "The Handling of Motion Picture Film at High Temperatures," by J. I. Crabtree.*

Trans. S. M. P. E., Vol. 19, p. 39.

"The Development of M. P. Film by the Reel and Tank System," by J. I. Crabtree.

Trans. S. M. P. E., Vol. 16, p. 163.

(Continued from Page 5)

some of the European productions, the fact is clearly established at last, I believe, that it is the all-powerful medium through which a picture must rise or fall. The director who used the camera in such a way as to merely transfer the convential stage to the screen—with all of the legitimate's direct and inflexible angles—has long since become obsolete. The more thoroughly a director knows the camera, the better chance he has to succeed as a director.

¶ "It is my belief that the producers recognize this fact more than ever before. Therefore, I further believe that within the next couple seasons, a substantial number of cinematographers will win deserved promotions to the posts of directors.

¶ "After this, just what the future holds intrigues the imagination. With camera lore universally recognized as an indispensable part of the equipment of every director, the director of the future stands well to find a thorough training in the technique of the camera just as essential as a realization of the fundamentals of drama itself. We may contemplate, then, a time when this prerequisite knowledge will produce a production artist who will in fact be a combination of director-cinematographer, with the chances, in many instances, that he has qualified as a full-fledged cinematographer before he has graduated to the wider calling."

PROJECTION-Conducted by Earl J. Denison

Projection in Foreign Houses

By Daniel B. Clark, A.S.C.

President of A.S.C. Speaks of Experiences of Members Who Visit Foreign Theatres

A. S. C. members whose travels take them to every corner of the globe come in contact with every variety of motion picture theatre. While their chief duties of course are the photographing of films in whatever clime they may be sojourning, they have a natural interest in the manner in which the native exhibitors are presenting American pictures; hence, time permitting, it is not long before they are making friends with the exhibitors, about whose methods and problems they learn much.

Projection System

Possibly the first thing which comes to their attention, once the exhibitor has shown them about his plant, is the system of projection employed in a given location.

And what systems they encounter!

Obsolete

In the finer houses of the larger cities, they of course find projection layouts as modern as those used in similar American establishments. But in far too many instances, obsolete types of projectors, much the worse for wear, are still being pressed into service after years of negligence and extremely rough usage.

Similar Cases

The result is much the same as is experienced, sad to relate, in some American houses. The audience views an imperfectly rendered picture which does violence to the efforts of all those who were connected with its making and distribution—the old, old story. Even the most cursory analysis will show that such a situation produces no benefits in a market—foreign distribution—from which a great portion of the profits of American productions should be derived.

Needless Cost

Furthermore, there is the item of the physical damage to the film itself, as caused by the imperfect action of the out-of-date projection equipment. This works a cost of many thousands of dollars which should otherwise be saved.

"Picture Wise"

From the standpoint of the foreign exhibitor, it does not seem logical that he should be indifferent to the excellencies of film presentation. It is true enough that many of the foreign audiences are satisfied with any type of picture just so long as it moves, but it is as true of these assemblages, as it has been proved of those in the United States, that they inevitably will become "picture wise"—which will mean that the quality of presentation must be improved or patronage will fall off.

Creating New Patrons

Keeping a theatre filled up is something of an educational process. It seems less likely in the foreign fields, than in any others, that the point of saturation should set in among theatre-goers—the point where the old law of diminishing returns sets in. What these exhibitors need to do is to convert more people, who have never acquired the habit of attending motion pictures, into confirmed theatre-goers. This is worthy promotion work. The task then is not only to hold old patrons but to create new ones.

Where to Begin

And one of the most basic places to start in such a constructive program is in the projection room. Why, it is said that some of these houses, which are supposed to be superlative in their particular localities, maintain but one projector, when it now has become the accepted practice, for ideal exhibitions, to have no less than three.

What these men need to do is to give thought to their projection—its quality, its working units, and how these units are working. If new equipment is needed, the best investment in the world is to buy it—for, after all, it means future dollars and cents at the box office.

Cameras Invade Alaska for Klondike Gold Rush Picture

Batteries of cameras are "grinding" on the Chilkoot Pass, White Horse Rapids and frozen lakes of the Klondike region, filming outdoor scenes in the original locales for "The Trail of '98," Metro-Goldwyn-Mayer's forthcoming epic of the Gold Rush, based on Robert W. Service's novel.

While Clarence Brown is directing interiors with Dolores Del Rio, Ralph Forbes, Harry Carey and others, Harry Schenck, one of his technical assistants, is at work with a crowd of extras in the Klondike. The picture, it is stated, will be even larger than "Ben-Hur," with thirty-seven principals and 15,000 extra players.

John F. Seitz, A. S. C., is chief cinematographer on the Brown picture. Faxon Dean, A. S. C., is among the cinematographers who are in Alaska.

Lon Chaney Stars in Film Made by Amateur Methods

Lon Chaney is star, director, cameraman, scenarist and title writer of his latest film—an entirely one-man affair.

It will never be seen by the public—only by his friends. Chaney, who is an amateur movie camera enthusiast, staged a little scenario of his own during his vacation, with Mrs. Chaney and his son, Creighton, as a supporting cast. He wrote his own titles and cut the picture himself.

Refrigerators Used to Keep Film on Desert Location

Refrigerators had to be imported into the Mojave desert to film the outdoor sequences of Lillian Gish's Metro-Goldwyn-Mayer vehicle, "The Wind." The temperature ran to 125, so refrigerators were shipped in, the films taken from the camera and stored next to ice, and the pictures saved. The new picture is an adaptation of Dorothy Scarborough's romance of Texas, with Lars Hanson and a notable cast directed by Victor Seastrom.

Whitman to Direct Sennett Comedies

Philip H. Whitman, A. S. C., has begun the direction of comedies at the Mack Sennett Studios, Hollywood.

For the past several months, Whitman has been a member of the Sennett scenario staff, having co-directed on a number of the short subjects.

His promotion to full directorship comes as a reward of his splendid services with the Sennett organization, with which he gained his first experience as a cinematographer.

In the cinematographic field Whitman is noted as a master of trick and intricate camera work, having at various times done special photographic assignments with Universal, Douglas Fairbanks, Cosmopolitan and the Long Island plant of Famous Players-Lasky. It was on the completion of his contract with the latter studio that the A. S. C. member came west to enter the scenario department at Sennett's.

* * *

George Schneiderman, A. S. C., has completed the photographing of Fox's "Colleen," which Frank O'Connor directed.

* * *

Alfred Gilks, A. S. C., has finished the shooting of "Ten Modern Commandments," which Dorothy Arzner directed for Paramount.

* * *

Victor Milner, A. S. C., has returned to Hollywood from Oakland, where he took location scenes for a current Paramount production.

* * *

Joseph A. Dubray, A. S. C., has begun the filming of his latest Tiffany production.

CLASSIFIED ADVERTISING

RATES: *Four cents a word. Minimum charge one dollar per insertion.*

All copy must be prepaid and must reach us before the fifteenth of the month preceding publication.

CLASSIFIED ADVERTISING
AMERICAN CINEMATOGRAPHER,
1222 GUARANTY BUILDING
HOLLYWOOD, CALIFORNIA

WANTED—MOTION PICTURE CAMERAS

GOOD USED Motion Picture Camera. State make, condition, price, etc. Saul Schwartz, production manager, Artcraft Studios, Charlotte, N. C.

WILL PUT you in touch with buyers for Bell & Howell cameras and equipment. Phone or write the A. S. C., 1222 Guaranty Bldg. GRanite 4274, Hollywood, California.

BELL & HOWELL or Mitchell Camera outfit; Projection Printer; Cinex timer; Straight Line Processing Machine; Nutting Reflectometer; Polishing Machine; State price, Equipment. Fred Jeffery, Giles Street, Rose Park, South Australia.

16 mm. Eastman Cine-Kodak, Model A, with F 3.5 or F 1.9 lens. Must have top and back built-in finders. State serial number, equipment, price. Hamilton Riddel, 1622 North Wilcox Ave., Hollywood.

WANTED—Used movie camera. Old model considered. State condition, make, price, etc. Albert R. Bly, Rosedale, Kansas. General delivery.

AKELEY CAMERA. Phone Perry Evans, DUnkirk 3890, or care A. S. C., 1222 Guaranty Bldg., Hollywood.

FOR SALE—CAMERAS

DEBRIE, aluminum box, dissolving shutter, 8 magazines, Mitchell tripod. 40, 50, 75 mm. Carl Zeiss lenses. Thalhammer iris. Veeder footage recorder, ¼-way mat box. Glen MacWilliams, c/o A. S. C., Hollywood.

PATHE CAMERA—(Enclosed magazine like DeBrie); 4 circular magazines; 1 metal tripod with tilt; 1 finder; 1 50 mm. Voigt lens. Box H, American Cinematographer.

LATE MODEL Bell & Howell Camera, 170-degree shutter, case and trunk; 4 magazines and carrying case; 4 lenses, 1 Iris outfit, tripod and finder. Address Box X, American Cinematographer.

WILART camera, latest model, complete with tripod and carrying cases and retort case and magazines. John L. Russel, 1643 North Gardner St., Hollywood. HEmpstead 9554.

BELL & HOWELL Eyemo, carrying case, four one hundred feet daylight loading Eastman negative, guaranteed perfect. First $225.00 gets it—cost $385.00. Cameron, Manhattan Beach, N. Y.

$75—Angeles 400-feet Carl Zeiss 3.5, case, tripod. Want 4 by 5 Graflex or f 1.9 to fit De Vry. 2590 Midlothian Dr., Altadena, Calif. Colorado 0342.

BELL & HOWELL Eyemo, brand new, B-1702, with carrying case and five spools, $225.00, C. O. D. Guaranteed. Roscoe Wright, 2223 Clifton Ave., Cincinnati, O.

FOR RENT—CAMERAS

FOR RENT—Bell & Howell studio equipment complete. 170-Degree Shutter. Liberal commission to cameramen. Call Mr. Smith, MEtropolitan 4686. Evenings call MAin 0947. (Los Angeles.)

NEW Eyemo camera, fully equipped; rent by day or longer. Joe La Shelle, 9038 Dorrington Ave., Hollywood; Phone OXford 5840.

AKELEY, Bell & Howell and Mitchell Cameras for rent, all latest equipment. Phone GRanite 2213 or GRanite 1914. John W. Boyle, 1207 North Milton Ave., Hollywood.

BELL & HOWELL. Victor Milner, 2221 Observatory Ave., Los Angeles, California. 596-944.

MITCHELL, and Bell & Howell Cameras. F.2:3; F.2:7; F.3:5 lenses—40-50-75 mm. Complete equipment. J. R. Lockwood, 523 North Orange St., Glendale, California. Glendale 3361-W, or HOlly 0764.

E. BURTON STEENE, Bell & Howell, and Akeley. Complete Camera Equipment. Latest models. Address American Society of Cinematographers, Hollywood, California.

BELL & HOWELL, 170, with 30, 40, 50 and 75 lens equipment. Baby Tripod. Also B. & H. Cine Motor. Charles Stumar. GRanite 9845. 7501 Lexington Ave., Hollywood.

FOR RENT—One Eyemo camera, complete with all accessories. Bert Glennon, 6936 Woodrow Wilson Dr., Hollywood, Calif. Phone HEmpstead 2743.

BELL & HOWELL No. 627. Five lenses: 32, 40 (f.2.7), 50 (f.2.7), 75, 100 mm. Complete studio equipment: gauzes, filters, etc. GLadstone 0033.

TWO Bell & Howells. Large finders. Also Eyemo for rent. Lenses: F 2.5; 2.3; 2.7. Frank M. Cotner, 6273 Selma Ave., Hollywood. HOllywood 5046.

SPEED CAMERA: Bell & Howell, fully equipped for miniature and slow motion work 40, 50, 75 mm. and 6-inch lenses. Alvin V. Knechtel, 1179 North Kenmore. 597-054.

BELL & HOWELL cameras, Akeleys and other makes—portable lights, special lenses by the day, week or month. We sell everything that any cameraman might ever need—new or used—at a big saving. Keep us in touch with your wants. Ruby Camera Exchange, Ruby Building, 727 Seventh Ave., N. Y. Bryant 0631 or 8457.

BELL & HOWELL—Phone Perry Evans, DUnkirk 3890 or Hollywood A.S.C.

FOR TRADE—CAMERAS

WILL trade practically new Model K.5 late model Eastman Aero Camera, complete with venturi tube and anti-vibration suspension mount (Gimbal) for good second-hand Mitchell or Bell & Howell camera. Cecil M. Thomson, 510½ Travis St., Houston, Texas.

TWO 170 shutter Bell & Howell cameras, fully equipped. One with super-speed attachment. ORegon 3726, 407 N. Milton Ave., Hollywood.

FOR RENT—AIRPLANES

AIRPLANES equipped to carry cameras, facilitating the photographing of stunts or other unusual action, for rent by the hour, day or week. Jerry Phillips, Professional Pilot, Clover Field, Santa Monica, California.

FOR RENT—STILL CAMERAS

WILL RENT still camera to local parties. Special arrangements to A. S. C. members. Geo. Meehan, Ph. GRanite 3830, 744 Curson Ave., Hollywood, California.

FOR RENT—One 4x5 Graflex Camera and one 4x5 Grafic. Bert Glennon. Phone HEmpstead 2743.

FOR SALE—LENSES

ONE three-inch Dahlmeyer F. 1:9, mounted for Mitchell; one two-inch Bausch & Lomb F.2:7; one Dahlmeyer Pentac 37 mm. F.2:9. Georges Benoit, 3306 North Knoll Drive, North Hollywood.

CARL ZEISS, F. 2.7, 50 mm. in Bell & Howell mount. Dan Clark, care American Society of Cinematographers.

NEW 40 mm. Goerz Hypar f. 3. 5. lens in Bell & Howell mount; price $50.00. Write Charles Clarke, 1222 Guaranty Building, Hollywood, California.

RUO LENSES—Sole U. S. Agent. Robert Ackerschott, 1575 N. Vine St., Hollywood. 25 mm. to 100 mm.; F. 2. and F 2.5 (Latest type: Telephoto, 10-inch, F. 4.5).

CARL ZEISS, 50 mm., F. 3.5, in Bell & Howell mount, $50; without turret mount sleeve, $41.50. Write Gaylord A. Wood, 1821¾ N. Wilcox Ave., Hollywood, Calif.

WANTED—PROJECTOR

USED SIMPLEX wanted. State model, price, condition, etc. Address Box R, American Cinematographer.

WANTED—MISCELLANEOUS

WANTED—Photographs of nature, birds and animals, etc.; for educational library. E. R. Gammage, Animated Film Library, Westlake, La.

FOR SALE—SPECIAL CAMERA EQUIPMENT

GEAR BOX attachment for Bell & Howell camera; makes automatic fades and dissolves from four to 20 feet. Also complete new style Bell & Howell matt box for sale. Joseph B. Walker, 1037 N. Sycamore Ave., Hollywood. Phone GLadstone 3797.

HOW TO LOCATE MEMBERS OF THE

American Society of Cinematographers

Telephone GRanite 4274

OFFICERS

Daniel B. Clark	*President*
John W. Boyle	*First Vice President*
Victor Milner	*Second Vice President*
Frank B. Good	*Third Vice President*
George Schneiderman	*Treasurer*
Charles G. Clarke	*Secretary*

BOARD OF GOVERNORS

Victor Milner	Alfred Gilks	Fred W. Jackman
Daniel B. Clark	Charles G. Clarke	Georges Benoit
George Schneiderman	John W. Boyle	E. Burton Steene
L. Guy Wilky	John F. Seitz	Ira H. Morgan
Frank B. Good	King D. Gray	Floyd Jackman

Abel, David—with Warner Brothers.
Arnold, John—with Metro-Goldwyn-Mayer Studios.

Barnes, George S.—with Samuel Goldwyn Prod.
Beckway, Wm.—
Benoit, Georges—
Boyle, John W.—
Brodin, Norbert F.—with Warner Bros.
Broening, H. Lyman—
Brotherton, Joseph—with Universal.

Clark, Dan—with Tom Mix, Fox Studios.
Clarke, Chas. G.—with Warner Bros.
Cowling, Herford T.—with Eastman Kodak Co., Rochester, N. Y.
Cotner, Frank M.—
Crockett, Ernest—
Cronjager, Henry—

Davis, Chas. J.—with Warner Bros., "Vitaphone," New York City.
Doran, Robert V.—
Dored, John—Riga, Latvia.
Du Par, E. B.—with Warner Bros.
DuPont, Max B.—
Dubray, Joseph A.—with Tiffany Prod.

Edeson, Arthur—with First National, Burbank.
Evans, Perry—

Fildew, Wm.—
Fischbeck, Harry A.—with Famous Players-Lasky.
Fisher, Ross G.—with First National, Burbank.
Fried, Abe—with Warner Bros.

Gaudio, Gaetano—with United Artists Studio.
Gilks, Alfred—with Famous Players-Lasky.
Good, Frank B.—
Gray, King D.—with Fox Studios.
Griffin, Walter L.—with David Hartford Productions.
Guissart, Rene—Paris, France.

Haller, Ernest—with Robert Kane Productions, New York City.
Heimerl, Alois G.—

Jackman, Floyd—with Fred W. Jackman Productions.
Jackman, Fred W.—directing Fred W. Jackman Productions.
Jennings, J. D.—with Buster Keaton.

Knechtel, Alvin V.—with First National, Burbank.
Koenekamp, Hans F.—
Kurrle, Robert—with Edwin Carewe.

Lockwood, J. R.—
Lundin, Walter—with Harold Lloyd Productions, Metropolitan Studios.
Lyons, Reginald—with Fox Studios.

McCord, T. D.—
McGill, Barney—
MacWilliams, Glen—with Fox Studios.
Meehan, George—with Fox Studios.
Milner, Victor—with Famous Players-Lasky.
Morgan, Ira H.—with Metro-Goldwyn-Mayer Studios.
Musuraca, Nicholas—with F.B.O. Studio.

Norton, Stephen S.—with Tiffany Prod.

O'Connell, L. Wm.—with Fox Studios.

Palmer, Ernest S.—with Fox Studios.
Parrish, Fred A.—Colorado Springs, Colo.
Perry, Harry—with Famous Players-Lasky.
Perry, Paul P.—with Famous Players-Lasky.
Polito, Sol—with First National.

Ries, Park J.—
Roos, Len H.—Sydney, Australia.
Rose, Jackson J.—with Universal.
Rosher, Charles—with Mary Pickford, United Artists Studio.

Schneiderman, George—with Fox Studios.
Scott, Homer A.—
Seitz, John F.—with Metro-Goldwyn-Mayer Studios.
Sharp, Henry—with Metro-Goldwyn-Mayer Studios.
Snyder, Edward V.—with Pathe, Fine Arts Studio.
Smith, Steve, Jr.—
Steene, E. Burton—
Stumar, Chas.—with Universal.

Tolhurst, Louis H.—producing microscopic pictures, for Pathe.

Van Buren, Ned—with Eastman Kodak Co., Hollywood.
Van Enger, Charles—with First National, Burbank.
Van Trees, James C.—with First National, Burbank.

Warrenton, Gilbert—with Universal.
Wenstrom, Harold—
Whitman, Philip H.—Directing with Mack Sennett Studios.
Wilky, L. Guy—

Zucker, Frank C.—Robt. Kane Prod., Cosmopolitan Studios, New York City.

Eastman George—Honorary Member.
Edison, Thomas A.—Honorary Member.
Webb, Arthur C.—Attorney

Meetings of the American Society of Cinematographers are held as called on Monday evenings in the A. S. C. assembly rooms—
1219-20-21-22 GUARANTY BUILDING
Hollywood Boulevard and Ivar Avenue
HOLLYWOOD, CALIFORNIA

LOYALTY PROGRESS ART

CECIL B. DE MILLE PICTURES CORPORATION

DE MILLE STUDIO

CULVER CITY

CALIFORNIA

April 6, 1927

Mr. H. F. Boeger,

Mitchell Camera Corporation,

Los Angeles, Calif.

Dear Mr. Boeger:-

Not until the completion of "King of Kings", Cecil B. DeMille's greatest epic, did I fully realize the perfection of the Mitchell camera.

I am still using the same camera I purchased from you---you know, one of the first on the old Lasky lot. In all these years I have yet to have any mechanical trouble and I attribute much of my success as Mr. DeMille's chief cinematographer to this machine.

I can assure you, Mr. Boeger, when a picture is costing from $5000 to $8000 an hour, there is great satisfaction in shooting a Mitchell.

Please inform me of any possible changes or improvements in your camera.

Very truly yours,

Peverell Marley

Vol. VIII. No. 4
25 Cents a Copy

JULY, 1927

American Cinematographer

Published in
Hollywood, California

By American Society
of Cinematographers

South Sea Island Scene in American Samoa. Still photographed by Fred H. Parrish, A. S. C., and reproduced from Location Library of American Society of Cinematographers, Hollywood

THIS MONTH:

A Pneumatic Film Squeegee—By J. I. Crabtree and C. E. Ives; Amateur Cinematography: A Professional's Notes for Amateurs—By Joseph A. Dubray, A.S.C.

Vol. VIII JULY, 1927 No. 4

American Cinematographer

FOSTER GOSS, *Editor and General Manager*

Table of Contents:

An educational and instructive publication, espousing progress and art in motion picture photography.

Subscription: United States, $3.00 a year; Canada, $3.50 a year; foreign, $4.00 a year; single copies 25c.

Published monthly by THE AMERICAN SOCIETY OF CINEMATOGRAPHERS, Inc.

Advertising rates on application.

1219-20-21-22 Guaranty Building, Hollywood, Calif. Telephone GRanite 4274

Reliable Advertisers

ADVERTISERS in the American Cinematographer are reliable. In their respective lines, they represent the strongest firms in the world. They have built up their reputations by fair dealing. They give service. They, like their products, are dependable.

He who deals with those whom the American Cinematographer is proud to number among its family of advertisers, does business with the world's best.

The EDITOR'S LENS focused by FOSTER GOSS

EFFORTS AT ECONOMY

THAT a strategic blunder was committed in attempting to impose the reduction in studio salaries recently is the opinion that has slowly but surely crystallized among all those concerned with the contemplated cut.

¶ Meanwhile, until August first, the proposed decrease in salary is deferred; and those who should know claim that it will not be enforced.

¶ The crux of the cut was purported economy in film production. That such economy is desired and needed, no one doubts. But whether it can be achieved through reduction of salaries is extremely doubtful.

¶ The play on the salary situation cast its shadow some time in advance, if the events of the past several months are reviewed. In some studio quarters the cue revealed itself in comic opera fashion through the medium of high-pressure "pep" meetings; promulgation of doctrines of executive arrogance; and flattering, if official, slaps on the back for fair-haired employes. In addition, the program had its way paved by a certain corner of the trade press, which now has resorted to a precarious position on the fence, with its attitude divided between utterances of justification and attempting to prognosticate just what side of the hedge will be safer to land on, after August first. Added to these songs and dances there has been an obligato of vague allusions that relentless Wall Streeters had decreed that the fickle film people were being paid too much for good. substantial Americans—which should be sure-fire stuff to bring forth the plaudits of those suffering thousands who may be pestered with that ogre, the inferiority complex.

¶ So with sober faces, sanctified enunciations of the tenets of higher "economics," and the atmosphere of churchly music, the cut was ushered in. Master showmen, learned in all the ways, impulses and reactions of human nature, called in the employes of their studios, and of course, sent they away happy in the divine thought that their wages were going to be cut. Naturally, they were at once converted into grateful, conscientious, serious and economizing workmen!

¶ No one denies that there are some salaries which are out of proportion to that which their recipients contribute toward the making of a motion picture. On the other hand, the equation is over-balanced by the wages of the many who are underpaid, in ratio to what they give in production of a picture. Such people as these have a right to expect a raise in salaries rather than a decrease.

¶ The most logical way to achieve economy in the film industry is not by making its faithful workers dissatisfied, but by routing that omnipotent bugaboo —true economic waste. Perhaps this heralded economy would not have been necessary if the thousands of dollars had not been poured in the sump hole of bad judgment that is represented by any one of a half dozen million-dollar-plus photoplays which can be named by any one who is at all familiar with the picture business. While these productions serve as outstanding examples, there are phases of practically every feature wherein real economy can be effected. Sets built at the cost of hundreds of dollars and never used; ill-picked locations whose chief virtues are unnecessary expense; thousands of feet of excess footage unintelligently directed; pictures begun and shelved forever because there was never a chance for them to be marketable—these are but a few items; if executives do not know others, let them confer with the men and women who are performing the physical tasks of making their films.

¶ Where salary reductions would save in units of tens, elimination of the foregoing factors would save by hundreds and thousands. And these factors can be detected and pruned within the studios themselves, without the aid of the stupid methods of self-important "efficiency experts" from the East.

¶ The greatest good can be done by the greatest number by the definite abandonment of the idea of unwarranted decreases in wages. It is unsound, not only economically, but as an effort at general discipline. Moreover, the notoriety attendant on such dodges, boomerangs just as injuriously as the old stories of inflated salaries of stars.

* * *

SPLENDID WORK

THOSE who enthused on the types of photography exemplified in "Variety," "The Last Laugh" and other German productions, will do well to inspect the work of Victor Milner, chief cinematographer in Paramount's "The Way of All Flesh," starring Emil Jannings. Milner's creations are not only a triumph for himself, but serve to demonstrate the mastery of the American cinematographer over any type of motion photography conceivable to direction, acting or scenario writing.

¶ As a contrast to the heaviness of the Jannings film, consult the manner in which the beautiful love theme of "Seventh Heaven" was handled photographically by Ernest Palmer, another member of the American Society of Cinematographers. Palmer has many notable productions to his credit, but it is universally admitted that this is his masterpiece.

Camera Experiments Bring Film Economy

Private Research by Cinematographers Saves Thousands in Production Costs Each Year

(The following interview, written by the editor of this publication, appears in the current Studio Section of Exhibitors Herald:)

Experiments conducted by individual cinematographers cost hundreds of dollars each year, but result in cinematographic improvements which save motion picture producers thousands per annum, according to a statement by Daniel B. Clark, president of the American Society of Cinematographers.

"Practically every cinematographer of note," Clarke reveals, "spends much of his own leisure time in experimenting along various lines in cinematography. Many of them have small experimental laboratories and private workrooms, equipped with precision instruments and machinery wherein they pass hours working out improved methods and machinery for motion photography. Hans Koenekamp, Max Dupont and Joseph A. Dubray are among the A. S. C. members whom I might mention offhand as maintaining equipment of this sort.

"Such activities, it can easily be seen, means a substantial investment to an individual, not only for the outfitting of such establishments but for the materials used in experiments, not to mention the fact that no reward is at hand for the time consumed in such work. Many other cinematographers, who do not maintain their own little laboratories, have special arrangements with precision mechanics for the execution of whatever improvements they work out in their camera instruments.

"Speaking of these improvements," Clark continued, "there is little or no effort on the part of the rank and file of cinematographers to capitalize on the fruits of their ingenuity. What they work out is applied on first opportunity in their next production; and, at meetings of the American Society of Cinematographers, one of the prime purposes of which is the exchange of ideas, these new wrinkles are explained and passed on to fellow cinematographers, who, in turn, are enabled to incorporate them in their own productions.

"It is therefore readily evident how the efforts of a single cinematographer are carried on to the benefit of the industry generally, with the resultant saving of thousands of dollars each year in production costs. Practically every cinematographer, in his way, contributes something toward this general cause. For the cinematographer, there is no personal recompense—and, in fact, very little credit—for these silent professional endeavors of his. There is no increase in his salary, even when they are applied in his own productions; and no one, with the exception of fellow cinematographers, even thinks of the originator of such improvements when they are taken advantage of at other studios. But it is this high professional spirit, coupled with self-effacement, that has made possible the progress of the industry through the steady and phenomenal advances of cinematography."

John W. Boyle, A.S.C., Signed As Sennett Camera Chief

John W. Boyle, first vice president of the American Society of Cinematographers, has signed a contract to become chief cinematographer at the Mack Sennett studios, where he has already begun his new duties.

Boyle's last production was "Topsy and Eva," starring the Duncan Sisters for United Artists. He has been affiliated with the most prominent producing organizations in the business, and has been a ranking cinematographer since the pioneer days of the industry in New York City.

Lecture on Color Carbons Given at A. S. C. Meeting

Charles W. Handley, of the National Carbon Company, was the principal speaker of the evening at the open meeting of the American Society of Cinematographers held June 27, in the A. S. C. assembly rooms, Hollywood.

Mr. Handley spoke on color carbons. Guests of the meeting included Fred McBan and Glen Gano of Creco, Inc., and Paul Allen.

Arrangements for the meeting were in charge of Victor Milner, A. S. C.

A. S. C. members are seldom available; when they are, they may be reached through the A. S. C. offices—GRanite 4274.

A Pneumatic Film Squeegee

By J. I. Crabtree and C. E. Ives

Apparatus Outlined for Removing Excess Moisture After Washing, Before Drying

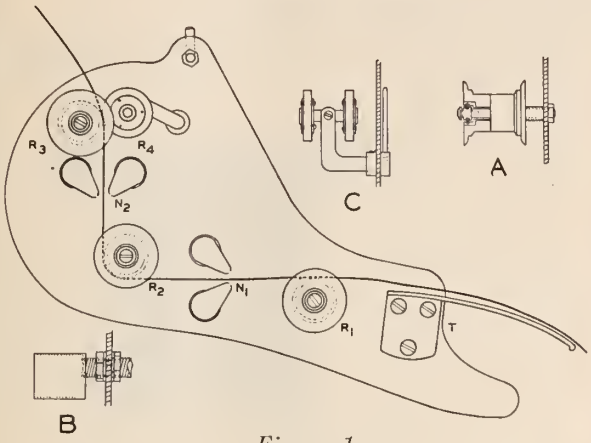


Figure 1

Figure 2

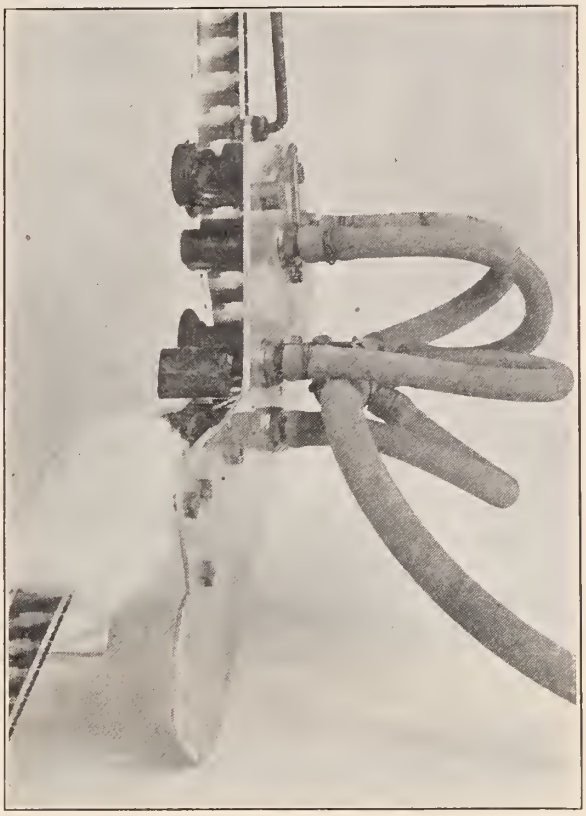


Figure 3

(Communication No. 305 from Research Laboratory, Eastman Kodak Company, Rochester, N. Y.)

It is very necessary to remove all excess moisture from motion picture film after washing and before drying in order to prevent the possible formation of markings during drying.[1] This is especially true if the gelatin coating of the film is abnormally swollen, which condition may exist in warm weather if the processing solutions are not kept at normal temperature, or if the film is insufficiently hardened either before or during fixation.

When developing motion picture film by the rack system it is customary to wipe the film with absorbent cotton, chamois, or sponge during transference to the drying reel,[2] but this involves the expenditure of a considerable amount of labor and the gelatin coating of the film is liable to be scratched unless great care is exercised in the wiping process.

Excess Moisture

The most satisfactory method of removing excess moisture from the film after washing is to impinge a blast of air on both sides of the film. Pneumatic squeegees for accomplishing this are in general use on processing machines but they have not been adopted by laboratories using the rack and tank system of development, owing o the non-adaptability of the conventional squeegee for this purpose.

A simple air squeegee having a single pair of air nozzles was first constructed and this produced good results, but it did not permit of leading the film on the drying reels sufficiently rapidly. The apparatus was modified by adding a second pair of nozzles working at right angles to the first set and at a distance of about six inches away which permitted the film to travel at twice the speed.

Plan of Apparatus

A plan of the apparatus is shown in Fig. 1. The wet film first passes over a short wiping table T, over which a wad of wetted absorbent cotton wrapped around the

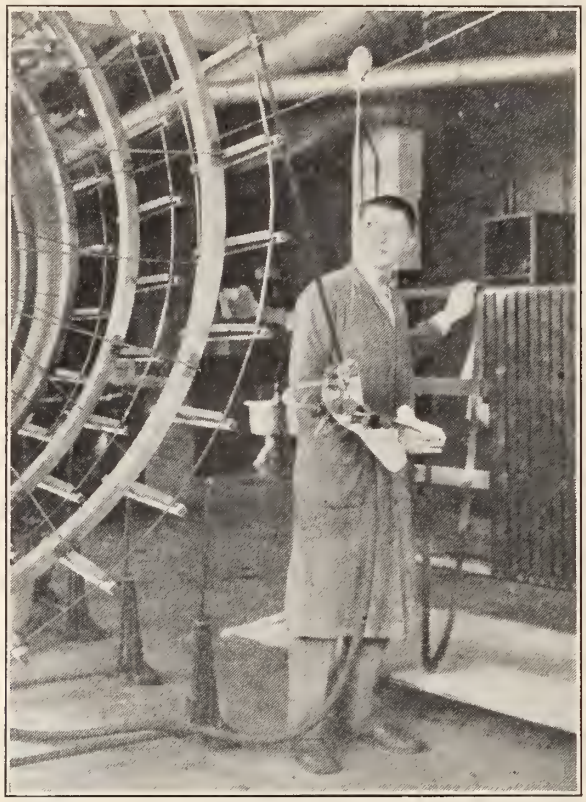


Figure 4

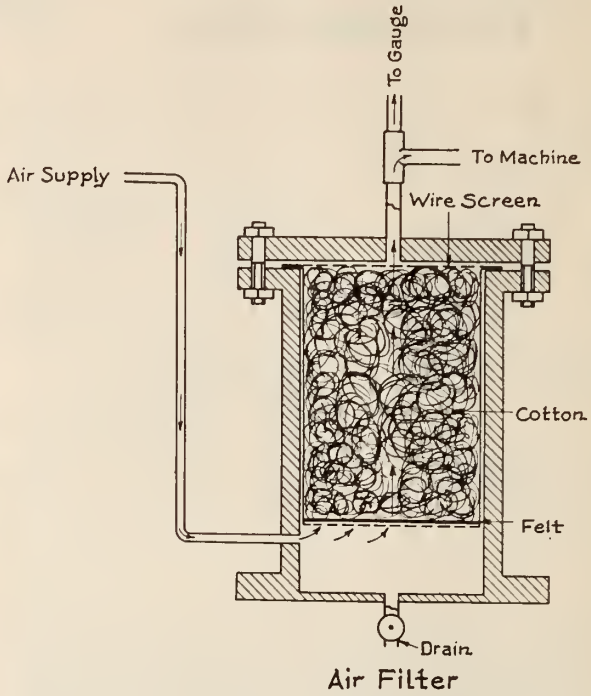


Figure 5

film is held so as to loosen any dirt adhering to the film. After passing over the idler roller R_1 the film passes between the first pair of air nozzles N_1 over roller R_2 and between the second pair of nozzles N_2 and then over roller R_3 to the drying reel. Rollers R_1, R_2 and R_3 are necessary in order to keep the film taut between the nozzles, otherwise any variation in the air pressure on the two sides causes the film to vibrate so that there is danger of the gelatin coating touching the nozzles, which would produce scratches. The roller R_4 consists of two narrow soft rubber discs bearing on the perforations and held down by a light tension spring. This prevents the film jumping off the roller or backing down when threading the machine. It is convenient to turn on the air pressure by means of a trigger, otherwise, the air flow interferes with the threading.

Rollers R_1, R_2 and R_3 are shown in section at A, Fig. 1. The emulsion side of the film is in contact with rollers R_2 and R_4 but only over the perforation area. A section of the nozzles N_1 and N_2 is shown at B and of the roller R_4 at C. A photographic elevation of the squeegee is shown in Figs. 2 and 3.

The rollers and air nozzles are assembled on an aluminum plate in the relative positions shown in Fig. 1, which is drawn to scale.

The Air Nozzles

Careful adjustment of the air nozzles is necessary to insure efficient removal of the water. An angle of inclination of about 40° to the film was found satisfactory with a 1-32″ slit, an air pressure of 20 to 30 pounds per square inch, and a separation of 1-8″ between the nozzles and the film.

Air is supplied to the nozzles by means of a four-way junction from a main supply distributed through pressure rubber tubing (Fig. 3.) A pressure regulator should be inserted in the air line so as to insure uniform performance of the squeegee.

Manipulation of Squeegee

Although it is possible to hold the squeegee before the drying reel if two persons are employed for the film transfer, it was found preferable to suspend the apparatus from a pulley traveling along a wire cable stretched in front of the drying reels as shown in Fig. 4, which clearly indicates the method of use. It is necessary to maintain a free loop of film between the rack and the squeegee and to maintain a constant speed of rotation of the drying reel during leading, which must be slower than during drying. With two persons employed for loading the reel speed can be regulated by hand, but with one operative it is necessary to control the speed of the reel by means of a foot brake. The precise braking mechanism required depends on the nature of the reel drive. Usually a band brake fitting over a drum attached to the reel axle and actuated by a foot level will suffice. The operator must unwind the film rack, progress the squeegee along the drying reel, and control the drying reel speed simultaneously, but this can be accomplished with a little practice.

(Continued on Page 16)

In Camerafornia . . .

and News Notes of the Month

E. B. DU PAR, A. S. C., has finished his cinematography on Sid Chaplin's last starring vehicle for Warner Brothers. The cast includes Helene Costello, Clara Horton and Duke Martin.

Du Par is in charge of the filming of Vitaphone features at the newly erected Vitaphone studio at the Warner Bros. Hollywood plant, and shortly will begin the filming of "The Jazz Singer," starring Al Jolson. He has already made a number of preliminary subjects at the new studio.

The A. S. C. member has been experimenting with Mazda lighting and has been using nothing but panchromatic film for the Vitaphone numbers. Du Par's investigations reveal, he says, that much better results are derived from this combination than from straight stock and arc lights. Among the advantages are the absence of noise from the light source; better pictorial values, and, according to figures kept by the A. S. C. member and Frank Murphy, Warners' electrical chief, the saving of approximately 60 per cent in electrical costs.

* * *

E. Burton Steene, A. S. C., has put in another busy month in his activities as an Akeley camera specialist. Following a location trip to San Francisco, Steene did the Akeley work in First National's "The Drop Kick," starring Richard Barthelmess, after which he returned to the Paramount studios to preside similarly in the filming of "The Gentleman from Paris," starring Adolphe Menjou.

* * *

Walter Griffin, A. S. C., is filming the latest Duke Worne feature.

* * *

Dan Clark, A. S. C., returned from location at Prescott, Arizona, during the past month, only to depart almost immediately for Merced County, California, for another location journey for the latest Tom Mix feature.

* * *

Tony Gaudio, A. S. C., is chief cinematographer for Douglas Fairbanks' "The Gaucho," now in production at United Artists studio.

* * *

Charles Rosher, A. S. C., is photographing Mary Pickford's "My Best Girl.

Gilbert Warrenton, A. S. C., is filming "A Man's Past," starring Conrad Veidt at Universal. George Melford is directing.

* * *

Charles Clarke, A. S. C., is shooting "Ham and Eggs," which Roy Del Ruth is directing for Warner Brothers.

* * *

John F. Seitz, A. S. C., is finding current Southern California weather inconsistent with the theme of his cinematography in Metro-Goldwyn-Mayer's "The Trail of '98," which has to do with the gold rush days in the frozen Alaskan wastes.

* * *

Reginald Lyons, A. S. C., is shooting "Chained Lightning," starring Buck Jones, for Fox.

* * *

George Schneiderman, A. S. C., is photographing Fox' "Two Girls Wanted," starring Janet Gaynor. Al Green is directing.

* * *

King Gray, A. S. C., is shooting "Why Blondes Leave Home" at the Fox studios.

* * *

Nicholas Musuraca, A. S. C., is filming F. B. O.'s "South Sea Love," starring Patsy Ruth Miller and directed by Ralph Ince.

* * *

Charles Van Enger, A. S. C., is photographing First National's "The Life of Riley," featuring Charlie Murray and George Sidney. William Beaudine is directing.

* * *

Arthur Edeson, A. S. C., is in charge of the cinematography on "The Drop Kick," a First National production starring Richard Barthelmess. Millard Webb is directing.

* * *

Sol Polito, A. S. C., is shooting "Hard-Boiled Haggarty," starring Milton Sills, for First National. The story is one of aviation during the World War. Charles Brabin is directing.

Amateur Cinematography

A Professional's Notes for Amateurs

Part IX
By Jos. A. Dubray
A. S. C.

Convergent and Divergent Lenses; Points and Planes; and Other Data Considered

(Continued From Last Month)

J. A. Dubray

It is a well known fact that if a convergent lens is placed facing the sun, a certain position will be found at which a small and extremely brilliant spot will be seen at a certain distance from the lens. Furthermore, if the hand is placed at this distance from the lens so that the brilliant spot rests upon it, an impression of heat is immediately felt, which becomes rapidly unbearable for its intensity. If the spot is made to fall upon some quite inflammable material, such as paper, dry straw, cotton, etc., a relatively short exposure to its heat is sufficient to ignite the material.

This point of extreme maximum heat, is called the *"focus"* of the lens. Focus, is from the Latin word *focus,* which means "fire."

Let us consider a bi-convex lens as in Fig. 20.

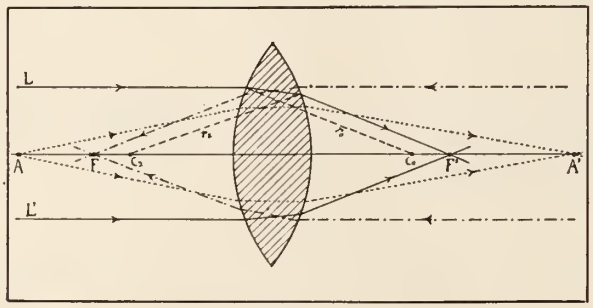


Figure 20

The rays emanating from the sun and incident to the first surface of the lens, may be considered as being *parallel to the axis of the lens,* due to their extreme distance from it.

Following the laws of refraction, these rays will be refracted at their entrance into the lens, and refracted again at their emergence from it.

If we consider only two rays, L and L′ in the figure, placed one above and one below the axis and at the same distance from it, we will find that, after refrection, they meet at a common point on the axis; and following the usual construction for all the other rays incident upon the first surface of the lens, we find that they all nearly meet at the same point on the axis.

In other words, all the rays parallel to the axis and incident upon the first surface of the lens, will, after refraction, converge, or concentrate at a certain point on the axis. It is this concentration of the rays that increases the brilliancy and temperature of any substance placed at this very point.

This point of convergence is called the second *principal focus,* or second *principal focal point* of the lens and is always designated by the capital letter F′. (Fig. 20.)

If we suppose now that the incident light is made to fall upon the other surface of the lens, also parallel to the axis, it is evident that the refracted rays will also converge on a point on the axis and this point is called the *first principal focal point,* which is designated by F.

It is evident that the position of the Principal Focal Points of a lens is *dependent upon the amount of the refraction* suffered by the rays of light incident upon it, consequently upon the *index of refraction* of the substance of which the lens is made, and *upon the curvature of the surfaces of the lens.*

Conjugate

LET us consider now the case in which the course of light is placed at a *finite distance* from the lens, and let us consider two rays of light emanated by a luminous point placed on the axis of the lens and in front of it. (Point A in Fig. 20), incident upon the first surface of the lens at points equidistant from the axis. The construction of the refracted rays, indicated by dotted lines in the figure, shows that their direction, after emergence from the lens, brings them to meet at a point A′ which is on the axis of the lens, but *more distant from it,* than the principal focal point F′.

As all of the rays emanated from A, incident to the first surface of the lens, nearly intersect at A′ after refraction, the point A′ is called the *conjugate focus* of the point A. Conjugate, being a term from the Latin word *"conjugo,"* meaning "to couple."

Any luminous point placed upon the axis, in front of the lens at anay distance from it and *in front* of F, will have its *conjugate* on the axis, *behind* F′.

It is evident that, if the luminous point is placed exactly at F, it would have no conjugate, because the refracted rays would emerge from the lens parallel to the axis.

Any luminous point placed in front of the lens, at a greater distance than F, and *above* or *below* the axis, will

(Continued on Page 17)

Graininess of Motion Picture Film

By J. I. Crabtree

Results of Projection Tests and Graininess of Duplicates Are Recounted

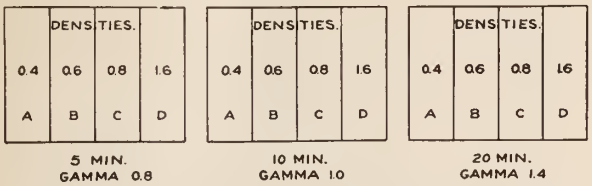
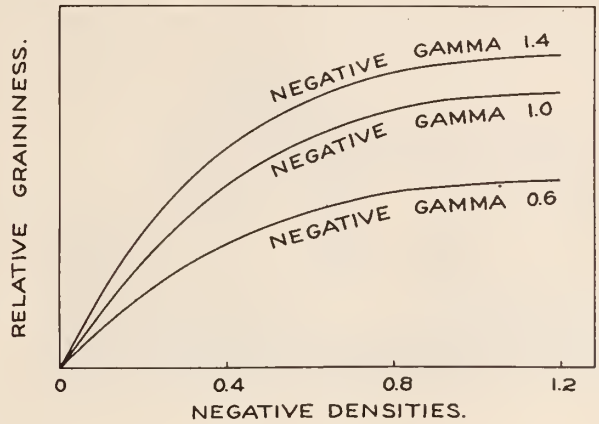


Figure 2

Showing arrangement of densities on a single frame of motion picture negative film for observing graininess on projection.

