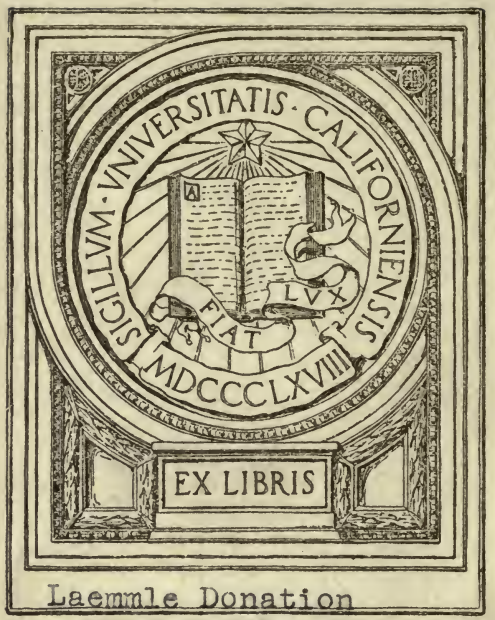
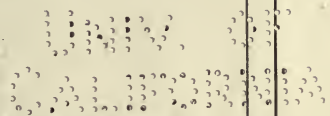



HOWARD BROWN

BEHIND THE MOTION-PICTURE SCREEN

HOW the Scenario Writer, Director, Cameraman, Scene Painter and Carpenter, Laboratory Man, Art Director, Property Man, Electrician, Projector Operator and Others Contribute Their Share of Work Toward the Realization of the Wonderful Photoplays of Today; and How the Motion Picture is Rapidly Extending Into Many Fields Aside from that of Entertainment



BY

AUSTIN C. LESCARBOURA

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INTRODUCTION

IN preparing this work the author has endeavored to steer a literary course midway between the deeply technical books intended for those actively engaged in the motion-picture industry, and the popular works written for those seeking entertainment rather than information. Both those classes of works have their missions and perform them most admirably, to be sure. But for the film devotee of a more serious turn of mind who would ask pertinent questions and expect understandable answers concerning what takes place behind the motion-picture screen, and who would be unable or unwilling to turn to the technical volumes with their formidable verbiage, this book has been written with the fondest hopes that it will fulfill a long-felt want.

Every important phase of motion pictures has been touched upon, more or less, depending upon its relative value to the entire art. Technicalities have consistently been avoided. It has been the aim to lay a general foundation for cinematographic knowledge, so that the reader, after mastering these pages, can turn to the more exhaustive works which have heretofore been barred to him as a layman.

In explaining special forms of motion pictures, the author has made use of certain systems. It is not to be assumed that these are recommended or selected solely on their merits from among all other similar systems. Indeed, they have been selected either because their general characteristics serve to make them typical of motion pictures of that particular category, or because their operation lends itself best to simple explanation.

The author is deeply indebted to Mr. Maurice Schoenbaum of New York City, an authority on domestic and foreign cinematography, who has been kind enough to go over the manuscript to insure accuracy of the more technical portions of this book. Also is the author deeply indebted to the various film producing companies, particularly those mentioned on another page, through whose generosity and coöperation this book is so profusely and fittingly illustrated.

New York, March 1st, 1919.

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"CREDIT TO WHOM CREDIT IS DUE"

Credit is due the following firms and individuals for their whole-hearted co-operation in illustrating this work:

Famous Players-Lasky Corporation	Select Pictures
Vitagraph Company of America	Goldwyn Distributing Corporation
W. W. Hodkinson Corporation	Pathé Exchange
Mutual Film Corporation	Metro Pictures Corporation
Arrow Film Corporation	Selznick Pictures Corporation
Fox Film Corporation	World Film Corporation
Triangle Film Corporation	Gaumont
Educational Films Corporation	Essanay
Universal Film Manufacturing Co.	Prizma Company
Eugene Lauste	American Film Company
Wharton Brothers	International Film Service

and many others in the divers fields of cinematography.

CHAPTER I.

WORKING PLANS OF THE MOTION PICTURE

THE STORY is the soul of the photoplay. It is the very foundation upon which is erected the elaborate series of scenes which makes up the finished film. A photoplay is judged good or poor by the story it tells; for, after all, it is the story which interests the audience. The direction, acting and photography are important, to be sure; but they are more or less a matter of routine, depending for their success upon the foundation which is given them to build upon. And to cater to the whims of a fickle and blasé public, the screen scribes will ever be industriously prospecting in many fields for those golden nuggets of the photoplay—plots.

EVERYTHING must start with an idea. After the idea comes the plan, more or less complete but gradually perfected as the work progresses. So with motion pictures; there must first be an idea or plot for a film story, followed by a more or less complete set of plans for the actual production.

The plans for motion pictures are known as scenarios and are written by scenario writers. A scenario is nothing more than a story in skeleton form. First it tells in its synopsis what the story is about, gives the cast of the photoplay in question and, lastly, outlines the action of each scene in the proper order. Titles and inserts such as letters and telegrams are included in the scenario; for it is this set of plans which guides the director in his work of producing the photoplay.

THE AUTHOR OF THE PHOTOPLAY SCRIPT

The writing of scenarios is at once simple and difficult. To some it seems quite natural to tell stories in outline or action form; and without having had any previous experience in literary work, they succeed in writing successful scenarios from their very start in this branch of endeavor. To others who have had years of training in journalism and in fiction writing, a scenario always remains an unmastered yet tempting undertaking.

It is no doubt the seemingly simple form of the scenario that tempts so many persons to try their hand at this kind of writing. Contrasted with the average short story, the scenario appears to be mere child's play; for there is no dialogue, no lengthy descriptions and no great command of elegant English required in preparing the plan for a photoplay.

But the fact that is overlooked at first is that the scenario, simple as it may seem, must tell a story in action only. The novelist can do much with lengthy descriptions. He can have his reader read the innermost thoughts of any of his characters. His dialogue can carry the story along in an attractive and effective manner when the action might be weak and unconvincing. In sharp contradistinction the motion picture, and therefore the scenario, must tell a story entirely by action. True, there are titles; but the practice is, and should be, to have as few titles as possible, for the audience wants to see pictures and not titles.

"WHAT COMES NEXT?"—DIRECTOR, PLAYERS AND CAMERAMAN REFERRING TO THE SCRIPT OR SCENARIO PREPARATORY TO FILMING A SCENE FOR A FORTHCOMING PHOTOPLAY

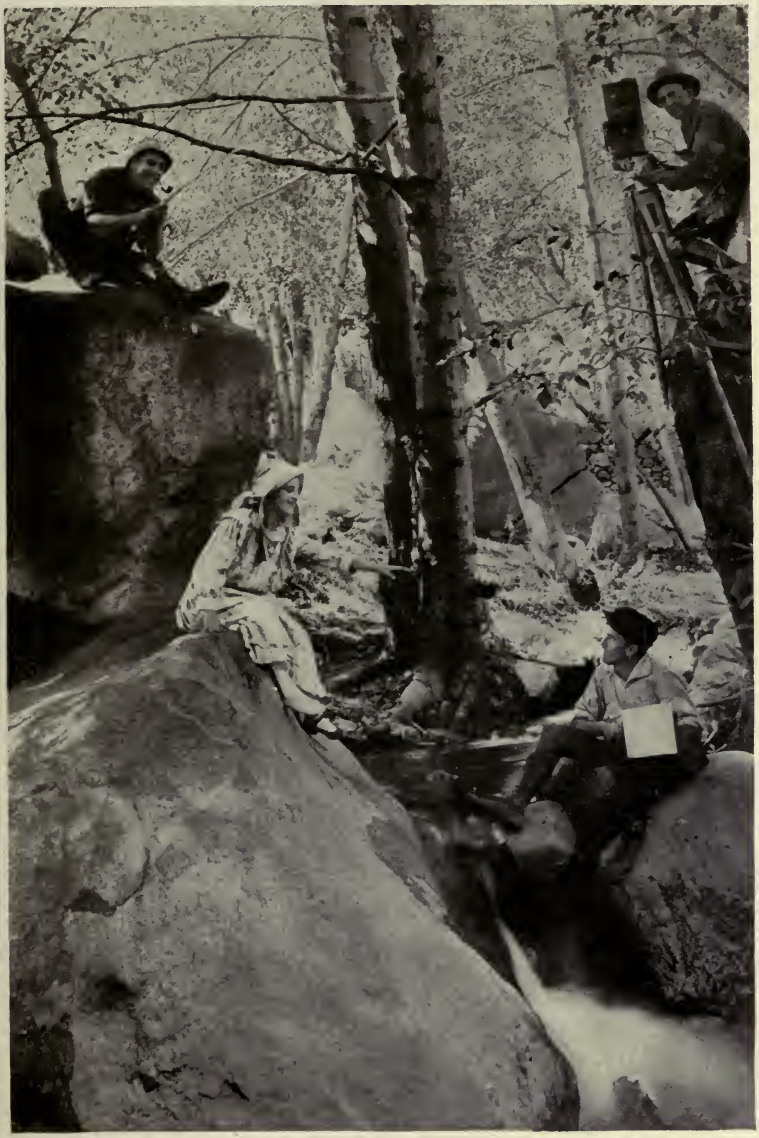
So the scenario is a skeleton story told in action only. Some writers have the peculiar knack of telling stories in this manner, while others have not the knack and try as they may they will never acquire it. It is the same state of affairs as may be found in the world of artists, where one man may be a good cartoonist, telling his story in rough, outline form, and the other a skilled artist who tells his story in the form of an elaborate oil painting. To the first the work of the second is wonderful; he can never hope to do that kind of art work. And to the second the cartoons of the first, crude yet so effective in telling a story, seem the products of an ingenious mind; the skilled artist admits that he lacks the ability to do such clever work.