Right, Figure 3



From the Research Laboratory of the Eastman Kodak Company. Presented at the spring convention of the S. M. P. E., Norfolk, Va., 1927.

(Continued from Last Month)

IF MATCHED positive prints are made from negatives of the same subject developed to a low and high degree of contrast, respectively, within practical limits, there is no difference in the graininess of the images. This is because low contrast development of the negatives is offset by high contrast development of the positive.

In order to confirm further the above conclusions, and to determine the effect of printing through different negative densities (obtained by varying the exposure and degree of developmnt) on the graininess of a constant positive density obtained by a fixed degree of development, the following experiments were made.

Strips of negative motion picture film were exposed on a motion picture printer with a series of neutral density strips fitted in the gate. These consisted of gelatin containing a black dye and were entirely grainless. The density strips were so adjusted that on developing the negative to gammas (degrees of development) of 0.6, 1.0, and 1.4, respectively, the densities of the areas on each picture frame measured 0.4, 0.8, 1.2, and 1.6 respectively. This was accomplished by trial and error.

After Development

The negative frames after development appeared as in Fig. 2.

Positive prints were then made from these negatives. These prints were all given the same degree of development and the exposure was so adjusted as to give a density of 0.4 from each density strip of the negative. Referring to Fig. 2 step A was printed to a density of 0.4, then step B was printed to the same density, and so on.

The positive prints were then projected and the graininess of the various strips having a density of 0.4 were compared visually. Since the strips to be compared followed in rapid succession, a reliable comparison of graininess was possible. Three observers were employed for judging the projected prints and they all concurred in their findings. The projection tests revealed the following facts:

Results of Projection Tests

1. Maximum graininess of the positive appears in the tones having a density of about 0.4 to 0.5. This confirms the observations of Hardy and Jones.

2. Maximum graininess of the positive increases as the density of the negative increases from which it was printed. The increase is most rapid up to negative densities of around 0.8 and beyond this graininess increases only slightly. The effect is shown by the curves in Fig. 3, which are merely relative. This means that other conditions being equal, an increase in exposure of the negative, which is turn increases the density of the various tones, tends to increase graininess. This confirms the findings of Hardy and Jones.

3. In the case of a negative of given density contrast which has received a high degree of development, the maximum graininess of the positive print from this is greater than that of a similar print from a corresponding negative which received a low degree of development.

With regard to the observation above that an increase of exposure from f/11 to f/3.5 did not materially affect graininess, this would appear to be in contradiction to the results indicated by the above curves. In practice, however, owing to the limiting contrast which it is possible to obtain by over-development of positive motion picture film, it is necessary to secure a certain critical density contrast in the negative in order to obtain a satisfactory positive print even with forced development. This density contrast is of the order of 1.2, and assuming that the shadows have a density of 0.2, this means that a minimum highlight density of 1.4 is required in the negative. The above curves indicate that densities above this value do

not give appreciably more graininess in the positive so that within a practical range of exposure, over-exposure of the negative has little effect on graininess.

7. The conditions during drying.

The experiments of Jones and Hardy[2] indicated that abnormal conditions during drying, such as prolonged drying in a humid atmosphere at relatively high temperatures did not affect graininess. It is possible, however, that under certain circumstances incipient reticulation may produce a condition resembling graininess.

Graininess of Duplicates

An increasing number of prints from duplicate negatives are being exhibited in present day theatres. Such duplicate prints are often made from projection positive prints and their graininess is usually very objectionable.

Up to within recent date it has not been possible to prepare satisfactory duplicate negatives with existing materials even when the original negative was available. If a negative is printed into regular motion picture negative film so as to produce a master positive and in turn a duplicate negative is made from this, a print from the duplicate negative is objectionably grainy. This is a result of lack of resolving power of the emulsion used, or its inability to reproduce fine detail. During printing the emulsion is not able to record an image of the finest grains of the image being printed, so that each printing operation increases graininess.

Motion picture film is now available which is especially adapted for making duplicate negatives. It consists of a fine grained emulsion containing a yellow dye and has greatly improved resolving power so that the increase of graininess produced at each printing operation is reduced to a minimum. Details for handling this film have been given by Capstaff and Seymour.[7] Prints from duplicate negatives made on this material are only slightly more grainy than prints from the original negatives, and providing the original negative was developed in the borax developer above, the graininess of the print from the duplicate is no greater than that of a print from a negative developed in an ordinary developer.

It is obviously impossible to prepare satisfactory duplicate negative from a regular projection positive print. Duplicates should always be made from the original negative whenever possible. The use of special duplicating film, however, will give the best possible results if only a projection positive is available.

Practical Recommendations

Graininess in motion picture film can be reduced to a minimum by observing the following precautions:

1. Forced development of the negative should be avoided whenever possible since graininess increased as the degree of development of the negative increases. In some cases the necessity of forcing development can be avoided by employing contrasty lighting when photographing the subject so that only a relatively low degree of development is necessary to produce a negative of average density contrast.

This does not mean that negatives should be underdeveloped. If a negative of a flatly lighted subject is developed to a low degree of contrast it is necessary to force development of the positive, in which case the positive will be just as grainy as if development of the negative was forced in the first place.

2. Develop ordinary and panchromatic motion picture negative film in the following developer, which gives finer grained images than any other commercially used developer:

Fine Grain Developer for Motion Picture Film

	Metric	Avoir.
Elon	2 grams	13 oz.
Sodium sulphite (Anhy. E.K.Co.)	100 grams	41 lbs.
Hydroquinone	5 grams	2 lbs.
Borax	2 grams	13 oz.
Water to make	1 liter	50 gals.

Directions for Mixing—Owing to the high concentration of sulphite in this formula, it is somewhat difficult to dissolve all the chemicals unless directions are followed carefully.

First dissolve the elon in a small volume of water (about 125°F) and add the solution to the tank. Then dissolve approximately one-quarter of the sulphite separately in hot water (about 160°F) and add the hydroquinone with stirring until completely dissolved. Add this solution to the tank. Then dissolve the remainder of the sulphite in hot water (about 160°F) add the borax, and when dissolved pour the entire solution into the tank and dilute to the required volume with cold water.

With use, this developer may become slightly muddy but this is due to a suspension of colloidal silver which is likely to form and which is harmless and may be ignored. The tank usually becomes coated with a thin white deposit of silver, but this does no harm.

The development time varies with the number of feet which have been processed but the average time for a fresh batch is from 10 to 15 minutes at 65°F. If a slower working developer is required the quantity of elon, hydroquinone, and borax should be reduced. To obtain a faster working developer, increase the quantities of these chemicals. Dilution of the developer tends to destroy its ability to produce fine grained deposits.

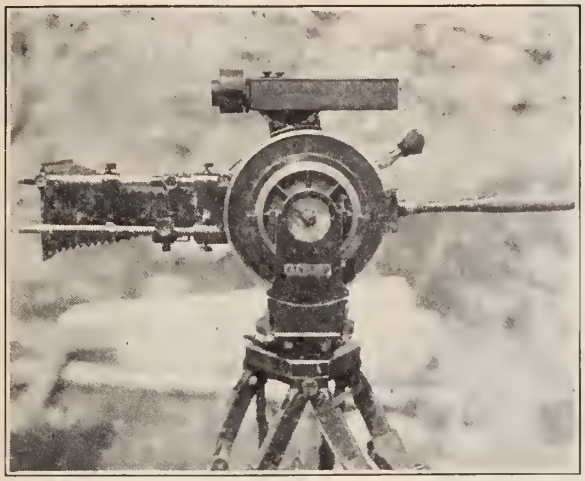
The life of the developer is practically the same as that of the usual motion picture developers in general use. An idea of the increase in development time with use may be gained from the fact that after 4,000 feet of film have been processed per 50 gallons of developer the development time is practically doubled.

The developer may be revived once or twice during its life by the addition of half the quantity of borax, elon and hydroquinone originally used in the formula. A trace of sulphite should be added when mixing this reviving solution to prevent oxidation of the elon and hydroquinone.

This developer is somewhat sensitive to the effect of sodium bromide produced by the conversion of the silver bromide in the processed film to metallic silver. A comparatively fresh solution is therefore necessary for de-

(Continued on Page 21)

Special Device for Akeley Camera Perfected by Steene



Akeley Camera Showing Device Perfected by E. Burton Steene

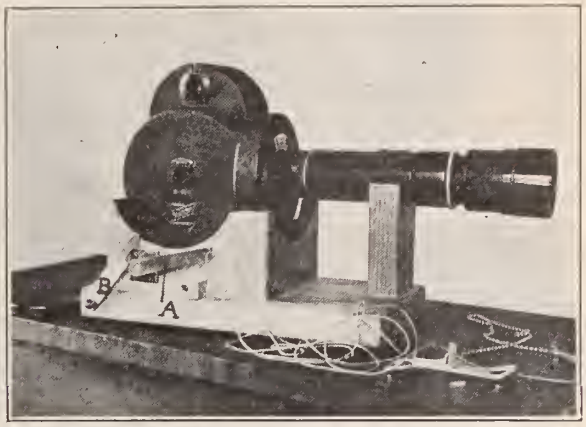
AFTER two years of experiments, E. Burton Steene, A. S. C. member and Akeley camera expert, has perfected for his Akeley a device that comprises a long sunshade bellows in which is incorporated four-way mattes, both solid and gauze; and filter and gauze matter holders for all lenses from 32mm. to 17-inch.

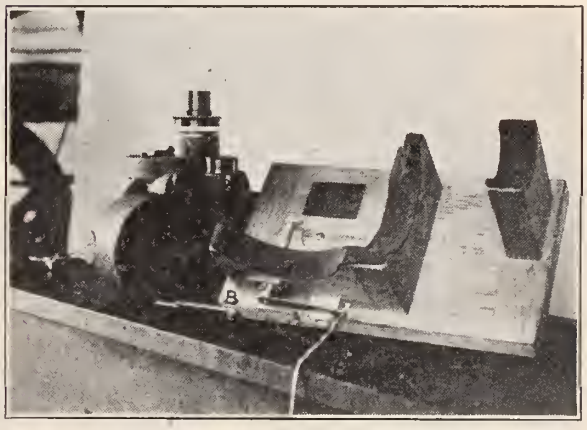
Steene devised and had the arrangement built to meet his own needs as an Akeley specialist in professional film production.

"The mask box," Steene stated in explaining the device, "in no way interferes with using the finder tube which is fixed on the camera for all lenses. There is an auxiliary finder, however, of the erect type, on the top of the camera, by which the image is shown right side up, left and right, and is also seen exactly as the eye sees it, or as it is seen in the original Akeley eyepiece. The finder on top is in a cradle, which is calibrated for the various focal length lenses, and by a library of masks gives the correct image for each lens. This finder is invaluable for airplane work and running inserts, heretofore the bane of all Akeley men.

"The finder," Steene continued, "can be removed, an Eyemo camera put in its place and automatically stopped and started. This gives the opportunity often to secure a double negative of the same shot. The lenses on the Eyemo match the ones used on the Akeley below it. Inasmuch as some Akeley shots are short—say 35 or 40 feet—this arrangement enables the making of two matched negatives without stopping to rewind the Eyemo."

Eyemo Camera Stand Made for Medical Research Work



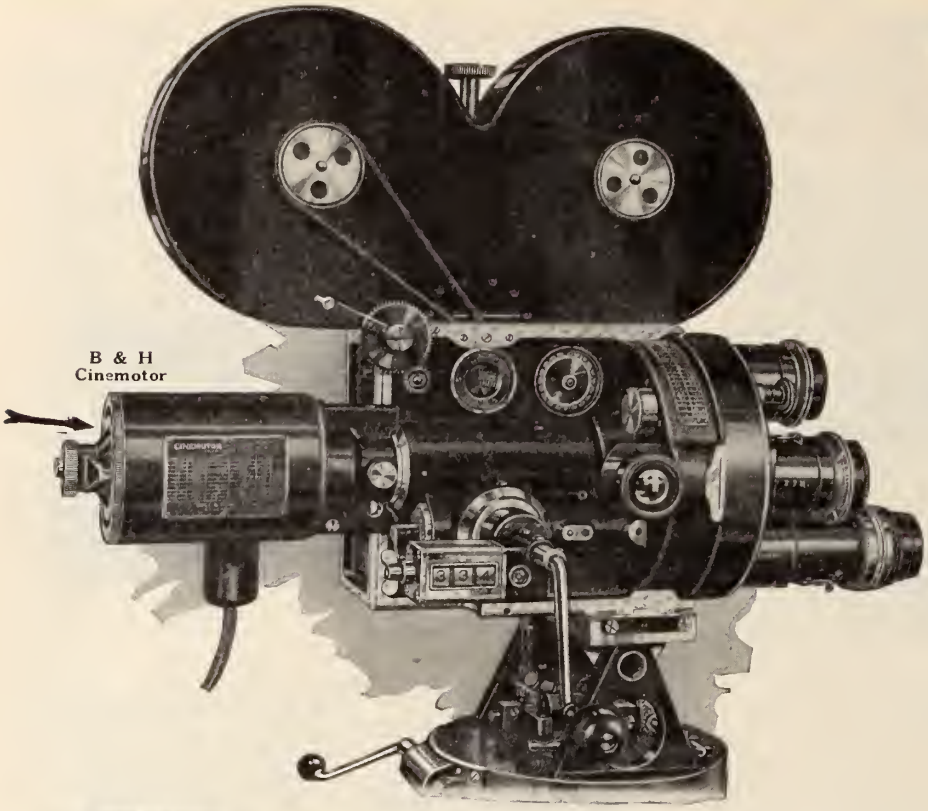


THE pictures shown above represent a solid stand for the Eyemo camera, which is absolutely vibration-free, especially useful when telephoto lenses are employed. It can be placed on any flat surface or screwed on a tripod. Furthermore, it enables the operator to work the camera from a remote point by means of pulling a cord attached to level A in the picture. On loosening the cord the motor stops.

If one desires to keep the camera going continuously, the arrester, B, should be used, which keeps lever A down when once started. Thus the operator may appear in the picture from the beginning.

The stand is especially useful on explorations or for shots from dangerous angles.

The arrangement was worked out by Heinz Rosenberger, of the Micro Cinema Laboratory, of the Rockefeller Institute for Medical Research, New York City, and a member of the Society of Motion Pictures Engineers.



BERT GLENNON

Head cinematographer for Cecil B. DeMille, pointing out the 1/8" aperture lens of a Bell & Howell Camera, through which was drawn the $2,000,000 worth of gorgeous spectacle and thrilling drama for the biggest cinema production yet made, Cecil B. DeMille's "The Ten Commandments."

BELL &
CAM

possess featu
that make o

CINEMA MA

GREAT productions are nev
purpose behind every finer oi
cinema screens today had o
Howell camera designer more th
provided for interchanging all deta
are quickly added without distu
great refinements is the Bell & H
making many a screen masterpiece

The Bell & H

A beautiful piece of equipment th
would use palette, brush and delic
of a control knob, speeds ranging
ward are at the instantaneous and

Electricity is the motive power.
volts. Operation is absolutely fre
variability of human operation are

Through using the Cinemotor, the
The distance is limited only by the

Ask for booklet containing comple
ited opportunities for photographic

EYEMO

The Bell & Howell EYEMO aut
perior to other designs for many
the operator has one hand free to "
operation. Iris stops and focus
view finder which makes multipl
you can follow action from bright
ments with free hand as you go.
Eyemo. It is a 47mm. F 2.5 T
meter focusing mount, regularly
complete is $264.00. Write for
superiorities which make it worth

BELL & H

New York

HOWELL
ERAS

of refinement
r productions

STERPIECES

de by accident. There is deliberate . Many an artistic touch visible on gin in the conceptions of the Bell & enty years ago. The original design s. All improvements brought by time the original camera. One of the Cinemotor, which has contributed to

well Cinemotor

nts photographic artistry as a master dorings. By the simple manipulation 2 to 20 exposures per second and up- command of the cinematographer.

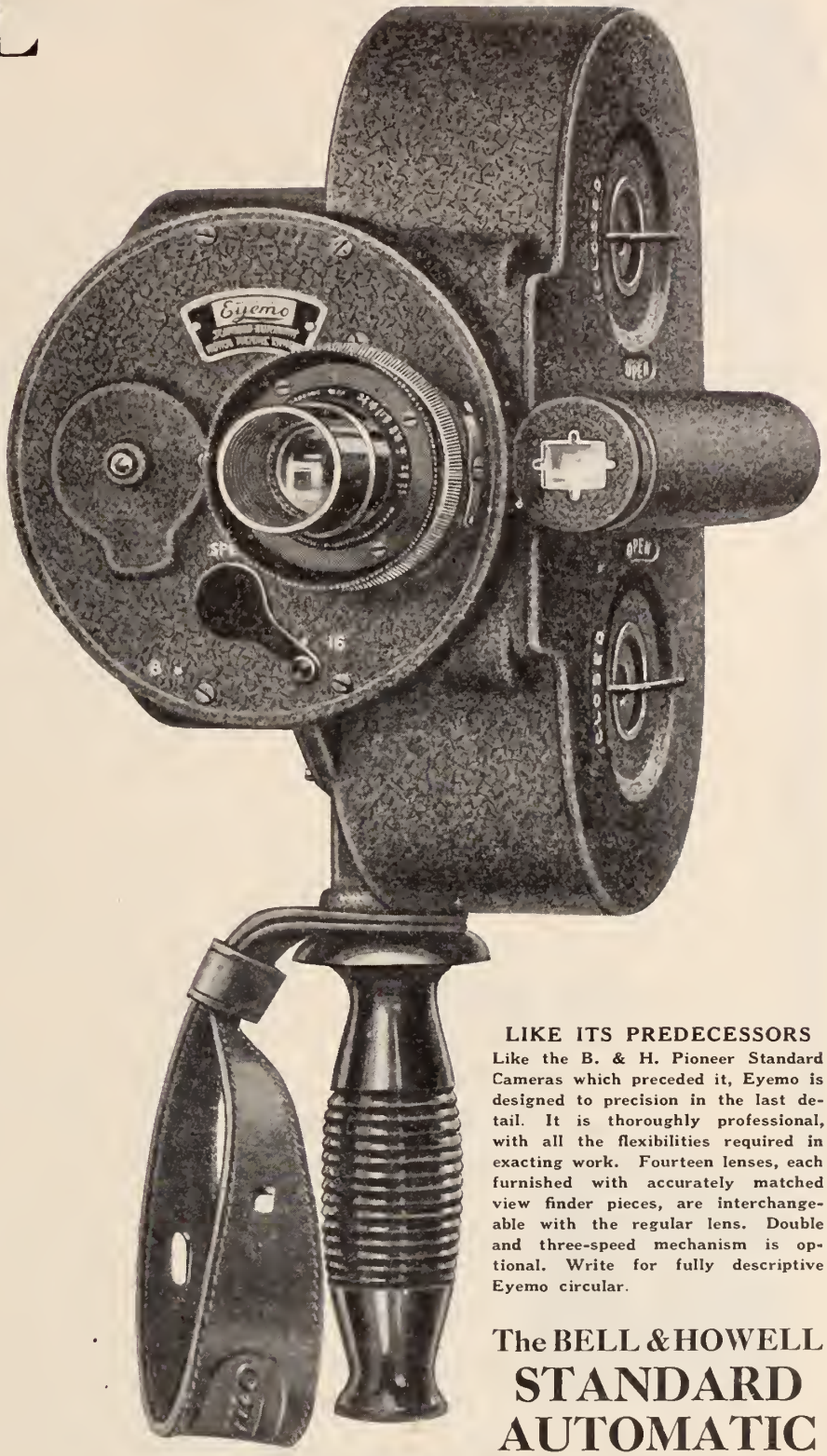
r direct or alternating current, 110 vibration. Hand cranking and the tely eliminated.

a may be operated by remote control. of electric extension cord.

ifications and explaining how unlim- are offered.

TOMATIC

c professional camera is distinctly su- s. First among these is the fact that focus" or "dial iris" with camera in s are plainly visible in the spy-glass finders unnecessary. With Eyemo ght into deep shadow, making adjust- superior lens also is furnished with Hobson Cooke anastigmat in micro- for $83.00. The price of Eyemo iptive Eyemo circular detailing the



LIKE ITS PREDECESSORS

Like the B. & H. Pioneer Standard Cameras which preceded it, Eyemo is designed to precision in the last detail. It is thoroughly professional, with all the flexibilities required in exacting work. Fourteen lenses, each furnished with accurately matched view finder pieces, are interchangeable with the regular lens. Double and three-speed mechanism is optional. Write for fully descriptive Eyemo circular.

The BELL & HOWELL STANDARD AUTOMATIC

WELL COMPANY

MAKES MOVIES AS THE EYE SEES
Eyemo
REGISTERED

archmont Avenue, Chicago, Ill.

wood London Estab. 1907

A PNEUMATIC FILM SQUEEGEE

(Continued from Page 8)

With the above mentioned air pressure and nozzle adjustment, the water is thoroughly removed with the film passing through the machine at a speed of two feet per second. When running at higher speeds it is necessary to increase the air pressure, but this increases the propensity of the film to vibrate rapidly between the nozzles thus increasing the possiblty of scratching. About two minutes are therefore required to transfer two hundred feet of film to the drying reel. While this is somewhat longer than is required for this operation without the use of an air squeegee, no later wiping is required, while the drying time is shortened because drying is well under way when the film reaches the drying reel. With ordinary methods drying is retarded where the film passes over the reel slats because the latter are wetted during transference of the wet film from the rack.

Measurements of the drying times for motion picture positve film at a temperature of 75°F and relative humidity 70% with cotton wiping and air squeegeeing were as follows:

	Cotton Wiping	Air Squeegeeing
Time for loading reel	2 min.	3 min.
Time for wiping film	2 min.	nil
Time of drying	19 min.	16 min.
Time for polishing film	2 min.	nil

Thus, a 25% saving of time is effected by the use of the air squeegee, while subsequent polishing of the film is unnecessary.

Air from a mechanical blower usually contains fine particles of oil in suspension. It is very necessary that the air supply should be entirely free from oil, otherwise drops of oil on the film prevent the emulsion from drying and cause crater-like markings on the surface which may be ferrotyped, due to contact with the film base when wound in the roll. They may be prevented by filtering the air supply thoroughly. A satisfactory filter for this purpose is shown in Fig. 5 This consists of a metal cylinder about 15″ long and 9″ in diameter, fitted with a coarse brass wire screen top and bottom and packed with absorbent cotton. This fits inside an outer casing, the details of which are clearly illustrated. The cotton should be renewed at frequent intervals and the filtered air supply tested before commencing work by placing a moistened cloth over the air nozzles for one minute. Any discoloration of the cloth indicates that the air has not been efficiently filtered.

In some cases two or more filters arranged in series may be necessary to completely free the air from oil.

1. Trans. Soc. M. P. Eng. 17, 29 (1923); also B. J. Phot. 71, 6, et seq. (1924.)

2. Trans. Soc. M. P. Eng. 16, 163, (1923); also Le Phot. 11, 69, et seq. (1924.)

AMATEUR CINEMATOGRAPHY

(Continued from Page 10)

have a conjugate behind the lens, farther from it than F′, and in an inverted position in comparison of the position of the luminous point, in respect to the axis. So the conjugate of a luminous point placed *above* the axis, will be found *below* it and vice versa, the conjugate will be *above* the axis, if the luminous point is placed *below* it.

All converging lenses, bi-convex, plano-convex and convex meniscus, have two principal focal points, the first placed in front and the second placed behind it, and these points can be found by following the same reasoning and construction used for the bi-convex lens in the figure.

Divergent Lenses

ALL DIVERGENT lenses have *no real* foci, because the rays refracted by them do not converge towards the axis, but diverge from it, whatever the distance of the source of light. But if we prolong the refracted rays in a direction opposite to their path (Fig. 21) we find that their prolongation meet at a certain point on the axis, and this point is called the *virtual focus of the lens.*

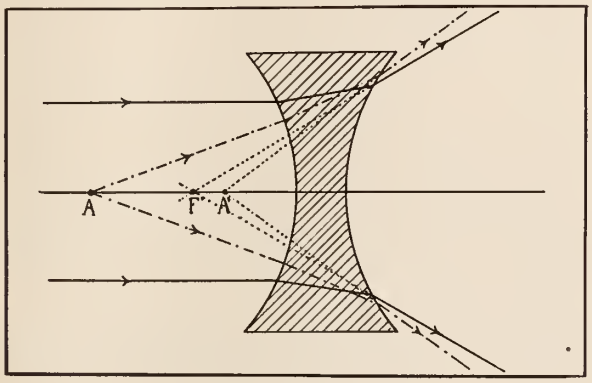


Figure 21

As in convergent lenses, the *principal focal points* are given by the refraction of rays incident upon the first surface of the lens, while traveling in a direction *parallel to the axis,* but the focal point F′ will be found *in front* of the lens, and F *behind* the lens, in an inverse position than the one they occupy in convergent lenses.

As for convergent lenses, the path of the rays emanated from any point on the axis, may be calculated and its *virtual conjugate focus* will be found to lie on the axis, between the virtual principal focus and the lens (A and A′ in Fig. 21).

A *virtual* focus will also be found by convergent lenses whenever the luminous point, source of light, is placed between the first principal focus and the axis. In such case, the refracted rays emerge from the lens *diverging* from the axis, and a *virtual* focal point will be created by their prolongation, as in the case of divergent lenses.

Points and Planes

THE location of the principal focal points can be readily located by trigonometrical calculations which involve no great difficulty and the question now arises: As the lens has a certain thickness, which is greatest at the axis for convergent lenses and least for the divergent ones, from which point of the mass of the lens shall the distance from F′ or from F be reckoned?

To the German physicist and geometrician *Gauss,* is due the remarkable theory by which a set of points and planes can be calculated for each individual lens, and for any combination of lenses.

These are called the Gauss points and planes, in honor of the discoverer of the theory.

It would be beyond the scope of these articles to attempt to give a detailed description of the fundamental principles that are the basis of the theory; we will therefore confine ourselves in the description of their position and properties.

If we consider the formation of conjugate foci, we arrive at the conclusion that if a screen is placed so as to collect the conjugate of any luminous point, we will perceive, in the case of positive lenses, on the screen the *image* of that luminous point.

If instead of a single luminous point placed in front of a convergent lens on or outside the xais, we imagine a *plane* perpendicular to the axis, it is evident that this plane can be considered as an *object* composed by an incalculable number of points, each one of which will act as a luminous point.

Each one of these luminous points will have its conjugate behind the lens, and the conglomeration of the conjugate foci will establish a plane *behind* the lens, conjugate to the plane in front of it.

The first plane is called *object plane,* and each and every one of its points is an *object point.* Its conjugate is called the *image plane* and each and every one of its points is an *image point.*

Now, the F′ point is evidently the *image point* of a luminuous *object point,* placed at an infinite distance from the lens. In fact the small, extremely brilliant and extremely hot small disc which can be collected on a screen when presenting a positive lens to the sun is merely an infinitely reduced *image* of the sun itself.

Two imaginary planes, perpendicular to the axis at the F points will therefore be called the *focal planes.*

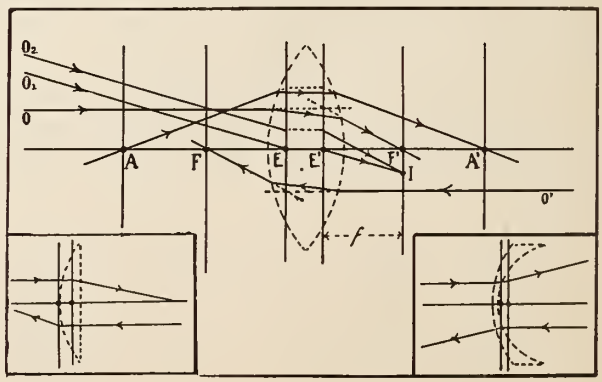


Figure 22

In Fig. 22 the planes are represented by lines perpendicular to the axis.

If we prolong one ray which is parallel to the axis and incident to the first surface of the lens (Ray O in the figure), and also we prolong its refracted ray emergent from the lens, their prolongations will meet at a certain point, which we can consider as belonging to a plane perpendicular to the axis and intersecting it at the axial point E′. The point E′ and the plane to which it is part are respectively called the *second principal point* and the *second principal plane.*

If we repeat the same construction for a ray emanated from a luminous point situated *behind* the lens (Ray O′ in the figure) we find a similar plane and corresponding axial point E, which are respectively called the *first principal plane* and the *first principal point.*

Principal points and planes can be found for all lenses, convergent or divergent (insets in Fig. 22), but their position varies according to the curvaure of the surface of the lenses. In a bi-convex lens, whose radii of curvature are equal for both faces, the principal points are found to be symmetrically placed at a distance fro meach other, approximately equal to one-third of the thickness of the lens. For lenses whose faces have different curvatures, the principal points are found to be displaced toward the face of greater curvature and in some cases they may lie entirely outside the mass of the lens.

The functions of the principal points are as follows:

(a) Rays parallel to the axis emerge from the lens after refraction, *as if the original incident ray had proceeded to the farther principal plane and thence had been bent toward the focal point of the lens.* (Note in Fig. 22 the rays O and O′.)

(b) In the case of rays incident to the first surface of the lens from an infinite distance from it, and *not parallel to the axis,* it will be found that *one* ray will, after its passage through the lens, emerge from it with an inclination to the axis at an angle equal to the angle that the incident ray makes with the axis. Such ray is called a *principal ray* (Ray O_1 in Fig. 22), and it appears as if it had followed a straight path to the point E, and emerged parallel to itself but from the point E′.

A ray O_2, parallel to a principal ray, will appear as if it had followed a straight line to the principal plane E, had been transferred right across to the principal plane E′ and from this point it had joined the refracted ray O_1 at the image point I situated in the focal plane F′ of the lens.

(c) Any ray emanated from a luminous point placed *on the axis* (Ray A in the figure), will appear as having followed a straight line up to the principal plane E, having skipped straight across to the other principal plane, and thence having followed a straight line to the conjugate of the point A.

The true focal length of a lens is measured from the *principal point of emergence* to the *focal point* of the lens, and is always denoted by the small italic letter *f*. I II

In Fig. 22 the local length of the lens is then the distance between the point E′ and F′.

(To be Continued Next Month)

AMERICAN CINEMATOGRAPHER,
1219-20-21-22 Guaranty Bldg.,
6331 Hollywood Blvd., Hollywood, Calif.

Gentlemen: Please find enclosed three dollars (foreign rates additional), for one year's subscription to the AMERICAN CINEMATOGRAPHER, to begin with the issue of

....., 192....

Name.....

Address.....

Town.....

State.....

(Note: Camera Craft or Photo-Era will be sent for a slight additional sum. Consult the clubbing offers.)

"Film Records" Will Rival Music Records is Prophesy

THE phonograph record has an ultra-modern rival for popularity in the American home in the newly developed "film records" of one hundred feet, for use with home movie projectors, according to Stephen F. Voorhees, architect of the New York Telephone Building, and vice president of the Amateur Cinema League, the non-commercial national organization of home movie makers and users.

The analogy between these short entertainment films and the familiar phonograph records is very marked, according to Mr. Voorhees. With one of the small, reasonably priced projectors in the home, corresponding to the phonograph, the private citzen can now call on Gloria Swanson, Felix the Cat or a Rocky Mountain Travelogue for entertainment, merely by placing one of the reels on the machine, just as he is now accustomed to commandeering the melody of Galli Curci of Paul Whiteman through recorded discs. Thus, in addition to their own filming, interchange of films with friends and rental pictures, home movie fans may now have their own film libraries at moderate cost, just as easily as a supply of phonograph records.

The small films run for four minutes, but can be joined together in fours to run sixteen minutes, the approximate length of a standard theatre reel. They are being produced, Mr. Voorhees reports, by the big camera and film manufacturers, by local dealers, and, most recently by the motion picture production companies, which draw on their most popular films for subject matter. Every foot of negative ever taken is a possible source for conversion to this new home consumption, he declares, so that the increasing popularity of this method of entertainment promises the ultimate creation of a tremendous variety from which the home exhibitor may draw.

Nor is the "home news reel" being overlooked, he points out. The actual films of Lindbergh's home coming reception were ready for distribution to the homes of the nation within one week of his tumultuous welcome. With the logical development of this field the time is not far distant, Mr. Voorhees prophesies, when the news of the world will be viewed in American homes in film form at the same time it is being shown in the theatres.

Gundlach-Manhattan Absorbed in Rochester Camera Merger

The plant, asset and patents of the Gundlach-Manhattan Optical Company have been bought by the Seebold Invisible Camera Corporation of Rochester, N. Y., and the two companies have been merged under the name of the latter firm, according to an announcement made last month.

The new organization will operate at the address of the old Gundlach-Manhattan company, whose lines will be continued under the merger.

GRAININESS

(Continued from Page 12)

veloping extreme under-exposures. With average studio exposures, however, excellent negatives can be obtained even with the partially exhausted developer.

3. When making duplicate negatives a minimum of graininess is insured by employing a special emulsion adapted for the purpose. Whenever possible duplicates should be made starting from the original negative and never from a projection positive unless this is the only record available.

4. Keep the camera lens clean. A dirty lens scatters light, causing lens flare. This reduces the brilliancy of the negative in the same manner as slightly fogging the negative before development. In order to offset the effect of lens flare it is necessary to force development of the negative, which in turn increases graininess.

[The End]

New Debrie Instrument of Finder Type Is Announced

A new Debrie instrument called the Visographe is being introduced in the American market by Willoughby's of New York City.

The device is of the finder type, the purpose of which is to save the time of both director and cinematographer in ascertaining absolutely correct field and angle of the picture taken, advising what focal length lens to use, the exact proportion or dimensions of the subject to be photographed and the photographic value of colors and tones in the subject.

The instrument is made entirely of metal, the size being 75mm by 75mm by 45mm. It weighs not quite a pound. It can be carried either in the pocket or over the shoulder by a strap—like binoculars.

It is composed of two parts, forming a box. These parts are brought together or separated by a set of lazy tongs; they will indicate angles or view taken in by any motion picture lens uup to 8¼ inches. A measure on one side indicates the focal length of lens, after sighting through the back of the apparatus to ascertain the field or angle.

There is a mask slot in the center, which corresponds to all models of professional cameras. The apparatus indicates the portion of the picture affected by masks employed.

To assist in determining photographic values of colors and tones in the subject, a blue-green glass is conveniently located to pull down over the eyepiece.

PROJECTION—Conducted by Earl J. Denison

Good Prints for Long-run Theatres

By Daniel B. Clark, A. S. C.

POSSIBLY the original urge which established the institution of "first nighters" in legitimate theatres was the desire, on the part of dramatic connoisseurs, to view a presentation in all of its pristine spontaneity, rather than a jaded performance which players are wont to offer on the fag end of a long run of any vehicle.

Film Theatres

Does the same condition sometimes obtain in motion picture theatres which have a policy of lengthy engagements?

Standard Falls

My point is simply this: If a production has been running several weeks or months, through continuous performances, very often the print arrives at such a condition where the images, as viewed on the screen, certainly do not represent the high standard of screening which attended the first night exhibition of the film.

Strain Tells

With one print in continuous use during such a long run, it attains, in a concentrated period of time, an old-age which, in general exhibition, could only be reached in a couple of years. The care of the projectionist may be the best, and the projector may be working in perfect order; but if the preparation of the print has been faulty in the least, the strain soon begins to tell.

Special Prints

In New York and Los Angeles, many of the long-run houses have prints especially prepared for their own use; and, because of this extra preparation, those in command are loathe to furnish another print if the special print begins to show signs of wear.

Withstand Wear

Therefore, it behooves the producer and the distributor to use every means known to furnish such houses with a print, which not only meets their own conditions but which will stand up under the most exacting wear.

Worn-Out Positives Injure Performances; Ventilation in Projection Rooms Needed

Ventilation

WITH the heavy hand of summer heat on Eastern and Middle Western communities, the matter of ventilation for projection rooms is more vital than ever.

Personal Discomfort

Many designers of theaters, still actuated by the rules of the days of projection "booths," have not been generous in laying out the compartments wherein the projectionists preside at their calling. The result is cramped quarters, and a great degree of personal discomfort.

Air Circulation

If, in such places, the projectionist cannot be given more elbow room, he certainly should enjoy the advantages of adequate ventilation. The theatre itself lists ample ventilation among its prime necessities; many houses in fact make an advertising feature of their systems of ventilation—when, on the same premises the projectionist may be perspiring away to the point of melting.

There are efficient means of ventilation for the projection room just as there are for the theatre itself. The cost of installation should not be a hindrance, and the welfare of the projectionist certainly deserves this consideration.

New Colors for Tinting Films Announced by du Pont Company

The Dyestuffs Department of E. I. du Pont de Nemours & Company announces the introduction of an entirely new line of spirit soluble colors, which they are placing on the market under the name of Luxol Colors.

From among them, a range of the colors desired for tinting photographic films has been selected.

The outstanding features of this series of colors are their high solubility, exceptionally good fastness to light and the wide range available.

The Luxol colors are soluble in methyl and ethyl alcohol. They are also soluble in pyridine, furfural, diacetone-alcohol; a few are even soluble in acetone.

Creco Physicist Discusses Incandescent Lamp Problems

DISCUSSING "The Incandescent Lamp Situation," Fred McBan, physicist of the Creco Research Department, Hollywood, dwells on a number of practical details which have been revealed in the experiments of his organization. Mr. McBan's discussion follows:

"In order that the filament in the lamp will not oxidize and burn, it is placed in a bulb in which all air has been removed. A method of preventing oxidization is to replace the air in the bulb by inert gas. To summarize an incandescent lamp: It is essentially a filament of some material that is able to light by its being heated to incandescence by an electric current. To prevent this filament from oxidizing or burning up, it is operated either in a vacuum or in an atmosphere of inert gas, notably hydrogen. In a vacuum a filament suffers by reason of the absence of pressure to hold it together and counteracts the tendency for it to vaporize. This difficulty can be overcome by the use of gas in the bulb, which permits operating the filament at a higher temperature without causing undue vaporization. However, disadvantage results in the form of heat losses through the path provided by the gas in the cast of straight filament; but with a closely coiled filament the loss is small enough so that in many cases it does not offset the gain in efficiency resulting from higher filament temperature.

"With the development of the helically coiled filament it was found that the reduction in the rate of evaporation of the filament permitted operation at a temperature which increased the volume of light to an extent that more than offset the disadvantage of increased energy loss through conduction and convection by the gas, convection in this particular case meaning the transmitting of heat by gas. This conduction and convection loss is nearly independent of the diameter of filaments of commercial size, and hence in lamps designed for a definite voltage, those of the higher wattage are the more efficient in lighting values.

"The gas in the bulb of this type of lamp furnishes a pressure about the filament corresponding approximately to atmospheric pressure, and thus it greatly reduces the tendency of the filament to vaporize or disintegrate. In the case of a filament operating in a vacuum the condition is reversed, the basis of pressure favors the disintegration of the filament, with the result that the filament cannot be satisfactorily operated at as high a temperature as in gas. It was pointed out that one of the reasons for not using an inert gas in the bulb in the earlier lamp was the fact that this gas conducted the heat of the filament away very rapidly. The coiled filament made it possible to concentrate the filament into a small space at the center of the bulb, so that its surface was much less freely exposed to the surrounding gas, and the heat loss through the gas was thus greatly reduced. The principle is the same as that

which makes it possible for a herd of cattle to keep warm on a cold day by huddling together, thereby reducing the total surface of the mass exposed to the elements or weather conditions.

"Another factor that we have to take into consideration is the breakage, or the fragility of the lamps. The physical liquidification point of tungsten is 3,400C or 6,152F, yet the lamp must reach this figure to operate at the full light efficiency. It follows from this that the nirogen gas jacket around the tungsten filament must act as a shock absorber to take care of the vibration that will happen when moving on the sets made necessary for lighting effects.

"I feel at this time that some form of filter may be necessary to choke back the infra red rays that we know to exist in the case of incandescent lamp. I especially refer to the 3KW, 5KW and 10KW lamp now advocated for studio use.

"The higher the operating temperature of gas-filled lamps also accounts for an advantage in the color quality of the light. In general, as the temperature of a solid is increased, the color of the light it emits grows whiter. A tungsten filament lamp of the vacuum type gives a whiter light than the carbon filament, primarily because it operates at a higher temperature. In the same way the tungsten filament in a gas-filled lamp gives a still whiter light because of the higher operating temperature made possible with the use of gas in the bulb. Even the light of gas-filled tungsten lamps, however, is not as white as average daylight, primarily because they operate at far less than sun temperature. Where it is desired to produce light approaching daylight in color quality, so as to cause colors to appear approximately the same as they do under daylight, the light may be filtered through blue-green glass. The blue glass, if it is of proper color content, will screen out the excess of red and yellow rays with the result that while the total amount of light is reduced, its color quality is much nearer to that of sunlight.

"Yet another angle is that of psychology. Most of us feel that red heat which the incandescent lamp is very strong in, is hotter than white, green, or blue heat, in the case of the carbon arc.

"To sum up the individual merits of the incandescents, as against that of the carbon, needs considerable thought at this time, but since we of the motion picture business usually solve our own problems without outside technical aid, I don't think that we will lose any sleep on this."

Whitman Assigned to Direct "Smith Family" Comedy Series

Philip H. Whitman, A. S. C., who was recently promoted to directorship at the Mack Sennett studios, is directing the "Smith Family" series which is being released by Sennett through Pathe.

Whitman, a veteran cinematographer, was in the scenario department at Sennett's before being elevated to the directorial post.

CLASSIFIED ADVERTISING

RATES: *Four cents a word. Minimum charge one dollar per insertion.*

All copy must be prepaid and must reach us before the fifteenth of the month preceding publication.

CLASSIFIED ADVERTISING
AMERICAN CINEMATOGRAPHER,
1222 GUARANTY BUILDING
HOLLYWOOD, CALIFORNIA

WANTED—MOTION PICTURE CAMERAS

BELL & Howell, 170-degree camera. Complete. Will pay cash. Fred Kaifer, HEmpstead 4621, Hollywood.

AKELEY camera wanted. Must be cheap for cash. State condition of equipment and lowest cash price in your letter. Frank King, 36 Crestwood Ave., Buffalo, N. Y.

GOOD USED Motion Picture Camera. State make, condition, price, etc. Saul Schwartz, production manager, Artcraft Studios, Charlotte, N. C.

WILL PUT you in touch witb buyers for Bell & Howell cameras and equipment. Phone or write the A. S. C., 1222 Guaranty Bldg. GRanite 4274, Hollywood, California.

BELL & HOWELL or Mitchell Camera outfit; Projection Printer; Cinex timer; Straight Line Processing Machine; Nutting Reflectometer; Polishing Machine; State price, Equipment. Fred Jeffery, Giles Street, Rose Park, South Australia.

16 mm. Eastman Cine-Kodak, Model A, with F 3.5 or F 1.9 lens. Must have top and back built-in finders. State serial number, equipment, price. Hamilton Riddel, 1622 North Wilcox Ave., Hollywood.

WANTED—Used movie camera. Old model considered. State condition, make, price, etc. Albert R. Bly, Rosedale, Kansas. General delivery.

AKELEY CAMERA. Phone Perry Evans, DUnkirk 3890, or care A. S. C., 1222 Guaranty Bldg., Hollywood.

FOR SALE—CAMERAS

DEBRIE, aluminum box, dissolving shutter, 8 magazines, Mitchell tripod, 40, 50, 75 mm. Carl Zeiss lenses. Thalhammer iris. Veeder footage recorder, ¼-way mat box. Glen MacWilliams, c/o A. S. C., Hollywood.

PATHE CAMERA—(Enclosed magazine like DeBrie); 4 circular magazines; 1 metal tripod with tilt; 1 finder; 1 50 mm. Voigt lens. Box H, American Cinematographer.

LATE MODEL Bell & Howell Camera, 170-degree shutter, case and trunk; 4 magazines and carrying case; 4 lenses, 1 Iris outfit, tripod and finder. Address Box X, American Cinematographer.

WILART camera, latest model, complete with tripod and carrying cases and retort case and magazines. John L. Russel, 1643 North Gardner St., Hollywood. HEmpstead 9554.

BELL & HOWELL Eyemo, carrying case, four one hundred feet daylight loading Eastman negative, guaranteed perfect. First $225.00 gets it—cost $385.00. Cameron, Manhattan Beach, N. Y.

$75—Angeles 400-feet Carl Zeiss 3.5, case, tripod. Want 4 by 5 Graflex or f 1.9 to fit De Vry. 2590 Midlothian Dr., Altadena, Calif. Colorado 0342.

BELL & HOWELL Eyemo, brand new, B-1702, with carrying case and five spools, $225.00, C. O. D. Guaranteed. Roscoe Wright, 2223 Clifton Ave., Cincinnati, O.

FOR RENT—CAMERAS

THREE Bell & Howell 170-degree cameras. Complete equipment. Eddie Linden, 6017 Eleanor Ave., Hollywood, HEmpstead 8333 or Hollywood 7716.

FOR RENT—Bell & Howell studio equipment complete. 170-Degree Shutter. Liberal commission to cameramen. Call Mr. Smith, MEtropolitan 4686. Evenings call MAin 0947. (Los Angeles.)

NEW Eyemo camera, fully equipped; rent by day or longer. Joe La Shelle, 9038 Dorrington Ave., Hollywood; Phone OXford 5840.

AKELEY, Bell & Howell and Mitchell Cameras for rent, all latest equipment. Phone GRanite 2213 or GRanite 1914. John W. Boyle, 1207 North Milton Ave., Hollywood.

BELL & HOWELL. Victor Milner, 2221 Observatory Ave., Los Angeles, California. 596-944.

MITCHELL, and Bell & Howell Cameras. F.2:3; F.2:7; F.3:5 lenses—40-50-75 mm. Complete equipment. J. R. Lockwood, 523 North Orange St., Glendale, California. Glendale 3361-W, or HOlly 0764.

E. BURTON STEENE, Bell & Howell, and Akeley. Complete Camera Equipment. Latest models. Address American Society of Cinematographers, Hollywood, California.

BELL & HOWELL, 170, with 30, 40, 50 and 75 lens equipment. Baby Tripod. Also B. & H. Cine Motor. Charles Stumar. GRanite 9845. 7501 Lexington Ave., Hollywood.

FOR RENT—One Eyemo camera, complete with all accessories. Bert Glennon, 6936 Woodrow Wilson Dr., Hollywood. Calif. Phone HEmpstead 2743.

BELL & HOWELL No. 627. Five lenses: 32, 40 (f.2.7), 50 (f.2.7), 75, 100 mm. Complete studio equipment: gauzes, filters, etc. GLadstone 0033.

TWO Bell & Howells. Large finders. Also Eyemo for rent. Lenses: F 2.5; 2.3; 2.7. Frank M. Cotner, 6273 Selma Ave., Hollywood. HOllywood 5046.

SPEED CAMERA: Bell & Howell, fully equipped for miniature and slow motion work 40, 50, 75 mm. and 6-inch lenses. Alvin V. Knechtel, 1179 North Kenmore. 597-054.

BELL & HOWELL cameras, Akeleys and other makes—portable lights, special lenses by the day, week or month. We sell everything that any cameraman might ever need—new or used—at a big saving. Keep us in touch with your wants. Ruby Camera Exchange, Ruby Building, 727 Seventh Ave., N. Y. Bryant 0631 or 8457.

BELL & HOWELL—Phone Perry Evans, DUnkirk 3890 or Hollywood A.S.C.

FOR TRADE—CAMERAS

WILL trade practically new Model K.5 late model Eastman Aero Camera, complete with venturi tube and anti-vibration suspension mount (Gimbal) for good second-hand Mitchell or Bell & Howell camera. Cecil M. Thomson, 510½ Travis St., Houston, Texas.

TWO 170 shutter Bell & Howell cameras, fully equipped. One with super-speed attachment. ORegon 3726, 407 N. Milton Ave., Hollywood.

FOR RENT—AIRPLANES

AIRPLANES equipped to carry cameras, facilitating the photographing of stunts or other unusual action, for rent by the hour, day or week. Jerry Phillips, Professional Pilot, Clover Field, Santa Monica, California.

FOR RENT—STILL CAMERAS

WILL RENT still camera to local parties. Special arrangements to A. S. C. members. Geo. Meehan, Ph. GRanite 3830, 744 Curson Ave., Hollywood, California.

FOR RENT—One 4x5 Graflex Camera and one 4x5 Grafic. Bert Glennon. Phone HEmpstead 2743.

FOR SALE—LENSES

ONE three-inch Dahlmeyer F. 1:9, mounted for Mitchell; one two-inch Bausch & Lomb F.2:7; one Dahlmeyer Pentac 37 mm. F.2:9. Georges Benoit, 3306 North Knoll Drive, North Hollywood.

CARL ZEISS, F. 2.7, 50 mm. in Bell & Howell mount. Dan Clark, care American Society of Cinematographers.

NEW 40 mm. Goerz Hypar f. 3. 5. lens in Bell & Howell mount; price $50.00. Write Charles Clarke, 1222 Guaranty Building, Hollywood, California.

RUO LENSES—Sole U. S. Agent. Robert Ackerschott, 1575 N. Vine St., Hollywood. 25 mm. to 100 mm.; F. 2. and F 2.5 (Latest type: Telephoto, 10-inch, F. 4.5).

CARL ZEISS, 50 mm., F. 3.5, in Bell & Howell mount, $50; without turret mount sleeve, $41.50. Write Gaylord A. Wood. 1821¾ N. Wilcox Ave., Hollywood, Calif.

WANTED—PROJECTOR

USED SIMPLEX wanted. State model, price, condition, etc. Address Box R, American Cinematographer.

WANTED—MISCELLANEOUS

WANTED—Photographs of nature, birds and animals, etc.; for educational library. E. R. Gammage, Animated Film Library, Westlake, La.

FOR SALE—SPECIAL CAMERA EQUIPMENT

GEAR BOX attachment for Bell & Howell camera; makes automatic fades and dissolves from four to 20 feet. Also complete new style Bell & Howell matt box for sale. Joseph B. Walker, 1037 N. Sycamore Ave., Hollywood. Phone GLadstone 3797.

PATHE panorama head for professional camera, with detachable aluminum tilting head, easily adapted to any standard tripod. A first-class unit for some one, who is experimenting or engaged in research work, to add to their equipment. Stephen S. Norton, care A. S. C., Guaranty Bldg., Hollywood.

HOW TO LOCATE MEMBERS OF THE

American Society of Cinematographers

Telephone GRanite 4274

OFFICERS

Daniel B. Clark	*President*
John W. Boyle	*First Vice President*
Victor Milner	*Second Vice President*
Frank B. Good	*Third Vice President*
George Schneiderman	*Treasurer*
Charles G. Clarke	*Secretary*

BOARD OF GOVERNORS

Victor Milner	Alfred Gilks	Fred W. Jackman
Daniel B. Clark	Charles G. Clarke	Georges Benoit
George Schneiderman	John W. Boyle	E. Burton Steene
L. Guy Wilky	John F. Seitz	Ira H. Morgan
Frank B. Good	King D. Gray	Floyd Jackman

Abel, David—with Warner Brothers.
Arnold, John—with Metro-Goldwyn-Mayer Studios.

Barnes, George S.—with Samuel Goldwyn Prod.
Beckway, Wm.—
Benoit, Georges—
Boyle, John W.—with Mack Sennett Studios.
Broening, H. Lyman—
Brotherton, Joseph—with Universal.

Clark, Dan—with Tom Mix, Fox Studios.
Clarke, Chas. G.—with Warner Bros.
Cowling, Herford T.—with Eastman Kodak Co., Rochester, N. Y.
Cotner, Frank M.—
Crockett, Ernest—
Cronjager, Henry—

Davis, Chas. J.—with Warner Bros., "Vitaphone," New York City.
Doran, Robert V.—
Dored, John—with Paramount News, Riga, Latvia.
Du Par, E. B.—with Warner Bros.
DuPont, Max B.—
Dubray, Joseph A.—

Edeson, Arthur—with First National, Burbank.
Evans, Perry—

Fildew, Wm.—
Fischbeck, Harry A.—with Famous Players-Lasky.
Fisher, Ross G.—with First National, Burbank.
Fried, Abe—with Warner Bros.

Gaudio, Gaetano—with Douglas Fairbanks, United Artists.
Gilks, Alfred—with Famous Players-Lasky.
Good, Frank B.—
Gray, King D.—with Fox Studios.
Griffin, Walter L.—with David Hartford Productions.
Guissart, Rene—Paris, France.

Haller, Ernest—with Robert Kane Productions, New York City.
Heimerl, Alois G.—

Jackman, Floyd—
Jackman, Fred W.—directing Fred W. Jackman Productions.
Jackson, Harry—with Corinne Griffith Prod., United Artists.
Jennings, J. D.—with Buster Keaton.

Knechtel, Alvin V.—with First National, Burbank.
Koenekamp, Hans F.—
Kurrle, Robert—with Edwin Carewe.

Lockwood, J. R.—
Lundin, Walter—with Harold Lloyd Productions, Metropolitan Studios.
Lyons, Reginald—with Fox Studios.

McCord, T. D.—
McGill, Barney—
MacWilliams, Glen—with Fox Studios.
Meehan, George—with Fox Studios.
Milner, Victor—with Famous Players-Lasky.
Morgan, Ira H.—with Metro-Goldwyn-Mayer Studios.
Musuraca, Nicholas—with F.B.O. Studio.

Norton, Stephen S.—

O'Connell, L. Wm.—with Fox Studios.

Palmer, Ernest S.—with Fox Studios.
Parrish, Fred A.—Colorado Springs, Colo.
Perry, Harry—with Famous Players-Lasky.
Perry, Paul P.—with Famous Players-Lasky.
Polito, Sol—with First National.

Ries, Park J.—
Roos, Len H.—Sydney, Australia.
Rose, Jackson J.—with Universal.
Rosher, Charles—with Mary Pickford, United Artists Studio.

Schneiderman, George—with Fox Studios.
Scott, Homer A.—
Seitz, John F.—with Metro-Goldwyn-Mayer Studios.
Sharp, Henry—with Metro-Goldwyn-Mayer Studios.
Snyder, Edward V.—with Pathe, Fine Arts Studio.
Smith, Steve, Jr.—
Steene, E. Burton—with Famous Players-Lasky.
Stumar, Chas.—with Universal.

Tolhurst, Louis H.—producing microscopic pictures, for Pathe.

Van Buren, Ned—with Eastman Kodak Co., Hollywood.
Van Enger, Charles—with First National, Burbank.
Van Trees, James C.—with First National, Burbank.

Warrenton, Gilbert—with Universal.
Wenstrom, Harold—
Whitman, Philip H.—Directing with Mack Sennett Studios.
Wilky, L. Guy—

Zucker, Frank C.—Robt. Kane Prod., Cosmopolitan Studios, New York City.

Eastman George—Honorary Member.
Edison, Thomas A.—Honorary Member.
Webb, Arthur C.—Attorney

Meetings of the American Society of Cinematographers are held as called on Monday evenings in the A. S. C. assembly rooms—
1219-20-21-22 GUARANTY BUILDING
Hollywood Boulevard and Ivar Avenue
HOLLYWOOD, CALIFORNIA

LOYALTY PROGRESS ART

1645 Comstock Ave.
Westwood Hills Calif.
May 24th 1927.

Mitchell Camera Co.
Hollywood Calif.

Gentlemen:-

Some eighteen months ago I was lucky enough to be given the opportunity of putting to the test of actual use the first Mitchell high speed movement which was built for experimental purposes.

It was soon evident that it would far exceed its fondest hopes and now after having shot something over 150,000 feet of negative, it is in as good condition as when it first came out of the shop.

Negative has been shot under almost every kind of condition and at speeds ranging from less than one picture per second up to 128 pictures per second and I have used the same movement again in making double prints from the negatives where one was made at eight times normal and the other at eight pictures per second with a resultant print "steady as a rock".

Some of the pictures on which this camera has done the photographic trick work are; "Hell Bent for heaven" "The Third Degree" "The Winning of Barbara Worth" "The Better Ole". "The Kentucky Hills of San Francisco" "Bitter Apples" and "Old Ironsides" "Matinee Ladies" picture I used not only 41 camera but two others which had just been completed and gave them their initial tryout, except for short tests, on an earthquake shot that had to be photographically right on the first take. The confidence was well placed and all three functioned perfectly.

In fact, I believe that the Mitchell high speed camera is the greatest engineering job of its kind, making it possible to do that class of work with an assurance of photographic perfection, the goal of all cameramen.

Very truly yours,

Friend F. Baker

Vol. VIII. No. 5.
25 Cents a Copy

AUGUST, 1927

American Cinematographer

Published in
Hollywood, California

By American Society
of Cinematographers

The Desert at Palm Springs, Calif. Reproduced from Location Library of American Society of Cinematographers, Hollywood. Photographed by C. Curtis Fetters.

THIS MONTH:

Amateur Cinematography: A Professional's Notes for Amateurs—By Joseph A. Dubray, A.S.C.; 16 M.M. Film in Golf Instruction—By Hamilton Riddel; A New Era in Lighting.

Vol. VIII AUGUST, 1927 No. 5

American Cinematographer

FOSTER GOSS, *Editor and General Manager*

Table of Contents:

An educational and instructive publication, espousing progress and art in motion picture photography.
Subscription: United States, $3.00 a year; Canada, $3.50 a year; foreign, $4.00 a year; single copies 25c.
Published monthly by THE AMERICAN SOCIETY OF CINEMATOGRAPHERS, Inc.
Advertising rates on application.
1219-20-21-22 Guaranty Building, Hollywood, Calif. Telephone GRanite 4274

Reliable Advertisers

ADVERTISERS in the American Cinematographer are reliable. In their respective lines, they represent the strongest firms in the world. They have built up their reputations by fair dealing. They give service. They, like their products, are dependable.

He who deals with those whom the American Cinematographer is proud to number among its family of advertisers, does business with the world's best.

The EDITOR'S LENS focused by FOSTER GOSS

INTO THEIR OWN

¶ In this year of grace, 1927, the motion picture cameraman, or the cinematographer, as he is now most generally yclept, has entered into his own.

¶ Of all the servants of the cinema this unassuming artist-technician has been the most faithful and uncomplaining.

¶ Ever ready to take orders like a good soldier, standing the gaff cheerfully even unto the risking of life and limb, on the job 100 per cent and delivering 100 per cent, the cinematographer has served through the years unheralded and unsung, yet the one of all the classes of studio workers able to stand at the bar of the industry as a "workman that needs not to be ashamed" and plead not guilty to the charge of WASTE.

¶ The camera being the sine quo non of the cinema, the fulcrum upon which the industry turns, the cameraman's work has been measured in footage. He has EARNED his stipend in the sweat of his brow and in the employment of his artistry. The cinematographer's work is tangible, there is no theory about it.

¶ Through the years he has sprung to his duties as a minute-man intent upon giving not only his best, but constantly reaching out for a better best. Nobody has told him what to do. Having his own idea of perfection before him, he has untiringly striven to achieve it. He thought, imagined, experimented, researched, kept an open mind, was never satisfied with results, and all the time he made no demands.

¶ His spirit of co-operation is well nigh the finest tradition (if the youthful cinema has any such thing), in all the history of the industry and never in a single instance has he "held up the set" through any temperamental strabismus of his own, and now in these days of chemicalization in the industry he arises to announce modestly, but earnestly, that he has served his apprenticeship, that he has earned his spurs, and that he is ready to take the place that he rightfully deserves—a seat in the councils of the industry on equal terms with the representatives of the other departments of motion picture production.

¶ Not to parade his power does he assert his right to these things, although the organization of the cameramen, the A. S. C., is the most complete, the most cohesive, the most harmonious and both strategically and numerically the strongest in the industry, but he asserts his right for the most excellent of all reasons—that he is equipped to help in the economy of production and has a voice that can be raised in wisdom when knotty questions are in discussion.

¶ "Loyalty, Progress and Art," the motto of The American Society of Cinematographers, is not an empty slogan. Through the years since the first motion camera was cranked Loyalty has been the gonfalon of the cinematographer; Progress has been his guiding star; Art his passion, and this to the glory of the cinema. And yet through the years he has been inarticulate for the most part because his loyalty and modesty caused him to be simply taken for granted and his rightful seat at the council table occupied by some less worthy.

¶ That day has passed. By sheer force of artistry, intelligence and indefatigable labor the man at the camera crank has wrought his emancipation and with his forces coherent, harmonious, aspiring, and marshalled under a leadership at once intelligent and aggressive he expects the recognition he has so long looked for and so richly deserved.

¶ During the recent weeks the cinematographic forces of the motion picture industry, local and foreign, have rallied to the banner of the A. S. C., and by forces is meant first cameramen, second cameramen and still men, until the organization so nobly sustained and upheld through the years by the devoted Old Guard of pioneers, is able today to claim practically a 100 per cent membership. All eligible men are enrolled and others will be as they become eligible, so that now the men of the camera are able to speak with one voice, and that a magnavox of courage and confidence proclaiming that the CAMERAMASTERS OF THE WORLD have entered into their own and are marching on to new triumphs and to the enjoyment of their full share of the glory that is to be the future of our beloved and ever more wonderful cinema.

Greater Sports Era Resulting from Pictures

Greater champions in every field of sport, as a result of the use of motion pictures in athletic training, are prophesied by Grantland Rice, authoritative sports writer, in the August Sports Number of Amateur Movie Makers, published by the Amateur Cinema League.

"Burns' wish has come true," Mr. Rice declares, "and today we not only see ourselves in films as others see us, but we see ourselves so unmistakably as others see us that we do not like it at all and set out at once to make ourselves over—and to play a better game of golf, or whatever our favorite sport may be."

Motion picture films, which reveal the secrets of the technique of famous athletes and even of whole teams, are now an indispensable part of modern coaching systems, according to Mr. Rice. Through slow motion, suspended animation and line analysis pictures, the elements of form and skill are today being demonstrated so simply and clearly that emulation of experts has become possible for everyone. The result has been an unparalleled advance in the standards of sport performance.

Slow motion pictures, in this connection, are now a familiar device. Suspended animation and line analysis are new developments, described in another article in this issue of Amateur Movie Makers. By suspended animation any particular position of the player, as, for instance, the position in which the racquet is held at the moment of service in tennis, can be closely observed, the frame showing the posture in question being duplicated fifteen or more times in the laboratory. Thus the player seems to stop at the crucial moment long enough for his form to be carefully studied, and then the action proceeds. In line analysis the stroke of the golf club, bat, or tennis racquet is traced on the film with a dotted line, which visualizes each stroke with marvelous clarity.

Not only are films of these types now being prepared for theatrical presentation, but schools, universities, athletic clubs and such national organizations as the United States Lawn Tennis Association are utilizing these methods in their sports training programs. Development of personal motion picture equipment and the availability of these films for home projection, have also made it possible for the ardent golfer to study his game in his own home under the tutelage of such experts as Bobby Jones, or, if he is a tennis fan, to receive the personal guidance of Rene Lacoste, Helen Wills or William Tilden, and similarly in all other sports to call on the world's finest teachers at will.

Through this home film development, Mr. Rice contends, "we may all get so well acquainted with our fumbles that we'll all be champions before long."

News-Reels for Homes Are Latest Movie Quirk

A home movie news-reel, made up of films of the latest news events and issued twice monthly at the same time these events are being shown in the theatres, is the outstanding development of the month in the fast growing hobby of home movies it will be announced in the August issue of Amateur Movie Makers, the magazine of the Amateur Cinema League.

"Highlites from the News" is the title of these bimonthly releases. Issued the first week in July, the initial "Highlite" featured the Hawaiian Trans-Pacific Flight, Byrd's Atlantic attempt, and Columbia University's winning of the intercollegiate regatta at Poughkeepsie. The second July release is devoted to the Dempsey-Sharkey fight. Two editions of this "Highlite" were necessary, one for New York State, showing the actual fight pictures, and a second for national distribution to conform to interstate rulings on fight films.

All of the speed devices developed by the theatre news reels are being employed in this home news service. The Hawaiian flight pictures, for example, were rushed to New York by aeroplane and the home reels were being distributed at the same time the New York newspapers were printing the first photographs of the flight.

Genesis of this news reel service, according to Amateur Movie Makers, was in the covering of the Lindbergh flight for home movie fans. This brought about the discovery that there was a national demand for film news service, and also that the same speed in news gathering and distribution to the individual consumer could be economically developed, as for the customary theatre showings.

These news-reels are 100 feet in length and on the narrower width amateur film for use on home projectors. They are released by a national film company and are being distributed by dealers in photographic supplies.

A. S. C. members are seldom available; when they are, they may be reached through the A. S. C. offices—GRanite 4274.

Chemical Composition of Light Carbons in Therapeutics

By Fred McBan

Continuing the discussion of lighting problems appertaining to motion pictures, Fred McBan of Creco goes into the technical detail of color carbons.

The electric arc and colored carbon has long been advocated for physical and mental ailments by scientists and physicians. The self same form of lighting could be ably applied to lighting methods for motion picture photography.

As the painter would take the several pigments or colors and create a definite result, so is the cinematographer endeavoring to paint with light. But the necessary lighting mediums have been lacking in color values in the past.

The incandescent lamp seems to have fallen by the wayside, so to speak, by lacking depth and quality in color gradation. On the other hand, excellent results have been obtained by using the carbon arc with vari-colored carbons, especially on Du Pont Panchromatic and Agfa super speed film. Commendable at this time is the C. B. Dreyer method of resensitizing film stock applicable to all general lighting conditions.

The chemical composition of Therapeutic or light treatment carbons, follows in detail.

Therapeutic A Carbon

This carbon contains rare earth fluoride. It gives a bluish white light. These lines extend from the infra red through the visible and ultra violet to approximately 2800 AU with scattered lines extending to wave lengths shorter than 2000.

For a given input of electric energy this arc is more nearly like sunlight than any other arc or any other light source. At large currents and high current densities such as used in the "High Intensity" lamps, the light produced is a very close reproduction of noon, June, California sunlight. The High Intensity arc to which we refer is used in the large serchlights operated by the Army and Navy, in the floodlights used to illuminate the large air mail fields and in the lamps used for projecting the pictures in large motion picture theatres.

Therapeutic B Carbon

The Therapeutic B Carbon contains iron. The flame of this carbon is not particularly blue, but it gives a little light of a bluish tinge. The general color of the visible light is similar to that from Therapeutic A Carbons, but has a candle power of less than one-fourth than from the A Carbons for similar conditions of electrical current consumption.

The spectrum of light from this arc is qualitatively characterized by many lines that extend from the visible through the ultra violet to 2300 AU or shorter. Quantitatively it is comparatively weak in the visible part of the spectrum and very strong in the short ultra violet region. It gives much light in the region from 2300 to 3000 AU.

Light from this arc is in general more similar qualitatively to light from the quartz mercury arc which is widely used in light therapy. Quantitatively the amount of ultra violet light from most Therapeutic B Carbons gives customarily larger electric energy consumption in the carbon arc.

This arc can be used when the object of treatment is to produce an erythema. Light from this arc is applicable in the general type of cases where the mercury arc is useful.

Light from Therapeutic B Carbons is particularly powerful in causing conjunctivitis, Klieg Eye. Therefore every opportunity should be taken to impress on the mind of the user he necessity of protecting the eyes when using this carbon. Protection for the eyes is required when working with any therapeutic carbon. Therapeutic B requires special caution in its use.

II *Therapeutic C Carbons* I

Therapeutic Carbon C is a "poly metallic" type of carbon. Several metals are to be found in the core. In this case the metals are iron, nickel and aluminum. Silicon is also present in this carbon.

The carbon is designed to produce the maximum quantity of ultra violet light. The carbons give ultra violet in large quantities as do some other—Therapeutic B and G particularly, but Therapeutic C gives a more even distribution of light through the entire ultra violet range than either of these. This carbon gives more nearly equal quantities of ultra violet throughout the physiologically active range than any other.

The same care to protect the eyes must be used when burning this carbon as is found necessary when burning the Therapeutic B Carbons.

Therapeutic D Carbon

The Therapeutic D Carbon contains an alkali silicate as an arc supporter. The flame of this arc is nearly colorless or faintly violet. The spectrum consists of a few groups of lines on a continuous background. Most of the energy is in the red, infra red, and near ultra violet region. The ultra violet light is confined almost exclusively to the region of 3500 to 4200 AU.

It is difficult to predict just to what use these carbons can be applied. They are included in this list because they are being used by physicians with some clinical success. Some physicians demand them. We are not at present in a position to state that they are not the best thing to use in any given case. There is some short wave ultra violet in these arcs but the quantity is comparatively small.

Therapeutic E Carbon

The Therapeutic E Carbon contains strontium. The flame of these carbons is red. The spectrum consists of lines in the red and in the extreme violet. The ultra violet is relatively weak in these carbons but large quantities of long wave red light are emitted.

These carbons should be useful where the object of treatment is to apply heat to underlying tissues while giving the surface a small dose of ultra violet light.

(Continued on Page 23)

The Man Who Shoots Tom Mix

By Robert Yost

Dan B. Clark
President A. S. C.

Dan Clark, the intrepid camera man who has shot first camera on all Tom Mix pictures for the past three years, is a quiet, unassuming person who takes the chances incident to the filming of Mix pictures with a philosophical calm. And the chances are great. All of the "stunts" which the William Fox star uses in his pictures mean of necessity that the camera is in some point of vantage and therefore in almost as great danger as the star himself.

The greatest thrill which Mr. Clark ever got out of a picture was during the filming of "The Lone Star Ranger," when a scene of horses swimming was taken in a huge glass tank with the cameras and camera men under water. It was decided to shoot the scene before the tank was completed and the hatchways leading out of the tank, as a safety device, were not finished. Everything was perfectly satisfactory until one of the horses became frightened and began kicking. Luckily the glass was strong and did not break, but it was a hectic few minutes after Mr. Clark had communicated, by means of the air valves, with those above until the tank was hoisted up, as there were thousands of pounds of pressure and no way of getting out.

Mr. Clark claims that there is no vehicle on wheels on which he has not set up his camera, automobiles, trains, racing cars, engines and aeroplanes being a few of the modes of transportation on which he has placed his tripod and ground out thousands of feet of film. Even the cage of an aerial cable has been commandeered as a fitting spot from which to get the best results for the picture.

Another time in which those who watched the camera crew held their breath was during one of the recent Mix pictures when the cameras were placed on top of an old stage coach and the horses were actually running away. The coach, being a rickety old thing, the doubletrees were not so secure as they had once been and in the middle of a perilous turn the horses broke away

(Concluded on Page 16)

Use of 16 M. M. Film In Golf Instruction

By Hamilton Riddel

The camera never lies! With this axiom in mind Alex J. Morrison, professional golfer and author of the Morrison System of Golf, has made use of the 16 m.m. motion picture equipment. Well known at the Hotel Ambassador, Los Angeles, where he is golf instructor, Morrison has long been an advocate of achieving simplicity and naturalness in playing this popular game. And he has great faith in the power of a photographic lense to depict the true form of the experienced golfer.

Realizing that the fundamentals of golf had not been arrived at, in perfect analysis, Morrison decided to use a motion picture camera for this purpose. Hence, as early as 1916, Morrison made one of the first slow motion pictures of golf. This film clearly depicted the various strokes of golf. However, being unable to stop this film during projection for a longer perusal of each individual picture, or "frame," it was necessary to have still picture enlargements made. Yet this method was costly and not entirely satisfactory.

With the advent of the 16 m.m. amateur film the difficulties which Morrison had encountered with larger standard film were done away with. As is known, the 16 m.m. film being non-inflammable, and there being provision made on most all of the amateur projectors, the film can be stopped, during projection, and the picture viewed as a still.

Morrison now uses an amateur camera and photographs a pupil while playing. It has been his experience that a pupil may not comprehend a correction as to his form. Morrison then runs the movie which he has taken of the player. He projects the film one "frame" at a time, each position of the player's body being clearly depicted. In this way the movie cleared up what a world of oral correction can not do.

Recently Morrison has made a one-reel subject of his system of golf with the co-operation of the William Horsley Laboratories of Hollywood. This film contains natural, as well as slow motion, views of all golf strokes together with close-ups of the proper grip for each club, and also incorporates a golf exercise, a part of the Morrison system.

It is frequently Morrison's experience that a player, who has taken lessons from him, about to return to his home city, will inform Morrison that he fears he will not retain the golf instruction. Further, that he will have no means of checking up on his proficiency at the game. In such cases Morrison has available to the player a 16 m.m. print, fully titled, of his system of golf. Thus the player has at his immediate command, in his own home, a graphic reminder of the instruction he has received from Morrison in person. Quite often the player has a 16 m.m. amateur motion picture camera and pro-

(Concluded on Page 24)

In Camerafornia . . .

and News Notes of the Month

Reginald E. Lyons, A. S. C., has just returned from Sonora, Calif., where he filmed Buck Jones' latest picture, "Blood Will Tell." He is now working on the "Branded Sombreo" with the same star, Buck Jones. The picture is being directed by Lambert Hillyer.

* * *

Dev Jennings, A. S. C., is photographing Buster Keaton's next comedy feature for United Artist release. Charles Riesner is directing.

* * *

George Barnes, A. S. C., is photographing the Samuel Goldwyn production, "The Devil Dancer," at the De Mille Studio. Gilda Grey and Olive Brook are starred.

* * *

Nick Musuraca, A. S. C., is experiencing a busy month at the F. B. O. Studios where he is shooting "The Bandit's Son," starring Bob Steele, and is also in charge of the cinematography for Tom Tyler's next western feature, "The Gambler's Game," which Robert De Lacey is directing.

* * *

Ross Fisher, A. S. C., is photographing the next western feature of Ken Maynard for First National release, "Gun Gospel."

* * *

Arthur Edeson, A. S. C., is chief cinematographer on Richard Barthelmess' latest picture, "The Drop Kick." Millard Webb is directing from a continuity by Winifred Dunn.

* * *

Glenn Mac Williams, A. S. C., is shooting a William Fox feature, "Pajamas," under the direction of J. E. Blystone.

* * *

George Schneiderman, A. S. C., is chief cinematographer on the next John Ford production for William Fox release.

* * *

Dan Clark, A. S. C., chief cinematographer for the Tom Mix unit at the William Fox Studios, is engaged in the cinematography for Mix's new production, "Silver Valley," which is being directed by Ben Stoloff.

* * *

George Meehan, A. S. C., is having a lively time photographing the latest kangaroo comedy, "Kangaroo's Kimona," at the William Fox Studio.

* * *

John Arnold, A. S. C., recently completed the cinematography on the latest Lillian Gish production, "The Enemy," which was directed by Fred Niblo. With William Nigh directing, Arnold will next be occupied with the camera work on Metro-Goldwyn-Mayer's film production of the popular musical success, "Rose Marie."

* * *

Frank B. Good, A. S. C., has just finished photographing "The Wise Wife" for the De Mille Studio, E. Mason Hopper directing. In the cast are Jacquelin Logan, Phyllis Haver, and Tom Moore.

* * *

E. Burton Steene, A. S. C., has been assigned the Akeley camera work on Frank Strayer's next production for Paramount. The comedy team, Wallace Beery and Raymond Hatton, are starred. Harry Perry, A. S. C., is chief cinematographer on this picture, "We're Up in the Air Now," which is a sequel to the popular successes, "Behind the Front" and "We're in the Navy."

* * *

H. F. Koenekamp, A. S. C., one of the foremost comedy cinematographers, has just finished shooting Larry Semon's latest two-reel comedy entitled "Dummies," to be released through Educational. This comedy is the first of a series of eight scheduled for this year.

* * *

Gaetano Gaudio, A. S. C., is finishing cinematographic work on Douglas Fairbanks' newest production, "The Gaucho," at the United Artist Studios.

* * *

Charles Rosher, A. S. C., long Mary Pickford's chief cinematographer, is busily engaged on her latest picture, "My Best Girl," now in the course of production at the United Artist Studios.

* * *

Henry Sharp, A. S. C., is photographing the Metro-Goldwyn-Mayer production, "Lovelorn," at the Culver City studio.

* * *

John Seitz, A. S. C., who was chief cinematographer on the special Metro-Goldwyn-Mayer production, "The Trail of '98," directed by Clarence Brown, is now photographing Marion Davies. Miss Davies' new picture is "The Fair Co-Ed" and it is being directed by Sam Wood from a story by Byron Morgan.

* * *

Edward J. Snyder, A. S. C., is shooting the latest Pathe serial. The Pathe company recently moved its production activities to the Metropolitan Studios.

* * *

Walter Lundin, A. S. C., has started camera work on Harold Lloyd's latest production, at the Metropolitan Studio. The continuity calls for many exteriors to be taken in the East.

Amateur Cinematography

A Professional's Notes for Amateurs

Part X

By Jos. A. Dubray A. S. C.

Lenses Powers and Image Formation

(Continued From Last Month)

In some cases, very rare indeed, a lens may be placed between two media or different composition, such for instance as AIR and WATER, AIR and OIL, etc.

If we consider the human eye as an optical instrument, we can easily conceive such a case.

The incident light, travels from an object through the first medium AIR, and is first refracted by the Cornea, which is the transparent membrane in front of the eyeball. It follows then, its allotted path through the acqueous humor, the Crystalline lens, the vitreous body, suffering refractions in accordance with their Index of refraction, and finally reaches the Retina, where the image of the external object is formed.

The first media in this case is AIR, the last media is the VITREOUS BODY, which are of different composition, hence of different density and possess therefore a different refractive index.

In such case, another set of Gaussian points and corresponding planes may be located and these new points and planes, are called the NODAL POINTS and PLANES of the lens or optical instrument.

In fact the principal points are supersided by the NODALS and, as the formers are but the OPTICAL CENTERS of the lens, we can express the formation of the Nodal points as follows:

"WHENEVER THE FIRST AND LAST MEDIA ARE DIFFERENT, THE OPTICAL CENTERS OF A LENS, ARE DISPLACED ALONG THE AXIS AND IN THE DIRECTION OF THE DENSER MEDIUM."

It is then evident that the NODAL POINTS have the same functions as the PRINCIPAL POINTS; and in the case in which the lens is placed between identical media, the Nodal Points COINCIDE with the Principal points, and they are indifferently referred to, as Nodals or Principals.

According to the Gauss theory, we have then three sets of points pertaining to each lens, namely:

The FOCAL POINTS.
The PRINCIPAL POINTS.
The NODAL POINTS.

These sets of points, fully determine the path of rays refracted by a lens and are therefore called he CARDINAL POINTS of the lens.

We have previously stated that the amount of refraction that rays of light undergo while passing through a lens, is subordinate to the refractive index of the material of which the lens is made, and the radii of curvature of its bounding surfaces. Consequently the amount of refraction determines the position of the FOCAL POINTS and the FOCAL LENGTH of the lens.

It is evident then, that the degree of convergence to which parallel rays are forced when passing through a positive lens, INCREASES as the focal length diminishes, and if we call this amount of convergence the POWER of the lens, we find it to be INVERSELY PROPORTIONAL to the focal length of the lens.

The International congress of 1879, has adopted the name DIOPTRE (from the Greek word DIA meaning *through* and the root OP, *to see*) to indicate the POWER of a lens, i. e., its power to imprint a curvature on the front wave of light, when striking the first surface of refracting medium.

It is opportune to remark that the *curvature* imprinted upon the front wave of light as expressed in the preceeding paragraph, must not be confused with the RADIUS OF CURVATURE of the faces of the lens.

If the lens is a positive one, the front wave will be forced by the lens to undergo a curvature of hollow shape and thus to converge to a focus. The DIOPTRE value will be in such case reckoned as positive and as such will be preceeded by the sign + or by no sign at all at the will of the physicist.

Inversely if the lens is a negative one, the front wave will undergo a bulging curvature, and form a virtual focus. The DIOPTRE value in such case, will be reckoned as NEGATIVE and always preceeded by the sign —.

In order to establish a uniform numerical value of the DIOPTRE, a lens with a focal length of ONE METER, is taken as unit.

The reciprocal of the focal length, gives the number which indicates its POWER.

Thus:—The unit lens whose focal length is One meter, has a power of

$$\frac{1}{1} = 1 \text{ DIOPTRIES}$$

A lens having a focal length of meters 0.50 has a POWER of

$$\frac{1}{0{,}50} = 2 \text{ DIOPTRIES}$$

(Continued on Page 17)

The Cinematographer As a Prophet . . .

The American Cinematographer has made good as a prophet as the following editorial from the Cinematographer of November 1, 1921, attests. The Pacific Era is here and the giant city is building and Hollywood sits serenely in the midst sure of a marvelous destiny:

"To a cinematographer standing on the summit of Mount Lowe and looking down upon 'the cities of the plain' the whole marvelous panorama suggests nothing so much as a motion picture of unspeakable beauty. The picture does not really move, but the constant shifting of the observer's vision from mountain peak to canyon, to valley, to hill, to sea, to sky, to cloudbank, to rugged trail, to valley mist, to the islands of the sea and back to the majesty of the mountains, every prospect softened by the magic touch of nature's color, produces the effect of motion and the whole scene seems to be alive.

"Standing at such a point of vantage it is not difficult to project the vision into the future and see spread out there below a city reaching from the Santa Monica Mountains to Sierra Madre, from Balboa far beyond Burbank and from the Beverly Hills to Santa Ana—a city mightier than any ever built by man—with as many millions as London and New York combined! And why not? 'Westward the course of empire takes its way' constantly, and, already, West is East.

"Is the movement to California and the West Coast simply an hegira of some millions of people looking for soft living, or is it a very definite part of the plan of Divine Providence in the evolution of the human race?

"The world war ends and suddenly all nations turn their eyes toward the Pacific. Japan, already a child of the Pacific, suddenly looms as a tremendous power. For good or evil? That is what all nations are asking. Why? Because Japan in her spirit of Bushido (the Soul of Japan), asserts herself as the arbiter of her own destiny and proclaims her power and intention to fulfill that destiny. This takes concrete form in sundry strategic movements looking indubitably to the dominance of the Far East—China, Siberia and the islands of the sea which, translated into political import, means dominating the Pacific.

"We see Great Britain hastening to concentrate a gigantic fleet at Singapore; Australia openly disapproves of Japan's aspirations; China, awake, bides her time; and the United States, with the Philippines on her hands, watches anxiously, while professional war-makers look for an opportunity to precipitate the struggle. And why all this shifting of men on the international chess board? Is what we see with our eyes all there is to these great movements of nations?

"It is worth remark, in view of these things, that students, teachers and writers of the so-called Theosophical subjects have interesting light to throw upon these phenomena, the outstanding headlands of which are:

1. That a new race is in the process of building here in Southern California.
2. That a new continent is in process of forming in the Pacific.
3. That the future great activities of the world are to find their theatre on the new continent and the coasts adjacent to it.

"It requires deep research into the strange and recondite books of the Theosophical religio-science-philosophy to gain an understanding of the Great Plan of evolution of the Logos of our solar system; of the building of the root races and their differentiation into subraces; of the rise and fall of nations and the growth, the flourishing and the breaking up of continents.

"Western science now knows of the existence of the long departed continent of Lemuria and of the more recently existing continent of Atlantis. If these two great continents with their mighty civilizations came and went, why shall not others come and old ones go and why may not this great movement toward the Pacific be in truth the outward, visible sign of the working of a great cosmic law—a world movement according to the Great Plan of Divine Law?

"This same source of information tells us that the dominating race of the present day is the Teutonic (not in any sense the German nationality), including among others all the English-speaking peoples, and that this race is the Fifth Sub Race of the Fifth Root Race; that the next race to be developed is the Sixth Sub Race, the pioneers of which are beginning to appear among the highest types of children of California; and that the glories of all present and former civilizations will pale before the glory of this new type of humanity in the ages to come.

"Of the Japanese we are told that they have a mighty destiny to fulfill which in no way interferes with nor detracts from the glory of any other peoples.

"The Theosophical message is, therefore, fraught with glad tidings of great joy to all peoples and especially to the people of Southern California and the West Coast. Let the new continent arise and the new race come forth to the glory of the God of races and, this time, the Divine panorama will not be lost to posterity, for our cinematographer of Mount Lowe will be at his tripod ready to record the march of events the like of which in time past perished because there were no cinematographers."

Another Creco Innovation

Make use of your SHORT ENDS OF FILM, don't throw them away.

The one hundred per cent efficiency of Kamra for fool proofing locations, settings, etc., etc., will pay for the original cost many times plus.

CRECO, INC., have secured distribution rights to the Ellison Kamra. They will be ready for distribution September first.

Remember, Kamra will be ready for distribution September first. The price is twenty-seven fifty ($27.50).

Shooting Stills In The Sky

Difficulties In Aerial Photography

(This interesting article, submitted without identification, is published anonimously until such time as our unknown contributor is discovered.)

THE stumbling block for the aerial photographer lies principally in the failure of the shutter and plate magazine to operate properly. Both have been mechanically perfected, to the utmost, yet under changing conditions of an aerial voyage, they give rise to faulty operation whose cause is not readily discerned.

The most frequent failure, very common during the cold days of the year, is the non-operating of the roller-blind shutter of the curtain slide. This is due to the coldness of high altitudes. In winter at an altitude of 13,000 to 20,000 feet, the temperature may be as low as 45° to 60° F. Under such conditions the working of the mechanical parts of the apparatus are greatly taxed and the failure of the shutter is a direct result of the cold. However, the cause is not, as sometimes assumed, the stiffening of the roller, but simply a freezing of the oil or fat with which the shutter is lubricated. For instance, I noticed in one camera that even the shutter after descent did not work, and on taking the apparatus apart I found that the mechanism was covered with a yellow mass as hard as stone, which after thawing out, proved to be a lubricating fat which let the shutter operate to perfection. Shutters operating perfectly on the ground fail in the air, and when warmer atmospheres are reached begin to perform again. Experiments with thin watch oil as lubricant lead to the same result, as nearly every lubricating oil or fat will freeze at these temperatures.

The best way to overcome this difficulty is to clean the shutter mechanism of all traces of oil and fat and then lubricate the frictional surfaces with a very thin layer of glycerine. Such shutters will operate even at the lowest temperatures. It is quite useless to attempt operation of the shutter simply by increasing the tension of the spring —this is one of the commonest means used by the aviator in his desperate attempt to make the shutter work. The springs are delicate and the increased tension of the springs will only wear them out prematurely, and cause irregular running of the shutter which naturally will produce stripes on the negative.

The second failure is with the plate holder and the plate magazine. With the rapidity with which a picture must be taken from the flying aeroplane, it occurs frequently that an operation is forgotten and the plate jams, the amateur then uses force and the plate holder drops or the plate breaks. The modern plate magazines have been made so simple that it appears ever to be the fault of the photographer if something happens. Usually it is not the fault of the aviator photographer but of the assistant who loaded the camera. Many plates are not manufactured to the same thickness; some are thicker, some are thinner. If you force a thick plate in the thin plate holder it will break at the first change and prevent succeeding operation of the magazine; therefore, fill the plate holders only with plates which fit in easily. In changing plates try never to force the issue by mere strength, for you are dealing with a delicate instrument, like a compass and altitude indicator which refuse to serve when treated roughly.

Lastly, a few pointers regarding the pictures themselves. We frequently see pictures from low altitudes which are not clear and sharp. This brings up the question of the influence of the flying speed on the sharpness of the picture, which is a simple problem of physics. The indistinctness of the picture will become greater the lower the plane travels and the larger the focus of the camera. Hence, to determine the distinctness of the picture one must consider height of the aeroplane and focus of the objective.

The measure for distinctness or indistinctness of the picture is the path which a point of the object travels during the time of exposure upon the plate. In order that a picture appear sharp this path cannot exceed a certain limit. As limit, we assume a length of 0.004 inches.

By taking this limiting value for the measure for sharpness and assuming an aeroplane traveling with a speed of 95 miles per hour, we come to the following table of necessary exposures. This table is interesting in many respects; we learn, for instance, that it is impossible to take sharp pictures, even under the best light conditions, from flying heights of 220-1100 yards by using long focus lenses of 20 to 50 inches. On the other hand the table likewise shows that from extreme heights with short focal objectives the exposures can be made much longer than is usually assumed (1/200 sec.) and still sharp pictures be obtained, provided other contrary influences, as motor-vibrations, are eliminated.

In using the table it must be remembered that the given exposures are calculated for the longest time permissible and if the light conditions are favorable, naturally, a shorter exposure than that given in the table should be attempted.

Exposure Table

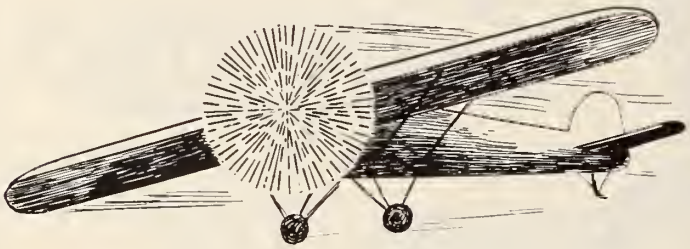
Longest exposure permissible for obtaining sharp pictures from an aeroplane flying with a speed of 95 miles per hour.