The average scenario writer starts out with a plot around which he works up a series of incidents, just the same as the author of a novel. But instead of describing each of his characters and describing the action of the story, with here and there a bit of dialogue to connect the various parts together, the scenario writer looks upon his story as a series of pictures. The idea must be reduced to action, and the action must be divided into scenes, so arranged that they will tell the story with here and there a title or insert. So proficient are some photoplay authors that they can visualize an idea in motion-picture form, accepting certain bits of action and rejecting others while turning the plans over in their mind before consigning them to paper. Indeed, in many instances the scenario writers can actually determine in this manner how much action they can get into each scene so that the entire production will come within a prescribed length.

ESSENTIALS OF A SCENARIO

Like the blueprint of an architect, the scenario must tell the director how to go about his work. There is this difference, however, that in the case of the latter he does not have to follow the scenario to the letter: here and there, where the circumstances and his experience and judgment dictate, he can alter the action in order to produce a better picture. Very rarely is a scenario strictly followed out; for the director, having the actual work of production in hand, can usually improve upon many situations outlined in the plans.

Reduced to essentials, then, a scenario or script is generally



LEADING LADY AND HER DIRECTOR DISCUSSING A BIT OF ACTION CALLED FOR BY THE SCENARIO

composed of a cast of characters with a brief description of each; a brief but clear synopsis of the story; and a list of scenes which, when filmed, are to tell the story in photoplay form. Thus, in the case of a comedy photoplay, the arrangement of the scenario would be about as follows:

Austin C. Lescarboura,
10 Sherman Avenue,
Inwood, New York City.

Submitted at your
Usual Rates.

THE SUCCESSFUL FAILURE

Percival Farnsworth, a pampered child of the wealthiest family in Hamville, at the age of 25 years, is still groping around for something to do. His father has placed him in the local bank, the department store, the electric light company and in other local organizations; but the son soon tires of all these things. He is madly in love with Anita, daughter of Hamville's prosperous brewer, Schulteis. A motion-picture company comes to town. Percival is interested in their work, and then and there decides to become a motion-picture producer.

He seeks capital with which to buy the necessary equipment. His father, discouraged long ago, turns him down. He seeks the girl's father, but gets no sympathy. Finally, he approaches Abe Hinsley, the miser of the town, by interesting Hinsley's daughter, Mary, a would-be scenario writer, in the project. He offers to produce one of her scripts, and she in return gets the required money from her father. Percy goes to the city, purchases his equipment, and starts his studio in Hamville. He employs local talent throughout, for it is the proud boast of this Hamville Film Corporation that the film is "Made in Hamville."

But amateur motion-picture producers have much to learn. All kinds of ridiculous mistakes are made, both photographically and in the staging. Throughout, the staging of the pictures is ludicrous. Finally, the five-reel feature—a drama entitled "In the Days of Old When Knights Were Bold," is completed.

Percival starts out proudly for the city. He goes to the leading film company and offers his feature. He is told by the office boy

WHEN THE SCENARIO CALLS FOR A THRILLING RAILROAD STORY, THE FILM COMPANY HIRES A RAILROAD

to leave his film and to report in about two hours, so as to give the directors a chance to look it over. The Giant Film Company directors go into the projection room to view the production. They roar. The film is certainly hopeless. But Wainright, one of their younger directors, suddenly tells the men that the production should be bought because of its possibilities. The others are thunderstruck at what they consider a foolish suggestion. Wainright explains his scheme for converting the ridiculous film into a roaring comedy. When Percival comes back that afternoon, Wainright in all seriousness informs him that the film is accepted. Just as he is handing the check to Percival, he asks whether Percival would mind if the Giant Film Company went out to Hamville to get the photographs of the youthful director and his company in action. Percival tells them to go ahead. In this manner an appropriate opening and ending is obtained for the drama turned comedy.