Height feet	10 in. lens	12 in. lens	20 in. lens	28 in. lens	39 in. lens	47 in. lens
656	1/525	1/625	1/1050	1/1500	1/2100	1/2500
985	1/350	1/425	1/700	1/1000	1/1400	1/1700
1640	1/200	1/250	1/425	1/600	1/850	1/1000
1196	1/150	1/175	1/300	1/425	1/600	1/700
3280	1/100	1/125	1/200	1/300	1/425	1/500
4920	1/70	1/85	1/140	1/200	1/275	1/325
6561	1/50	1/65	1/100	1/150	1/200	1/250
8201	1/40	1/50	1/85	1/125	1/175	1/200
9842	1/35	1/45	1/70	1/100	1/150	1/175
13123	1/25	1/30	1/50	1/75	1/100	1/125
16404	1/20	1/25	1/40	1/60	1/85	1/100

(Concluded on Page 21)

Railroad Tr

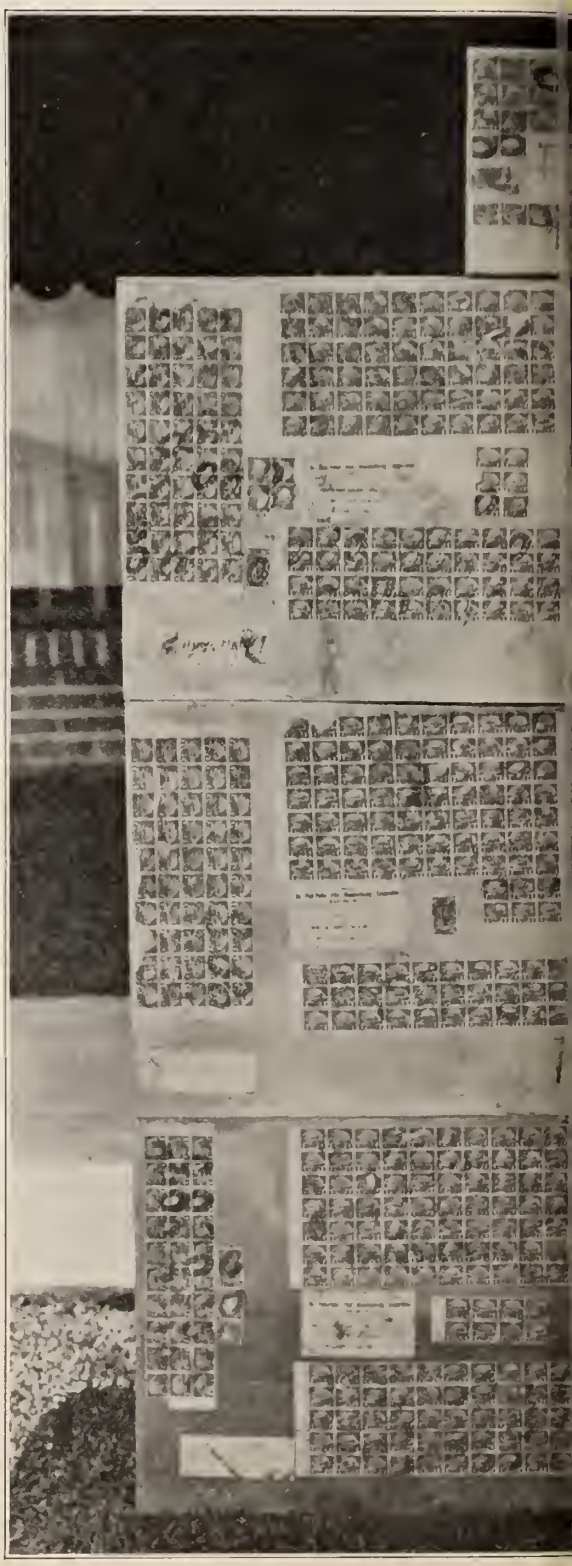
The demand among Hollywood Studios for DUPONT Orthochromatic and Panchromatic raw stock was so pressing in July that an emergency supply had to be forwarded on telegraphic advices via United States Air Mail. This constituted the Largest **Commercial Shipment of Any Commodity Ever Made by Air Mail.**



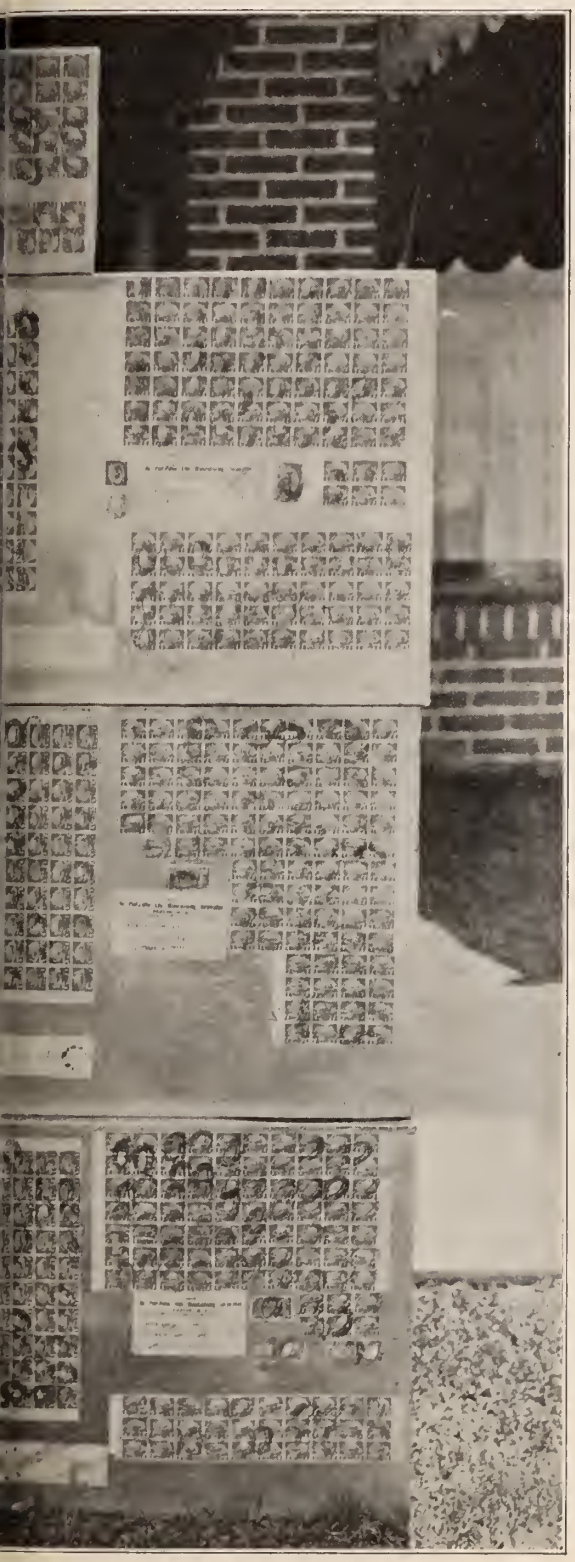
The shipment left New York on Wednesday, July 20th, at 11 a. m., and arrived at Los Angeles Air Port at 6 p. m., Thursday, July 21st.

Of the seven hundred pounds of mail matter carried on this trip, four hundred pounds consisted of DUPONT Raw Film, forty thousand feet in all, packed in Zinc containers and sent first class, insured, at a total postage charge of nearly Thirteen Hundred Dollars ($1,300.00).

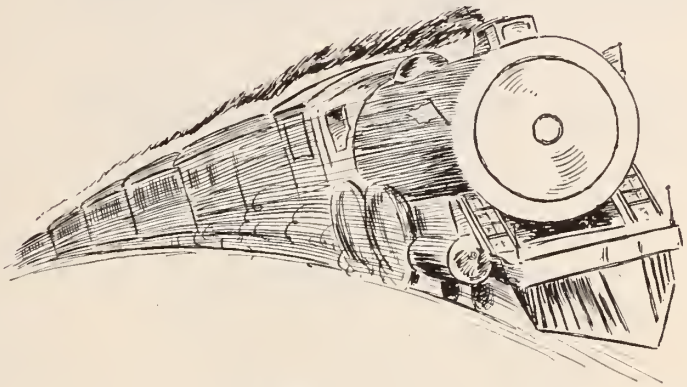
There must be a reason for the extraordinary growth in the demand for **Raw Film** and this DUPONT reason technically stated is that this film possesses an extreme latitude combined with speed, fineness of grain, high sensitivity and better color separation, which combination of qualities produces incomparable negatives.



ins Not fast Enough



The phenomenal success of DUPONT **Film** is one of the outstanding developments of **motion picture production.**



It is in line with DUPONT traditions that "The DUPONT Trade-Mark Has Never Been Placed on An Inferior Product."

DUPONT

Dupont-Pathe Film Manufacturing Corp.

35 West 45th Street, New York

SMITH & ALLER, Inc.

Pacific Coast Distributors

1056 North Cahuenga Ave. Granite 6669

Hollywood, Calif.

THE MAN WHO SHOOTS TOM MIX

(Continued from Page 8)

and ran as fast as they could tear down the road. The coach careened into the bank, but had it chosen to turn to the other side there was nothing but a five hundred foot drop between the camera men, cameras and eternity.

Having an infuriated cougar jump onto the camera platform is another of the minor incidents which Mr. Clark recalls. It was during the filming of "The Trouble Shooter." The cougar became enraged and made a flying leap for the cameras. The savage animal stood rigid for a moment and then his attention was diverted and he jumped down again. Cameraman Clark likewise stood perfectly rigid and had he moved, it is highly probable that the animal would have attached himself to the camera crew with astonishing rapidity.

Having a troop of bucking bronchos make a bee-line for the cameras and get all mixed up in them is all part of Mr. Clark's day's work. The camera man and his assistants simply pick the cameras and themselves out of the debris, set up in another spot and go on shooting the scene.

Luck plays a big part in all of the work done on Mix pictures. Very often when some particularly tricky scene is under way and a certain angle must be used, the scene will be completed before anything untoward happens. For instance, at one time, Mr. Mix coming down an incline of forty-five degrees on "Tony" was the action. Cameras were placed on a small incline railway and were grinding as the platform was drawn down the hill by a cable. Mr. Clark suddenly realized that the super-structure of the platform was slipping, so the camera crew held the cameras on with their hands until the bottom of the hill was reached. Just as the last foot of film was completed the platform slipped for good and the camera crew took a tumble into space, but luck was with them and they dropped into soft dirt. It so happens that any number of things of like nature have occurred which make the Mix company positive that there is no need to worry about a film being spoiled. Up to the present there have been many narrow escapes but no disasters.

"There is one big chance that I take almost every day in the year," asserts Mr. Clark, "and that is boxing with Tom." The two men box each night after the day's work is over and the result is usually in favor of Tom, but Dan is determined that some day he will get in a punch that will make him the champion of the Fox lot.

Incidentally, Mr. Clark has to his credit forty-eight Mix pictures taken since January, 1921, a record not equalled by any camera man engaged in motion picture work, and since joining the Mix company he has not indulged in a vacation. Often one picture is begun the day after the previous one is finished. That is also a record of which any camera man may well be proud.

AMATEUR CINEMATOGRAPHY

(Continued from Page 10)

And a lens having a focal length of 2 meters, has a POWER of

$$\frac{1}{2} = 0{,}5 \text{ DIOPTRIES}$$

Expressing the Dioptric value as a formula, we have

$$D = \frac{1}{f \text{ (in meters)}}$$

where D indicates Dioptre; and f the focal length of the lens.

As the meter is equal to 39.37 inches, if the focal length of the lens is given in inches, we must divide 39.37 by the given focal length thus

$$D = \frac{39.37}{f \text{ (in inches)}}$$

As an example let us suppose a lens having a focal length of 2 inches.

We can find its POWER, by the Formula

$$D = \frac{39.37}{2} = 19.69 \text{ DIOPTRIES}$$

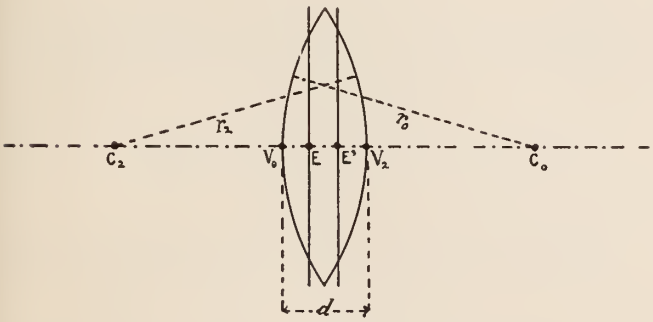
or, as two inches equal meters 0.05080, by the Formula

$$D = \frac{1}{0.05080} = 19.69 \text{ DIOPTRIES}$$

The formulae used for finding the position of the Cardinal Points of a lens, require a too lengthy explanation for the space allotted to these articles.

We will therefore give the formulae, referring the reader to more complete works on the subject, for their thorough investigation.

Let us suppose a thick lens as in Fig 23



of which the value r_0, r_2, d and n, are known.

The values r_0, r_2 and d, may be easily obtained by actual measurements and the value n is always given by the manufacturer of the lens.

In such a lens,

$$\text{The distance } V_0 E' = \frac{r_0 d}{n (v_0 + r_2 - d) + d}$$

(Continued on Page 18)

Victor Milner, A. S. C., is in charge of photography for Emil Jannings' next picture for Paramount. The second American picture which Jannings is now making is entitled "Hitting For Heaven," and is being directed by Mauritz Stiller.

* * *

John Boyle, A. S. C., is photographing Mack Sennett's special feature, "The Romance of a Bathing Girl" and is directed by Alf Goulding. Johnny Burke, of vaudeville fame, is in the cast.

* * *

Joseph Brotherton, A. S. C., is shooting a Universal picture with Jack Daugherty under the title of "Haunted Island." Robert Hill is directing.

* * *

Edward Du Par, A. S. C., is chief cinematographer for the special Warner Brothers production, "The Jazz Singer." Alan Crosland is directing, with Al Jolson as the star. May McAvoy is featured.

* * *

Conrad Wells, A. S. C., is busily engaged shooting two Warner Brothers productions. The first is "A Sailor Sweetheart" with Louise Fazenda, and directed by Lloyd Bacon. The second production stars George Jessel in "Sailor Izzy Murphy," a sequel to "Private Izzy Murphy."

$$\text{The distance } E\,V_2 = \frac{r_2\, d}{n\,(r_0 + r_2 - d) + d}$$

$$\text{The distance } E\,E' = \frac{d\,(r_0 + r_2 - d)\,(n-1)}{n\,(r_0 + r_2 - d) + d}$$

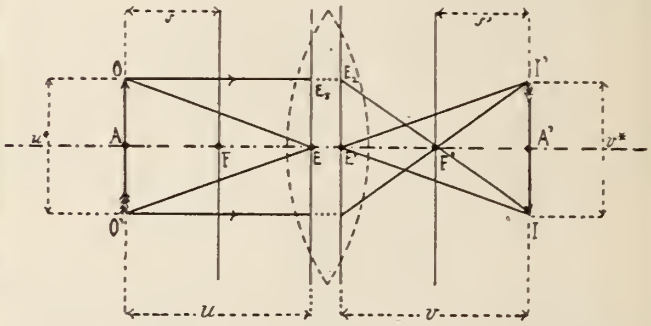
and the f value, or true Focal length, will be given by the formula,

$$f = \frac{n}{n-1}\left(\frac{r_0\, r_2}{n\,(r_0 + r_2 - d) + d}\right)$$

These formulae, are applicable to all lenses, but it must be borne in mind that the radii of curvature of convex surfaces are to be reckoned as POSITIVE, while those of concave surfaces must be reckoned as NEGATIVE.

IMAGE FORMATION

Let us consider now, a positive lens, characterized by its Gaussian points as in Fig. 24.



And let us place an object O O′ at a distance from the first Principal plane, equal to the double of the focal distance F E.

Taking the point O as a center of disturbance, we can consider a number of rays of light emited by it, which strike the first surface of the lens. Among these rays, let us select two: First, the ray that emanates from O parallel to the Axis and is incident to E_1 and secondly, the ray that joins the point O with the Principal point E.

According to the Gaussian theory, the ray O E_2 will emerge from the lens as if coming from the point E_2 of the Second principal plane, and cross the Axis at the Focal point F′.

The ray O E will emerge from the lens as if proceeding from the point E′, in a direction parallel to O E. The two refracted rays will then meet at the point I.

If the height E E_2 is sufficiently small (the angle E_2 F′ E′ should not exceed 6°), we will find that all rays emanated from O and incident to the first surface of the lens will, after refraction, meet at the point I which consequently is the conjugate of O.

An IMAGE of the point O will therefore be formed at I. This image can be collected on a screen placed at I or can be seen by the unaided eye if it is placed on the path of the rays emanated from I.

The same construction may be followed for the object point O′ and its conjugate will be found at I′ and similarly ALL POINTS of the object plane will have their conjugate in the Image plane, thus a perfect image of O O′ may be collected on a screen placed at I I′.

This image will be REAL and INVERTED as it is the case with an image formed by a pine-hole aperture (see April issue American Cinematographer), but with the great advantage that the pin-hole is replaced by a much greater aperture, which admits a greater number of rays for each point of the object, concurring to form its image, which in turn considerably increase the luminosity of the image itself.

Let us, now, designate the distances that can be seen in Fig. 24, by symbols, according to the convention of symbols and signs.

The distance A E, or distance from the object to the first principal point of the lens is always designated by the letter U.

The distance E′ A′, or distance of Image from second principal point, is always designated by the letter V.

The height of the object O O′ is designated by U^* and the height of the image by V^*.

The ratio of the size of the image to the size of the object, is equal to the ratio of the distance of image from the lens to the distance of the object from the lens, or

$$\frac{V^*}{U^*} = \frac{V}{U}$$

this ratio gives the magnification of the image, and is always designated by the letter M.

We thus obtain the formula:

$$M = \frac{V}{U}$$

In Fig. 24 in which the object is placed at a distance from the lens equal to the double of the focal length, the values U and V are equal and therefore their ratio $\frac{V}{U}$ equals 1 meaning that the image is of equal size as the object. In such a case, the object and image points A and A′ and the corresponding image planes are called symmetrical.

If the object is placed at a distance from E, greater than double the focal length of the lens the ratio $\frac{V}{U}$ is less than 1, meaning, in such a case, a MINIFICATION of the size of the image in respect to the size of the object, takes place.

tween the points A and F the ratio $\frac{V}{U}$ is greater than unity, meaning a MAGNIFICATION of the image in respect to the object.

If the object is placed exactly in the focal plane, NO IMAGE will be formed, because all rays emanated by the

object will, after refraction, emerge from the lens parallel to the Axis.

Finally if the object is placed between the focal point and the lens, only virtual conjugate foci will be formed see July issue of The American Cinematographer), and therefore a VIRTUAL image will be obtained, ERECT AND LARGER THAN THE OBJECT. This is the case of all common magnifying glasses.

From the foregoing, we can deduce that "FOR A GIVEN OBJECT DISTANCE THE IMAGE, DISTANCE AND THEREFORE THE M VALUE IS DETERMINED BY THE FOCAL LENGTH."

Thus:

$$\frac{1}{f} = \frac{1}{U} + \frac{1}{V}$$

and if we call S and S' (Fig. 24) the extra focal distances, or the distances from object to F and from Image to F′ respectively, we have

$$M = \frac{V}{U}$$

$$M = \frac{V\text{-}f}{f}$$

$$M = \frac{S'}{f}$$

$$M = \frac{f}{S}$$

(To be continued next month)

Enlarging Camera Shown

A new departure to enlarge greatly the field covered by the motion picture camera has been presented to the Acadmy of Sciences in Paris.

The device was invented by Henri Chretien, of the Institute of Optics. It would extend the field of the camera either horizontally or vertically. The same attachment is used on a projection machine for the showing of pictures. —The Exhibitor Trade Journal.

Alfred Gilks, A. S. C., is photographing Paramount's "Heaven Help the Working Girl," which features Esther Ralston and is directed by Eddie Sutherland.

King Gray, A. S. C., is at San Diego for location exteriors for a William Fox production.

SHOOTING STILLS IN THE SKY

(Continued from Page 12)

When photographing with a lens of 28 inch focal length below a height of 1607 feet, objects are indistinct and lack sharpness while the same holds true for a camera with a lens of 10 inch focal length below an altitude of 225 feet. Only from these heights and upward is it possible to obtain clear sharp pictures.

The shutter speed, therefore, has even from a stationary aeroplane (head wind) a certain lower limit. The vibrations of the motor are transmitted to the photographer and hence to the camera. They differ in different makes of aeroplanes and depend upon the construction of the motor and its position. They prevent the camera from absolute rest at the moment of exposure and the shutter must work with great speed to eliminate these vibrations, otherwise a distorted picture results.

Summarizing:—The aerial photographer should follow these rules:

BEFORE THE EXPOSURE — Make sure that everything is in working order. Take off objective cover and see that no oil droplets are on the lens, adjust diaphragm, put on the light filter tightly, wind up the shutter, drop first plate in plate holder, stop the barograph and make note of the altitude.

DURING FOCUSING—See that no part of the aeroplane comes into the picture (wires and wings).

ON EXPOSURE — Hold camera freely in your hands, do not rest the arms on parts of the aeroplane to avoid vibrations, release the shutter slowly and not impulsively as otherwise the camera may move.

Craze for Home Movies Growing

Opinions are varied over the effect which the public's craze for amateur picture-making will have on regular exhibition.

Some are of the opinion that this constant tinkering with motion picture-making will quicken the interest of the present theater-going public and attract new patrons to theaters.

Others state that the vogue will tend to keep theatergoers at home projecting their own pictures rather than attending shows. Both proponents and opponents of the movement, however, are in agreement that here is a situation which the exhibitor will have to contend with in the next three or four years and, probably, in less time than that.

Eastman Kodak has developed a library composed of dramatic features which have been reduced down from standard to narrow gauge. These pictures are designed for home projection and can be shown through the Kodascope, the Eastman projector sold either with or without the Cine Kodak, which equipment takes motion pictures. In New York there are several libraries wherein the public may either buy or lease various types of entertainment pictures.—Film Daily.

A NEW ERA IN LIGHTING

A special telegram to the "Film Daily" from Los Angeles recently carried this story:

"Engineers from the General Electric Company at Schenectady are in Los Angeles to confer with John Arnold, cameraman, and Lou Kolb, chief engineer at M-G-M, on the 'Arnold lights,' a new development of incandescent bulbs used in place of the old-time arcs.

"Arnold has used the incandescent lights in two productions."

Mr. Arnold is one of the charter members of the A. S. C. and has long experimented with incandescent lights for use on the set. His success is in line with the experience of other members of the A. S. C. who have for more than three years been researching on this subject.

One of the first authentic records of the use of incandescent lights preserved in the archives of the A. S. C. is contained in an article written by Victor Milner and published in "The American Ginematographer" of date, March, 1925, one excerpt from which follows. Writes Mr. Millner:

"When I arrived the lights were practically all set for the long shot. They were of the latest type B. E. actinic photographic equipment, similar to the ordinary 'Mazda' lamps used in the households since years ago. It was these lamps that eliminated our former enemy, excessive heat, for they gave a 'cold light' with never a suggestion of carbon dust or klieg eyes. Each lamp was equipped with dimmer arrangements. True, they were of terrific candle power, if measured by the standards of the first quarter of the twentieth century, but they were easily controlled by a single operator stationed near he camera. Breakage was impossible as the lamps were slung in a cradle-suspension contrivance. Gone were the cables which for endless years had made us walk as if we treaded on the proverbial eggs; gone were the spots with cracked condensers which had brought forth far too many oaths because they had given spots everywhere except desired."

Other members of the A. S. C. who have experimented with great success in the use of the incandescent globes are President Daniel B. Clark, George Barnes, Alfred Gilks, Arthur Edeson, Ned Van Buren and probably many others who have not yet reported. But enough has been done to establish the fact beyond question that the incandescent lamp has come to the studios to stay and a new era of lighting pictures is here at last.

The illuminating engineers have also turned their talents in this direction and are designing and building the incandescent lights for studio use.

Once more the cinematographer has scored as a pioneer. Once more on his own initiative he has discovered a better, cheaper, more efficient way to do the work in his department of cinema production—an improvement long needed and long hoped for.

In the September issue of "The American Cinematographer" this subject will be treated in detail by a symposium of experts and it will be one of the most interesting articles ever published in this magazine because of its almost revolutionary character.

This much may be said here, however—it is already certain that the new method of lighting will bring about a saving of not less than 25 to 75 per cent over the old, a tremendous item in the cost sheet of a picture.

Attention Members A. S. C.

Because of the unprecedented rush of work in connection with the admission and installation of new members it has been impossible to prepare a complete roster of membership of the A. S. C. in time for this, the August issue. The September issue will contain a list complete up to the date of going to press which will be before the fifteenth.

Announcement

The American Cinematographer begs the indulgence of its readers this month because of the delay in issuing the August edition, which was due to the insurmountable volume of extra work thrown upon the executive staff attendant upon the tremendous rush of applicants for membership. The amazing growth of the A. S. C., due to the recognition of its position as the logical head of the cinematographic department of the industry, will eventuate in a bigger and better AMERICAN CINEMATOGRAPHER, and henceforth, the magazine will be issued on time. Thank you.

Chemical Composition of Light Carbons in Therapeutics

(Continued from Page 7)

Threrapeutic F Carbon

The Therapeutic F Carbon contains tungsten. The spectrum of the somewhat bluish flame of these carbons consists of many lines thru the entire ultra violet region. The energy emitted by such arc seems in at least some cases to be similar to that from the D Carbons. They are demanded by some physicians who are using this type of carbon with some clinical success.

Therapeutic G Carbon

The Therapeutic G Carbon contains nickel. The light from these carbons has a slight greenish tinge. The spectrum consists of many lines through the visible and ultra violet similar in general nature to the B Carbons but the energy emitted is different. Some very strong lines at 2295 AU and a very strong band at 2900 AU to 3500 AU are the chief characteristics.

Therapeutic H Carbon

The Therapeutic H Carbon contains calcium fluoride. The light from this carbon is a mixture of red and green which gives the eye the impression that the light is yellow. The spectrum consists of broad bands in the red and green region which emits most of the energy. The rest of the spectrum is decidedly discontinuous. The violet percentage is comparatively small.

These carbons are good sources of visible and infra red energy combined with a small amount of ultra violet. They are being used by some physicians.

Therapeutic K Carbon

Therapeutic Carbon K is a carbon cored with cobalt. This carbon gives a spectrum with about as many lines in the ultra violet region as are found in the spectrum of B or G Carbons. They are found in different parts of the spectrum and their energy distribution is considerably different. In the light from these carbons considerable energy of wave lengths from 3100 to 3500 AU is found. The chief physiologically active part of this light is in the extreme short wave length region. A higher proportion of the ultra violet light is of wave lengths below 2500 AU than for any of the other carbons. It is therefore more nearly like the Kromeyer water cooled mercury arc than any other carbon arc so far developed. These very short ultra violet waves are quite destructive in their action. Probably this carbon should be used with all the precautions and only in types of cases similar to those found suitable for employing the water cooling mercury arc.

A recent distinguished visitor to the rooms of the A. S. C. was Mr. Otto B. Becker, cinematographer of U. F. A., the greatest of the European studios. Mr. Becker is already a Hollywood booster and an enthusiastic admirer of American motion pictures.

Use of 16 M. M. Film in Golf Instruction

(Continued from Page 8)

jector. To such players Morrison advises them to be photographed executing the varied exercises and strokes. Not only can the player thereby supply himself with a perfect diagnosis of his game, he can also compare this film with Morrison's, and thus eradicate his apparent mistakes.

It is Morrison's conviction that the 16 m.m. amateur motion picture outfits are a boon to all golfers. He has great faith in the camera for its clear, graphic, and truthful portrayal of golf, and deems it an invaluable aid to better golf.

CLASSIFIED ADVERTISING

RATES: *Four cents a word. Minimum charge one dollar per insertion.*

All copy must be prepaid and must reach us before the fifteenth of the month preceding publication.

CLASSIFIED ADVERTISING
AMERICAN CINEMATOGRAPHER,
1222 GUARANTY BUILDING,
HOLLYWOOD, CALIFORNIA.

WANTED—MOTION PICTURE CAMERAS

BELL & Howell, 170-degree camera. Complete. Will pay cash. Fred Kaifer, HEmpstead 4621, Hollywood.

AKELEY camera wanted. Must be cheap for cash. State condition of equipment and lowest cash price in your letter. Frank King, 36 Crestwood Ave., Buffalo, N. Y.

GOOD USED Motion Picture Camera. State make, condition, price, tion of equipment and lowest cash price in your letter. Frank Charlotte, N. C.

WILL PUT you in touch with buyers for Bell & Howell cameras and equipment. Phone or write the A. S. C., 1222 Guaranty Bldg. GRanite 4274, Hollywood, California.

BELL & HOWELL or Mitchell Camera outfit; Projection Printer; Cinex timer; Straight Line Processing Machine; Nutting Reflectometer; Polishing Machine; State price, Equipment. Fred Jeffery, Giles Street, Rose Park, South Australia.

WANTED—Used movie camera. Old model considered. State condition, make, price, etc. Albert R. Bly, Rosedale, Kansas. General delivery.

AKELEY CAMERA—Phone Perry Evans, DUnkirk 3890, or care A. S. C., 1222 Guaranty Bldg., Hollywood.

FOR SALE—CAMERAS

DEBRIE, aluminum box, dissolving shutter, 8 magazines, Mitchell tripod, 40, 50, 75 mm. Carl Zeiss lenses. Thalhammer iris. Veeder footage recorder, ¼-way mat box. Glen MacWilliams, c/o A. S. C., Hollywood.

PATHE CAMERA—(Enclosed magazine like DeBrie); 4 circular magazines; 1 metal tripod with tilt; 1 finder; 1 50 mm. Voigt lens. Box H, American Cinematographer.

LATE MODEL Bell & Howell Camera, 170-degree shutter, case and trunk; 4 magazines and carrying case; 4 lenses, 1 Iris outfit, tripod and finder. Address Box X, American Cinematographer.

WILART camera, latest model, complete with tripod and carrying cases and retort case and magazines. John L. Russel, 1643 North Gardner St., Hollywood. HEmpstead 9554.

BELL & HOWELL Eyemo, carrying case, four one hundred feet daylight loading Eastman negative, guaranteed perfect. First $225.00 gets it—cost $385.00. Cameron, Manhattan Beach, N. Y.

$75—Angeles 400-feet Carl Zeiss 3.5, case, tripod. Want 4 by 5 Graflex or f 1.9 to fit De Vry. 2590 Midlothian Dr., Altadena, Calif. Colorado 0342.

BELL & HOWELL Eyemo, brand new, B-1702, with carrying case and five spools, $225.00, C. O. D. Guaranteed. Roscoe Wright, 2223 Clifton Ave., Cincinnati, O.

FOR RENT—CAMERAS

BELL & HOWELL, 170 degree, complete. Modern equipment. Fred Kaifer, HEmpstead 4621.

THREE Bell & Howell 170-degree cameras. Complete equipment. Eddie Linden, 6017 Eleanor Ave., Hollywood, HEmpstead 8333. or Hollywood 7716.

FOR RENT—Bell & Howell studio equipment complete. 170-Degree Shutter. Liberal commission to cameramen. Call Mr. Smith. MEtropolitan 4686. Evenings call MAin 0947. (Los Angeles.)

NEW Eyemo camera, fully equipped; rent by day or longer. Joe La Shelle, 9038 Dorrington Ave., Hollywood; Phone OXford 5840.

AKELEY, Bell & Howell and Mitchell Cameras for rent, all latest equipment. Phone GRanite 2213 or GRanite 1914. John W. Boyle, 1207 North Milton Ave., Hollywood.

BELL & HOWELL. Victor Milner, 2221 Observatory Ave., Los Angeles, California. 596-944.

MITCHELL and Bell & Howard Cameras. F.2:3, F.2:7, F.3:5 lenses—40-50-75 mm. Complete equipment. J. R. Lockwood, 523 North Orange St., Glendale, California. Glendale 3361-W, or HOlly 0764.

E. BURTON STEENE, Bell & Howell, and Akeley. Complete Camera equipment. Latest models. Address American Society of Cinematographers, Hollywood, California.

BELL & HOWELL, 170, with 30, 40, 50 and 75 lens equipment. Baby tripod. Also B. & H. Cine motor. Charles Stumar. GRanite 9845. 7501 Lexington Ave., Hollywood.

FOR RENT—One Eyemo camera, complete with all accessories. Bert Glennon, 6936 Woodrow Wilson Dr., Hollywood, Calif. Phone HEmpstead 2743.

BELL & HOWELL No. 627. Five lenses: 32, 40 (f.2.7), 50 (f.2.7), 75, 100 mm. Complete studio equipment; gauzes, filters, etc. GLadstone 0033.

TWO Bell & Howells. Large finders. Also Eyemo for rent. Lenses: F 2.5; 2.3; 2.7. Frank M. Cotner, 6273 Selma Ave., Hollywood. HOllywood 5046.

SPEED CAMERA: Bell & Howell, fully equipped for miniature and slow motion work 40, 50, 75 mm. and 6-inch lenses. Alvin V. Knechtel, 1179 North Kenmore. 597-054.

BELL & HOWELL cameras, Akeleys and other makes—portable lights, special lenses by the day, week or month. We sell everything that any cameraman might ever need—new or used—at a big saving. Keep us in touch with your wants. Ruby Camera Exchange, Ruby Building, 727 Seventh Ave., N. Y. Bryant 0631 or 8457.

BELL & HOWELL—Phone Perry Evans, DUnkirk 3890 or Hollywood A. S. C.

FOR TRADE—CAMERAS

Will trade practically new Model K.5 late model Eastman Aero Camera, complete with venturi tube and anti-vibration suspension mount (Gimbal) for good second-hand Mitchell or Bell & Howell camera. Cecil M. Thomson, 510½ Travis St., Houston, Texas.

TWO 170 shutter Bell & Howell cameras, fully equipped. One with super-speed attachment. ORegon 3726, 407 N. Milton Ave., Hollywood.

FOR RENT—AIRPLANES

AIRPLANES equipped to carry cameras, facilitating the photographing of stunts or other unusual action, for rent by the hour, day or week. Jerry Phillips, Professional Pilot, Clover Field, Santa Monica, California.

FOR RENT—STILL CAMERAS

WILL RENT still camera to local parties. Special arrangements to A. S. C. members. Geo. Meehan, Phone GRanite 3830, 744 Curson Ave., Hollywood, California.

FOR RENT—One 4x5 Graflex Camera and one 4x5 Grafic. Bert Glennon. Phone HEmpstead 2743.

FOR SALE—LENSES

ONE three-inch Dahlmeyer F.1:9; mounted for Mitchell; one two-inch Bausch & Lomb F.2:7; one Dahlmeyer Pentac 37 mm. F.2:9. Georges Benoit, 3306 North Knoll Drive, North Hollywood.

CARL ZEISS, F. 2.7, 50 mm. in Bell & Howell mount. Dan Clark, care American Society of Cinematographers.

NEW 40 mm. Goerz Hypar f. 3. 5. lens in Bell & Powell mount; price, $50.00. Write Charles Clarke, 1222 Guaranty Building, Hollywood, California.

RUO LENSES—Sole U. S. Agent. Robert Ackerschott, 1575 N. Vine St., Hollywood. 25 mm. to 100 mm.; F. 2. and F. 2.5 (Latest type: Telephoto, 10-inch, F. 4.5).

CARL ZEISS, 50 mm., F. 3.5, in Bell & Howell mount, $50; without turret mount sleeve, $41.50. Write Gaylord A. Wood, 1821¾ N. Wilcox Ave., Hollywood, Calif.

WANTED—PROJECTOR

USED SIMPLEX wanted. State model, price, condition, etc. Address Box R, American Cinematographer.

WANTED—MISCELLANEOUS

WANTED—Photographs of nature, birds and animals, etc.; for educational library. E. R. Gammage, Animated Film Library, Westlake, La.

FOR SALE—SPECIAL CAMERA EQUIPMENT

COMPLETE new style Bell & Howell matt box for sale. Joseph B. Walker, 1037 N. Sycamore Ave., Hollywood. Phone GLadstone 3797.

PATHE panorama head for professional camera, with detachable aluminum tilting head, easily adapted to any standard tripod. A first-class unit for some one, who is experimenting or engaged in research work, to add to their equipment. Stephen S. Norton, care A. S. C., Guaranty Bldg., Hollywood.

HOW TO LOCATE MEMBERS OF THE

American Society of Cinematographers

Telephone GRanite 4274

OFFICERS

Daniel B. Clark	*President*
John W. Boyle	*First Vice President*
Victor Milner	*Second Vice President*
Frank B. Good	*Third Vice President*
George Schneiderman	*Treasurer*
Charles G. Clarke	*Secretary*

BOARD OF GOVERNORS

Victor Milner	Alfred Gilks	Fred W. Jackman
Daniel B. Clark	Charles G. Clarke	Georges Benoit
George Schneiderman	John W. Boyle	E. Burton Steene
L. Guy Wilky	John F. Seitz	Ira H. Morgan
Frank B. Good	King D. Gray	Floyd Jackman

Abel, David—with De Mille.
Arnold, John—with Metro-Goldwyn-Mayer Studios.

Barnes, George S.—with Samuel Goldwyn Prod.
Beckway, Wm.—
Benoit, Georges—
Boyle, John W.—with Mack Sennett Studios.
Broening, H. Lyman—
Brotherton, Joseph—with Universal.

Clark, Dan—with Tom Mix, Fox Studios.
Clarke, Chas. G.—Fox Studios.
Cowling, Herford T.—with Eastman Kodak Co., Rochester, N. Y.
Cotner, Frank M.—
Crockett, Ernest—
Cronjager, Henry—

Davis, Chas. J.—with Warner Bros., "Vitaphone," New York City.
Doran, Robert V.—Harold Lloyd.
Dored, John—with Paramount News, Riga, Latvia.
Du Par, E. B.—with Warner Bros.
DuPont, Max B.—
Dubray, Joseph A.—

Edeson, Arthur—with First National, Burbank.
Evans, Perry—

Fildew, Wm.—
Fischbeck, Harry A.—with Famous Players-Lasky.
Fisher, Ross G.—with First National, Burbank.
Fried, Abe—with Warner Bros.

Gaudio, Gaetano—with Douglas Fairbanks, United Artists.
Gilks, Alfred—with Famous Players-Lasky.
Good, Frank B.—De Mille.
Gray, King D.—with Fox Studios.
Griffin, Walter L.—with David Hartford Productions.
Guissart, Rene—Paris, France.

Haller, Ernest—with Robert Kane Productions, New York City.
Heimerl, Alois G.—

Jackman, Floyd—
Jackman, Fred W.—directing Fred W. Jackman Productions.
Jackson, Harry—with Corinne Griffith Prod., United Artists.
Jennings, J. D.—with Buster Keaton.

Knechtel, Alvin V.—with First National, Burbank.
Koenekamp, Hans F.—Larry Semon.
Kurrle, Robert—with Edwin Carewe.

Lockwood, J. R.—
Lundin, Walter—with Harold Lloyd Productions, Metropolitan Studios.
Lyons, Reginald—with Fox Studios.

McCord, T. D.—
McGill, Barney—
MacWilliams, Glen—with Fox Studios.
Meehan, George—with Fox Studios.
Milner, Victor—with Famous Players-Lasky.
Morgan, Ira H.—with Metro-Goldwyn-Mayer Studios.
Musuraca, Nicholas—with F.B.O. Studio.

Norton, Stephen S.—

O'Connell, L. Wm.—with Fox Studios.

Palmer, Ernest S.—with Fox Studios.
Parrish, Fred A.—Colorado Springs, Colo.
Perry, Harry—with Famous Players-Lasky.
Perry, Paul P.—with Famous Players-Lasky.
Polito, Sol—with First National.

Ries, Park J.—
Roos, Len H.—Sydney, Australia.
Rose, Jackson J.—with Universal.
Rosher, Charles—with Mary Pickford, United Artists Studio.

Schneiderman, George—with Fox Studios.
Scott, Homer A.—
Seitz, John F.—with Metro-Goldwyn-Mayer Studios.
Sharp, Henry—with Metro-Goldwyn-Mayer Studios.
Snyder, Edward V.—with Pathe, Metropolitan Studio.
Steene, E. Burton—with Famous Players-Lasky.
Stumar, Chas.—with Universal.

Tolhurst, Louis H.—producing microscopic pictures, for Pathe.

Van Buren, Ned—with Eastman Kodak Co., Hollywood.
Van Enger, Charles—with First National, Burbank.
Van Trees, James C.—with First National, Burbank.

Warrenton, Gilbert—with Universal.
Wenstrom, Harold—
Whitman, Philip H.—Directing with Mack Sennett Studios.
Wilky, L. Guy—Fox Studios.

Zucker, Frank C.—Robt. Kane Prod., Cosmopolitan Studios, New York City.

Eastman George—Honorary Member.
Edison, Thomas A.—Honorary Member.
Webb, Arthur C.—Attorney

Meetings of the American Society of Cinematographers are held as called on Monday evenings in the A. S. C. assembly rooms—
1219-20-21-22 GUARANTY BUILDING
Hollywood Boulevard and Ivar Avenue
HOLLYWOOD, CALIFORNIA

LOYALTY PROGRESS ART

EDWARD R. HALPERIN VICTOR HUGO HALPERIN

HALPERIN PRODUCTIONS

HOLLYWOOD STUDIOS
6642 Santa Monica Boulevard
HOLLYWOOD, CAL.
Hollywood 1431

17 November 23.

Mr. Alvin Wyckoff,
1577 Gower St.,
Hollywood, Calif.

My dear Mr. Wyckoff:

I'm writing to thank you most heartily for the splendid artistry you displayed in SOUVENIR.

Agnes Ayres, Percy Marmont, George Siegmann, Kathlyn Williams, Robert McKim, and Mary Alden were all highly enthused over the way you photographed them. You complimented me, as the author of this opus, by accurately depicting the delicate moods, the fine shadings and the startling effects for which we strove.

You saved us, the producers, a lot of money. Out of that magic box of yours came scenes which otherwise might have been lost because of fast-ebbing daylight; you worked fast on the set and never once were we held up for a moment on account of "lights" or cameraman's temperament.

Our release tells us your name counts with the exhibitor - so we certainly are going to number you among the "featured players".

Every time Halperin Productions has a story to tell to the movie-going public be assured we're going to ask you to help in its translation to the screen!

With all best wishes, I am,

Cordially yours,

Victor Hugo Halperin

HALPERIN PRODUCTIONS.

VHH/L

Victor Hugo Halperin's
SOUVENIR
with an
All Star Cast

Victor Hugo Halperin's
TEA—WITH A KICK
with a
27 Star Cast

including

12 Famous Comedians:
Louise Fazenda
Dot Farley
Snitz Edwards
Harry Todd
Billy Franey
Gale Henry
Chester Conklin
Hank Mann
Spike Rankin
Earl Montgomery
Tiny Ward
Victor Potel

5 Leading Ladies:
Doris May
Irene D'Annelle
ZaSu Pitts
Rosemary Theby
Dale Fuller

10 Dramatic Celebrities:
Ralph Lewis
Julanne Johnston
Creighton Hale
Stuart Holmes
Harry Lorraine
Edward Jobson
William Dyer
Hazel Keener
William DuVaull
Sidney D'Albrook

10 Prize-Winning Beauties

100 Hollywood Heartbreakers

2000 Supporting Cast

Victor Hugo Halperin's
THE DANGER POINT
with an
All Star Cast

Mr H. F. Boeger, President.

The Mitchell Camera Corporation.
6025 Santa Monica Blvd.
Los Angeles, Calif,.

My dear Sir,

It might interest you to know that I used my entire Standard Mitchell Equipment to photograph "Souvenir".

The time saving features of the Mitchell Camera enabled me to work with top speed and accuracy constantly. It is indeed a wonderful instrument.

Sincerely

Alvin Wyckoff.

Alvin Wyckoff

Vol. VIII. No. 6.
25 Cents a Copy

September, 1927

U. S. Postage
2c Paid
Los Angeles, Calif.
Permit No. 941

American Cinematographer

Published in
Hollywood, California

By American Society
of Cinematographers

Sunset on Great Salt Lake. Reproduced from Location Library of American Society of Cinematographers, Hollywood. Photographed by C. Curtis Fetters.

THIS MONTH:

An Epoch Marking Meeting of Cinematographers; Amateur Cinematography: A Professional's Notes for Amateurs—By Joseph Dubray; "The Stills Move the Movies"; Kamera Komics; Questions and Answers

Vol. VIII SEPTEMBER, 1927 No. 6

American Cinematographer

SILAS EDGAR SNYDER
Editor and General Manager

JOSEPH DUBRAY
Technical Editor

Table of Contents

An educational and instructive publication, espousing progress and art in motion picture photography.

Subscription: United States, $3.00 a year; Canada, $3.50 a year; foreign, $4.00 a year; single copies, 25c.

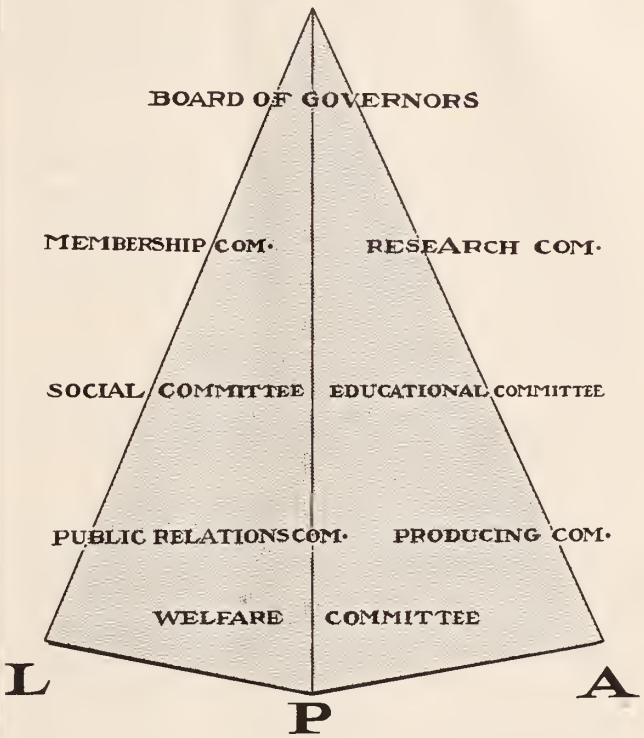
Published monthly by
THE AMERICAN SOCIETY OF CINEMATOGRAPHERS, INC.

Advertising rates on application.

1219-20-21-22 Guaranty Building, Hollywood, Calif.

Telephone GRanite 4274.

A·S·C
THE PYRAMID OF PROGRESS



COMMITTEES

RESEARCH COMMITTEE—Victor Milner, Chairman; Joseph Dubray, Percy Hilburn, George Barnes, Eastman Kodak Laboratories, John Seitz, George Meehan, Ned Van Buren, Gilbert Warrenton, Thomas A. Edison.

WELFARE COMMITTEE—Charles G. Clarke, Chairman; Gaetano Gaudio, Arthur Edeson, John Arnold, Charles Rosher, Karl Struss.

EDUCATIONAL COMMITTEE — Frank Good, Chairman; Alfred Gilks, Floyd Jackman, L. Guy Wilky, E. Burton Steene, King Gray, Entire Membership.

PRODUCTION COMMITTEE—Fred Jackman, Chairman; Homer Scott, James Van Trees, Gaetano Gaudio.

PUBLIC RELATIONS—John W. Boyle, Chairman; Arthur Edeson, Georges Benoit, Gilbert Warrenton, Arthur Webb, Glen MacWilliams, Herford T. Cowling, John Seitz, George Eastman, Rochester, N. Y.

SOCIAL—To be named.

MEMBERSHIP—To be named.

What The Movies Have Accomplished

In that little book, "Can Anything Good Come Out of Hollywood," which went to bat for Hollywood and the motion picture industry at a time when everybody seemed to be taking a left handed wallop at them, the following tribute was paid to the cinema. It is still the best thing ever written about the pictures and should be preserved in bronze:

Before the advent of the motion picture the world was rather slow. The common people, especially the people in the smaller towns and in the country had little in the way of amusement. A limited number in the larger cities who had the price and a developed taste for the theater had opportunity to see all that was worth while in drama, vaudeville and opera, and, occasionally, the smaller communities saw a road show headed by some celebrity, the road show being usually a mere shadow of the New York production.

The country towns caught the "ten-twent-thirt" shows, the patent medicine companies, the fakers, the carnivals and the one-ring circuses. It was darkest Africa for ninety per cent of the good people so far as amusements went, and so it still would be but for the coming of the motion picture. * * *

The moving picture has lengthened the lives of the old by giving them a new interest in life. The neighborhood theater, easy of access from the home, is a blessing to the old people. It puts them in touch with the world and renews their youth.

It helps the parents to keep up-to-date with the kiddies and keeps the family together in the evening. Boys and girls are not in mischief when at the picture show. If a picture be objectionable parents should keep the kiddies away from it.

It has made a tour of the world possible by staying at them acquainted so that the peoples of the world for the first time understand each others needs. This is the greatest influence for world wide peace.

It has made atour of the world possible by staying at home. The film takes the fan everywhere and broadens his mind and makes him a better citizen.

It shows us how things are made and gives us an understanding of the tremendous cleverness of man. This stimulates interest in arts and crafts. People who habitually see pictures are better informed than people who taboo them.

For a long time the church looked upon the film as a devil, but it has been found to be a great medium for good and now the churches are installing projection machines so rapidly that theater managers have taken alarm. The film is used to illustrate sermons, in Sunday school work, in the missions, in propaganda, in entertainments and to earn money with.

In educational work its usefulness has no limit. It is in all large schools, colleges and universities and has been found so much superior to the text book that educators look for it to revolutionize educational methods. Its use tends to quicken instruction and, therefore, to shorten the school and college terms and this brings girls and boys into the channels of production at an earlier age, the grand result being to lighten the economic burden of the world and greatly lessen poverty. Thomas A. Edison said recently that he could teach children more history in fifteen minutes with a film than they could learn in two weeks from a text book.

It has vastly aided the healing science by spreading broadcast the knowledge of hygiene and sanitation and is doing a great work of instruction in surgery and the care of the sick and insane.

It helped win the World War by arousing patriotic sentiment and it was one of the most powerful factors in selling Liberty Bonds and in putting over the various drives for relief funds.

The motion picture theater is the theater of the common people and was the first form of high class entertainment in reach of the great public. It took the greatest stars in the world into the small towns and put them in reach of all. Without the pictures they would never have been seen by the great majority of the people.

It has developed a wealth of dramatic talent that would never have reached the stage and it has been a God send to hundreds of clever player-folk who had been thrown into the scrap heap by the stage because of advancing years.

It has encouraged and vivified all the arts.

It has taken the fine old stage plays—long on the shelf—that otherwise always would have been lost to the masses and sent them into all the world at prices the people could pay.

It has stimulated the drama, painting, sculpture, music, literature, poetry, dancing, by demanding all of these in its productions and by employing the greatest masters in all arts in the production of films and in the theaters.

It has inculcated a taste for good music among the people and is rapidly destroying jazz because the people for the first time in their lives are given the best music at prices they can pay.

It has stimulated every trade and especially the building trades and the liberal arts. Almost everything imaginable from fine art to a biscuit; from an elephant to a mouse; from a city to a doll's house, is used in making pictures and the men and women employed in the arts and crafts that produce these things are used along with them.

It has created many new professions as directors, art directors, technical directors, scenarioists, cinematographers, cutters, editors, etc., etc.

It has enriched authors by utilizing their old works and demanding their new ones.

It employs a vast army of men and women in its manifold activities of production, distribution and exhibition and in the arts and crafts that feed it.

It has touched the whole wide world and its touch has been to bless. And these are only a few of the good things the films have done.

EDITORIAL—THE VOICE OF THE A. S. C.

¶ A new era in the history of cinematography burgeoned into bloom on the night of September 6th, in the auditorium of the Hollywood Chamber of Commerce, when one hundred and fifty candidates took the obligation of the A. S. C. and became full-fledged members of the greatest organization of cinematographers in the world. It was the largest gathering of camera operatives in the history of the camera and undoubtedly the most important event in the annals of the photographic department of the industry, for it marked the time of amalgamation of all the cinematographic forces into one harmonious and progressive body, all dedicated to the proposition that motion pictures constitute the greatest civilizing power on earth and that the men of the camera are the exponents of this power. Now, at last, the *Cameramasters* of the industry present an unbroken front in the cinema's march of progress and the new era is hailed as the apotheosis of the camera. The pen and the sword are mighty, but the camera is the winged emblem of world peace, and in this sign do the cinematographers have faith that they will conquer. *"Camera suprema est"* might well be their slogan.

¶ President Daniel Clark of the A. S. C. announces the appointment of Silas E. Snyder as editor and general manager of THE AMERICAN CINEMATOGRAPHER, to succeed Mr. Foster Goss, resigned. Mr. Snyder needs no introduction either to our readers or to members of the A. S. C., as he created THE AMERICAN CINEMATOGRAPHER in its magazine form, was for two years its editor and, after several years' activity in motion picture publicity, is just getting back to the "old home". The A. S. C. bespeakes for Mr. Snyder the cordial support of its membership and the readers and advertisers of our magazine.

¶ THE CINEMATOGRAPHER regrets to announce the retirement of Mr. Foster Goss who, for six years, has been editor and general manager. During his incumbency Mr. Goss was a constructive worker in his field, and his success in building up THE CINEMATOGRAPHER will long be remembered with gratitude by the A. S. C., whose good will follows him and his in any pursuit he may choose. THE CINEMATOGRAPHER takes this occasion to thank the retiring editor for his efficient and intelligent administration.

¶ THE CINEMATOGRAPHER is happy to announce the addition to its editorial staff of Mr. Joseph Dubray, A. S. C., who, beginning with this, the September issue, will have supervision of the technical features of our publication. Our many technical readers will be glad to know this, as it insures absolute correctness in technical details. Mr. Dubray needs no introduction to the photographic world of two continents, as he has had long experience in the laboratories and studios of Europe as well as in the United States. He was formerly representative of Pathe Freres in America and has always held a prominent place in the photographic department of the cinema. He was a soldier of France and is a veteran of the A. S. C., which is proud to own him as a member. Mr. Dubray is a linguist and a writer of note in several languages.

CONSTITUTION WEEK

¶ The Constitution Anniversary Association is a national organization with headquarters in Chicago, Illinois.

¶ The object of the Association as set forth in the Articles of Incorporation is as follows:

¶ "To engage in such activities as will tend to bring about a better understanding of the Constitution of the United States;

¶ "To further a widespread observance of the anniversary of its completion;

¶ "To urge a study of the discussions which resulted in its adoption, interpretation and administration;

¶ To encourage an adequate appreciation of its importance as an aid to the solution of present-day problems."

¶ This is the fifth year of our service in urging a worthy observance of the week of September 17, which has come to be known as Constitution Week, and which in 1927 will be September 11-17.

¶ The A. S. C. is in hearty accord with this movement, and enjoins upon its members a study of the Constitution and observance of Constitution Week.

A NEW MILESTONE IN THE EVOLUTION OF THE A. S. C.

The greatest assemblage of cinematographers in the world's history of cinematography was that which gathered in the auditorium of the Hollywood Chamber of Commerce on the night of September 6, 1927, when 130 candidates were initiated into membership of the American Society of Cinematographers, the parent organization of the motion picture photographers of America.

A formal dinner was tendered the new members by the A. S. C., presided over by Daniel B. Clark, President of this Society, who, in his speech of welcome to the incoming members, sounded the keynote of co-operation and economy, through loyalty, progress and art, the three cardinal qualifications stressed in the slogan of the organization.

Before the program of the evening was opened President Clark called upon the assemblage to stand in silence in memory of the late Marcus Loew, who the society, in resolutions, declared to have been one of the greatest factors in the upbuilding of the cinema.

After dinner the obligation was administered the new and old members and the former were instructed in the ritual of the A. S. C. by the three Vice-Presidents, John Boyle, Victor Milner and Frank B. Good, speaking respectively on Loyalty, Progress and Art.

Mr. Boyle dwelt upon the Society's long career of loyalty to the industry and told of the harmonious relations between members and how loyalty had led to the great success of the A. S. C. in its long struggle to achieve its present exalted place in the world of motion pictures. He said in part:

"It is my privilege to speak to you tonight on the subject of 'Loyalty,' the first word of our motto, *Loyalty, Progress and Art.* And what is Loyalty? The dictionary defines it as 'A quality or state of being constant and faithful in any relation implying trust and confidence; the bearing of true allegiance to constituted authority or the devoted allegiance or service to a friend or cause,' while Webster says that it is sentiment accompanying a sense of allegiance. Since both these have a large sale, we'll say they're right.

"To us, fellow craftsmen, Loyalty means all of these things—and more. From early childhood we are taught loyalty to our God, our country, our family, our friends, and when we enter the business field we learn a new form of loyalty—that which binds together many as one, because of their unity of purpose, their high ideals, their desire to do bigger and better things in their particular art.

"It is not given to all of us the opportunity to carry out our own personal aims, but each man can do his bit to raise the standard of his own work and thereby improve the profession itself.

"As Henry Ward Beecher said: 'All higher motives, ideals, conceptions and sentiments in a man are of no account if they do not come forward to strengthen him for the better discharge of his duties which devolve upon him in the ordinary affairs of life.'

"In the picture business nothing is easier than fault-finding, and the next time we catch ourselves at it let's try and remember that it takes no talent, no self-denial, no brains and no character to set up in the grumbling business, and, since we long ago committed the Golden Rule to memory, let us now apply it to life. Let us not by word or deed seek, in the presence of others, to belittle or deride a fellow member or his work, which may have been due to circumstances beyond his control. Let us be generous in our praise and encouragement and ever ready to help one another, as it is 'much easier to be critical than to be correct.' Co-operation is not a sentiment, but an economic necessity. Charles Dickens never said a truer thing than when he said: 'It is well for a man to respect his own vocation, whatever it is, and to think himself bound to uphold it and to claim for it the respect it deserves.'

"In our work loyalty is synonomous with conscientiousness. The ability to concentrate on the work at hand, completing each detail with thoroughness, is a trait to be acquired by all of us (if we would win success), from those starting out to those who have already reached the top. Every one of us can look back and recall individuals whose success has been largely due to loyalty, not only to their superiors but loyalty to their work and to themselves.

"The longer I live the more deeply I am convinced that what makes the difference between the weak and the powerful, the great and the insignificant, is energy, invincible determination, a purpose once formed, then Death or Victory.

"Loyalty, then, means success, and the straightest road to success is Merit. Don't forget that. You may bluff your way along for years, or you may have a million-dollar 'drag,' but in the end you'll find that unless you possess merit you'll be given what every service station gives away free—the air.

"Success, as we all know, means money. It is good to have money. Sort of gives a fellow a snug and comfortable feeling to know that his check for five dollars won't be returned marked N. S. F., but, at the same time, it is a good thing to check up once in a while and make sure we have not lost the things money *cannot* buy. So, don't part with your ideals, for when they are gone *you* may still exist, but you have ceased to live. As Polonius said to his son, Laertes, who was about to take a long journey:

> " 'This, above all, to thine own self be true,
> and it must follow, as the night the day, thou
> can'st not then be false to any man.' "

Mr. Milner was equally eloquent in his talk upon progress, sketching in terse, vigorous sentences the evolu-

(Continued on Page 16)

"THE STILLS MOVE THE MOVIES"

By Joseph Stillman

"THE STILLS MOVE THE MOVIES." This is the paradox a clever film salesman served the writer a few days ago.

And it is true. The stills move the movies on the market. Either in the salesman's kit, as advance information to distributor and exhibitor, in the newspaper and magazine or presented to the public in the form of lobby displays, they assuredly MOVE THE MOVIES.

This axiom once established THE "AMERICAN CINEMATOGRAPHER" decided to inaugurate in this issue a STILL PICTURES DEPARTMENT, the main object of which is to bring forth a closer co-operation between all branches of our industry in this matter of vital importance.

Mr. Producer, Mr. Publicity Director, Mr. Distributor, Mr. Film Salesman, Mr. Exhibitor and finally Mr. PUBLIC—you are all invited, nay, you are all urged to express your opinions, your wants, your criticisms, your praise, your suggestions to the Still Photographer through the medium of "THE AMERICAN CINEMATOGRAPHER."

The "AMERICAN SOCIETY OF CINEMATOGRAPHERS," the sponsor of this publication, has opened its doors to the Still Photographer engaged in the motion picture industry. No better proof could be given of the importance attached to this branch of the industry by the cinematographer himself. No better guarantee could be given, that Still Photography, will progress with the same gigantic strides, that Cinematography has been made to progress ever since it's first appearance. ....

It is the aim of "THE AMERICAN CINEMATOGRAPHER" to keep this department ALIVE; to investigate and discuss all matters pertaining to it, the artistic, the technical, the comercial points of view, in a manner that will lead to constructive open discussion and be an incentive to progress.

One of the greatest assets, perhaps the greatest, in a pictorial expression, is *good composition.*

As the main scope of a picture is to tell a story, the different elements of a picture must be arranged, composed in such a manner that not only are they pleasing to the eye, but also that they hold the interest of the observer, emphasize the salient points of the subject, force the eye to *read* the story as a normal succession of events and stimulate the imagination to a truthful elaboration of the story itself.

Still photography as applied at present to motion pictures has not at it's disposal the great asset of *colour,* hence *composition* must be attained by the still photographer through a judicious disposition of *lines* and of *lights and shades.*

It has been the privilege of the writer to have at his disposal the interesting set of still pictures that have been made for the C. B. De Mille production, *"The King of Kings."* Among the maze of truly beautiful stills the writer had no other choice but to close his eyes and, through the eenie, meenie, minie, mo prank let Fate decide which of these stills he should bring forth for an analysis on composition.

In the picture, "The Last Supper," Mr. Wm. Thomas has started his composition with the vertical line of the Savior, and has used as second principal line the horizontal given by the table and the highlights on the faces of the disciples.

These two lines form a cross which we would like to

"The Last Supper"

see more complete in its vertical arm in the dark gap under the table between the two disciples seated in the foreground.

The opposition of these two lines enhances the strength of the central figure while the eliptical form, perfectly discernable in conjunction with the horizontal, brings about the impression of unity and continuity so difficult to obtain in a group composed of numerous figures.

The stability of the composition is given by the triangular or pyramidal construction, having the head of the Savior as apex, the line of His right arm extended by the folds of the sleeve of the Disciple, the top of the stool on one side, and the head of Judas seated at the left of the Christ, followed by the outstretched leg of one of the Disciples in the right lower corner of the picture, forming the other side.

The curved archway frames in most of the group, greatly helping the circular sweep of the eye and keeping it concentrated upon the subject without means of escape.

The dangerous tendency of the line of vision to make an exit from the picture is manifest at the left side of the picture.

The eye starts at the focus of the picture, the head of the Christ, and is immediately attracted to travel from left to right, to the strong heads of the three Disciples at the left. From there it follows the circular sweep towards the left, through the white shirt of the Disciple at the right, the horizontal of the bench, the top of the stool, the knee of the Disciple at the left, the hand resting on the thigh, the forearm, and would from there be led astray out of the picture, were it not for the happy intervention of the vertical line of the drape at the extreme left, which checks this tendency and brings the eye back into the picture to the face of the Disciple and from there follows its natural course up to the starting point, the head of the Savior.

The verticals given by the highlights on the walls at the left and right of the picture will help to keep the

(Continued on Page 18)

First Aid Saves Life and Treasure

On Sunday, August 28th, at the home of Tom Mix, Fox western star, in Beverly Hills, a demonstration in first aid was staged by a team of experts from the personnel of the Southern California Telephone Company of Los Angeles.

The demonstration was arranged by Daniel Clark, president of the A. S. C., and for many years chief cinematographer for the Tom Mix unit, Mr. Clark being the pioneer among motion picture operatives in a movement looking to the general adoption of first aid in the industry.

Dan Clark, A. S. C., demonstrates first aid for drowning with Tom Mix as the subject

The proper way to rescue a drowning person is demonstrated in Tom Mix's swimming pool

That the time has come for such a movement is not denied and it is not too much to hope that within the near future every operative in motion pictures will have received instruction in first aid and be able to apply it practically and efficiently in time of emergency.

Of course the first consideration in the adoption of first aid is humanitarian, but of second and very great importance, also, is that of economy, of which subject much is heard in these days.

Mr. Clark cites a case where a company on remote location and carrying a twenty-four hour overhead of several thousand dollars added many thousands to the negative cost because of an accident which might have been saved from fatality by prompt and efficient application of first aid. As it was a life was lost, and days wasted waiting for another player to take the place of the deceased and in scores of retakes necessary to be made.

The demonstration at the home of Mr. Mix was arranged because of the western star's personal interest in the subject, he, himself being an expert as a result of his war training overseas.

While this particular demonstration was put on for the benefit of only a limited number of motion picture operatives it attracted hundreds who eagerly appropriated the instruction which included first aid methods in the treatment of deep cuts, fractures, shock, drowning, asphyxiation, etc., etc.

Mr. Clark is especially anxious that the camera crews become expert in first aid as the camera is at all times near the theater of action and therefore in a strategic position to be the first to administer treatment.

Once more, therefore, does the cameraman prove himself a pioneer in motion picture progress toward the ideal in co-operation and efficiency.

William Williams, A. S. C., is photographing Billy Evans at the Mack Sennett Studio.

* * *

Paul Allen, A. S. C., is in charge of the photography for Sierra Pictures' "Baby and the Savages."

* * *

Harry Forbes, A. S. C., is shooting the latest Newlyweds comedy at the Stern Brothers Studio.

Vernon Walker, A. S. C., is shooting the latest Smith family comedy at the Mack Sennett Studio. Phil Whitman, also an A. S. C. member and recently assigned to directorial work, is the director. Raymond McKee and Ruth Hiatt are featured.

* * *

George Barnes, A. S. C., continues photographing the Samuel Goldwyn production, "The Devil Dancer," in which Gilda Grey and Clive Brook are starred.

In Camerafornia . . .

and News Notes of the Month

John P. Whalen, A. S. C., is chief cinematographer on "White Flames" now in the course of production at the new Monrovia Studios. Joseph La Shelle is at the second camera. Following the new vogue in studio lighting only incandescent lamps are being used. The production is being directed by Victor Adamson and the cast includes George O'Hara, William V. Mong, Jack Mower, Eileen Sedgwick and Frances Raymond.

* * *

Frank B. Good, A. S. C., after having recently finished a production for the Cecil B. DeMille Studios, is now busily engaged in photographing a William Fox production.

* * *

Nick Musuraca, A. S. C., has recently returned from Keene Camp in the San Jacinto mountains, where he was on location with the Tom Tyler unit of the F. B. O. Studios. James Dugan directed Tyler and Frankie Darro was also co-starred. Musuraca has been assigned the camera work on "Red Coats of Canada," which stars Patsy Ruth Miller. Under the direction of Robert De Lacy the company will spend two weeks on Mount Shasta on location.

* * *

Dev Jennings, A. S. C., is continuing camera work on the forthcoming Buster Keaton comedy feature now in the course of production at the Keaton Studio.

* * *

Edgar Lyons, A. S. C., in association with Jack Brean, is shooting the current Billy Dooley comedy at the Christie Studio. William Watson is directing.

* * *

Joseph Walker, A. S. C., is chief cinematographer on Columbia's "The College Hero," now being directed by Walter Lang.

* * *

J. Peverell Marley, A. S. C., is photographing William Boyd's next starring vehicle, "The West Pointer," at the Cecil B. DeMille Studios. Donald Crisp is director.

* * *

Lucien Andriot, A. S. C., is in charge of photograph for "The Main Event," which is directed by William K. Howard and stars Vera Reynolds.

* * *

David Abel, A. S. C., has started camera work on "The Forbidden Woman," which stars Jetta Goudal, is being directed by Paul Stein, and was written by Clara Beranger.

* * *

St. Elmo Boyce, A. S. C., is shooting a Mack Sennett comedy which features Madeline Hurlock.

Ernest Miller, A. S. C., is chief cinematographer on the James Cruze production, "On To Reno," being completed at the Metropolitan Studio. Marie Prevost is being starred.

* * *

Dwight Warren, A. S. C., is shooting, at the Educational Studios, the latest Eddie Quillan comedy, as yet untitled.

* * *

Len Smith, A. S. C., is in charge of the photograph on "Wheels of Destiny". The picture is being produced at the Fine Arts Studio under the direction of Duke Worne.

* * *

William Hyer, A. S. C., is now photographing Educational's boy star, Big Boy, in an untitled comedy.

* * *

Len Smith, A. S. C., is in charge of the photography on "Blondes By Choice," now being shot at the Fine Arts Studios. Claire Windsor is the star of the production. which is being directed by Hampton Del Ruth.

* * *

Georges Benoit, A. S. C., of the fine old Benoit family of France and St. Louis, is the tremendously proud father of Georgette, eight and one-half pounds in weight, who arrived the last day of August. Mother and daughter are getting on fine.

* * *

William Daniels, A. S. C., is photographing, at the Metro-Goldwyn-Mayer Studios, "Bringing Up Father." The comedy team of Polly Moran and Marie Dressler are featured, the continuity being by Frances Marion.

* * *

Max Fabian, A. S. C., is in charge of the photography on "In Old Kentucky," now being made at M-G-M.

* * *

Ira Morgan, A. S. C., has spent several weeks in the East for William Haines' next picture, "West Point," the production being directed by Ed Sedgwick.

* * *

Clyde De Vinna, A. S. C., is shooting Tim McCoy's next western picture, "Wyoming," for M-G-M release.

* * *

Walter Lundin, A. S. C., chief cinematographer for Harold Lloyd, is still in the East, where the famous comedy star is shooting scenes for his next production. Lundin is being assisted by Robert Doran, also an A. S. C. member, and many interior scenes are being shot at the erstwhile Famous Players-Lasky Studio on the East coast.

Amateur Cinematography

A Professional's Notes for Amateurs

Part XI

By Jos. A. Dubray
A. S. C.

Lenses Powers and Image Formation

(Continued from August Cinematographer)

In the preceeding chapters, we have summarily analyzed the conditions which are indispensable for the formation of Images by lenses, and the fundamental laws that regulate such phenomena.

We have reached the conclusion that only *positive* lenses form a *real* Image, and therefore the positive value is an essential feature of lenses or combination of lenses that are to be used for the formation of Images for photographic purposes.

In our investigation and analysis, we have always assumed that the light emanated by the object or luminous source, was monochromatic and the rays concurring to form the image, were at *a very small distance from the axis of the lens.*

Although the use of a lens under the specified conditions mark a great improvement, over the use of the pinhole aperture, it presents a number of imperfections which impair the orthoscopic qualities of the instrument.

These imperfections are called *aberrations.*

Let us consider a spherical, positive lens, of a diameter greater than the one subtended in an angle of 12 degrees, were the focal point is taken as the apex of the angle.

Following the reasoning and formulae given for tracing either geometrically or trigonometrically, the path of rays concurring to form an image, we find that the marginal rays, or the rays that are further away from the axis, meet, after refraction, at a point *nearer* to the lens than its *focal* point.

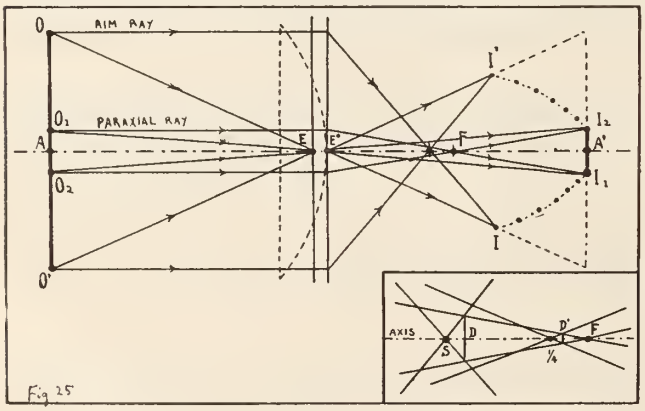


Fig 25

In Fig. 25, this phenomena is graphically represented, exaggerating the convergence of the marginal rays, in respect to the paraxial ones or rays parallel and near to the Axis, in order to emphasize this phenomena of aberration.

The conjugate I_1 of the object point O_1, and the conjugate I_2 of the object point O_2 define the limits of the *orthoscopic* image, because all rays emanated from the object within the area bounded by these and all points within the limits O_1 O_2, intersect at the point F. on the Axis of the lens.

But, if we consider the marginal points O and O′, we find that the meeting of the refracted rays, takes place on the Axis, at a point nearer the lens than the Focal point, and consequently their conjugates are formed *outside the image plane.*

All rays emanated from object points lying between the paraxial ones and the extreme marginals, will have their conjugates in *different Image points, which are more distant from the orthoscopic image plane, the more distant is the object point from the axis.*

A screen placed at the image plane A′, will then collect an image which appears *sharp* within the limits I_1 I_2, and will gradually decrease in sharpness, *the more distant the image-point is from the axial image-point A′.*

It is quite obvious that the refracted rays, could be forced to all meet at the point F. on the Axis, by modifying the form of the refracting surfaces. This modification is in the realm of possibilities, but the refracting surfaces should then be modified so that they would no longer be spherical but parabolical. Now such a curve is extremely difficult to obtain by the grinding of the glass, so difficult, in fact, that it is impractical, if other means of destroying the aberration can be found.

Considering that this sort of aberration is caused solely by the spherical shape of lenses, physicists have called it *spherical aberration.*

The inset in Fig. 25, shows in a greatly exaggerated way, the intersections of different refracted rays, on the Axis.

The rays meeting on the Axis at the point S, are the rim ray refracted by a lens. The rays crossing the Axis at F. are two paraxial rays ,and therefore the point F. represents the Focus of the lens. The third set of rays meeting at the point marked ¼ represent two refracted rays, corresponding to two incident rays, parrallel to the Axis and midway between the paraxial and marginal rays.

The distance S F, is called the *longitudinal spherical aberration of the lens.*

It would seem logical to think that the degree of aberration, should be proportional to the aperture of the lens, but facts prove that it is not so. The incident rays placed at equal distances from the rim and paraxial rays, do not meet at half-way between S and F, but at a point situated at ¼ the distance S F, from F. We arrive therefore at

(Continued on Page 13)

Our Questionaire

Since the whole world has gone daffy on questionnaires, THE AMERICAN CINEMATOGRAPHER, not to be outdone, begs leave of its readers to submit the following. For the first one hundred per cent answer received it offers a one hundred years' subscription to the CINEMATOGRAPHER. Read 'em and think:

What is (or was) a "bust" in cinematography?
Who was the first motion cameraman? ffl ffl
Who invented the first tripod?
Who photographed "Kismet"?
Why is a camera so named?
How is a daguerreotype made?
What does 16 mm. mean?
Where was the first feature length motion picture produced and exhibited?
What is a supervisor and what are his duties, if any?
Who stole Charlie Ross?

* * *

Camera Faults and How to Remedy Them
By Len H. Roos, A. S. C., A. R. P. S., Sydney, Australia, N. S. W.

(This is written for no reason at all except that the author is propped up in bed with a fractured ankle and has nothing else to do.)

Much has been written about the operation of motion picture cameras, but very little has appeared about operating them. It is hoped the following suggestions will be of some help to the cinematographer who wishes to attend to his own repairs. I might state that it is usually cheaper to take a refractory camera to a good mechanic in the first instance, but where expense does not enter the proposition the following suggestions will be found useful—especially to the manufacturers of cameras.

Fault—Cause—Remedy

Camera refuses to turn.

It's sick—or something.

Remove camera from tripod. Lay on floor. Go out to car and retrieve from tool kit a hammer, a screw driver and a cold chisel (this may be possible if your car hasn't been in the garage lately). Remove lenses from front of camera with screw driver and roll these across the room out of the way. Remove front of camera with screw driver and hammer, then look inside. You will notice a black circular disc staring you in the face (if it isn't there then you've been stung, because it ought to be in the camera). This is called the shutter. With a pair of snips or heavy scissors cut this away, close to its hub, and you will notice a few gears and what is commonly known as a cam, by whose rotation uniform traversing motion is imparted to a vertical bar (or anyway that is what it is supposed to do). Tap the cam and bar a few times with the chisel and hammer. Now try the camera. If it still refuses to move, soak the whole works in a saturated solution of Hyposulphite of Soda. This should fix it.

Fault—Cause—Remedy

Upon developing negative taken from camera it is noticed that the images are upside down. Commonly called reversal of image.

Lens has been inserted upside down.

Turn camera upside down on tripod and crank with left hand.

* * *

Fault—Cause—Remedy

Negative has muddy appearance.

Mud has been allowed to get on the surface of the lens.

Rub mud off lens with a piece of coarse emery cloth.

* * *

Fault—Cause—Remedy

Pictures unsteady on screen.

Too much "B" battery potential.

Jack up camera and back a new tripod under it.

A Letter From Len H. Roos

Our good friend, Len H. Roos, A. S. C., writes from Sydney, Australia, the following interesting letter:

"I met Scott Dunlap, who is over here to direct Eva Novak in a series of Australian picture, and agreed to photograph his first picture. At the completion of this picture, I got a proposition to direct 52 single-reel comedies for an Australian company, and am now busy on these, as you will see by the enclosed advertisement from a local trade paper. I have completed two at this writing and they appear to be going over very well with Australian audiences. As far as I can find out, this is the first attempt to make single-reel comedies over here.

"Sydney is rapidly acquiring a Hollywood colony. At present we have Norman Dawn, Scott Dunlap, Eva Novak, Edith Roberts, Jack Gavin, Walter Long, Eric Wilkinson and Bill Reed.

"The American Cinematographer has a fine circulation over here and is very much appreciated by everyone in the business."

ERRATA

In the August issue of THE AMERICAN CINEMATOGRAPHER, page 7, line 17, a full line was inadvertently omitted. Instead of reading: "especially Dupont, etc.," it should read: "With vari-colored carbons, especially on color sensitized and high sensitive film, as Dupont Panchromatic, Eastman Panchromatic and Agfa superspeed." Apologies to Mr. McBan and our readers.

The AMERICAN CINEMATOGRAPHER has, since its inception, been the recipient of a voluminous correspondence from its readers, displaying a great and constantly increasing interest in the progress of cinematography.

Flattering plaudits and sincere criticisms on the cinematographer's work, inquiries on how, where and when, pertaining to most of the outstanding photographic features of many motion picture productions and, of late, a real deluge of requests from amateur cinematographers for advice and information on the many problems facing them in their new enterprise, and which can be solved only through long experience and indefatigable study.

This correspondence has reached such a volume that the AMERICAN CINEMATOGRAPHER cannot any longer directly and personally answer it, hence the inauguration of this new department, which is dedicated to all the friends of cinematography.

All inquiries that reach the office of the AMERICAN CINEMATOGRAPHER will receive the most prompt consideration possible and all answers will be quoted from the most reliable sources.

The AMERICAN CINEMATOGRAPHER extends, henceforth, a cordial invitation to all its readers to avail themselves of this new service, which will assuredly prove to be a source of enjoyment and of closer relations among themselves.

The AMERICAN CINEMATOGRAPHER wishes to encourage the exchange of ideas that will tend to increase the popularity of motion pictures in both the professional and amateur fields and sponsors this movement heartily and with a spirit of good comradeship.

* * *

QUESTION.—*What is the meaning of the mm. sign after the figure 16 which designates the film used in amateur moving picture cameras?*

ANSWER.—mm. means millimeters, and the figure 16 serves to indicate the number of millimeters giving the width of the film.

The millimeter is a measure of length, one-thousandth the length of the meter, which is the unit of length in the metric system.

The metric system is exclusively used in almost all the European countries, and in all scientific calculations and works in the United States.

The length of the meter was obtained by determining the ten-millionth of the fourth of the Terrestrial Meridian, i. e., the ten-millionth of the distance from the Equator to the North Pole.

A bar made of an alloy of platinum (90%) and Iridium (10%) is kept at the International Bureau of Weights and Measures in Paris (France), and its length at a temperature of 0° Centigrade represents the true and International Meter.

As the metric system is decimal, the fractional units of the meter are as follows:

The DECIMETER = 1/10 of a meter
The CENTIMETER = 1/100 of a meter
The MILLIMETER = 1/1000 of a meter

By act of July, 1866, Congress has fixed the relation:

1 METER = 39.37 INCHES

and therefore 1 millimeter = inches 0.03937, and 16 millimeters are equal to a trifle over ⅝ of an inch.

* * *

QUESTION.—*What is the difference between a 6-inch lens and a 6-inch telephoto lens?*

ANSWER.—The principal difference between a 6-inch lens and a telephoto lens of the same focal length is that the telephoto lens requires a much lesser bellows draw than the usual photographic lens.

In other words, the distance of the back element of the 6-inch telephoto lens to the film is less than the distance required by a 6-inch lens for the same object, the camera being placed at the same distance for the obtention of a picture of the same size.

The advantage of using a telephoto lens is evident when it is desired to reduce the actual length of the lens mount and thus make the camera more portable and less cumbersome.

In the other end, the telephoto lens, being a combination of a collecting and a dispersing lens, its relative aperture is small as compared with a regular all-collective lens. Its speed is then reduced, and a longer exposure required.

There are two kinds of telephoto lenses, one with variable focal length, and one with fixed focal length. In the latter the construction is quite simplified, and several excellent telephoto lenses of this type are now available on the market, which combine a quite large relative aperture with the compactness that is the main and most advantageous feature of telephoto lenses.

A discussion on telephoto lenses will appear in one of the future issues of the AMERICAN CINEMATOGRAPHER.

* * *

QUESTION.—*How can you obtain a fade-out with an amateur motion picture camera?*

ANSWER.—A fade-out with an amateur motion picture camera can be obtained by gradually closing the diaphragm while taking the picture. This operation can hardly be performed by the photographer unless the camera is attached to a tripod.

A good length for a fade-out is from 65 to 90 frames, and the operator should experiment and accustom himself in gradually and smoothly closing the diaphragm in the time necessary for the taking of this number of frames, from 4 to 6 seconds at the normal speed.

* * *

QUESTION.—*Can I get backwards motion with a Filmo camera?*

ANSWER.—Yes. Just hold the camera upside down while taking the picture. But remember to separate the reversed scene from other straight scenes that may be on the same roll, upon its return from the laboratory, and splice it again, reversing end-for-end, so the scene will run right side up on the projecting screen.

* * *

QUESTION.—*How long can a roll of exposed film be kept without danger to the image, before it is sent to the finishing station?*

ANSWER.—We strongly advise to send a roll of film to the laboratory as soon as possible after exposure. A delay of weeks may prove injurious.

* * *

QUESTION.—*How many feet of 16 mm. film are required for titles of normal length?*

ANSWER.—If title exceeds eight words use TWO feet of film for every FOUR words.

If the title has less than eight words, use TWO feet every THREE words.

In NO CASE should a title be shorter than TWO feet.

* * *

QUESTION.—*Who is responsible for the beautiful photography in Emil Janning's picture, "The Way of All Flesh"?*

ANSWER.—Mr. Victor Milner, of Famous Players-Lusky, and member of the A. S. C.

AMATEUR CINEMATOGRAPHY

(Continued from Page 10)

the conclusion, that *the aberration increases with the square of the aperture.*

It is also evident that the distance D, represents the *disc of confusion,* or degree of unsharpness due to the aberration for rim rays and the distance D^1 represents the *disc of confusion* for rays placed midway between paraxial and rim rays.

From the figure it is easy to deduce that *the disc of confusion, increases with the sube of the aperture* from which we deduce that, *spherical aberration is greatly reduced by reducing the aperture of the lens,* (by means of a diaphragm for instance). The circle of confusion is reduced to one-eighth of its full aperture value, if the lens is *stopped down* to *half aperture.*

Let us, now, analyze the path of incident and refracted rays, through a positive lens of the Plano-convex type, as illustrated in Fig 26a.

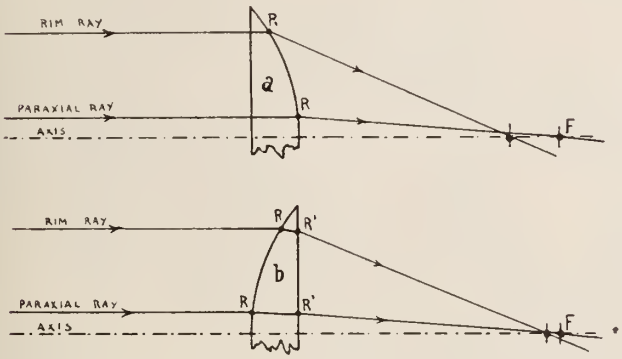


Fig. 26

The first surface of the lens, which is turned towards the object, is *plane.*

The rays *parallel* to axis and incident upon this face suffer, then, *no refraction,* and enter and travel through the lens in a path which is still parallel to the Axis.

Refraction will take place only when the incident ray, strikes the second surface, so the *curvature imprinted on the front wave, is entirely dependent upon this curved surface.*

By trigonometrically tracing the path of the refracted rays, we find that *the more the incident ray is inclined to the surface-point of the lens which determine its refraction, the more the spherical aberration is pronounced,* and viceversa.

The more the incident ray is normal to the refracting surface-point, the less spherical aberration is liable to occur.

It is quite evident, then, that if the incident rays can be forced to follow a path that requires the least effort (so to speak) in order to undergo refraction, the spherical aberration will be reduced to a minimum.

This hypothesis, is proven to be true, by the fact that, if we simply turn the plano-convex lens around, so as to present its bulging surface to the object, the aberration is greatly lessened, because the effort of refraction is divided among the two surfaces of the lens.

If we examine Fig. 26, this effect, is quite noticeable.

In Fig. 26a, the incident rays parallel to the axis, do not suffer refraction in entering the lens, because they are perpendicular to its first surface and the amount of refraction which is dependent upon the value of the lens and upon its radius of curvature, takes place entirely at R.

In Fig. 26b, the incident rays suffer refraction, first to point R, and further refraction at the point R^1, because their parallelism to the axis is destroyed by the refraction at R.

(Continued in October)

SHOOTING STILLS IN THE SKY

That excellent article, "Shooting Stills in the Sky," in the August CINEMATOGRAPHER was written by Frederick A. Parrish, A. S. C., of Colorado Springs.

THE CAMERAMASTE

Initiation dinner of the American Society of Cinematographers, September 6, 1927, when one hundred fifty new members were welcomed into the fold. The membership of the A. S. C. has, since June, 1927, increased three hundred per cent, and includes ninety-eight per

ERS OF THE WORLD

cent of the men who have produced that same percentage of the world's motion picture masterpieces. Only a portion of the membership is here shown—many were on location or at work on productions.

A NEW MILESTONE IN THE EVOLUTION OF THE A. S. C.

(Continued from Page 6)

tion of the art of cinematography and forecasting the progress of the future. According to Mr. Milner the Golden Age of cinematography is yet to come, and he sees in the A. S. C. the greatest factor in ushering in this Golden Age.

Mr. Good, at the station in the ritual symbolizing Art, said in part:

"Art is reality. Too often we are tempted to regard the products of art as art itself when, in fact, art is a body of ideas, of which the art is only an outward expression. In motion pictures art may be crudely described as the skill or ability of the cinematographer to visualize *instantly* how any scene will look in values of black and white. He must have the ability to do so *instantly,* because the industry has not yet evolved to that high level where the cinematographer is called into the pre-production councils and conferences to determine art values before shooting begins. This much-needed reform is sure to come if for no other reason than it will save time and thereby money.

"It is slowly percolating into the minds of the producers that if a picture has real value as a work of art, it is because the camera master had most to do with putting the *Art* into it.

"Usually we are given something to shoot—and find it all set for us. We have no opportunity to use our imagination in the construction of the scene we are to shoot, but the art of the cinematographer is in the way he does it.

"There is no set rule of procedure. Take a dozen cinematographers and no two will photograph the scene alike, but all will get beauty into the scene—and beauty is art.

"Our problem is usually that of skillfully blending the action into the scenic investiture so there will be nothing incongruous, no false note and nothing out of harmony —nor to offend the asethetic taste of the critic—and I will say here that the camera masters have been outstandingly successful in producing *artistic* results and, in doing so, have proven themselves to be natural artists of no mean ability. We take nothing away from the other departments of the cinema when we claim that no other group in our industry has gone so far in so short a time.

"Summed up—your art is your own personal method of handling any given photographic problem, so as to secure the best possible art values, according to your ideals."

After the Vice-Presidents had spoken President Clark introduced those past-presidents of the A. S. C. in attendance at the dinner, Messrs. Homer Scott, James Van Trees and Gaetano Guadio, who spoke briefly, but eloquently, of the A. S. C. and of the dignity, importance and artistry of the cinematographic profession. They poured enthusiasm into the occasion and gave the incoming members something to think about.

Arthur Webb, attorney of the A. S. C., reminded the assembly that the Society is The *American* Society of Cinematographers, Incorporated, organized under the laws of California, and a tangible asset in the community, an institution of standing and importance in the commonwealth and one of which all members should be proud.

Secretary Charles Clarke and Treasurer George Schneiderman spoke of the economic side of the cinematographer's relations to the Society, while Arthur Edeson, one of the distinguished members of the Old Guard, welcomed the new members and paid a tribute to the organization.

As stated, President Clark's keynote was the furtherance of co-operation and economy through Loyalty, Progress and Art. He counseled patience, alertness, energy and enthusiasm, and prophesied a glorious future for the A. S. C. and its constituent members, who had shed luster upon the cinema by their unmatchable record of devotion to duty, growth in efficiency and in the requirements of their art. He pointed out that the cinematographer is, first of all, an artist; and a stunt man only when called upon to do stunts.

He explained that the Board of Governors had recommended revision of the By-Laws, to conform to the requirements of the greatly increased membership, and that questions of policy would be discussed at a more opportune time. He saw nothing ahead save that which might bring encouragement to every member and to every other operative in the industry.

The President elucidated his plan for the future discharge of the business of the Society through a system of standing committees, a diagram of which may be seen on Page 3 of this issue. These committees, as announced, with their personnel, are:

Public Relations—John Boyle, chairman; Glen MacWilliams, Arthur Edeson, Gilbert Warrenton, Herford Tynes Cowling, John Seitz, Georges Benoit, George Eastman, Thomas A. Edison, Arthur C. Webb.

Production—Fred Jackman, James Van Trees, Homer Scott, Gaetano Gaudio.

Educational—Frank Good, Guy Wilky, Alfred Gilks, E. Burton Steene, Floyd Jackman, King Gray.

Welfare—Charles G. Clarke, Chas. Rosher, Gaetano Gaudio, Arthur Edeson, John Arnold, Karl Struss.

Research—Victor Milner, Gilbert Warrenton, George Meehan, John Seitz, Ned Van Buren, Thomas A. Edison, George Eastman, Percy Hilburn, George Barnes, Joseph A. Dubray.

The members of the Board of Governors are ex-officio members of all committees, but all committees will have a free hand to act independently under the direction of their respective chairmen, and it is believed that, through this system, the increased work of the Society may be speeded up. There is much to be done and some great developments to the glory of both the Society and the industry loom in the not distant future.

Treasurer George Schneiderman made the important announcement that a special committee, to be chosen at large from representative men in all classifications of the membership, would meet with a committee of the producers on Monday, September 12.

The program closed with a whole-hearted fraternizing of the old and new members, and the sentiment was general that the occasion constituted the most significant event in the history of motion photography and that it marked the beginning of great things for the cinematographic department of the industry.

The members of the A. S. C. are congratulating their brother cinematographer, Mr. Louis W. O'Connell, upon becoming a Benedick. The event happened on August 15th, at the home of the bride's mother, Mrs. Elizabeth Burns, Bellingham, Washington. Joyce May Burns, the lovely bride, is a popular society girl of Bellingham. The O'Connells are at home at 2041 Glencoe way, Hollywood.

Sol Polito, A. S. C., is shooting the First National feature, "Shepherd of the Hills," at the Burbank Studio.

Jack McKenzie, A. S. C., is chief cinematographer on the special First National production, "A Texas Steer," which stars Will Rogers, the famous mayor of Beverly Hills.

"THE STILLS MOVE THE MOVIES"

(Continued from Page 7)

vision within its boundaries while the turning of all the faces towards the central figure greatly enhances its importance.

The play of lights and shades is remarkably well handled and the radiation of light from the center still emphasizes the unity of the composition and brings into relief the importance of each of the disciples as a different unit in a whole, without destroying, even perhaps increasing, the importance of the figure of the Christ.

The attitudes of the Disciples and their expressions of tense anxiety tell the whole story in a simple and dignified manner and the variety of movement on the part of the Disciples increases the dignity of the calmness of the Christ, who with extended arms denotes His willingness to submit to the supreme sacrifice while giving an impression of stupendous strength and power.

"Neither Do I Condemn Thee"

This picture as treated by Mr. Mortensen presents the fundamental schemes of good composition.

The sternness and grandeur of the subject is carried through the powerful vertical lines of the columns and the line of the figure of the Savior continued by the white column of smoke above His head.

The ascent of the verticals is stopped by the horizontal line (which, although broken, is by no means weak) formed by the highlights of the sub-bases of the columns which, beside relieving the verticals, serve as a frame above the main subject.

The stability of the composition is brought about by the evident pyramidal structure which has the head of the Savior as apex, the right arm and the mass of the sinner on one side and the left arm and the three stones

(Continued on Page 19)

on the ground on the other side, while the well defined horizontal shadow on the ground serves as base.

The head of the Christ is the focus to which the eye is immediately attracted; the slight sympathetic inclination of the head besides relieving the sternness of the figure, leads the eye to follow the line of the right arm down to the crouching, but not exempt of grace, form of the sinner.

The darkness of this figure, the act of her turning her face away from the observer, the modesty implied by the position of her left hand, make an admirable contrast with the powerful and majestic figure of the Christ.

From the figure of the woman the eye is led up to the upper part of the picture by the vertical apportioned by the base of the candelabrum and its shaft to the opening through which the sky may be perceived.

The danger of ending here the visual path is avoided by the curved line of the block on the sill of the opening and the decorative design on the column. This line leads the eye to the curl of smoke, hence back into the picture, to the left arm of the Christ and the three stones which complete the story telling qualities of the picture.

The horizontal lines of the steps would be too prominent if they were not clevely broken by the dark mass of the hair of the woman and relieved by the oblique shadows on the ground.