Three months hence a Broadway audience is splitting its sides laughing over the five-reel comedy, "Reeling the Drama in Hamville."

CHARACTERS

PERCIVAL FARNSWORTH, the youthful son of wealthy folks; a jack of all trades and master of none.

ROBERT G. FARNSWORTH, father of the hero.

ELIZABETH FARNSWORTH, mother of the hero.

ANITA SCHULTEIS, daughter of the town brewer and very much in love with and very much loved by Percival.

RUPRECHT SCHULTEIS, brewer, father of Anita, and a firm believer in boys making their own way in this world.

ABE HINSLEY, the town miser who is greatly influenced by his daughter.

MARY HINSLEY, daughter of Abe and a would-be scenario writer.

PAUL WAINRIGHT, young director of the Giant Film Company.

Villagers, amateur actors, and directors in the offices of the film company.

LOCALE

For the most part the scenes are laid in the typical country

THE WESTERN PHOTOPLAY, PRODUCED IN SUCH SURROUNDINGS AS THESE, HAS BEEN A REAL INSTITUTION IN AMERICAN PRODUCTIONS. ITS POPULARITY NEVER SEEMS TO WANE

town of Hamville. A few scenes are laid in a large city, preferably New York or Chicago.

SCENES

SCENE 1.—*Subtitle:* Twelve-thirty and Percival had no thought of departing.
Parlor in home of the Schulteis family. Percival is holding hands with Anita who, from time to time, yawns. Hall clock in the background points to 12.30.

SCENE 2.—Head of stairs on next floor. Schulteis comes out of bedroom, clad in pajamas and bath robe. Looks at watch and shakes head angrily. Starts downstairs.

SCENE 3.—Same as No. 1. Father comes downstairs and into living room, while lovers are so intent in each other that they do not see him approach. They pay no attention to him. Finally, he comes between them on the sofa and turns angrily toward Percival.
Subtitle: "Don't you know when to go home. Furthermore, I might as well tell you now that until you can find a job and become a man, you might as well stop calling on my daughter!"
Percival is taken unawares. Does not answer but starts fidgeting about. Gets up and walks out to hall and gets his hat and coat. Bids Anita good night but is visibly angry with her father, who then scolds her and sends her upstairs to bed.

SCENE 4.—Living room in Farnsworth home. Father is waiting for his son. Clock on mantlepiece (close-up) indicates 1.30. Son walks in, hangs hat and coat on rack in hall at rear of stage. Sees his father and walks in. Father drops his newspaper and stands up. Looks angrily at son.
Subtitle: A fine hour for you to come home, young man.
Son begins to explain where he was. Father shakes

SCENARIO WRITERS ARE NOTORIOUSLY CRUEL. WITHOUT A MOMENT'S HESITATION THEY CALL FOR A HERO STRUGGLING WITH DEATH AMONG CAKES OF FLOATING ICE—AND THE ACTOR MUST DO IT

head. Reaches into his inner pocket and pulls out an envelope, which he hands to son, who opens it and pulls out a letter which he unfolds and reads. *Subtitle—Letter Form:* January 5th, 1918. Dear Mr. Farnsworth:—This is to inform you that we have been obliged to discharge your son, Percival, because we found him utterly unsuited to our work. He appears to have no taste or inclination for electrical work, and as much as we should like to give him the training you desire, we believe it would only be time wasted. Yours very truly, Hamville Utilities Company.

And so the idea is carried out, scene by scene.

Scenarios follow no absolute rule, and there are many variations as can well be imagined. In fact, of late the majority of producing concerns prefer to work from a synopsis only, rather than from a complete scenario which an outsider might submit. For, having a better understanding of the requirements and the limitations of the studio, the inside scenario writers or editors are in a far better position to prepare the scenario than the average free lance. Given the idea or synopsis, they can set to work on a script which will come pretty close to meeting the demands of the directors with the minimum of changes in actual production.

Thus if there is a certain quality or distinguishing feature about the productions of any given producer, it is due to the fact that the scenarios are all prepared inside by staff writers or editors. Many of the foremost producers have long since given up the plan of purchasing outside material, although the best policy appears to be that of accepting ideas for photoplays and then preparing the scenarios inside.

Books and novels offer a rich field of ideas to the motion-picture producer. A considerable proportion of the present photoplays are taken from well-known works and magazines, and it is due to the skill of a staff scenario writer that these novels and stories make such excellent films; for skilled scenario writers have the knack of extracting those features of any given

IN A RECENT SCRIPT THE AUTHOR CALLED FOR THE SINKING OF THE LUSITANIA WITH ALL ITS HORRORS AND——

story which will make the strongest photoplay, and these they weave into an interesting screen pattern. It is largely due to this ability that the independent or free-lance scenario writer no longer has the opportunity he had formerly.