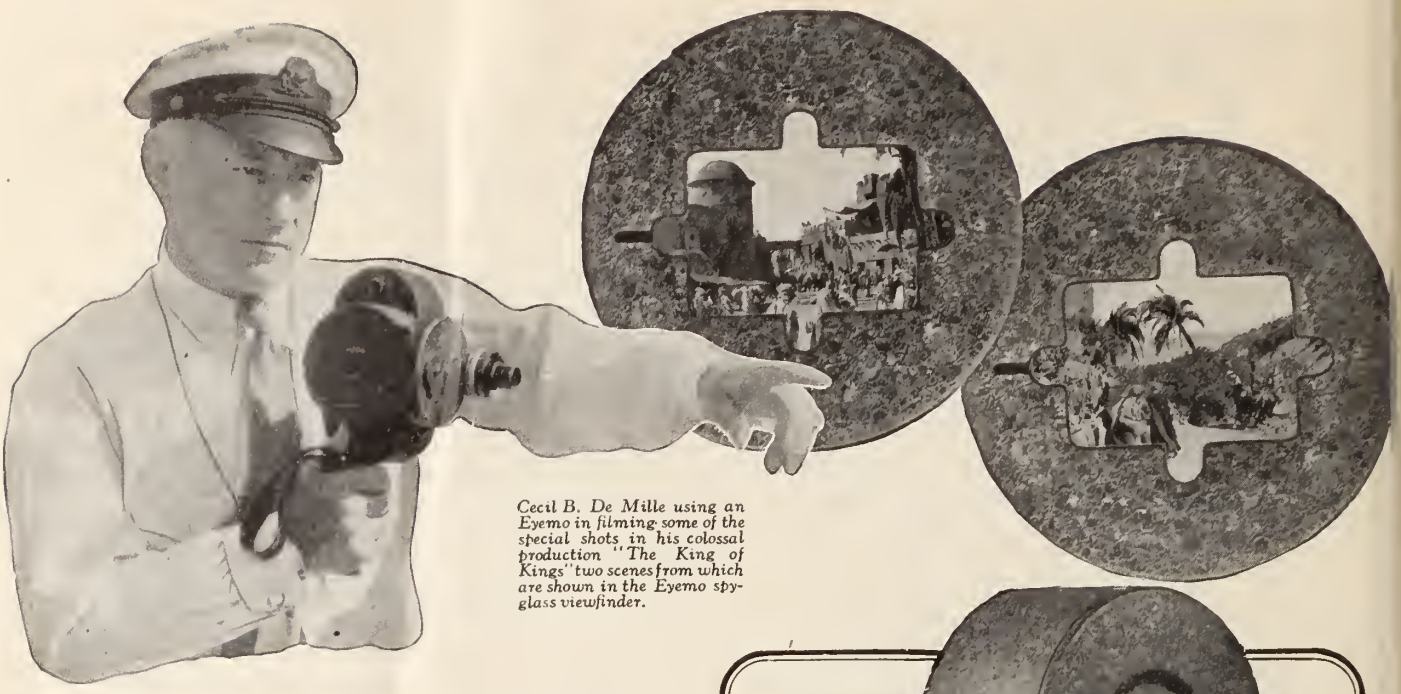
As they are they help to frame and give emphasis to the upper part of the figure of the Christ, which is the main motif of the picture.

"The Tempter"

Mr. Thomas is to be highly commended for the daring bit of composition sense displayed in the picture of Satan on the threshold of the Temple.

Here is another composition in which the verticals play the greatest part. The massiveness and sobriety of the lines of the columns and of the vertical of the figure continued by the impressive shadow on the central shaft give

(Continued on Page 21)



Cecil B. De Mille using an Eyemo in filming some of the special shots in his colossal production "The King of Kings" two scenes from which are shown in the Eyemo spy-glass viewfinder.

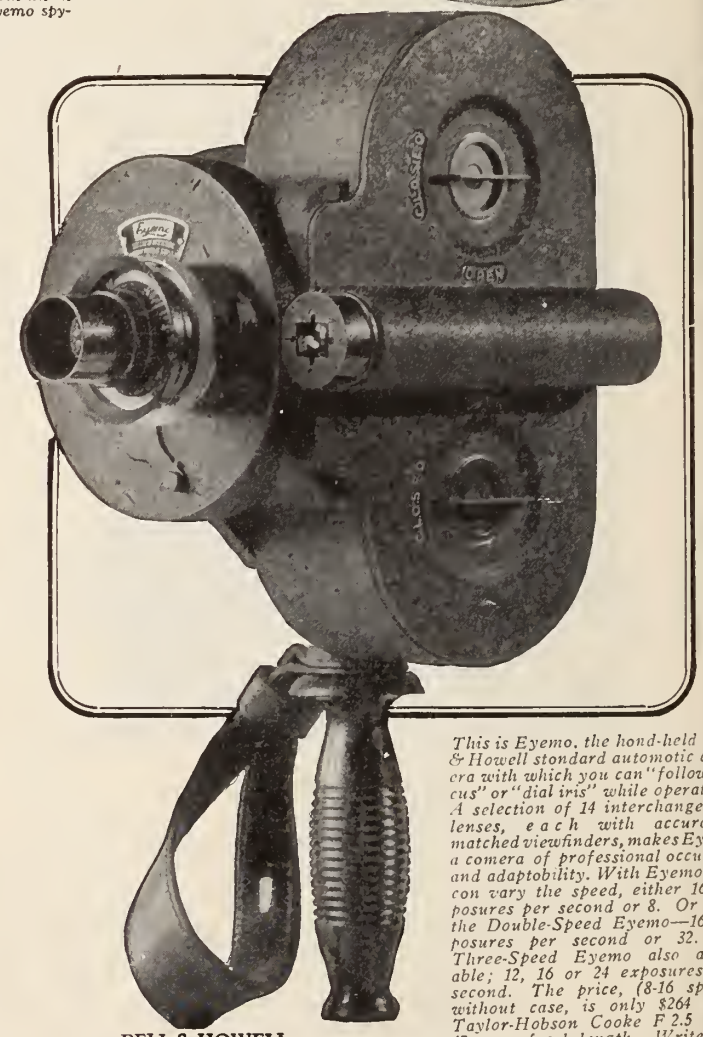
The Greatest PRODUCERS use BELL & HOWELL CAMERAS

OF all the requisites of professional picture making, PRECISION is the greatest. No chance can be taken in choosing the camera to record the story, cast and locations which represent outlays of *hundreds of thousands of dollars.*

BELL & HOWELL Cameras are *precision instruments.* Their reliability has been proved in over twenty years of picture making by leading producers all over the world.

Famous Players-Lasky, Paramount, Metro-Goldwyn-Mayer, Associated First National, De Mille, Universal, Vitaphone, Warner Brothers, Fox, Kinograms, International and many other leaders rely on Bell & Howell Cameras to impress the *fullest photographic meaning* of their trade names upon the theatre-going public.

Complete information on the Bell & Howell Cameras shown here will be mailed upon request.



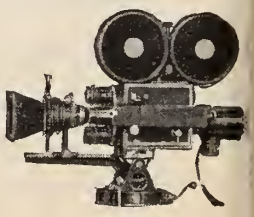
This is Eyemo, the hond-held Be & Howell standard automotic can era with which you can "follow fo cus" or "dial iris" while operatin A selection of 14 interchangeabl lenses, each with accurate matched viewfinders, makes Eyem a comera of professional occuroc and adaptobility. With Eyemo yo con vary the speed, either 16 e. posures per second or 8. Or wi the Double-Speed Eyemo—16 e. posures per second or 32. Three-Speed Eyemo also avo able; 12, 16 or 24 exposures p second. The price, (8-16 speec without case, is only $264 wi Taylor-Hobson Cooke F 2.5 len 47 mm. focol length. Write fo descriptive circulor.

BELL & HOWELL
MAKES MOVIES AS THE EYE SEES
Eyemo

The BELL & HOWELL PIONEER
Professional Standard

Nearly all productions shown at best theatres are made with this camera. For twenty years it has faithfully recorded the thousands of stories staged before it. All detail parts interchangeable — for sample: Normal and Ultra Speed mechanisms. The Cinemotor that eliminates cranking and paints artistry into the production. The camera that never becomes abolete no matter how old. Particulars on request.

Standard AUTOMATIC



BELL & HOWELL CO.

1805 Larchmont Avenue, Chicago, Ill.

New York, Hollywood, London [B. & H. Co., Ltd.]
ESTABLISHED 1907

"THE STILLS MOVE THE MOVIES"

(Continued from Page 19)

tremendous power to the whole composition, while the radiating lines, formed by the shadow on the wall intersected by the short, but powerful, one formed by the extended arm down to the elbow of his left arm, locate forcibly and unmistakably the focus of the picture at the face of Satan, though this point is located lower than the center of the picture.

Psychologically, although the figure of Satan is human, imposing and almost majestic, an expression of danger and repellance is vividly felt. The heavy shadow arched overhead limits the sphere of action of the main subject and refuses him access to the higher spheres.

In spite of this sense of danger, perhaps because of it, the figure is extremely attractive and the observer feels a desire to enter the picture were it not for the barrier existing in the foreground in form of the heavy horizontal shadow.

Even if this barrier could be removed or surmounted, no one, it seems, would dare expose himself to the lurking mysterious danger of being noticed by the figure by walking in front of it, and feels the inanity of the attempt of sneaking between it and the column through the narrow space left there as an opening.

(Concluded on Page 24)

Edward J. Snyder, A. S. C., is photographing "The Dog Wins" at the Metropolitan Studio under the direction of Noel Smith.

* * *

Henry Gerrard, A. S. C., is in charge of the photography for the latest Richard Rosson production for Paramount.

* * *

Harry Perry, A. S. C., continues the photography on "Now We're In the Air," which features the comedy team, Raymond Hatton and Wallace Beery.

* * *

J. Roy Hunt, A. S. C., is chief cinematographer for Bebe Daniels' next comedy, "She's a Sheik," now in the course of production at the Paramount Studio, under the direction of Clarence Badger.

* * *

Victor Milner, A. S. C., is still receiving congratulations for his excellent photography in "The Way of All Flesh," and which stars Emil Jannings.

* * *

George Stevens, A. S. C., is shooting the latest Max Davidson comedy at the Hal Roach Studios in Culver City.

* * *

John W. Boyle, A. S. C., is photographing Mack Sennett's special feature, "The Romance of a Bathing Girl." Johnny Burke, of vaudeville fame, and an all-star cast.

MEMBERSHIP of the

SEPTEMBE

OFFICERS

DANIEL B. CLARK	*President*
JOHN W. BOYLE	*First Vice President*
VICTOR MILNER	*Second Vice President*
FRANK B. GOOD	*Third Vice President*
GEORGE SCHNEIDERMAN	*Treasurer*
CHARLES G. CLARKE	*Secretary*

FIRST CINEMATOGRAPHERS

Adams, William S.—
Allen, Paul H.—
Androit, Lucien—De Mille.
Ash, Jerome H.—
August, Joe—United Artists.
Abel, David—De Mille.
Arnold, John—M.-G.-M.

Badaracco, Jake—
Barlatier, Andre—M.-G.-M.
Bergquist, Rudolph—
Boyle, Chas. P.—De Mille.
Boyce, St. Elmo—Sennett.
Bridenbecker, Milton—Universal.
Brown—Jas. S., Jr.—F. B. O.
Benoit, Georges—First National.
Barnes, George S—Goldwyn.
Boyle, John W.—Sennett.
Brotherton, Joseph—Universal.
Broening, H. Lyman—
Beckway, Wm. J.—

Carter, Claude C.—Australia.
Cline, Robt. E.—Scholck Studio.
Cline, Wilfried—Universal.
Crocker, Geo. D.—
Cronjager, Edward—Lasky.
Cronjager, Henry—
Clark, Daniel B.—Tom Mix, Fox.
Cooper, Harry H.—
Cotner, Frank M.—
Clarke, Chas. G.—Fox.
Cowling, H. T.—Eastman Dadok Co., Rochester, N. Y.
Crockett, E. J.—

Davis, Chas. JJ.—Warner-Vitaphone, N. Y.
Draper, Lauren—Sierra Pictures.
Daniels, Wm. H.—M.-G.-M.
Davey, Allen M.—
Davis, Harry.—
De Vinna, Clyde—M.-G.-M.
Davey, Allen M.—
Davis, Harry—
De Vinna, Clyde—M.-G.-M.
Doran, Robt. V.—
Dored, John—Paramount News, Riga Latvia.
Dubray, Jos. A.—
Du Par, E. B.—Warners.
Du Pont, Max—
Dean, Faxon M.—
Eldredge, F. R.—Universal.
Eslick, Le Roy—F. B. O.
Evans, Perry—
Edeson, Arthur—First National.

Fabian, Max—M.-G.-M.
Forbes, Harry W.—Stern Film Corporation.
Fryer, Richard—
Fildew, William—
Fischbeck, H. A.—Lasky.
Fisher, Ross G.—First National.

Gerrard, Henry William—Lasky.
Gheller, Edward—
Gerstad, Merritt B.—M.-G.-M.
Gobbett, David William—
Gosden, Alfred G.—Universal.
DeGrasse, Robert—F. B. O.
Gilks, Alfred—Lasky.
Gray, King D.—Fox.
Guissart, Rene—Paris, France.
Good, Frank B.—Fox Studio.
Griffin, Walter L.—David Hartford Productions.
Gaudio, Gaetano—Douglas Fairbanks-United Artists.

Hallenberger, Harry—Lasky.
Harris, Emil—Universal.
Heisler, Frank B.—Bennett.
Hilburn, Percy—M.-G.-M.
Hunt, Roy—Lasky.
Hyer, William C.—Educational.

Haller, Ernest—Robt. Kane Productions, N. Y.
Heimerl, Alois—
Jones, Allen C.—Universal.
June, Ray—Fine Arts Studio.
Jackman, Floyd—
Jackman, Fred W.—Directing Fred W. Jackman Prod.
Jackman, Floyd—

Jackson, H. A.—Corinne Griffin, U. A.
Jennings, J. D.—Buster Keaton.
Kershner, Glen—De Mille.
Kesson, Dave—United Artists.
Kesson, Frank A.—
Kirkpatrick, H. J.—Universal.
Klaffki, Roy H.—
Kornmann, Anthony—Universal.
Kull, Jacob—Universal.
Koenekamp, H. F.—With Larry Semon.
Kurrle, Robt. E.—First National.

Linden, Eddie—Universal.
Lloyd, Art—Hal Roach.
Longenecker, Bert—
Lyons, Edgar—Christie.
Lyons, Reginald—Fox
Lundin, Walter—Harold Lloyd, Metropolitan.
Lockwood, J. R.—
Lyons,Chester—Fox

Marley, J. Peverel—De Mille.
Mackenzie, Jack—Douglas McLean, Lasky.
Marsh, Oliver—M.-G.-M.
Marshall, Wm. C.—Lasky.
Martin, H. Kinley, Lasky.
Mescall, John J.—M.-G.-M.
Miller, Arthur—De Mille.
Miller, Ernest W.—Chadwick Studio.
Miller, Virgil E.—Universal.
Mohr, Hal—Warners.
McClung, Hugh C.—Douglas Fairbanks, U. A.
McCord, T. D.—
McGill, Barney.
MacWilliams, Glen—Fox.
Meehan, Geo.—Fox.
Morgan, Ira H.—M.-G.-M.
Musuraca, N.—F. B. O.
Milner, Victor—Lasky.
Murray, James V.—Lasky.
McManigal, E. L.—

Neumann, Harry C.—Universal.
Norton, Stephen S.—

Oswald, H. M.—
O'Connell, L. Wm.—Fox.

Powers, Len—Hal Roach.
Perry, Paul P.—Lasky.
Perry, Harry—Lasky.
Palmer, Ernest—Fox.
Polito, Sol—First National.

Reeves, Arthur—
Reynolds, Ben F.—
Ries, Irving G.—M.-G.-M.
Robinson, Geo. H.—Universal.
Rosson, Hal—
Roos, Len H.—Sydney, Australia.
Rose, Jackson, J.—Universal.
Rosher, Chas.—Mary Pickford-U. A.
Ries, Park J.—
Scheurich, Victor—Universal.
Schoenbaum, Chas.—Lasky.
Scholtz, Abe—
Shamroy, Leon—Fine Arts Studio.
Smith, Ernest F.—
Smith, Harold G.—
Smith, Leonard—Educational.
Stengler, Mack—F. B. O.
Stevens, Geo.—Hal Roach.
Stevens, Jack—Richard Talmadge, Universal.
Struss, Karl—
Stumar, John—Universal.

A. S. C. TO DATE

12, 1927

BOARD OF GOVERNORS

Victor Milner
Daniel B. Clark
George Schneiderman
L. Guy Wilky
Frank B. Good
Alfred Gilks
Charles G. Clarke
John W. Boyle
John F. Seitz
King D. Gray
Fred W. Jackman
Georges Benoit
E. Burton Steene
Ira H. Morgan
Floyd Jackman

Stumar, Chas.—Universal.
Sharp, Henry—M.-G.-M.
Smith, W. S., Jr.—
Schneiderman, Geo.—Fox.
Scott, Homer A.
Seitz, John F.—M.-G.-M.
Snyder, Edward J.—Pathe-Fine Arts.

Tannura, Philip—F. B. O.
Todd, Arthur L.—Universal.
Turner, Louis H.—Educational.
Tuers, Billy—
Tolhurst, Louis H.—Miocrscopic Pictures, Pathe.

Ullman, Eddie—

Van Enger, Chas. J.—
Van Trees, Jas. C.—First National.
Van Buren, Ned—Eastman Kodak, Hollywood.

Wagner, Blake—
Wagner, Sidney C.—Fox.
Walker, Earle F.—Tiffney.
Walker, Joseph—Columbia.
Walker, Vernon L.—Sennett.
Warren, Dwight W.—
Whalen, John P.—Santa Fe Studios (Monrovia).
Wheeler, Wm.—
White, Ben—Fox.
Williams, Wm. N.—Sennett.
Wrigley, Dewey—Metropolitan.
Wyckoff, Alvin—
Wells, Conrad—Warners.
Wenstrom, Harold—
Whitman, Philip H.—Directing Sennett Studio.
Wilky, L. Guy—Fox.
Warrenton, Gilbert—Universal.
Young, Jack R.—M.-G.-M.
Zucker, Frank C.—Robt. Kane Prod., New York.

HONORARY MEMBERS

Edison, Thomas A.
Eastman, George.

SPECIAL PROCESS AND TRICK CINEMATOGRAPHERS

Baker, Friend—
Binger, R. O.—M.-G.-M.
Cully, Russell A.—Lasky.
Knechtel, Alvin C.—First National.
Eagler, Paul E.—M.-G.-M.
Fulton, J. Phipps—Universal.
Pollock, Gordon B.—Lasky.
Smith, Jack—Fox.
Thompson, W. C.—
Mammes, Ray—M.-G.-M.
Cohen, Eddie—
Edouart, Farciot—Lasky.
Flora, Rolla—Lasky.
Lipstein, Harold—M.-G.-M.
Roberts, Oren W.—Lasky.
Schlockow, Paul A.—M.-G.-M.
Shearer, Douglas G.—M.-G.-M.
Smith, Arthur—Lasky.

AKELEY CINEMATOGRAPHERS

Bennett, Guy M.—
Blackstone, Cliff—Lasky.
De Vol, Norman—Fox.
Dyer, Elmer G.—Universal.
Fetters, C. Curtis—Fox.
Galezio, Leonard T.—Universal.
Greiner, A. Leroy—
Hickson, John T.—Universal.
Hoke, Ira B.—
Larabee, Nelson—Warner Bros.
Marshall, Chas. A.—M.-G.-M.
Marzorati, Harold J.—M.-G.-M.
Mason, Harry G.—
Novak, Jos. J.—Universal.
Olsen, R. B.—
Ramsey, Ray Lloyd—Universal.
Rank, William—Lasky.
Roberts, Josiah—M.-G.-M.
Sickner, William—First National.
Stout, Archie J.—Lasky.
Steene, E. Burton—Lasky.
Vogel, Paul E.—

NEWS CINEMATOGRAPHERS

Parrish, Fred—Fox, Colorado Springs.

Staub, Ralph S.—Columbia, Specialties.

STILL PHOTOGRAPHERS

Archer, Fred R.—De Mille.
Fryer, Elmer—De Mille.
Van Rossem, Walter J.—James Cruse, Inc., Met. Studio.

SECOND CINEMATOGRAPHERS

Bader, Walter S.—M.-G.-M.
Bauder, Steve L.—M.-G.-M.
Bennett, Monroe—
Borradaile, O. H.—Lasky.
Chaney, George—United Artists.
Chewning, Wallace D.—M.-G.-M.
Davis, Leland E.—
Doolittle, Jas. N.—First National.
Drought, Jas B.—Universal.
Fitzgerald, Edward—M.-G.-M.
Giridlian, Jas. N.—F. B. O.
Greene, Al M.—Technical Art.
Greenhalgh, Jack—F. B. O.
Haas, Walter—
Hasten, Charles—M.-G.-M.
Head, Gordon G.—Hal Roach.
Hendrickson, Fred S.—Lasky.
Huggins, L. Owens—
Jenkins, John—Chadwick.
Julian, Mac—
Keyes, Donald B.—
Landrigan, John S.—Lasky.
La Shelle, Joe—Monrovia Studio.
Lindon, Curly—
Martin, Robt. G.—F. B. O.
Marta, Jack A.—Fox.
Merland, Harry—Lasky.
Mols, Pierre M.—M.-G.-M.
MacLean, Gordon—M.-G.-M.
Nogle, Geo. G.—
Palmer, Robt—M.-G.-M.
Parsons, Harry—
Pittack, R. W.—Lasky.
Planck, Robt. H.—Columbia.
Prince, Al—Universal.
Pyle, Edwin L.—
Ragin, David—Fox.
Ray, Bernard B.—
Rees, Wm. A.—Fine Arts.
Schopp, Herman—
Shepek, John, Jr.—Educational.
Silver, John—
Smith, Jean C.—De Mille.
Tappenbeck, Hatto—Fox.
Trezo, Fred—Universal.
Thompson, John—F. O. B.
Unholtz, George—Sennett.
Valentine, J. A—
Wagner, Robt—First National.
Westerberg, Fred—De Mille.
Williams, Alfred E.—Lasky.
Witzel, E. L.—Universal.
Webb, Arthur C.—Attorney.

"THE STILLS MOVE THE MOVIES"

(Continued from Page 21)

The mystery that enshrouds the composition, is emphasized by the masterful play of light and shadows, the source of light coming from below, in a natural manner indeed, but forcibly enough to correspond to the popular conception of the lower, eternally burning depths.

"And the Earth Did Quake and the Rocks Rent"

The main motive of this picture by Mr. Mortensen is carried out by opposition of lines, the sweep of which brings the eye in rapid succession back and forth from one end of the picture to the other, while it is kept within the boundaries of the subject by the potential framing of the boulders on each side of the picture.

Even at the very first glance no doubt exists in the mind that a cataclysm is happening and that all the figures in the picture are doomed to certain destruction in spite of their rebellion against fate.

Even at the very first glance no doubt exists in the mind that a cataclysm is happening and that all the figures in the picture are doomed to certain destruction in spite of their rebellion against fate.

The sweep of the main lines is cleverly hatched up by an irregular succession of short verticals and slightly diagonal lines, mostly formed by upraised arms. These breakages of continuity emphasize strikingly the turmoil and chaos of the catastrophy.

The eye starts its movement from the tree and crumbling rocks at the left upper end of the picture, follows the slightly curved broken line of high lights on hands and heads against the darkened sky, rushes back diagonally to the slanting large rock at the left, returns into the picture in a gigantic curved sweep along the prostrate figures, the yelling face, the confused mass of humanity, up to the man standing against the boulder, where it is sharply stopped by the horizontal dark shadow on the boulder and returns into the picture along a beautifully mysterious foreground which would rush the eye out of the picture were it not for the dark, curved shadow in the left lower foreground, which leads it up using the rocks as stepping stones, to the trees, the original starting point in the analysis.

The eye follows thus a complete circle though the scurrying around from one end to the other maintains the impression of bustle, turmoil, anxiety, horror which are the main characteristics of the tragic event.

No figure is actually prominent, but the grouping, through its unity, makes one ponder over the fate of the *sinner,* be it an individual, a nation or humanity as a whole.

If the upper corners had been kept in a darker tone they would perhaps have better encircled the composition and would have still more emphasized the tragic element of the picture, but even as it stands it has a beautiful expression of tremendous action.

HOW BIG ARE THE MOVIES?

Of the world's land, the United States possesses	6%
Of the world's population the United States makes	7%
Of the world's wheat we grow	27%
Of the world's coal we mine	40%
Of the world's telephones we have	63%
Of the world's corn we grow	75%
Of the world's automobiles we make	80%
But of the world's motion pictures Hollywood produces more than	85%

DUPONT SCORING WITH 16 M. M.

Smith & Aller, distributors of Dupont Raw stock on the Pacific Coast, announce the addition of 16 m. m. negative and positive for amateur and professional use. The film has met with an enthusiastic reception throughout the country and the manufacturers and distributors are preparing to meet a heavy and constantly increasing demand for it.

It is said that upwards of 40,000 amateurs are at work shooting movies on their own account and it is evident that motion pictures in the home are already an important factor in the cinema industry.

CLASSIFIED ADVERTISING

RATES: *Four cents a word. Minimum charge one dollar per insertion.*

All copy must be prepaid and must reach us before the fifteenth of the month preceding publication.

CLASSIFIED ADVERTISING
AMERICAN CINEMATOGRAPHER,
1222 GUARANTY BUILDING,
HOLLYWOOD, CALIFORNIA.

WANTED—MOTION PICTURE CAMERAS

AKELEY camera wanted. Must be cheap for cash. State condition of equipment and lowest cash price in your letter. Frank King, 36 Crestwood Ave., Buffalo, N. Y.

GOOD USED Motion Picture Camera. State make, condition, price, tion of equipment and lowest cash price in your letter. Frank Charlotte, N. C.

WILL PUT you in touch with buyers for Bell & Howell cameras and equipment. Phone or write the A. S. C., 1222 Guaranty Bldg. GRanite 4274, Hollywood, California.

BELL & HOWELL or Mitchell Camera outfit; Projection Printer; Cinex timer; Straight Line Processing Machine; Nutting Reflectometer; Polishing Machine; State price, Equipment. Fred Jeffery, Giles Street, Rose Park, South Australia.

WANTED—Used movie camera. Old model considered. State condition, make, price, etc. Albert R. Bly, Rosedale, Kansas. General delivery.

AKELEY CAMERA—Phone Perry Evans, DUnkirk 3890, or care A. S. C., 1222 Guaranty Bldg., Hollywood.

FOR SALE—CAMERAS

170-DEGREE Bell and Howell wanted. Have 1924 Buick Sport Touring car, in excellent condition, as down payment. Remainder to be paid within six months of purchase. Write or phone Herman Schopp, care of the A. S. C., 1219 Guaranty Building, Hollywood, California. GRanite 4274 or GRanite 4704.

TKELEY camera for sale. Write or phone John Jenkins, care of the A. S. C., 1219 Guaranty Building, Hollywood, California. GRanite 4274 or GRanite 4704.

DEBRIE, aluminum box, dissolving shutter, ground glass focus, 3 magazines, 35, 50, 75 mm. Zeiss lenses, Veeder footage counter, carrying case, etc., all in perfect condition. Harry Hillier, ter, carrying case, etc., all in perfect condition. Harry Hillier, 1956 Elmhurst Ave., Detroit, Mich.

DEBRIE, aluminum box, dissolving shutter, 8 magazines, Mitchell tripod, 40, 50, 75 mm. Carl Zeiss lenses. Thalhammer iris. Veeder footage recorder, ¼-way mat box. Glen MacWilliams, c/o A. S. C., Hollywood.

WILART camera, latest model, complete with tripod and carrying cases and retort case and magazines. John L. Russel, 1643 North Gardner St., Hollywood. HEmpstead 9554.

BELL & HOWELL Eyemo, carrying case, four one hundred feet daylight loading Eastman negative, guaranteed perfect. First $225.00 gets it—cost $385.00. Cameron, Manhattan Beach, N. Y.

$75—Angeles 400-feet Carl Zeiss 3.5, case, tripod. Want 4 by 5 Graflex or f 1.9 to fit De Vry. 2590 Midlothian Dr., Altadena, Calif. Colorado 0342.

BELL & HOWELL Eyemo, brand new, B-1702, with carrying case and five spools, $225.00, C. O. D. Guaranteed. Roscoe Wright, 2223 Clifton Ave., Cincinnati, O.

FOR RENT—CAMERAS

ONE DE VRY Motion Picture Camera. Complete outfit. Alvin Wyckoff, Phone Care A. S. C., GRanite 4274.

ONE 8x10 still camera—complete. Care A. S. C., GRanite 4274.

BELL & HOWELL, 170 degree, complete. Modern equipment. Fred Kaifer, HEmpstead 4621.

THREE Bell & Howell 170-degree cameras. Complete equipment. Eddie Linden, 6017 Eleanor Ave., Hollywood, HEmpstead 8333 or Hollywood 7716.

FOR RENT—Bell & Howell studio equipment complete. 170-Degree Shutter. Liberal commission to cameramen. Call Mr. Smith, MEtropolitan 4686. Evenings call MAin 0947. (Los Angeles.)

NEW Eyemo camera, fully equipped; rent by day or longer. Joe La Shelle, 9038 Dorrington Ave., Hollywood; Phone OXford 5840.

AKELEY, Bell & Howell and Mitchell Cameras for rent, all latest equipment. Phone GRanite 2213 or GRanite 1914. John W. Boyle, 1207 North Milton Ave., Hollywood.

BELL & HOWELL. Victor Milner, 2221 Observatory Ave., Los Angeles, California. 596-944.

MITCHELL and Bell & Howard Cameras. F.2:3, F.2:7, F.3:5 lenses—40-50-75 mm. Complete equipment. J. R. Lockwood 523 North Orange St., Glendale, California. Glendale 3361-W, or HOlly 0764.

E. BURTON STEENE, Bell & Howell, and Akeley. Complete Camera equipment. Latest models. Address American Society of Cinematographers, Hollywood, California.

BELL & HOWELL, 170, with 30, 40, 50 and 75 lens equipment. Baby tripod. Also B. & H. Cine motor. Charles Stumar. GRanite 9845. 7501 Lexington Ave., Hollywood.

FOR RENT—One Eyemo camera, complete with all accessories. Bert Glennon, 6936 Woodrow Wilson Dr., Hollywood, Calif. Phone HEmpstead 2743.

BELL & HOWELL No. 627. Five lenses: 32, 40 (f.2.7), 50 (f.2.7), 75, 100 mm. Complete studio equipment; gauzes, filters, etc. GLadstone 0033.

TWO Bell & Howells. Large finders. Also Eyemo for rent. Lenses: F 2.5; 2.3; 2.7. Frank M. Cotner, 6273 Selma Ave., Hollywood. HOllywood 5046.

SPEED CAMERA: Bell & Howell, fully equipped for miniature and slow motion work 40, 50, 75 mm. and 6-inch lenses. Alvin V. Knechtel, 1179 North Kenmore. 597-054.

BELL & HOWELL cameras, Akeleys and other makes—portable lights, special lenses by the day, week or month. We sell everything that any cameraman might ever need—new or used —at a big saving. Keep us in touch with your wants. Ruby Camera Exchange, Ruby Building, 727 Seventh Ave., N. Y. Bryant 0631 or 8457.

BELL & HOWELL—Phone Perry Evans, DUnkirk 3890 or Hollywood A. S. C.

FOR TRADE—CAMERAS

TWO 170 shutter Bell & Howell cameras, fully equipped. One with super-speed attachment. ORegon 3726, 407 N. Milton Ave., Hollywood.

FOR RENT—AIRPLANES

AIRPLANES equipped to carry cameras, facilitating the photographing of stunts or other unusual action, for rent by the hour, day or week. Jerry Phillips, Professional Pilot, Clover Field, Santa Monica, California.

FOR RENT—STILL CAMERAS

WILL RENT still camera to local parties. Special arrangements to A. S. C. members. Geo. Meehan, Phone GRanite 3830, 744 Curson Ave., Hollywood, California.

FOR SALE—LENSES

ONE two-inch Bausch & Lomb F.2:7; one Dahlmeyer Pentac 37 mm. F.2:9. Georges Benoit, 3306 North Knoll Drive, North Hollywood.

CARL ZEISS, F. 2.7, 50 mm. in Bell & Howell mount. Dan Clark, care American Society of Cinematographers.

NEW 40 mm. Goerz Hypar f. 3. 5. lens in Bell & Powell mount: price, $50.00. Write Charles Clarke, 1222 Guaranty Building, Hollywood, California.

RUO LENSES—Sole U. S. Agent. Robert Ackerschott, 1575 N. Vine St., Hollywood. 25 mm. to 100 mm.; F. 2. and F. 2.5 (Latest type: Telephoto, 10-inch, F. 4.5).

CARL ZEISS, 50 mm., F. 3.5, in Bell & Howell mount, $50; without turret mount sleeve, $41.50. Write Gaylord A. Wood. 1821¾ N. Wilcox Ave., Hollywood, Calif.

WANTED—PROJECTOR

USED SIMPLEX wanted. State model, price, condition, etc. Address Box R, American Cinematographer.

WANTED—MISCELLANEOUS

WANTED—Photographs of nature, birds and animals, etc.; for educational library. E. R. Gammage, Animated Film Library, Westlake, La.

FOR SALE—SPECIAL CAMERA EQUIPMENT

COMPLETE new style Bell & Howell matt box for sale. Joseph B. Walker, 1037 N. Sycamore Ave., Hollywood. Phone GLadstone 3797.

PATHE panorama head for professional camera, with detachable aluminum tilting head, easily adapted to any standard tripod. A first-class unit for some one, who is experimenting or engaged in research work, to add to their equipment. Stephen S. Norton, care A. S. C., Guaranty Bldg., Hollywood.

ATTENTION A. S. C.

On the night of September 13 a special committee of the Motion Picture Producers and Distributors of America, composed of Messrs. Sol. Wurtzel, William Sistrom, Watterson Rothacker and Frederick Beetson, met with a special committee of the A. S. C. in the assembly rooms of the Society in the Guaranty Building, Hollywood.

The producers asked for a full and frank discussion of matters near to the hearts of the cinematographers and, after a four-hour session, it was the general opinion that much good would eventuate from the meeting.

For lack of time the proceedings of the meeting cannot be published in this issue, but will be communicated to the full membership by letter and discussed in the next open meeting of the A. S. C.

Arthur Reeves, A. S. C., is photographing a Burton King production now being made at the Tec-Art Studio.

* * *

H. C. Neuman, A. S. C., is shooting Hoot Gibson's latest Western picture for Universal release. The working title is "The Lion and the Lamb."

* * *

Arthur L. Todd, A. S. C., is chief cinematographer on Laura La Plante's next Universal production, "Thanks for the Buggy Ride." Miss La Plante's husband, William Seiter, is directing.

* * *

Ed Du Par, A. S. C., is photographing "Dog of the Regiment" for Warner Brothers.

* * *

Barney McGill, A. S. C., is in charge of the camera work on Dolores Costello's next Warner Brothers production, "The College Widow," which Archie Mayo is directing.

* * *

Max Du Pont and Earle F. Walker, both A. S. C. members, have just completed the cinematography on the newest Tiffany production, "Once and Forever." Directed by Phil Stone, the picture features Johnnie Harron, Patsy Ruth Miller, Paulette Duval and William Mong.

* * *

George Schneiderman, A. S. C., continues the camera work on the current John Ford production at the William Fox Studio.

* * *

Daniel B. Clark, A. S. C., is preparing to shoot the next Tom Mix feature, soon to be put into production at the Fox Studio.

* * *

Joseph August, A. S. C., is first cinematographer on Madge Bellamy's latest picture, "Very Confidential."

* * *

L. W. O'Connell, A. S. C., is photographing "Wolf Fangs" at the William Fox Studio.

* * *

Percy Hilburn, A. S. C., is chief cinematographer on the latest John Gilbert production for Metro-Goldwyn-Mayer release. Monta Bell is directing.

* * *

John Boyle, A. S. C., chief cinematographer for Mack Sennett, reports that the comedy king is using Technicolor in his two-reelers, the first time Technicolor has been used in short comedies.

* * *

Charles Boyle, A. S. C., has just finished the cinematography on the F. B. O. feature, "Ranger of the North," which features Lena Basquette and Hugh Trevor and was directed by Jerry Storm. Boyle established a record for efficiency in that the entire picture, filmed in the High Sierras, was completed in three weeks, only one day being required for interiors at the studio.

CLARENCE BROWN
UNIVERSAL CITY, CALIF

March 25, 1925

Mr. H. H. Boeger,
Mitchell Camera Corporation,
Los Angeles, Calif.

My dear Mr. Boeger:

My high opinion of the Mitchell camera is reflected not only in the fact that I have employed it in most of my productions, but also in the fact that I was the first director to use it when it was first manufactured in 1920. Another one of my cinematographers used your No. 2 outfit.

The Mitchell's good points start where other cameras leave off. It possesses the tremendous feature of economy. The saving in the "throw-over" just before actual shooting, totals an amount of time, during the course of the average production, which represents a saving in overhead of a cost equal to more than one-half the cost of the camera. This is an important factor and a unique quality which presents an additional reason for the overwhelming popularity of the Mitchell.

With best wishes, believe me

Very truly yours,

Clarence Brown

CB/J

Vol. VIII. No. 9

25 Cents a Copy

American Cinematographer

U. S. Postage
2c Paid
Permit No. 941
Los Angeles, Calif.

Dec, 1927

Vol. VIII December, 1927 No. 9

American Cinematographer

SILAS EDGAR SNYDER
Editor and General Manager

JOSEPH DUBRAY
Technical Editor

Table of Contents

An educational and instructive publication, espousing progress and art in motion picture photography.

Subscription: United States, $3.00 a year; Canada, $3.50 a year; foreign, $4.00 a year; single copies, 25c.

Published monthly by
THE AMERICAN SOCIETY OF CINEMATOGRAPHERS, INC.

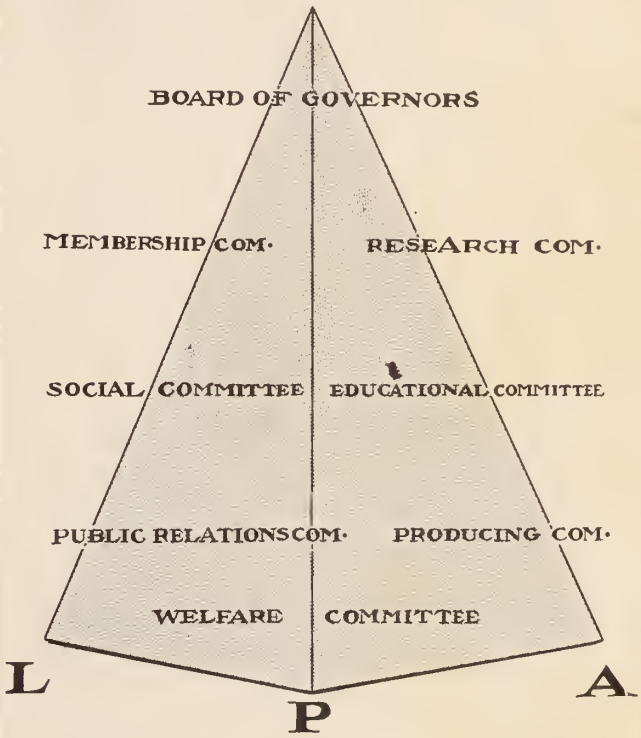
Advertising rates on application.

1219-20-21-22 Guaranty Building, Hollywood, Calif.

Telephone GRanite 4274.

A. S. C.

The Pyramid of Progress



COMMITTEES

RESEARCH COMMITTEE—Victor Milner, Chairman; Joseph Dubray, Percy Hilburn, George Barnes, Eastman Kodak Laboratories, John Seitz, George Meehan, Ned Van Buren, Gilbert Warrenton, Thomas A. Edison.

WELFARE COMMITTEE—Gaetano Gaudio, Chairman; Arthur Edeson, John Arnold, Charles Rosher, Karl Struss, Charles G. Clarke, Victor Milner, Oliver Marsh.

EDUCATIONAL COMMITTEE — Frank Good, Chairman; Alfred Gilks, Floyd Jackman, L. Guy Wilky, E. Burton Steene, King Gray, Entire Membership.

PRODUCTION COMMITTEE—Fred Jackman, Chairman; Homer Scott, James Van Trees, Gaetano Gaudio.

PUBLIC RELATIONS—John W. Boyle, Chairman; Arthur Edeson, Georges Benoit, Gilbert Warrenton, Arthur Webb, Glen MacWilliams, Herford T. Cowling, John Seitz, Joseph Dubray.

SOCIAL—Gilbert Warrenton, Chairman; Frank Good, Douglas Shearer, E. Burton Steen, Elmer Fryer, Douglas B. Keyes.

MEMBERSHIP—The Board of Governors; Joseph Dubray, King Gray, E. Burton Steene.

Motion Picture Film

The Du Pont Company Sought Another Outlet for Cellulose Products and That Is Why, Today, Du Pont-Pathe Film Is Contributing Pleasure to Millions

By George R. Rocker

Assistant to the President, Du Pont-Pathe Film Manufacturing Corporation

About fifteen years ago the du Pont Company, in accordance with its established policy of developing the field of industrial products made from cellulose, began to study the possibilities of the motion picture film, which was then a comparatively new invention. The large field for use of motion picture film in the theater, the home, the school, and in industry was easily appreciated, and the industry of producing the film itself appeared to be one worthy of consideration as a permanent investment. It was not, however, until 1914 that the company undertook actively the first experimental work on photographic emulsions and the celluloid base upon which these are coated.

This experimental work, like all other development work under way at that time, was temporarily suspended on the outbreak of the war and was not resumed until the close of the war. From then on, experimental work made rapid progress through laboratory and semi-works stages until the present factory for the manufacture of film was designed and constructed in 1921 and 1922. Active production began in 1923, and in 1924 the du Pont Company and Pathe Exchange organized jointly a new company which acquired the film manufacturing facilities and which has since administered this branch of the du Pont Company's activities.

Although the film industry is one of the youngest of the du Pont Company's ventures, its development has been remarkable because, contrary to the usual policy in recent years, the industry was not started by the purchase of a plant already in production or by the acquisition of complete details of plant and process from another manufacturer. The processes and machinery were developed entirely by the company's own technical staff. It was also remarkable because of the rapidity with which difficulties that had to be surmounted were overcome, all of which required infinite patience and attention to detail before success was achieved. This can be realized only when one considers the extreme sensitivity of photographic emulsions to light and to the minutest traces of impurities, or considers the requirements for proper speed and contrast upon which depend not only the registration of the image, but also the proper values of high lights and shadows.

In the manufacture of motion picture film the celluloid base or carrier for the emulsion is produced by casting solutions of nitrocellulose and camphor continuously upon a rotating drum. As the drum turns, the solvent used in making the solution is evaporated and a sheet of celluloid remains on the wheel. This sheet, before the drum makes a complete revolution, is sufficiently dry and tough to permit of stripping and is removed from the drum as a continuous endless sheet. After further drying, this sheet is wound up in large rolls which then go to a coating machine. On this machine the roll is unwound and the sheet is coated with a continuous layer of a silver halide gelatin emulsion. From the coating machine, the film passes into drying chambers, where it is dried and rewound. This coated roll is then slit into narrow widths, one and three-eighths inches wide, the standard width of professional motion picture film. The narrow rolls then pass to machines which punch small perforations on each edge of the film to fit the sprockets of motion picture cameras and projectors. The film in narrow roll form is then inspected and packed in light-proof containers. Operations from emulsion coating on are conducted in "dark rooms," where only a faint green light is permitted; also, all operations including the coating of film are conducted in rooms kept scrupulously clean, for even the smallest particle of dust on the film may injure the emulsion or may be magnified to a large spot on the projection screen.

At the present time the company is producing negative and panchromatic negative, positive and negative 16 m. m. and portrait.

There is probably no product of the chemical industry which today touches the minds and activities of mankind in so many and varied ways as the motion picture film. In the theater it has become a medium of dramatic expression with possibilities beyond those of the ordinary stage, because of the wide scope of its settings. It interprets and visualizes events and characters of drama, fiction and history. As a medium of portraying visually all that is best in literature it is unsurpassed. It appeals to the illiterate as well as to the educated. In another field, the recording of current events, it supplements the daily newspaper by bringing to every community living pictures of occurrences from all over the world. In the form of news reel it has been perhaps the most powerful educational force in recent years. Travel has always been considered educational, and travel with the news reel, which is not limited to the traveler's purse, and which millions of people enjoy daily, certainly has its broadening effect.

As an educational medium motion picture film is also playing an increasingly important part in schools and colleges, and some of the larger cities now have so-called departments of visual education. In many branches of biology, chemistry, physics, astronomy, ethnology and psychology, motion picture film is used extensively to record phenomena. In engineering, architecture, manufacturing industries and in other applied sciences, records are made of machine motion, of progress in construction or of unique processes, and such records are kept for study. As a medium for recording vanishing wild life, the habits and customs of fast-disappearing primitive races, or the rapidly-changing aspects of our present civilization, the film is of great value. In the practice of medicine its use for recording special phenomena or the progress of disease is becoming daily more important.

Motion picture film is finding large fields of usefulness in advertising, in safety campaigns, in office work, and finally, in the every-day life of the home, in recording events in the lives of children, or of anniversaries, weddings, fishing trips, vacation days, school or college sports. In undertaking its manufacture the du Pont Company has therefore entered a field which should not only afford a permanent outlet for cellulose products, but one which touches practically every side of human life.

EDITORIAL--The Voice of the A. S. C.

When Dr. Kenneth Mees, Chief of the Research Department of the Eastman Kodak Company, appeared before the open meeting of the A. S. C. at the Hollywood Chamber of Commerce, on Monday night, November 7th, he won a home in the hearts of all who heard the lecture.

The laboratory operatives were guests of the A. S. C. and after Dr. Mees had finished his blackboard talk, President Dan Clark, of the A. S. C., invited the assembled cinematographers and guests to "go to the mat" in discussion of the points brought out in Dr. Mees' address, and to bring up any subject that might be of personal interest appertaining to photographic or laboratory practice.

As Dr. Mees had graciously offered to answer questions he was bombarded by a rapid fire of interrogations covering a wide range of points and the discussion became general. The frank, spontaneous and good-natured exchange of views in which Dr. Mees freely participated, even after he had left the platform, had the effect of bringing about a better understanding between the laboratory men and the cameraman, and the feeling engendered was so friendly and generous that the sentiment was expressed by President Clark that the A. S. C. hoped very soon to see the laboratory men enrolled among the membership of the Society and this sentiment was echoed from the floor.

Because of lack of time no attempt is made to publish a resume of Dr. Mees' remarks, but in the January issue of THE AMERICAN CINEMATOGRAPHER we hope to present with diagrams the substance of his talk.

Dr. Mees is a happy talker. He is natural, eloquent, straightforward, sure of his subject, graceful in presentation and he possesses a sense of humor and good fellowship that gives his picture of hard technical facts a setting at once charming and refreshing.

We cannot, however, refrain from quoting our distinguished guest in the prefactory remarks to his address, wherein he paid this wonderful tribute to the A. S. C., for which President Clark, the Board of Governors and the members of the Society are deeply grateful. He said:

"YOU GENTLEMEN HERE ARE KNOWN THROUGHOUT THE WORLD WITHOUT ANY DISPUTE OR QUESTION AS THE GREATEST EXPONENTS OF THE ART OF PHOTOGRAPHY —THERE IS NO QUESTION ABOUT IT—THE CAMERAMEN OF HOLLYWOOD ARE THE GREATEST KNOWN IN THE ART OF CINEMATOGRAPHY—IN THAT FIELD YOU ARE SUPREME."

Come again, Dr. Mees. Come often and come soon.

In his article, "Hollywood in 1952," in the November Cinematographer, President John Camphouse, of The Bank of Hollywood, said:

"Look again and see here fifty more theaters; a great Aviation Union Station, where all transcontinental passenger, freight and mail air lines will center; a wonderful art palace housing the exhibits of Hollywood artists; sunshine factories turning out half a billion dollars worth of manufactures entirely aside from the product of the motion picture studios which will have evolved into something as much more wonderful than the present motion picture as the latter is more wonderful than the stereopticon.

"More than ten years ago the press agent of the old Balboa Studio at Long Beach had a dream about a machine with which three dimensional motion pictures in natural colors were to be disseminated with musical accompaniment by radio from central stations to thousands of motion picture screens in theaters and in homes, colleges, churches, hospitals, prisons and other institutions. Who shall say that this will not be a fact long before 25 years?"

Mr. Camphouse has already turned out to be "a prophet not without honor," for only this week the editor hears of a program now in process of working out which is almost identical with the dream of the Balboa publicity man. The movie world may prepare for amazing and revolutionary changes in every branch of the industry.

To Our Readers and Members of the A. S. C.:

During this, the transition period between the AMERICAN CINEMATOGRAPHER as it was, and THE AMERICAN CINEMATOGRAPHER as it is planned to be, the editor earnestly requests the indulgence of our readers as well as the members of the A. S. C.

Because of necessary changes and pressure of matter long delayed, together with our limited space, it has been necessary to postpone the publication of much excellent material especially personal matter regarding the activities of the membership.

By the first of 1928 we hope to have our new type dress ready and to be able to increase the size of our magazine to accommodate our increasing advertising and the new features to be added, among which latter are a department for the transactions and activities of the Society of Motion Picture Engineers and a department for the Amateur Cinematographer.

We especially regret the necessity for the curtailment, in this issue, of "In Camerafornia" and our department of "Questions and Answers."

Thank you.

Panchromatic Film

Mr. Physioc Answers That Insistent Question: "What Is This Film We Hear So Much About"?

By Lewis W. Physioc

There has been a great deal, already, written about this panchromatic stock, but when we hear the varied opinions as to its value, and the different ideas of its treatment we are impressed with the fact that there is little danger of exhausting the study of this very important development in motion picture photography.

This multifarious valuation among cameramen and laboratories is evidenced in the fact that there is almost as great variety of treatment as there are individuals manipulating it; consequently, there may develop a danger of sacrificing its broad values by improper treatment. There are cameramen who are timidly subjecting it to the same process as the ordinary emulsion, using no filters and exposing it to the same quality of light as with the ordinary emulsion, there are others, on the contrary, who are reckless in the use of filters, while some are still doubtful about the important question of make-up.

Lewis W. Physioc

These facts, naturally, arouse in the minds of those not engaged in the photographic department, the current question: "What is this panchromatic film we hear so much about, these days?"

The question is an important one and should be answered, especially for the benefit of those who are paying for the use of this highly perfected but delicate and exacting stock. Delicate, because of the difficulties of its manufacutre and its great sensitivity, and exacting because it demands a thorough knowledge of its use on the part of the cameramen, and laboratories that have to process it.

First, let us consider some of the reasons for its adoption.

Considering photography, as a whole, we must realize that despite the fact that it is a beautiful and wonderful art, it has its limitations and weaknesses, especially when working with the ordinary emulsion employed before the development of the panchromatic stock. Very often the perfect photograph is the result of chance conditions, except when the operator has at his disposal the proper equipment, as provided in the various studios.

It may be enlightening to review some of these difficulties.

1st. The lights of a subject are, usually, of a very high key compared to the luminosity of the shadows and to treat one correctly is to sacrifice the other, producing unpleasant contrasts. The remedy for this is the proper use of the above mentioned studio equipment, i. e., lowering the key of the high-lights by the use of screens and diffusers and illuminating the shadows by aid of reflectors and the proper placing of lights, all of which requires considerable experience and artistic taste.

2nd. Flat Lighting nearly always results in a very uninteresting picture. The subject may be sufficiently illuminated but so uniformly and highly diffused in all directions that the picture will be devoid of any relief, or what the artist terms chiaroscuro. This effect may also result from a poor rendering of color values. The remedy for flat lighting, where conditions cannot be improved by artificial equipment, is a minimum exposure with a maximum development. Panchromatic stock also improves this condition by furnishing more pleasing contrasts through a more perfect rendering of color values.

3rd. Modeling, is the antithesis of flat lighting and is an element highly important in photography and is difficult to achieve, especially in close-ups, because if it is carried the least bit to the extreme, harshness is produced and smoothness and delicacy of skin texture destroyed. However, without modeling, true portraiture is impossible, expression lost, and individual beauty and perfection in the mould of features sacrificed. Panchromatic film will often enhance the most delicate modeling because shading is often produced in color values, lost to the ordinary emulsion, and blotches and excrescences in the skin are smoothed out considerably by the use of panchromatic film.

4th. Color rendering is, also, a source of great worriment to the photographer, for, frequently, the excellence of the picture, in all of the above elements, is dependent upon a proper rendering of color values. Panchromatic film is the solution of this problem.

5th. Composition is the keynote of this beautiful tonic chord we call the picture; we can see, therefore, how it, in turn, must be influenced by the foregoing elements, as composition includes line, color harmony, lighting and modeling.

It is easy to understand, then, why a progressive cameraman should demand something that will enable him to reduce some of the weak spots of his medium and allow him to satisfy his ambition for greater excellence of expression. The result of this demand is panchromatic stock, a generous and able response on the part of the manufacturer; generous because of the tremendous additional expense and equipment necessary to produce it in large quantities, and able because of its great delicacy and the difficulties of its process of manufacture.

This stock differs from the ordinary stock in its range of sensitivity to the various colors, especially the reds, greens and yellows. This fact, however, introduces difficulties in the handling of it that we must take into consideration. The ordinary emulsion, being sensitive to one portion of the spectrum (the blue section) can be manipulated safely in red light whereas, panchromatic film being highly sensitive to the red rays is limited to the very poor illuminating properties of a certain green light and greater safety demands total darkness in the developing room.

In balancing expectations against disappointments, even with this great improvement in the photographic emulsion, we must take all of these difficulties into consideration, for we must remember that while rendering the reds, greens and yellows more perfectly the blues are yet very persistent and will continue to tantalize the photographer unless he finds a means of curbing them. This we treat under a proper paragraph. And further, while it relieves the cameraman of some of his worries it increases those of the developer; but we are ever progressing, and the time is not very remote when all of these difficulties will be taken care of by nearly automatic treatment.

Panchromatic film is obtained by treating the ordinary emulsion with certain dyes, known to chemists as the Isocyanine derivatives; cyanin, a peculiar blue and pinacyanol, a purplish tint, and even greater range may be obtained in the orange, yellow and green by the use of pinaverdol, and dicyanine will even render, somewhat, the infra-red rays. The film is bathed in these dyes and dried in the dark, and they may even be incorporated in the emulsion during the process of manufacture. Indeed, the excellent keeping quality of the present panchromatic stock leads us to believe that the latter method has been highly perfected. Even greater sensitivity may be obtained by hyper-sensitizing solutions of ammonia and silver salts. This latter emulsion has so great a range that excellent renderings may be had without the aid of

filters, thereby permitting very rapid exposures. However, this latter process provides a highly delicate fugitive material, and is seldom employed except for special night effects and for natural color photography. But there is no telling to what degree of excellence the modern scientist may develop even this latter process.

The action of these dyes is a very peculiar phenomenon and seems to be more the result of persistent experimentation than of axiomatic equation, and is, even yet, imperfectly understood. Chemists do not feel quite certain as to whether these dyes form direct compounds with the silver or whether the process is purely physical or pigmentary; however there is a certain modification in the character of the silver compounds in the emulsion that supports the theory that there is a positive reaction between the dyes and the silver, forming very complex combinations. This is further substantiated by the very remarkable nature of silver in reaction upon which the whole art of photography is founded. Others hold to the opinion that these dyes merely have a peculiar physical property of absorbing and holding in storage radiant energy.

Now it appears that one of the inviolable rules of progress is that each improvement must have its attendant problem; in fact, it is the final solution of this problem that leads to further achievements. This is none the less true in the case of panchromatic film. Having found that this stock considerably humors the red, green and yellow rays, we are confronted with fact, as before mentioned, that the blue and violet still remain powerful and troublesome. It is similar to adding one chemical solution to another to form a desired precipitate; we must filter off one before we can use the other. We must ,therefore, resort to some means by which we can curb the power of these blue and violet rays, and we find this can be done by the use of filters, i. e., colored mediums, placed between the subject and the film, either in front of the lens or back of it or even between the elements, near the diaphragm.

Here, the aforesaid law of development again asserts itself, for it introduces a subject that causes the heart to quicken. The colored filter plus the panchromatic film takes the photographer out of the limits of the monochrome artist and adds to his profession the study of the theory of color, a very coquettish mental companion. But without a little knowledge of the study of color, panchromatic film may lead one into a maze of difficulties.

In the study of color we are confronted with the proposition of a very complex theory quarreling with common observation, and it is very puzzling to those not of a scientific turn of mind, or who have not kept pace with modern physical research along these lines and who are apt to revert to early text books that have left them with the old idea of the three primaries red, blue and yellow, the mixture of which was supposed to produce white when considered as light, and mixed, in the form of pigments, produced black. The modern scientist discounts, to a great extent, this theory and accounts for each color by a definite wave frequency. Even at the present time, however, there is some uncertainty in the case of yellow, which is still puzzling, and which the earlier students despite their error, balanced well, in many ways, as a primary, but which is now accounted for as a mixture of red and green light.

The scheme is further complicated by the terminology. This is due to the fact that we are accustomed to compare and name colors according to the standard of the common pigmentary elements, because they are well defined and distinct in character. The very small child can call off blue, red or yellow, but immediately we stray from the primaries and consider the secondary and tertiary mixtures we can no longer give positive terms to a given tint; hence the distracting expressions such as yellow greens, golden yellows, orange, etc., each of which may be calculated from the first section of the spectrum from positive red to the so-called purples, between the extremes of pure red and pure blue and the variety of blues, blue-greens between the blue and green sections. From this, we come to the conclusion that the only way in which we can actually define a color is to compare it to the spectrum and the actual wave length will show whether it approaches a pure primary, as commonly known, or whether it belongs to the secondary or tetiary mixtures.

So that instead of venturing a name that might mean any gradation between these various sections of the spectrum, we study the findings of the scientist, as given below.

Considering colored light as a wave of a given length, vibrating with a given frequency, i. e., the number of waves passing a given point so many times per second; and calculating from the basis of the known fact that all of the waves (white light) travel at a speed of 186,000 miles per second, we are furnished with the following tables.

Wave Length

RED (Approximately)	34,000 to the inch
ORANGE (Approximately)	37,000 to the inch
YELLOW (Approximately)	42,000 to the inch
GREEN (Approximately)	48,000 to the inch
BLUE (Approximately)	51,000 to the inch
INDIGO (Approximately)	61,000 to the inch
VIOLET (Approximately)	64,000 to the inch

Frequency

RED (Approximately	400 billion per second
ORANGE (Approximately	440 billion per second
YELLOW (Approximately)	500 billion per second
GREEN (Approximately)	570 billion per second
BLUE (Approximately)	600 billion per second
INDIGO (Approximately)	700 billion per second
VIOLET (Approximately)	750 billion per second

And, further, Prof. Grunberg has worked out the following numerical units where mathematical equations are desired to prove the complements and certain combinations.

RED	Wave length	0.656
ORANGE	Wave length	.608
YELLOW	Wave length	.576
GREENISH YELLOW	Wave length	.564
GREEN	Wave length	.524
GREENISH BLUE	Wave length	.492
BLUE	Wave length	.483
INDIGO	Wave length	.462
VIOLET	Wave length	.433

The study of these figures will readily show us the difficulty of naming colors, but observing the ratio between each group will, however, enable us to approach, very nearly, a satisfactory definition. For instance, in the range between red and yellow, if we match a tint between 656 and 608 we might safely call it red because it is well beyond the yellow, past the orange and approaching very near to the pure red.

The theory of color is very puzzling to some artists who are not scientifically or mathematically inclined and who think of color in terms of pigments. It is difficult for them to conceive of green being an element, or yellow as a mixture. They reason, that there being nothing on their pallet that they may mix to produce red, blue or yellow, they will accept these as the primaries because, with these, they can mix any desired tint, from the secondaries, commonly called orange, green or purple, and further into the tertiaries, and infinite varieties of grays. So they continue to smile at these complicated technicalities and revel in their pigments.

Panchromatic film, without the use of filters, is not very satisfactory, except in interior work with the warm quality of the incandescent light now being adopted by some of the better informed cameramen. Without the use of filters, or the proper quality of light, the virtue of panchromatic film is somewhat sacrificed, because if development is carried sufficiently to profit by the correction in the reds, greens and yellows, the blues and violets continue to develop up in tremendous proportion and we are apt to produce the same unpleasant lack of balance as with the ordinary emulsion, with just a slight improvement in the reds. Now we must resort to our above mentioned simile of the chemical precipitate; we must filter out some of these powerful and troublesome

(Continued on Page 22)

"It Is In The Box"

An A. S. C. Man Finds Shooting Movies In Japan Nothing Like The Good Old U. S. A.

By Alfred Gosden, A. S. C.

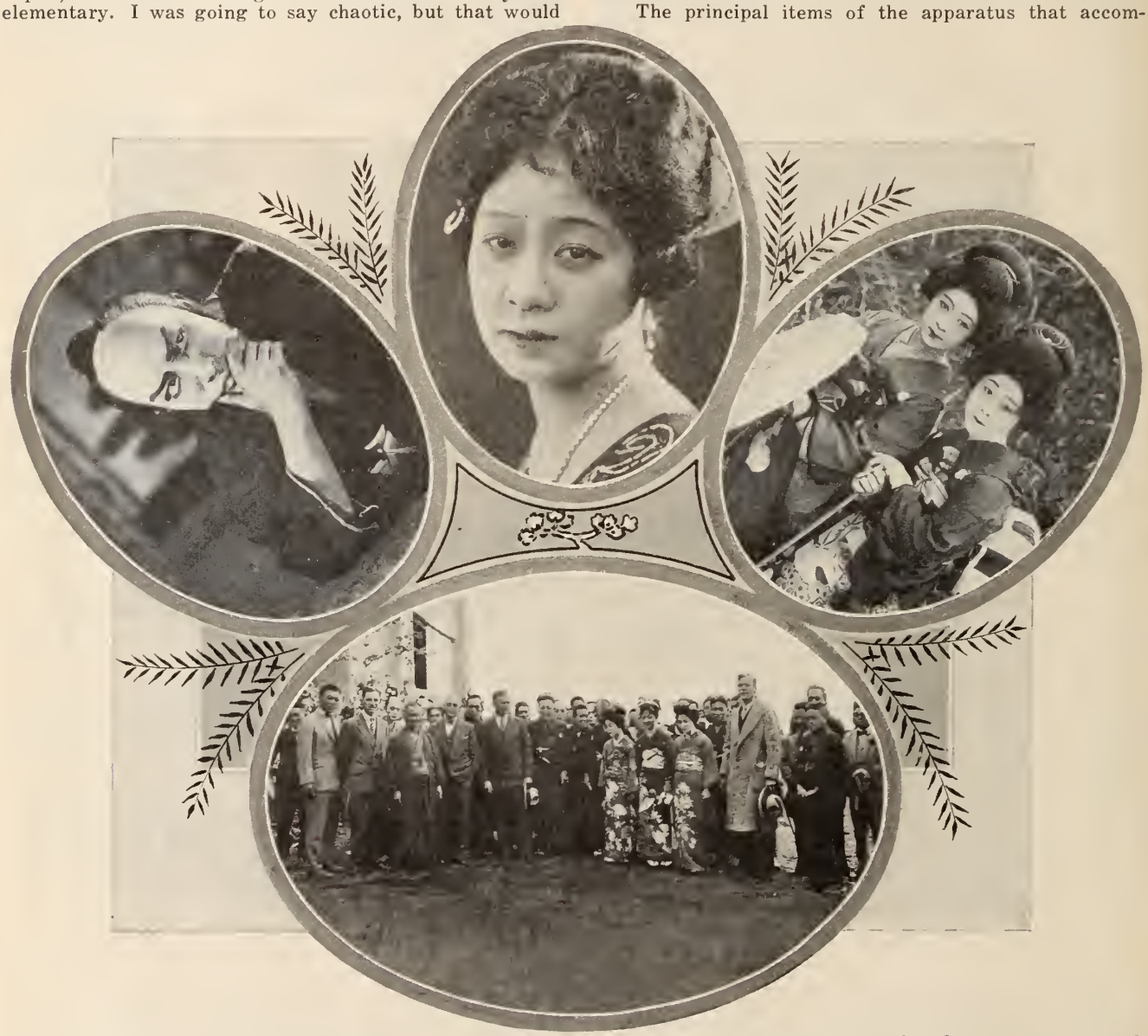
"HAKO NO NAKA NI ARIMASU!"—This strikes me as being quite an original main title and translated from Japanese into English means "It is in the box" to which I advisedly add "Maybe." I qualify the remark because when we arrived at the Bantsuma-Tachibana Universal Studios in Uzumasa near Kyoto, Japan, we found working conditions what I may call elementary. I was going to say chaotic, but that would not be quite just, for I believe that they were doing the best they knew how according to their knowledge and experience.

Our small company consisted of Jay Marchant in charge of production, Al. Boeckmann, electrician, with Harold Smith and myself looking after their knowledge and experience.

We were sent to Japan in an advisory capacity from Universal City, but actually were in the point employ of Universal Pictures (Japan Ltd. and the Bantsuma-Tachibana Co., the former a releasing company and the latter a producing company with studios at Uzumasa.

The principal items of the apparatus that accompanied us were four Bell and Howell cameras (one with high speed attachment) one Akeley, one Eyemo, a Duplex printing machine, about forty side arcs, two rotary spots, and several other spots, I forget exactly how

(Continued on Pages 16 and 17)



Top, left to right—Bantsuma-San, leading man; Gomei-San, star; Izumi-San and Mori-San, featured leads. Below—Personnel and stars of Bantsuma-Tachibana Studios at Uzumasa. Mr. Gosden is fourth from the left in the front row

IN CAMERAFORNIA

Our beloved Tony Gaudio, A. S. C., is temporarily confined to his home convalescing from an operation.

Reggie Lyons, A. S. C., is back from a sojourn to New York where he looked over all the good Broadway shows and some not so good. Mr. Lyons is back home on the Fox lot.

Shooting has started at the Metropolitan Studios on the McConnell Production, for Pathe release, in which "Thunder," the police dog, is featured. Harry H. Cooper, A. S. C., is chief cinematographer.

Howard Hughes has started production on "Hell's Angels," a British air force story, for United Artists release. Harry Perry, A. S. C., who was chief cinematographer on "Wings," is in charge of photography on this new air picture. Luther Reed is directing.

The aerial photography on the Universal comedy, "The Cohens and Kellys In Paris," was recently completed by William S. Adams, A. S. C. This feature is being produced under the direction of William Beaudine. It is of interest to note that in the last five air pictures which Adams has photographed, Art Goebel, winner of the Dole prize for the trans-Pacific-Hawaiian flight, has been pilot of the camera planes.

Alvin Wyckoff, A. S. C., has added to his already valuable photographic paraphernalia one of the finest camera equipments ever turned out by the Mitchell Camera Corporation of Hollywood. When Alvin quit ordering he had purchased every instrument and appliance turned out by this organization. Mr. Wyckoff is now the possessor of one of the finest cinematographic and still equipments in the industry.

Glenn R. Kershner, of Culver City, has been selected to do the camera work for the Pathe-Bray Colorado River Expedition with Leigh R. Smith as director. The expedition will go by train to Green River, Utah, where the boatmen and chief engineer of the previous National Geographical Expedition will meet them, load their equipment in boats and start on their wonderful trip down the Colorado River to the Grand Canyon, coming out at the El Tovar Hotel. One of the interesting features of the trip will be the broadcasting of each day's progress and location by government experts. Mr. Kershner is a member of the American Society of Cinematographers and the Two-Thirty-Three Club of Hollywood.

"Wings," Harry Perry's latest oeuvre, has soared to its second sensational success, according to "Paramount New."

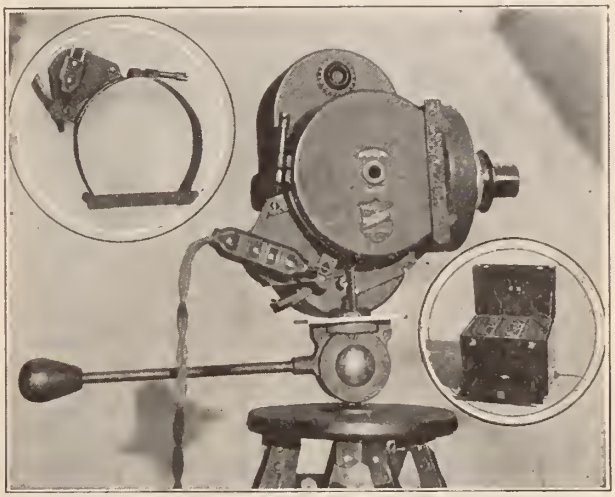
Opening at the Erlanger theater in Chicago, October 30th, it has swept the midwest metropolis by storm, arousing even greater enthusiasm than it did in New York, where it is now in its thirteenth week, with standees at every performance.

The film is being given the same marvelous presentation as in New York, with the enlarged screen and the tremendous sound effects developed by Roy Pomeroy and his staff. Without exception, the reviewers of Chicago paid high tribute to the perfection of the presentation, which plays so big a part in the success of "Wings."

By Remote Control

By Chas. G. Clarke, *Sec'y, A. C. S.*

The accompanying photographs illustrate an electric magnet device used for operating an Eyemo camera by remote control. It is used in making hazardous shots, natural history subjects, and for operating a camera in any position where it would be impossible for a human operator to be with it, such as from a fragile boom, wires, slides, etc. It is made by Fred Hoefner, 5319 Santa Monica Boulevard, Hollywood, from ideas originating with Chas. G. Clarke. It can be fixed to any Eyemo camera, alterations to the camera being unnecessary.



This device was used with success by Mr. Clarke for photographing the latest "Red" Grange picture, "A Racing Romeo." Scenes were taken from angles heretofore impossible. In some of the racing shots the camera was suspended across the road just above the drivers heads. On the screen this gave the thrilling effect of driving right into the spectators. It was also set up on the racing cars themselves, photographing the drivers with the whizzing scenery for background. The drivers pushed the switch, when the high speed was developed, before going into a crash or when the proper background was reached. While making these close-up shots other cameras were photographing the same action from different positions along the roadside, but the Eyemo on the car was inconspicuous because of its small size. This indicates how it may be used by professional motion picture cameramen.

For the amateur it opens up a great field of natural history subjects. For example a camera with this attachment could be set up and focused on a bird's nest or like subject, then by means of an electric cord connecting with the operator who is out of sight and hearing, the motor is set in motion when the bird appears at the nest. Light spring connections can be made so that the animals themselves make the closed circuits and photograph themselves. The resulting pictures would be of better quality and perspective than those flattened field pictures obtained when using telephoto lenses from a distance.

This device operates on 110 volts direct current, and when away from the studio Mr. Clarke uses the illustrated battery box which holds three 45-volt Radio "B" batteries. It has a volt meter built in and a drawer for cable. This is the same outfit carried to supply current for the Cinemotor on the standard camera.

For those wishing to operate the magnet from the batteries of their car it can be wound for 6 volt batteries.

Amateur Cinematography

A Professional's Notes for Amateurs—XIV

By Joseph A. Dubray, A. S. C.

(Continued from November Cinematographer)

In the investigation concerning the possibilities of correcting the "chromatic aberration" of lenses, the conclusion was reached that a combination of two lenses of opposite power and of suitable material, would bring nearly to a single focal point the coloured rays comprising the spectrum, without destroying refraction.

In reality, a complete focusing of all of the rays of the spectrum is a physical impossibility, due to the IRRATIONALITY OF DISPERSION, which is the term used to denote the lack of uniformity found in the dispersion of different refracting media.

The colours of the spectrum formed by dispersion through a glass prism, are always found to be in the same order from red to violet, as this splitting of the white light into its components is due solely to the different velocities acquired by the different coloured rays in the medium glass, but the extent of the different regions of the spectrum varies with the nature of the glass, and therefore the Fraunhofer lines, which are always to be found to correspond with the same colour, and always in the same rotation from A to H, are found to be at different distances from each other, depending on the composition of the glass.

In Flint glass, for instance the separation between the lines G and H, is greater than in Crown glass, the spectra of these two glasses, being equalized as to size.

It is quite evident that this irrationality brings about the necessity of making separate measurements of dispersion for each substance under investigation.

Irrationality of dispersion is evident in all refracting materials and it results quite evidently that in the construction of an achromatic doublet it is necessary to choose among the different optical glasses, a pair which show such similarity in their irrational behavior, that their irrationalities will as far as possible neutralize each other.

Optical glass manufacturers have devoted great time and prolonged efforts in the production of glasses which would put at the disposal of the designer and calculator of optical instruments, a great variety of glasses having different values of mean dispersion (the **n** value mentioned in the November number of the "American Cinematographer") among which they could choose the most appropriate for each particular need.

After Newton's contention in reference to the proportionality of refraction and dispersion had been demonstrated erroneous, and John Dollond, an English optician, had succeeded in 1757 in making achromatic combinations, with the glasses then available, Fraunhofer foresaw the possibility of incorporating in the glasses other elements in order to change their destiny and therefore their refractive and dispersive powers. His work was followed by investigations, by Faraday, Harcourt, Stokes and others who could obtain glasses better apt for the correction of chromatic aberration and until the year 1886 France and England held the supremacy in optical glass making.

In 1886, Schott and Abbe introduced into practical optics the famous Jena glasses and published their first catalogue, which included not less than 44 different glasses of which 19 were of entirely new composition.

Abbe and Schott results were obtained, after several years of patient scientific research, by incorporating in the glasses certain elements such as boron, zinc, cadmium, phosphorous, lithium, magnesium, bismuth, antimony, arsenic, fluorine, etc., etc. and by the scientific improvement of the manipulation of the component of the glass during the process of manufacture.

Abbe's and Schott's remarkable achievements started a new impulse in optical science and in the domain of photographic objectives a great number of constructions were rendered possible.

The mathematical investigation carried on, in view of the correction of the chromatic aberration, proves that two glasses will be better adapted to this scope, the less they differ as regards the values **a**, **b**, **g**, and the more they differ as regards the value **n** (See November issue of the "American Cinematographer").

In spite of the great variety of glasses known at the present day, the irrationality of dispersion, always present, does not permit perfect achromatism but for two of the coloured rays of the spectrum, and in some cases for three of them, to the sacrifice of other very valuable properties of the glasses.

When only two of the coloured rays are brought to a common focus, the remainder of the rays of the spectrum, are called the SECONDARY SPECTRUM and TERTIARY SPECTRUM is the appellation of the remaining rays when three of the colours of the spectrum are achromatized.

The existence of a secondary spectrum, is, of course, impairing the orthoscopy of the image produced by a photographic objective, but to a very little extent and if the two rays brought to a focus are carefully selected, the remaining chromatic aberration can be neglected.

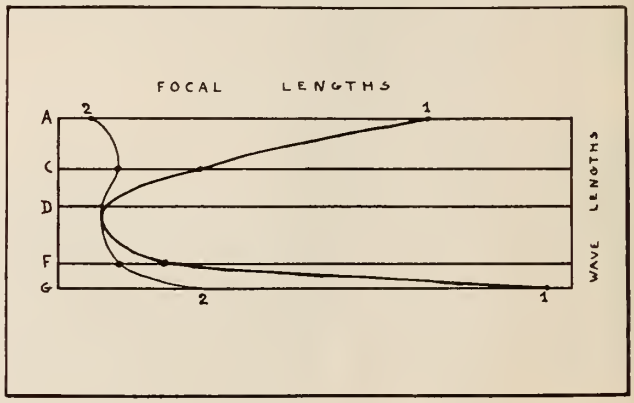
Dr. Hovestadt in his work on "Jena Glass and its scientific and industrial applications," gives graphically a very clear idea of the achromatization of lenses.

In Fig. 30, is shown the variation of focal length for the different rays of the spectrum, in two different combinations of glasses.

No. 1. A Silicate Crown with a Silicate Flint.

No. 2. A Phosphate Crown with a Borate Flint.

The focal lengths of the rays are taken as abscissae, and the wave-length as ordinates.



"On inspecting the curves, it will be seen that the "scattering of foci, is confined within much narrower "limits in the combination 2, than in the combination 1, "and further that the colour union obtained in 2, is triple "instead of double. The curve 1 is cut by any ordinate "in only two points so that chromatic foci will only be "united in pairs. But in curve 2, owing to the double "bend there will be union of three chromatic foci through-"out the whole region extending from near A1 to F, so "that there only remains a slight scattering of the rays "beyond F."

The above, quoting Dr. Hovestadt.

By the accompanying diagram, it is very easy to understand the significance of Secondary and Tertiary spectra

(Concluded on Page 25)

Must Be A Capitalist

CAMERAMEN FORCED TO INVEST HEAVILY TO PRACTICE THEIR PROFESSION

By AN A. S. C.

Not only the public, but even most people in the motion picture industry do not realize the investment necessary to be made by the average master cinematographer to successfully follow his profession. Even those employed in the many branches of photographic endeavor, who specialize, and those who have not yet advanced themselves to the master plane of achievement are weighted with more or less personal expense in acquiring necessary equipment.

On account of this forced situation the individual is not as well paid for his efforts as would seem at first thought. The remuneration is little above the level, if any, of that given the master technicians of other branches, such as carpenters, electricians, etc.

There are many cinematographers who have actually invested no less than $3500.00 in their equipment while others are burdened with an investment up to $10,000.00. It is not uncommon to find men who are constantly carrying an investment of $10,000.00.

In the main the producer forces this condition and usually expects the cinematographer to furnish the entire photographic equipment for the purpose of securing a proper negative to register his production before the public and his percentage of profit is greater because the cinematographer has carried the load of investment that was mechanically necessary to secure the negative.

The average salary paid the cinematographer for his services and the use of his equipment is little more than living wage. Figuring rental value, depreciation, repairs and interest on his investment there is little remaining that he can call "net." Only in a comparatively few cases is there sufficient salary paid whereby a fair net profit can be realized and these are usually instances where the individual is well established and recognized for his ability par excellence.

The larger corporations, except in isolated instances, furnish equipment which is of a high order. In such instances any additional equipment the cinematographer may desire to employ in order to obtain an effect that will stamp the finished production with his personality must be obtained at his expense.

The ambitious cinematographer often invests a good percentage of his earnings in experimental work that is highly advantageous to the producer and the artistic quality of a production without realizing any profitable return beyond the personal gratification attendant upon his success.

Except for the producer who finances the production, the cinematographer is the most necessary studio employee, for without photography there could be no production. He can very well be considered the "backbone" of the production, while the financing is the life that stirs the entire thought into action and, in order to portray a high percentage of photographic excellence, the best and most perfect and expensive photo equipment employed by a cinematographer, who has been through an intensive training for his profession, must be available in order to call forth and produce visually the spirit and thought that it is desired to impress upon the audience.

CLUBBING RATES

	U.S.	Canada	For'n
"American Cinematographer"	$3.00	$3.50	$4.00
In club with:			
"Camera Craft"	3.90	4.65	5.40
"Photo-Era"	4.15	5.00	5.90
"The Camera"	3.90	4.40	5.40

Boyle Heads Big Staff

Charles Boyle, A. S. C., as first and William Wheeler, A. S. C., as second photographer, are heading one of the biggest camera staffs on current production, shooting the Paramount-Christie special of "Tillie's Punctured Romance," which Edward Sutherland is directing. It will go into the unusual class of productions cinematographically on account of the many big shots in the circus atmosphere and also in the parts of the production which go into submarine stuff at sea and scenes in the trenches and Belgian villages.

On account of the numerous chariot races in the circus part of Tillie and some unique war angles which have been developed in the story by Monte Brice, Mr. Boyle will head a staff of twelve cameramen, not counting the assistants. He was recently with Sutherland in "Behind the Front," and "We're in the Navy Now."

[The Question and Answer Department of The American Cinematographer is not reserved for professional cinematographers, but is open to anyone who may have any inquiry to make appertaining to cinematography or to photographic subjects in general. The questions are answered by experts and the information published is as near 100 per cent correct as our archives and wide experience yield.—EDITOR'S NOTE.]

* * *

QUESTION—What is the meaning of the name "Metol?"

ANSWER—"Metol" is the trade name of a developer and also a name registered as a trade-mark by the Hauff Company of Germany.

The chemical name and composition of Metol is "Methyl-para-amido-metacresol-sulphate"

$$(C^6H^3CH^3NH^2CH^3)^2(H^2SO^4)$$

or "Mono-methyl-para-amido-phenol-sulphate"

$$2C^6H^4(OH)NH^2(CH^3)H_2SO^4$$

which names would be evidently unpopular for marketing purposes.

Metol is an extremely rapid developer, giving soft, delicate negative. Mixed with Hydroquinone which is a slow, contrasty developer, and ideal developer for all round commercial work, is obtained.

* * *

QUESTION—Is there such a thing as an F aperture for projection lenses?

ANSWER—Of course there is!.. The effective aperture of a lens, that is the optical diameter of the lens that limits the amount of rays admitted through it, is always measured in the ratio of the focal length.

In camera lenses, the F aperture is variable by means of the diaphragm. In projection lenses, the diaphragm is omitted and the aperture is given by the mount of the lens.

The aperture of any lens is determined through the calculations necessary to bring about the correction of the several aberrations pertaining to lenses.

* * *

QUESTION—What is the address of Mr. F. B. Good, Jackie Coogan's cameraman?

ANSWER—We are not authorized to give the private addresses of the members of the A. S. C.

If you want to communicate with Mr. Good, send your mail to the address of the A. S. C. Twelfth floor, Guaranty Building, Hollywood, and it will be forwarded to Mr. Good.

* * *

QUESTION—How many motion picture amateur cameras are they that work with standard 35 millimeters film?

ANSWER—The hand cameras for Standard 35 mm. film are the "Sept," made by Debrie of Paris, the "De Vry," made by the De Vry Co. of Chicago and "Eyemo," made by Bell & Howell of Chicago.

Claim Fool Proof Method Of Developing Negatives

Complete revolution in methods for developing motion picture negative is promised through the introduction of a machine for the purpose which has been designed and built under Frank E. Garbutt, head of the laboratory department of the Paramount Famous Lasky Corporation,, according to announcement by B. P. Schulberg, associate producer in executive control of the Paramount West Coast Studio. This negative developer or, more accurately, processing machine is declared to solve a problem that has been facing the film industry ever since the first foot of film was immersed in the "soup." Garbutt's device will bring about that absolutely uniform processing which has been the objective of motion picture laboratories since their inception.

Until the present time the processing of motion picture negative has depended on a series of hand manipulations of 200 foot or shorter lengths of film wound on racks and placed in succession in the developing, fixing, washing and other baths. The drying has been accomplished by transferring the film from many racks to large drums which are rotated in a clean atmosphere. Notwithstanding the many detail improvements which have been made in this general method as the industry has grown, it has been subject to many troublesome and more or less inherent difficulties. The cost has been high and the resulting quality of negative has often not been such as to yield the full pictorial value existing in the undeveloped negative. The more common defects of the method are well known to those in the laboratory end of the industry, as well as the ordinary means of minimizing these defects.

The real fundamental fault of this method is that it is dependable upon highly skilled manual manipulation and the personal judgment of operators of long experience, which means that an acceptable degree of perfection has been obtained only by virtue of continuous vigilance and careful inspection.

Moreover, as the industry has progressed in its pursuit of artistic perfection, the requirements have become increasingly stringent and the attainment of satisfactory quality more and more difficult and expensive. Faults which were accepted without criticism even a year ago are not now tolerated in the higher class of pictures, and this new standard of perfection has proven very expensive to maintain by the time-honored methods of hand negative processing.

Three or four years ago Garbutt foresaw the approach of this situation and, after studying the problem from all angles, concluded that the only real solution lay in the reduction of negative processing to a machine operation which would be so perfectly worked out as to practically eliminate the variables of human action and judgment. That this was a difficult problem may perhaps be best realized by a consideration of the fact that a single short length of exposed negative may constitute the only record of a scene which has cost thousands of dollars to take, so that the possibility of damage to such negative by reason of mechanical failure could not be tolerated. To devise a machine which would possess the absolute maximum of reliability combined with the delicate gradations of control necessary to secure all of the quality inherent in the negative, has been no easy task, as may be well appreciated.

Garbutt supplemented his intimate knowledge of the problem by enlisting the services of Leigh M. Griffith, a mechanical engineer formerly with the Government

(Continued on Page 21)

Happy Holidays

to

the Professional Movie People of the World

TO YOU who have contributed your efforts to the enjoyment of from **thirty** to **one hundred million** people of the world **daily** through your services to professional motion pictures, GREETINGS, and wishes for the best the holiday season can bring you. Your part, major or minor in a comparative sense, has been equally indispensable to the industry in its attainment of the dominant position it holds today. During the past twenty years you have been associated intimately, in some capacity, with Bell & Howell Cameras.

There has been a **mutual contribution** toward the attainment of **mutual success.** So it is, that out of a feeling of human warmth and professional pride, we pledge our continued support and thank you for the co-operation you have given us.

BELL & HOWELL CO.

1805 Larchmont Ave., Chicago, Ill.

New York, Hollywood, London (B. & H. Co., Ltd.)

Established 1907

Bell & Howell Cameras

MEMBERSHIP of the

NOVEM

Phones (

OFFICERS

Daniel B. Clark	*President*
John W. Boyle	*First Vice President*
Victor Milner	*Second Vice President*
Frank B. Good	*Third Vice President*
George Schneiderman	*Treasurer*
Charles G. Clarke	*Secretary*

FIRST CINEMATOGRAPHERS

Adams, William S.—
Allen, Paul H.—
Anderson, Melford A.—
Andriot, Lucien—De Mille
Ash, Jerome H.—
August, Joe—Fox.
Abel, David—De Mille.
Arnold, John—M.-G.-M.

Badaracco, Jake—
Barlatier, Andre—
Bergquist, Rudolph—
Boyle, Chas. P.—De Mille.
Boyle, John W.—Sennett.
Boyce, St. Elmo—Sennett.
Bridenbecker, Milton—Universal.
Brown—Jas. S., Jr.—F. B. O.
Benoit, Georges—
Barnes, George S—Goldwyn.
Brotherton, Joseph—
Broening, H. Lyman—
Beckway, Wm. J.—

Carter, Claude C.—Australia.
Cline, Robt. E.—Scholck Studio.
Cline, Wilfried—Universal.
Crocker, Geo. D.—
Cronjager, Edward—Lasky.
Cronjager, Henry—
Clark, Daniel B.—Tom Mix, Fox.
Cooper, Harry H.—
Cotner, Frank M.—
Clarke, Chas. G.—Fox.
Cowling, H. T.—Eastman Kodak Co., Rochester, N. Y.
Crockett, E. J.—

Davis, Chas. J.—Warner-Vitaphone, N. Y.
Draper, Lauren—Sierra Pictures.
Daniels, Wm. H.—M.-G.-M.
Davey, Allen M.—
Davis, Harry—Fine Arts.
De Vinna, Clyde—M.-G.-M.
DeGrasse, Robert—F. B. O.
Diamond, James—Metropolitan.
Doran, Robt. V.—
Dored, John—Paramount News, Riga Latvia.
Dubray, Jos. A.—
Du Par, E. B.—Warners.
Du Pont, Max—
Dean, Faxon M.—

Eagler, Paul E.—M.-G.-M.
Eldredge, F. R.—Universal.
Eslick, Le Roy—F. B. O.
Evans, Perry—
Edeson, Arthur—First National.
Fabian, Max—M.-G.-M.
Forbes, Harry W.—Stern Film Corporation.
Folsey, George Jr.
Fryer, Richard—
Fildew, William—
Fischbeck, H. A.—Lasky.
Fisher, Ross G.—First National.
Gerrard, Henry William—Lasky.
Gheller, Edward—
Gerstad, Merritt B.—M.-G.-M.
Gobbett, David William—
Gosden, Alfred G.—
Gilks, Alfred—Lasky.
Gray, King D.—
Guissart, Rene—Paris, France.
Good, Frank B.—Fox Studio.
Griffin, Walter L.—David Hartford Productions.
Gaudio, Gaetano—Douglas Fairbanks-United Artists.
Hallenberger, Harry—Lasky.
Harris, Emil—Universal.
Heisler, Frank B.—
Hilburn, Percy—M.-G.-M.
Hunt, Roy—Lasky.
Hyer, William C.—Educational.
Horne, Phliny—
Haller, Ernest—Robt. Kane Productions, Hollywood.
Heimerl, Alois—
Jones, Allen C.—Universal.
June, Ray—Fine Arts Studio.
Jackman, Floyd—Warner Bros.
Jackman, Fred W.—Technical Director, Warner Bros.
Jackson, H. A.—Corinne Griffin, U. A.
Jennings, J. D.—Buster Keaton.
Kershner, Glen—Metropolitan Studios.
Kesson, Dave—United Artists.
Kesson, Frank A.—
Kirkpatrick, H. J.—Universal.
Klaffki, Roy H.—
Kornmann, Anthony—Universal.
Kull, Jacob—Universal.
Kocnekamp, H. F.—
Kurrle, Robt. E.—First National.
Linden, Eddie—Universal.
Lloyd, Art—Hal Roach.
Longenecker, Bert—
Lyons,Chester—Fox
Lyons, Edgar—Christie.
Lyons, Reginald—Fox
Lundin, Walter—Harold Lloyd, Metropolitan.
Lockwood, J. R.—
Marley, J. Peverel—De Mille.
Mackenzie, Jack—Douglas McLean, Lasky.
Marsh, Oliver—M.-G.-M.
Marshall, Wm. C.—Lasky.
Martin, H. Kinley, Lasky.
Mescall, John J.—M.-G.-M.
Miller, Arthur—De Mille.
Miller, Ernest W.—Chadwick Studio.
Miller, Virgil E.—Universal.
Mohr, Hal—Warners.
McClung, Hugh C.—Douglas Fairbanks, U. A.
McCord, T. D.—First National.
McDonnell, Claude—London, England
McGill, Barney.
MacWilliams, Glen—Fox.
Meehan, Geo.—Fox.
Morgan, Ira H.—James Cruse, Metropolitan.
Musuraca, N.—F. B. O.
Milner, Victor—Lasky.
Murray, James V.—Lasky.
McManigal, E. L.—
Newhard, Robt.—
Neumann, Harry C.—Universal.
Norton, Stephen S.—
Oswald, H. M.—
O'Connell, L. Wm.—Fox.
Powers, Len—Hal Roach.
Perry, Paul P.—
Perry, Harry—United Artists.
Palmer, Ernest—Fox.
Polito, Sol—First National.
Reeves, Arthur—
Reynolds, Ben F.—
Ries, Irving G.—M.-G.-M.
Robinson, Geo. H.—Universal.
Rosson, Hal—
Roos, Len H.—Sydney, Australia.
Rose, Jackson, J.—Universal.
Rosher, Chas.—Mary Pickford-U. A.
Ries, Park J.—
Scheurich, Victor—
Schoenbaum, Chas.—Lasky.
Scholtz, Abe—
Schlockow, Paul—M.-G.-M.
Shamroy, Leon—Fine Arts Studio.
Smith, Ernest F.—
Smith, Harold G.—
Smith, Leonard—Educational. S.C
Stengler, Mack—F. B. O.
Stevens, Geo.—Hal Roach.
Stevens, Jack—Richard Talmadge, Universal.
Struss, Karl—United Artists-D. W. Griffith.
Stumar, John—Universal.
Stumar, Chas.—Universal.
Sharp, Henry—M.-G.-M.
Smith, W. S., Jr.—
Schneiderman, Geo.—Fox.
Scott, Homer A.
Seitz, John F.—M.-G.-M.
Snyder, Edward J.—Pathe-Fine Arts.
Thompson, W. C.
Tannura, Philip—F. B. O.
Tetzlaff, Ted—Chadwick.

In the Canadian Rockies—A study of Autumn days by Elmer G. Dyer, A. S. C.

(Above)

A Winter scene on the Truckee River, California —Photographed by Elmer Fryer, A. S. C.

(At Left)

Big Bear Lake in the Moonlight —Photographed by Elmer Fryer A. S. C.

Remarkable Composition of Desert and Cloud in Arizona—Photographed by Daniel B. Clark, President, A. S. C.

Mountain and Plain in the Desert of Arizona—Photographed by Daniel B. Clark, President, A. S. C.

(Above)

A Camera Painting from the Studio of Elmer G. Dyer, A. S. C.

The fine screen is caused by the grain of the satin finish paper.

(At Left)

"When the distant mountain stream reflects a golden glare."

By Elmer G. Dyer, A. S. C.

A. S. C. TO DATE

:R, 1927

BOARD OF GOVERNORS

:R. 4274
:R. 4704

Victor Milner
Daniel B. Clark
George Schneiderman
L. Guy Wilky
Frank B. Good

Alfred Gilks
Charles G. Clarke
John W. Boyle
John F. Seitz
King D. Gray

Fred W. Jackman
Georges Benoit
E. Burton Steene
Ira H. Morgan
Floyd Jackman

Tover, Leo—United Artists.
Todd, Arthur L.—Universal.
Turner, J. Robert—Educational.
Tuers, Billy—
Tolhurst, Louis H.—Microscopic Pictures, Pathe.
Valentine, J. A.—Fox Studio.
Van Enger, Charles J.—
Van Trees, Jas. C.—First National.
Van Buren, Ned—Eastman Kodak, Hollywood.
Vogel, Paul E.—
Wagner, Blake—
Wagner, Sidney C.—Fox.
Walker, Earle F.—
Walker, Joseph—Columbia.
Walker, Vernon L.—Sennett.
Warren, Dwight W.—
Whalen, John P.—Santa Fe Studios (Monrovia).
Wheeler, Wm.—Christie Studio.
White, Ben—Fox.
Williams, Wm. N.—Sennett.
Widen, Carl—Tiffany.
Wrigley, Dewey—Metropolitan.
Wyckoff, Alvin—
Wells, Conrad—Warners Vitaphone Prods.
Wenstrom, Harold—
Whitman, Philip H.—Directing Sennett Studio.
Wilky, L. Guy—
Warrenton, Gilbert—Universal.
Young, Jack R.—M.-G.-M.
Zucker, Frank C.—Harold Lloyd Unit. New York.

HONORARY MEMBERS

Edison, Thomas A., Orange, N. J.
Eastman, George, Rochester, N. Y.
Webb, Arthur C.—Attorney.

SPECIAL PROCESS AND TRICK CINEMATOGRAPHERS

Baker, Friend—
Binger, R. O.—M.-G.-M.
Cully, Russell—Lasky.
Knechtel, Alvin C.—First National.
Emlay, Earl—E.R.L. Studios.
Fulton, J. Phipps—Universal.
Pollock, Gordon B.—Lasky.
Smith, Jack—Fox.
Mammes, Ray—M.-G.-M.
Cohen, Eddie—
Edouart, Farciot—Lasky.
Flora, Rolla—Lasky.
Lipstein, Harold—M.-G.-M.
Roberts, Oren W.—Lasky.
Shearer, Douglas G.—M.-G.-M.
Stull, William—E.R.L. Studios
Smith, Arthur—Lasky.
Smith, Jack—Fox.

AKELEY CINEMATOGRAPHERS

Bennett, Guy M.—
Blackstone, Cliff—Lasky.
De Vol, Norman—Fox.
Dyer, Elmer G.—Universal.
Fetters, C. Curtis—Fox.
Galezio, Leonard T.—
Greiner, A. Leroy—First National.
Hickson, John T.—
Hoke, Ira B.—
Larabee, Nelson—Warner Bros.
Marshall, Chas. A.—M.-G.-M.
Marzorati, Harold J.—M.-G.-M.
Mason, Harry G.—
Novak, Jos. J.—Universal.
Olsen, R. B.—
Ramsey, Ray Lloyd—Universal.
Rand, William—Lasky.
Roberts, Josiah—M.-G.-M.
Sickner, William—First National.
Stout, Archie J.—Lasky.
Steene, E. Burton—Lasky.

NEWS CINEMATOGRAPHERS

Grimes, William H.—M.-G.-M.
Parrish, Fred—Fox, Colorado Springs.
Staub, Ralph B.—Columbia, Specialties.

STILL PHOTOGRAPHERS

Alexander, Kenneth—United Artists—D. W. Griffith.
Archer, Fred R.—De Mille.
Fryer, Elmer—De Mille.
Kahle, Alexander—De Mille
Mannatt, Clifford—M.-G.-M.
Parker, Robt. M.—E. R. L. Studios.
Richee, Eugene Robert—Lasky.
Rowley, Les—Lasky.
Sigurdson, Oliver—Metropolitan Studio.
Thomas, Wm. E.—De Mille.
Van Rossem, Walter J.—James Cruse, Inc., Met. Studlo.

SECOND CINEMATOGRAPHERS

Bader, Walter S.—M.-G.-M.
Bauder, Steve L.—M.-G.-M.
Baxter, George—De Mille.
Bennett, Monroe—
Borradaile, O. H.—Lasky.
Chaney, George—United Artists.
Chewning, Wallace D.—M.-G.-M.
Cunliffe, Donald—Universal.
Davis, Leland E.—
Doolittle, Jas. N.—First National.
Drought, Jas B.—Universal.
Dunn, Linwood G.—Metropolitan Studios.
Dyer, Edwin L.—
Fitzgerald, Edward—M.-G.-M.
Giridlian, Jas. N.—F. B. O.
Greene, Al M.—Technical Art.
Greenhalgh, Jack—F. B. O.
Guffy, G. Burnett—De Mille.
Haas, Walter—
Harten, Charles—New York.
Head, Gordon G.—
Hendrickson, Fred S.—Lasky.
Huggins, L. Owens—
Jenkins, John—
Julian, Mac—
Keyes, Donald B.—
Landrigan, John S.—Lasky.
Lang, Charles Bryant—Lasky.
Longet, Gaston—F. B. O.
Lanning, Reggie—Lasky.
La Shelle, Joe—
Laszlo, Ernest—
Lindon, Curly—
Martin, Robt. G.—F. B. O.
Marta, Jack A.—Fox.
Merland, Harry—Lasky.
Mols, Pierre M.—M.-G.-M.
MacLean, Gordon—M.-G.-M.
Nogle, Geo. G.—
Pahle, Ted—
Palmer, Robt—M.-G.-M.
Parsons, Harry—
Pittack, R. W.—Lasky.
Planck, Robt. H.—Columbia.
Prince, Al—Universal.
Pyle, Edwin L.—
Ragin, David—Fox.
Ray, Bernard B.—
Redman, Frank—DeMille.
Reed, Arthur—M.-G.-M.
Rees, Wm. A.—Fine Arts.
Schopp, Herman—Metropolitan Studios.
Shepek, John, Jr.—Educational.
Silver, John—
Smith, Jean C.—De Mille.
Stine, Harold E.—De Mille.
Tappenbeck, Hatto—Fox.
Trezo, Fred—Universal.
Thompson, John—F. O. B.
Unholtz, George—Sennett.
Van Dyke, Herbert—M.-G.-M.
Van Enger, Willard—Warner Bros. Vitaphone.
Wagner, Robt—First National.
Walters, Joseph J.—F. B. O.
Westerberg, Fred—De Mille.
Wilde, Harry—
Williams, Alfred E.—Lasky.
Witzel, E. L.—Universal.

It Is In The Box

By Alfred Gosden, A. S. C.

(Continued from Page 8)

many, a motor generator set and a Graham Bros. truck for the transportation of the M-G set.

We landed in Yokohama and after staying a few days in Tokyo, being entertained at Geisha parties, press banquets and so on, we proceeded by train to Kyoto, a night's journey.

The whole of the studio personnel was at Kyoto station to meet us, waving American and Japanese flags, then all were loaded into automobiles, and in what almost was a triumphal procession, with a brass band (?) in the lead, we proceeded to the studio.

Arrived at the studio, after being entertained with the inevitable o cha and sembei (tea and thin biscuits) we were introduced to the stars and departmental heads, photographed by the movie press men and then taken on a tour of inspection.

The studio consisted of one covered stage, another under construction, a number of good dressing rooms, executive offices, and a very fair laboratory, the latter not comparable with any that we have here, but much better than I had been led to expect from the information I had received in the Tokyo office. As a matter of fact, until we arrived in Tokyo, I had not expected to find any established studio at all.

The first thing to which my particular attention was directed was the developing time for negatives; it was **two and a half minutes**; can you credit it? So that being the case my first job was to change it to a twelve-minute developer; I, personally would have preferred a twenty-minute soup, but I hesitated to make too drastic a change at the first jump.

In the drying room there were three drums, each ten feet long by five in diameter, and the film was placed on them in a passable manner, but the method of removing it was far from that. Instead of running the film off into lined bins, as is usually done, they took it off in loops over their arms and carried it in this fashion into another room to a re-wind.

When I drew the attention of the laboratory head, Taumra-san, to the matter, who by the way, spoke and understood quite a bit of English, he remarked: "That all right, that Japanese way." I, having already concluded that a little tact would go a long way towards getting co-operation, said: "Listen, Tamura-san, in days gone by when you wished to go anywhere and it was beyond walking distance, what did you do?" To which he replied "Poor people walk all time, rich man ride horse." "Well," said I, "but now that you have adopted quite a number of foreign customs, especially travelling by train, bicycle and automobile, you no longer walk, but ride in the foreign way, which you must admit is a great advantage, so why not try the foreign way of taking the film off the drums, and I am sure that you will soon find that it will be an advantage to do so."

That won him over. Very soon we had some bins made up, lined with flannel and put into regular use.

The printing machine which they were using is one that is made in Japan, fashioned after the style of the old Moy and Williamson printing machines of about fifteen years ago, nominally a step printer, but as the film was being run through at an approximate speed of one hundred feet a minute, it was more in the nature of a continuous printer, without the latter's advantages, and scratches! It was truly awful, especially on release prints, after several copies had been made, each subsequent run causing a further batch of scratches to accumulate, so imagine what the fifteenth copy or thereabouts looked like on the screen.

As soon as it was possible we installed the Duplex printing machine, but there was quite a delay in getting it in working order as we were obliged to have a special series of batteries made to supply a steady and reliable current of electricity to the lamps; all "juice" in Japan comes to the consumer at 100v A. C. except for power, but in multiples of 100, not 110 as we have it here.

This matter of voltage also affected the working speed of the Duplex, the motor of which was wound for 110v, consequently slowing it up.

The method of making a light change on the Japanese machine, was to watch the negative in the aperture, then when a change of density in a scene came along, make a more or less correct guess at the light number, and attain it by running a lever around a selector ring. By this system usually about a foot or so ran through before the light change became effective. Imagine the result on the screen.

Having no testing machine, it was up to me to devise something in the way of a substitute; my first step was to have a light box made, with a ground glass front, in the usual fashion, then I tried to obtain a series of pieces of negative graduated in density equal to the printing lights. Being unable to accomplish this, I took a piece of negative, the correct printing light of which I knew to be nine, made prints from this on lights 1, 3, 5, etc., up to 17, then from the positive I made a duplicate negative on light 9, which I placed, cut into nine-inch strips at intervals along the front of my light box, but reversing their order, calling the dense piece on light 17 light 1, and 1 became 17, which gave me a fairly accurate graduate for comparison

The matter of camera exposure was another case that called for considerable attention; they were so uneven, especially when the Japanese cameraman made lap dissolves, or as they called them, "lapovers." It was frequently necessary to make as many as three notches in the course of a lap dissolve, to insure the change from one scene to the succeeding one not being too sudden, but the Japanese boys were anxious and willing to learn and gradually became more or less efficient in getting their exposures correct.

Most of the moving picture producing companies in Japan are located in Kyoto; the reason for this is that most of the pictures turned out are of the period of the Samurai, fighting men who went about the country armed with swords, fighting for various reasons but mostly as far as I could make out, for revenge. In the pictures one man usually kills as many as forty opponents. That this is historically true, I have grave doubts. These pictures are known as "old school" and the locations they require are found in and about Kyoto, it being the ancient capital, possesses a large number of old palaces, temples, shrines and gardens, as well as some remarkable scenery in the vicinity of Arishiyama about eight miles west of Kyoto.

From a foreigner's point of view (in Japan, all are "foreigners" who are not Japanese) going on location is not all beer and skittles. Excepting in the principal towns and places where tourists visit, there are no hotels where accommodations can be obtained that are run on the Occidental plan. When one is unaccustomed to sleeping on the floor, eating boiled rice, raw fish, or pickled radishes whilst sitting on the floor on a thin cushion, it is not quite, may I say, desirable.

As an example, I went on location with a company to a place called Sakomoto, situated on the shores of beautiful Lake Biwa, where there is a wonderful old temple. We started from the studio at about 8:00 a. m., going by "densha" (electric car), to Shijo-o-miya, transferred there to another, crossing the town of Kyoto to another transfer point. For some reason the remainder of the company did not arrive at this point until nearly one o'clock, so it was past two o'clock before we reached Otsu, where we were to change to a local steam train that would eventually land us in Sakomoto. In the "teishaba" (station) there was a news stand, where for 50s (25c) I procured a bar of chocolate, which was to be my sole sustenance from 7:30 a. m. until about 7:30 p. m., but I did not know it then. After waiting for some time I asked the interpreter, Isobe-san, what had happened to the train. He made inquiries and was in-

formed that the water in the tank had frozen solid; they were trying to thaw it out and hoped to start soon. The temperature must have been considerably below freezing point—just how much I do not know. Outside of a "mise" (store) I have no recollection of seeing a thermometer while I was in Japan.

You probably know what the Toonerville trolley is supposed to be like. Well, this little jerkwater line may not have been quite so bad as that but it was pretty shaky. I would like to say here that most of the railway travelling was very good indeed, the cars were comfortable, steam-heated, and all were furnished with the usual conveniences; high speed was not attempted but they were certainly punctual, under normal conditions.

To continue my location experience, as we were jolting along it commenced to snow, and by the time we reached our destination it had reached the proportions of a small blizzard.

Arriving at the hotel, after walking nearly two miles in the face of the storm, the first thing one had to do was to remove one's shoes while seated on the door step, then with feet wet and cold, we proceeded across several rooms or halls, some highly polished, others covered with the national mats, all shiny and cold, to a large room that had glass shoji (sliding doors) on three sides, and a temperature approximating that of an ice house.

Zabutons (cushions about an inch thick) were handed around by the maids, and the whole company seated, or rather squatted themselves in a large circle around the room, patiently waiting for something to turn up.

The only heating apparati were the ubiquitous hebachi. The hebachi is a metal or earthenware jar, varying in size from six inches to two feet in diameter and proportionately high; these are filled about two-thirds full with ashes or sand, which serves as a bed for a charcoal fire about the size of one's fist, sometimes a little larger.

The native method of getting warm is to hold the wrists over the glowing coals, with the idea, so far as I could make out, that the blood thus warmed gradually circulated through the system until the whole body is warmed, possibly I should say de-chilled, if I may coin the term, for they certainly cannot become really heated. Having had nothing to eat except the chocolate since breakfast at seven-thirty, a. m., it now being about 7:00 p. m., naturally the question was "When do we eat?" This was answered in due course by a large tub of hot boiled rice and a plentiful supply of Japanese tea being placed in the center of the room, from which everybody helped themselves. I inquired of my interpreter Isobe-san, if it was possible for me to get some "foreign" food. He informed me that they had sent to a little restaurant in the town, two miles away, that catered to the tourists in the season, and they were going to send something up for me. When the something arrived, it proved to be a very small steak and some French fried (?) potatoes, not much colder than ice. I had almost given up the idea of trying to eat this cold collation, when it occurred to me that it might be possible to warm it a little by piling some of the hot rice on it, but the reverse happened—the hot rice went cold. So after a day of fasting, my meal consisted of warm boiled rice, straight, and Japanese tea.

When the company had eaten and made up, we went out to the location, the electricians having hooked up to the high line in the afternoon, where we shot until 4:00 a. m.

My interpreter told me that if I would like a hot bath, I could get one. The Japanese bath room has as a rule just the one tub, a good-sized one sunk to floor level, with the fire under the tub. The modus operandi is to pour hot water, and it is HOT, over oneself, then soap all over, scrub, and after thoroughly rinsing, jump into the tub and soak. From where I was sitting I could see the bath room door, I counted fifteen people, I think was the number, going into the bathroom which decided me that I would continue to be cold, dirty and exclusive.

No breakfast being available, and having got them off to a good start, I decided to return to Kyoto, where going into the Kikusui Restaurant (foreign) I soon got

Labor Turnover in Studios

PRESIDENT CLARK OF A. S. C. SEES A WAY TO PREVENT GREAT WASTE

"While the motion picture economists are delving into cost sheets, organization, operation, maintenance, transportation, production, materials, overhead, etc., I would respectfully call their serious attention to the consideration of the overturn of labor in the studios as one of the greatest sources of waste if not indeed, the greatest."

So said Daniel B. Clark, President of the A. S. C., in an interview the other day with an eastern fiscal representative of a well known production company.

"The matter of personnel or labor turn-over," continued Mr. Clark, "is, it seems to me, of vital importance in our industry which from its very earliest days seems to have been in a state of flux.

"The personnel of units, studios and even administrative offices seems never to be permanent, so that even the greatest executive is not sure of a long tenure of office and the lesser operatives, down to the humblest understrapper, has not known very far ahead just where he was "at."

"This condition of uncertainty of employment has made for unrest and unrest has in turn bred inefficiency and laxness in work.

"Of course, I am cognizant of the fact that, because of the peculiar nature of our industry, it is impossible to maintain a hard and fast organization, especially in so far as the actor element is concerned, for the public demands variety, but in the case of technical operatives and executives and certain other employees it would seem to be only common sense for a producer to desire to build and maintain an organization as nearly permanent in its personality as possible.

"Such an organization should be notable for efficiency, through loyalty, harmony, spirit of co-operation, contentment and esprit de corps. This is obvious.

"Some economists have gone deeply into this subject, among them Professor Mangus Alexander, of Harvard University. This student of the economics of industrial organization, after investigation of many cases, has arrived at the conclusion that it costs an average of $72.00 to replace an ordinary employee of the grade of laborer; upwards of $500.00 to replace skilled labor and as high as $10,000 to replace an important executive. Applied to motion pictures, these figures would be astounding. They are amazing as they stand to any one new to this subject.

"In treating of this subject in his fine work, "Principles of Industrial Organization, Dexter S. Kimball, A. B., M. E., says:

(Concluded on Page 24)

three orders of ham and eggs, toast and coffee inside me and forgave everybody.

If we had had three Akeley cameras, we could have used them all, on account of the fact that they were a great adjunct to the making of the "Old School" pictures with their running fights and sword play. The Eyemo is also by now a standard requisite in the making of motion pictures in the flowery kingdom, at least I am presuming so, if the Japanese directors and cameramen there are as insistent in their demands for it as they were when we left there. It is a creditable fact that once the advantages of any innovation has been demonstrated to them to their satisfaction, they are real enthusiasts, frequently too much so. They are prone to overdo it and work a good thing to death.

During the six months that we were in Japan we supervised the making of between fifty and sixty pictures, ranging from six to twelve reels each.

There are three thousand moving picture theaters in Japan, seventeen showing straight foreign pictures, about thirty mixed foreign and domestic, and the remainder show Japanese entirely.

There are about sixteen producing companies and over fifty million feet of film of all descriptions are annually imported.

Projection

[*Abstracts from transactions of the S. M. P. E. read at the Lake Placid Convention*—EDITOR'S NOTE.]

Why Expert Knowledge and High Class Intelligence are Essential in the Theater Projection Room

By F. H. RICHARDSON

Abstract

Experience and intelligence are certainly needed in the projection room. Lack of those attributes by the projectionist means loss and their presence in the projection room makes for improved results upon the theater screen, greater economy of operation and increased box office receipts.

If projection practice as it now exists in most theaters is subjected to close scrutiny, its many faults are manifest. Imperfections in motion picture projection operate to lower the amusement and dramatic value of any projection, whereas perfect projection brings out the very best value contained in the production the films carry. However, no amount of expert knowledge upon the part of the projectionist will avail unless it be accomplished by sufficient energy, ambition and pride in the work to cause him to apply that expert knowledge in the best way.

The expense chargeable to unnecessary deterioration of projection equipment due to lack of expert knowledge upon the part of the projectionist is appaling. Lack of expert knowledge makes itself apparent in everything having to do with the results upon the theater screen as viewed by the theater audience, except of course, faults inherent in the films themselves.

* * * * * *

An Improved Type of Condenser System for Motion Picture Projection

By M. L. TOWNSEND

Abstract

When motion picture projectors were first built, the optical parts used were, for the most part, such as were already in use for other purposes and for this reason easily obtained. Many of these were ill suited for this new use but would be made to serve in some fashion. An example of this is the condenser lens which collects light radiated from the light source and converges it into the film whence it is imaged onto the screen. A comparatively small lens chosen years ago was adopted as standard.

Since the advent of the very large present day theaters, the motion picture industry has been faced with the very serious problem of finding a way of getting more light to the very large screens. A number of improvements in arc lamps have effected greater efficiency in illumination. Recently a condenser of large diameter has been developed. This lens collects light from the arc within a much greater angle than previously and so uses much more of the light now available.

* * * * * *

A Few Practical Needs in the Field of Projection

By ARTHUR GRAY

Abstract

The interest of the theater-going public in motion pictures, today, extends considerably beyond the star, the cast, and the story which the picture tells. They have been educated to expect good photography, good music and better projection.

Astute theater exhibitors find that high grade projection is good showmanship, and some have used this as an effective advertising feature, and business getter.

An increasing number of exhibitors have come to realize the fact that a scratched, dirty film seriously impairs the entertainment value of the picture, and are insisting upon receiving better conditioned film from the film distributing exchanges.

The general condition of the average circulating print, ability to pass without mishap through a projector, is undoubtedly gradually improving, but need for further improvement continues to exist.

A normal amount of wear and tear on the film is inevitable during the process of projection, but a large

Claim Fool Proof Method Of Developing Negatives

(Continued from Page 12)

but now Development Engineer at the Paramount Laboratory. Working with Thomas Ingman, Operations Engineer, a machine has been devised which promises to mark the beginning of a new era in the processing of negative. In line with the general effort of the industry, this new machine and method will reduce the cost of production. But of far greater importance is the fact that it will make possible the realization of that uniform high pictorial quality and freedom from minor defects which has long been the dream and objective of the progressive thinkers in the industry.

Owing to the high value of the undeveloped negative it was necessary to provide a mechanism of great delicacy and definiteness of control in order to insure against the possibility of mechanical damage to the film while in the machine. This has been accomplished by an entirely new and extremely elastic form of drive, so designed that the film is under very gentle but definite control at all points in its passage through the machine.

The undeveloped negative is first passed through a speed control mechanism which is adjustable to the exact speed required to give the proper time of development, from which it passes in succession through the developing bath, developer rinse, fixing bath, hypo-rinse, cascade washing bath and drying cabinet, the completely processed negative being delivered on reels at the discharge end. The entire operation of the machine is automatic, the film not being touched by hands at any point in its passage. Each operation is conducted under ideal conditions, the film moving smoothly and uniformly through the several baths and the dryer. As it passes from each bath, the film is freed of adhering liquid by a squeegee, so that progressive contamination of solutions is avoided. The developing and fixing solutions are continuously circulated through tanks in a separate chemical room, where their analysis and temperature are kept to rigid standards. The wash water is carefully treated and filtered. The drying air is washed and heated to the temperature and humidity best suited to give the proper condition to the finished negative, and is circulated through the drying cabinet sections in series.

As it is essential that the negative be not stopped during its passage through the developer, intermediate storage mechanism is provided at several points in the machine so that in the rare event of a breakage or other interruption to the film its movement through the developer may continue uninterrupted, while the film in the vicinity of the defect may be stopped and a repair or adjustment made. There is thus no loss of negative through over-development.

(END)

---

amount of the damage which a film often incurs is unnecessary, and is caused by careless handling either during inspection at the exchange, during shipment, or in the projection room at the theater.

Loose splices which separate while the film is being projected, and thereby cause an interruption in the show, continue to be one of the toughest problems with which a projectionist must contend.

The fewer spilces there are in a print, the less probability there will be for mishaps of this nature. Any planning which will result in the number of splices being kept at the very minimum is desirable and very important.

The recent circulation of a considerable amount of buckled film, which results in an oscilating, in-and-out-of-focus effect in the picture when the film is projected, is giving widespread trouble. Various causes have been asribed as being rescponsible for this ondition, and attempts are undoubtedly being made to abate the trouble.

It seems to be a rather complex problem, and must receive the cooperative efforts of technical workers in several different fields of the industry if it is to be quickly and effectively remedied. That the trouble be remedied as soon as possible is imperative.

Panchromatic Film

By Louis W. Physioc

(Continued from Page 7)

blue and violet rays in order to avail ourselves of those others that we desire; we, therefore, neutralize the highly actinic rays by filters, or mediums of complementary values. Despite the aid of the filters, however, we meet other attendant difficulties, for while they take care of some of the desired rays others must suffer to some degree and our experience teaches us that the selection of the proper tint and intensity of the various filters, together with the proper exposure are matters of very refined judgment; so that we cannot overlook the importance of the knowledge of color.

The physicist teaches us that:

1. White light is composed of mixture of RED, BLUE and GREEN light.
2. RED and GREEN give YELLOW.
3. RED and BLUE give MAGENTA (purple).

It is very evident, then, that panchromatic correction depends upon the selection of a filter nearly complementary to the color we desire to enhance. These complements are found as mixtures of any two elements against the other and we can aid ourselves in finding these by equations and charts as offered below.

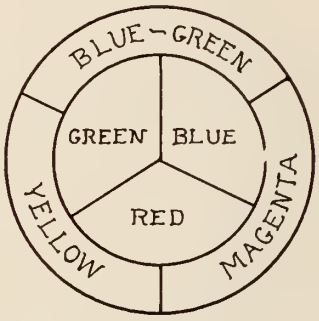
RED+BLUE+GREEN=WHITE LIGHT.

RED=W.L.—BLUE+GREEN (blue-green) Complementary to RED.

BLUE=W.L.—RED+GREEN (Yellow) Complementary to BLUE.

GREEN=W.L.—RED+BLUE (Magenta) Complementary to GREEN.

Or charting it we have:



Taking the centre of the above chart, we have the three elements, Green, Blue and Red, and in the outer circle, we find the secondary combinations. For example, we select green and directly opposite, in the outer circle, we find magenta, the complement of green; choosing next, blue, we find opposite, yellow, its complement and likewise opposite red we find its complement blue-green. We may further enlarge the circle and produce the tertiary tints and in like manner find the complements.

To illustrate the application of the above chart, let us assume that we have a subject in which we wish to suppress a broad area of sky and maintain certain cloud effects; we consult our chart and opposite the blue we find that the proper filter lies within the yellow region. This fact is proven by the general use of so-called K filters, made in varying strengths, K1, K2, K3, etc.

As certain colors can be suppressed so can others be enhanced. We observe this in the fact that some colors can be made to appear more brilliant by juxtaposition to others. This effect is called complementary harmony. The arrangement of colors of approximate wave length is termed analogous harmony.

The use of analogous filters with panchromatic film is quite different, however, from the arrangement of pigments, and can be illustrated by a very simple experiment. Place a two cent postage stamp upon a white piece of paper and view it through a filter of the same color as the stamp and the stamp will be barely visible. Or, which is more convenient, take an Eastman paper carton into the dark room and view it under the ruby

light and you will be unable to read the red label. The explanation of this is that the analogous filter provides for a maximum transmission of the rays from the stamp and the full absorption of the blue-green in combination with the white of the paper, allowing only the red to pass, bringing it to the same value as the stamp. These simple experiments suggest, then, that in the consideration of color, there is a double process continually going on, that of absorption and reflection among pigments and addition and subtraction in light.

Now suppose we wished to photograph this stamp on the white paper, it may be readily seen that if we select this red filter in conjunction with panchromatic film, which is so sensitive to red, we would not get much of a picture of the stamp. We may satisfy ourselves by further calculations.

Using Red Filter

Subject $B+G-B\ G$ (Absorbed by Filter)

White Paper $R+R+R$ (Transmitted by Filter) $=$ R (Reflected by paper and transmitted by Filter) $=R_3$

Red Stamp $R+R$ (Filter) (Stamp)

Using Yellow (RG) Filter

White Paper $B+R+G$ (Absorbed by Filter) $=$ Yellow (RG) Reflected and passed by Filter G_2+R_3

Red Stamp $R+$ Yellow $(R+G)$ (Transmitted by Filter) $=$ Orange $(G+R_2)$ (Transmitted by Filter)

Using Blue (Blue-Green) Filter Complementary to Red

White Paper $B+G$ Filter $=$ Blue Green (Refelcted by Paper and passed by Filter $B+G$

Red Stamp $R+R-R$ (Absorbed by Filter) $=R+B+G$ (Black Stamp) (Totally Absorbed)

Various filter combinations can be worked out and balanced in a similar manner.

In offering a practical illustration of the use of analogous filters, let us imagine, as our subject, a foreground group of redish, orange rocks against the shadow side of the mountains in the middle distance and background composed of hazy blues and lavenders, gray-greens, etc. To the eye, the rocks in the foreground furnish a wonderful contrast in color, drawing and light and shade, yet our experience tells us that, with the ordinary photographic process, these rocks, because of their color, will be rendered as dark as the shadows of the middle ground and may go even darker than the shadows of the foreground, despite their appearance to

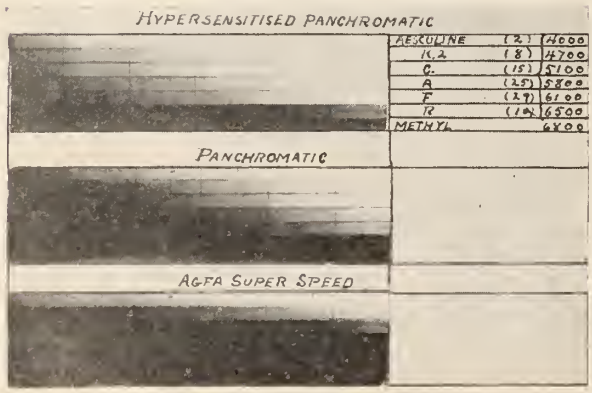
(Concluded on Page 24)

the eye. It is easy to understand, then, that this would produce a flat picture, destroying the contrast of light and shade, color values as well as the beauty of the composition. We, therefore, select an analogous filter, knowing that it will perform the double function of allowing the color of the rocks to pass to the film and of absorbing much of the blues and lavenders of the distance, they being complementary to the filter, thereby raising the key of the rocks in the foreground by the process of analogy.

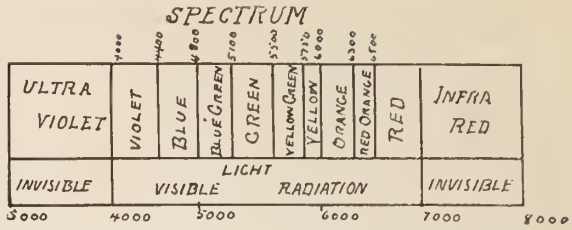
Now, stripping our subject of all technicalities, for the busy one who wishes to "read as he runs," we may deduce from the whole, a few simple facts:

1. That the full value of panchromatic emulsion depends on the proper use of filters.
2. But that in the use of filters of primary colors, values, in the subject, that are complementary to these filters must be sacrificed to a great degree.
3. That these primary filters should only be used where extreme effects are needed, as cited in particular applications, i. e., night skies, etc.
4. That for a general balance of values the yellow, (which is, theoretically, the mixture of the two primaries, red and green), in varying degrees of transparency, is most desirable; and absolute safety is found in the Aesculine (No. 2), Aero (No. 1) and the K2.
5. That, in lieu of filters, quality of light is the next important element.
6. That this light is found in early morning and late afternoon on exteriors, and on interiors, the best results, at the present time, is furnished by the tungsten incandescent.

In support of this last item we offer a series of tests made by Mr. Edward Gheller, A. S. C. These charts need no explanation, except that they were made on



three different stocks with two sets of screens, composed of pure colors approaching, as nearly as possible, the filters in common use. The colors are graduated, from right to left, by a squared ratio, to test the scope of the panchromatic emulsion in rendering hues of varying degrees of brilliance.



In conclusion, let us ever keep in mind a few of the errors most common to the use of panchromatic film.

Do not photograph a blue eyed blond with the cold light of the Cooper-Hewitts, or Blue mediums over arcs; the eyes will go white and the hair dark. In fact Cooper-Hewitt lights are valueless with panchromatic emulsion.

Do not make a beautiful blue sky look too black, by over correction, unless, of course, it is intended for a night effect.

Remember that filters greatly reduce exposures and that it is easier to under expose than over expose panchromatic film, therefore, freely illuminate the shadows.

Do not cut out all the hazy, atmospheric effects by over correction; "distance lends enchantment."

If softness is desired, by the use of the full opening of the lens, shutter compensation may be calculated by the following formula:

Normal Shutter (170): Normal Stop: Desired Shutter: Open Lens.

Labor Turnover in Studios

(Continued from Page 19)

" 'One of the most marked results of these changed conditions (from the old days when employees worked a lifetime in a factory) is the shifting character of the personnel in many factories. This difficulty has long been known to factory managers but the study of its economic aspect is comparatively new. Mr. Mangus Alexander has made a most interesting and important investigation of this matter. His report covers the experience of twelve factories which gave employment to 37,274 employees at the beginning of the year 1912 and 43,871 at the end of that year. The net increase for the year was therefore 6697 but during that period 42,571 people were hired and, as a consequence, 35,874 must have been dropped from the employment rolls during that same period. The factories examined were fairly representative in character and size, the range of work covering large steam engines, electrical apparatus, automobiles, and fine tools and instruments. The smallest factory employed 300 people and the largest had more than 10,000 employees on its payroll. In these twelve factories it was found that about 73 percent. of the employees engaged during the year had not worked in these factories before, while about 27 percent. had worked in them at some previous time.

" 'As a corroboration of this statement it was found by other investigators that in a certain large carpet factory near Philadelphia 75 per cent. of the employees had been in the employ less than one year, 9 per cent. from one to two years, 5 per cent. from two to three years, 4 per cent. from four to five years, and only 1 per cent. of the employees had been in the employ more than five years. While this last example may not represent average conditions it is true that this state of affairs and that reported by Mr. Alexander are undoubtedly too common and this constant shifting of workers is a source of great industrial loss. The term "labor turnover" has been given to this change in the personnel of the factory force and it is measured as a percentage. Thus if the average number of employees for the year is 1000 and 2000 new men are hired during that period and as many are "fired," to use a shop term, the labor turnover would be 200 per cent.'

"In view of these facts I would earnestly commend this subject to our producers with the recommendation that they put their economic engineers to work on their problems of labor turnover and if they find herein a source of loss, such as many other industrial concerns have found, I am sure that an almost revolutionary turn will be taken in the organization of our motion picture production units, to the everlasting well being of the industry and all its employees."

New Diffusing Screen

Geo. H. Scheibe, the well known filter specialist, is making a brand new line of diffusing screens, which require absolutely no increase in exposure. They are clear as glass and will give any desired diffusion. The manufacturer claims that they excel any other diffusion devices now on the market. Irises will also be made with central openings, round, oval and square.

Amateur Cinematography

(Continued from Page 10)

and it results clearly that the combination 1, has a secondary spectrum of considerable extent, while combination 2 has only a tertiary, so short as to be relatively negligible.

These facts illustrate the greatness of the improvement wrought in the construction of optical instruments, by the introduction of the new glasses, so called in opposition to the old ones in which the basic components were, as it has been explained elsewhere, in these articles, Lime and Lead, combined with Soda or Potash or both.

For practically all ordinary purposes, photographic objectives corrected for only two colours are quite satisfactory, if the choice of the two colours is made according to their actinic value, that is to say to their power of bringing about a chemical change in the emulsion sensitive to light.

In special processes such as the three colour process in which the three negatives must be not only perfectly sharp, but also of the same exact size, lenses presenting only the tertiary spectrum are indespensable.

These lenses are called APOCHROMATIC and are usually much slower than the Achromats.

An achromatic doublet, is then always formed of two glasses which have a very different value of **n**, and as in photographic lenses their power must be positive, the glass possessing the greatest value of **n** is used for the positive element of the doubtlet.

For the old glasses, the greatest was the **n** value, the lesser was the power of refraction of the glass, and therefore the crown lenses used as positive lenses had a smaller index than the negative flint used in conjunction with the positive crown to make the achromatic doublet. But in order to correct the astigmatic aberration of the doublet, it has been found necessary that the order of powers of refraction be inverted, and the flint glass be the one to have the smaller index of refraction. In other words, the glass possessing the greater **n** value should also have the greater ***n***.

This principle has been evolved by Dr. Paul Rudolph of Germany, who has called "Anomalous" the doublets thus constructed and "Normal" the ones constructed on the old principle.

Here again the importance of the new glasses is evident because the discovery of highly refracting phosphate crowns, has permitted the construction of anomalous doublets, which allow sufficient anastigmatism together with the chromatic correction, to permit the construction of photographic objectives possessing a much greater luminosity than it would have been possible to attain with the normal achromats.

The anomalous and normal doublets are also called "new" and "old" achromats according to Lummer's suggestion.

It is quite easy to realize from the foregoing that the correction of the chromatic aberration, has no bearings on the correction of the other imperfections which a lens suffers, such as spherical and astigmatic aberrations.

An achromatized doublet even of the anomalous kind, will not suffice to give an orthoscopic image of any object, and the problems aroused by the remaining aberrations must be solved jointly, in the designing of a lens, with the problems of chromatic correction.

These problems will be analyzed in the next issue of the "American Cinematographer."

(To Be Continued Next Month)

CLASSIFIED ADVERTISING

Rates: Four cents a word. Minimum charge one dollar per insertion. All copy must be prepaid and must reach us before the fifteenth of the month preceding publication.

American Cinematographer,
1222 Guaranty Building,
Hollywood, California

WANTED—MOTION PICTURE CAMERAS

CAMERAS WANTED—Wanted. Bell & Howell, Model B, with 120 degree shutter. Can be without magazines, lenses, or tripod. Low price for cash. W. Vinton, 89-91 Wardour Street, London, England, W. 1.

170-DEGREE Bell and Howell wanted. Have 1924 Buick Sport Touring car, in excellent condition, as down payment. Remainder to be paid within six months of purchase. Write or phone Herman Schopp, care of the A. S. C., 1219 Guaranty Building, Hollywood, California. GRanite 4274 or GRanite 4704.

FOR SALE—CAMERAS

FOR SALE—De Vry Projector using standard film. In first class shape—$100. Cost $225 new. (See the machine in the A. S. C. office, 1220 Guaranty Building, GR. 4274).

FOR SALE—Debrie 40-120mm. Tessar lenses, Vignetter, 6 magazines, tripod, 2 cases, $400. Universal turret type, 1½-3-in Gorez Hypar 30 mm. B. & L. tripod, 5 magazines, $350. Erneman 200 ft. 3.5. Zeiss, tripod, $95. Answer Box K, American Cinematographer.

FOR SALE—Wilart New All Metal Camera 3.5 Goez Lens, 200 ft. capacity. Priced $100.00. Examine C. O. D. through Express Co. H. A. Lyman, Oshkosh, Wis. RT

FOR SALE, CAMERA—Super-speed Debrie equipment. 2-inch B. & L. Lens, 2 magazines, 1 tripod, 2 jacks. Price $750.00. Abe Scholtz. See camera in A. S. C. office. GR 4274.

FOR SALE—New Eyemo camera, carrying case, extra magazine. Price $225. Call Ben White, OX 7335.

UNIVERSAL Motion Picture Camera 200 foot model, plain front, automatic dissolve, 3-200 foot magazines, single view finder, 1-50 m.m. B. & L. Tessar F. 3.5 in spiral focusing mount completely overhauled; good as new. List price $500.00. Will sell for $190.00 cash. Burke & James, Inc., Chicago.

FOR RENT—CAMERAS

FOR RENT—To reliable party, one Bell & Howell camera with Mitchell legs; Astro Lens F. 2.3., Fl. 8. 6 magazines. Fred Hoefner mat box. In perfect shape and fully equipped. Joe LaShelle. ORegon 6730.

FOR RENT—Two Bell & Howell cameras, large finders, astro lenses, F. 2.3. B & L 2.7. Also Akeley Head cinemotor, batteries and Eyemo. Frank Cotner, HO. 5046.

BELL & HOWELLS, Mitchell Speed Camera, Akeley Camera, special 17-inch Dahlmeyer lense. John Jenkins, GRanite 2174.

MITCHELL and Bell & Howell cameras. F.1.8 and F.2.3 lens equipment. All kinds of lenses and equipment for rent. John S. Stumar, 3602 Cardiff Ave., Palms, Los Angeles. Phone: Culver City 3542; or call C. Glouner, Camera Dept., Universal City, HEmpstead 3131.

ONE DE VRY Motion Picture Camera. Complete outfit. Alvin Wyckoff, Phone Care A. S. C., GRanite 4274.

FOR RENT—Akeley camera to responsible parties. Call A. Le Roy Greiner, A. S. C., GL 7046.

BELL & HOWELL, 170 degree, complete. Modern equipment. Fred Kaifer, HEmpstead 4621.

THREE Bell & Howell 170-degree cameras. Complete equipment. Eddie Linden, 6017 Eleanor Ave., Hollywood, HEmpstead 8333 or Hollywood 7716.

CAMERAS, ALL KINDS—Akeley, Bell & Howell 170%, also Speed, De Vry, Graflex, Still, (late model Anscos). For rent by day or week to responsible parties. Ries Bros., Ries Building, 1152 No. Western Ave. Phone GRanite 1185. Residence HO 1055.

BELL & HOWELL. Victor Milner, 2221 Observatory Ave., Los Angeles, California. 596-944.

BELL & HOWELL—Phone Perry Evans, DUnkirk 3890 or Hollywood A. S. C.

MITCHELL Friction Tilthead, 3 Mitchell cameras, 2 Bell & Howell. Astro F. 1.8, F. 2.3 lenses. Extra lenses and magazines. J. R. Lockwood, 523 N. Orange St., Glendale. Glen. 3361 W. Hollywood address, 861 Seward, Gl 6115.

E. BURTON STEENE, Bell & Howell, and Akeley. Complete Camera equipment. Latest models. Address American Society of Cinematographers, Hollywood, California.

BELL & HOWELL, 170, with 30, 40, 50 and 75 lens equipment. Baby tripod. Also B. & H. Cine motor. Charles Stumar. GRanite 9845. 7501 Lexington Ave., Hollywood.

BELL & HOWELL No. 627. Five lenses: 32, 40 (f.2.7), 50 (f.2.7), 75, 100 mm. Complete studio equipment; gauzes, filters, etc. GLadstone 0033.

TWO Bell & Howells. Large finders. Also Eyemo for rent. Lenses: F 2.5; 2.3; 2.7. Frank M. Cotner, 6273 Selma Ave., Hollywood. HOllywood 5046.

SPEED CAMERA: Bell & Howell, fully equipped for miniature and slow motion work 40, 50, 75 mm. and 6-inch lenses. Alvin V. Knechtel, 1179 North Kenmore. 597-054.

FOR TRADE—CAMERAS

WILL TRADE—Carl Zeiss, F. 3.5, 50 mm. lens in B. & H. mount. Trade for late model Veedor Counter. Bert Longenecker, 597-724.

FOR EXCHANGE—Practically new lens. Goerz Dogmar F. 4.5. Six inch focal length. Want F. 3.5 four inch. Zeiss Tessar preferred. Call John W. Boyle, GRanite 2213 or Ira Hoke, GRanite 5033.

FOR RENT—STILL CAMERAS

ONE 8x10 still camera—complete. Care A. S. C., GRanite 4274.

FOR SALE—LENSES

FOR TRADE—New 100 ft. Stineman Developing Outfit. One Reel, Three Tanks. Also F 3.5 Bausch & Lomb Tessar in Focus Mount with Diaphram and Sun Shade. Exchange for Tripod. Must be steady. George Horst, 1924 Green St., Philadelphia, Pennsylvania.

FOR SALE, LENSES—Carl Zeiss, F. 3.5, 50 mm., mounted in latest B. & H. mount. Looks like new. Perry Evans, 413 No. Mariposa Ave., Hollywood, California.

ONE two-inch Bausch & Lomb F.2:7; one Dahlmeyer Pentac 37 mm. F.2:9. Georges Benoit, care of American Society of Cinematographers, Hollywood, California.

CARL ZEISS, F. 2.7, 50 mm. in Bell & Howell mount. Dan Clark, care American Society of Cinematographers.

NEW 40 mm. Goerz Hypar f. 3. 5. lens in Bell & Powell mount: price, $50.00. Write Charles Clarke, 1222 Guaranty Building, Hollywood, California.

RUO LENSES—Sole U. S. Agent. Robert Ackerschott, 1575 N. Vine St., Hollywood. 25 mm. to 100 mm.; F. 2. and F. 2.5 (Latest type: Telephoto, 10-inch, F. 4.5).

WANTED—PROJECTOR

USED SIMPLEX wanted. State model, price, condition, etc. Address Box R, American Cinematographer.

WANTED—MISCELLANEOUS

FOR RENT—Akeley Head. Cinemotor, batteries and Eyemo. Frank M. Cotner. HO. 5046.

WANTED, CAMERA—Will buy Bell & Howell camera. State price and equipment. John P. Whalen. Gl. 1101 or A. S. C. GR. 4274.

WANTED, CAMERA—170 degree Bell & Howell camera. Would like Mitchell tripod. Harry H. Cooper, 851 No. Fuller Street. Phone GL 5239.

FOR RENT, LENSES—Trick lenses of all descriptions for rent by day or week. Call George Meehan, A. S. C. Phone GR 3830, 744 North Curson Ave., Hollywood, California.

WANTED—Will buy Bell & Howell cinemotor and a 32 M. M. Lense. Call Herman Schopp, HOlly 4735 or care A. S. C. office, GR. 4274.

FOR SALE—SPECIAL CAMERA EQUIPMENT

COMPLETE new style Bell & Howell matt box for sale. Joseph B. Walker, 1037 N. Sycamore Ave., Hollywood. Phone GLadstone 3797.

FOR SALE—100 ft. lengths of raw film with 10 ft. black leader on each end, suitable for hand cameras, $3.25 each. John Jenkins, 5849 Sunset Blvd., Hollywood, Calif.

PATHE panorama head for professional camera, with detachable aluminum tilting head, easily adapted to any standard tripod. A first-class unit for some one, who is experimenting or engaged in research work, to add to their equipment. Stephen S. Norton, care A. S. C., Guaranty Bldg., Hollywood.

REPAIRS, CAMERAS—Universal camera parts in stock. Complete overhauling of motion picture cameras given prompt attention. Send your camera in for an estimate. Burke & James, Inc., Chicago.

Announcing

The placing on the market of our new motor for camera drive. Has positive speed control, and works equally well on A. C., D. C., or 90 volt Radio "B" Battery. Literature is now being placed with the printer.

Mitchell Camera Corporation

6011-6025 Santa Monica Blvd.
Hollywood, California