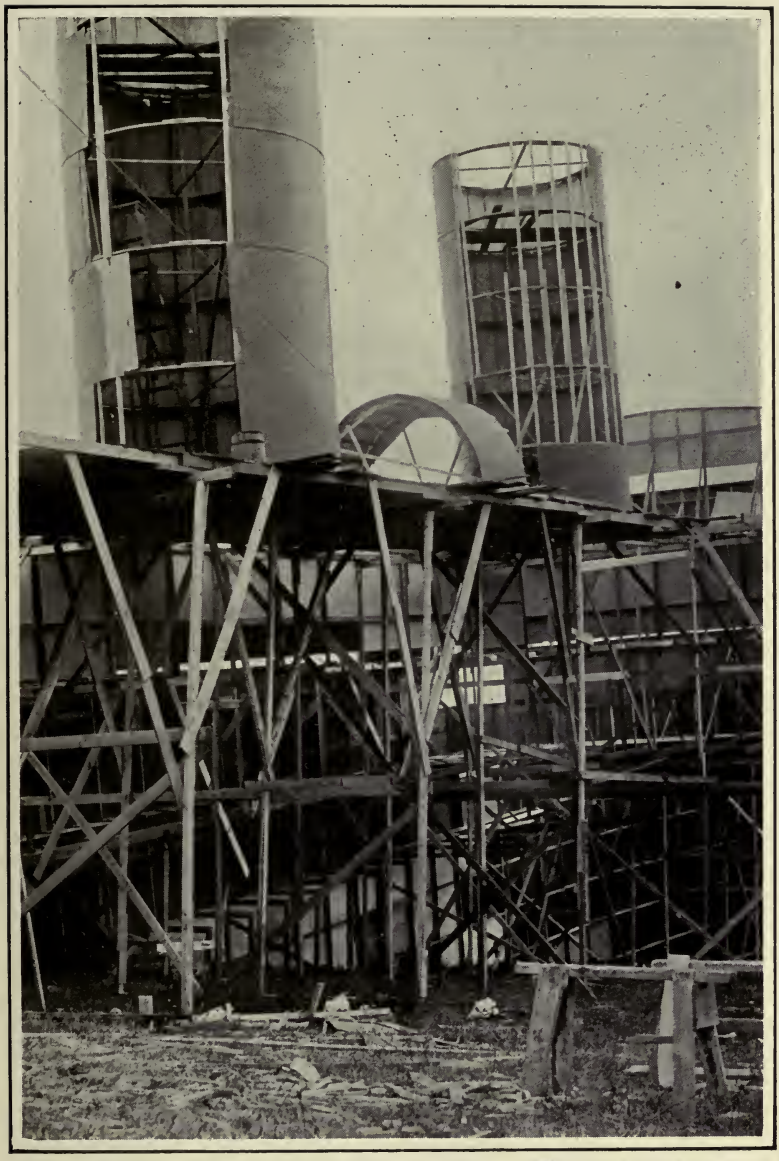
The introduction of the multi-reel feature too, has had a marked affect on the scenario market. Formerly, when producers were making single-reel subjects, many more scenarios were required; and because of the small expenses involved in producing photoplays, they were not so particular as to the merits of the story submitted. But today, with tens of thousands of dollars being expended for a single five-reel production, it is quite obvious that nothing but the best of plots can receive even preliminary consideration.

PRODUCTIONS WHICH ARE MADE UP AS THEY GO

The most difficult scenario is the comedy. It is comparatively easy to write a film story which will bring tears to the eyes of the audience, but it is not always possible to get a laugh from the same audience. The creating of humorous situations calls for considerable thought; and even an idea which seems laugh-provoking in script form is apt to fail completely when projected on the screen.

So it is the practice of leading comedy producers to work almost without a script. That is to say, their scenarios are little more than the general outline of the comedy. From the first scene to the last the players themselves and the director to some extent are depended upon to create comical situations, as the mood strikes them, in order that the entire production will be a steady series of laughs. Indeed, the whole success of a comedy depends upon this one factor: keeping the audience laughing so that they have no time to think about the incongruities of the story. Almost any comedy, if it were examined in detail, would prove so utterly foolish as to be rather a drama than a comedy; but when flashed at the rate of sixteen pictures per second, with one scene following fast on the heels of another, the audience simply has no time to think. It merely laughs at the humorous situations here and there.

And it is not often possible to write a complete comedy scenario. In producing a comedy the actors generally find it



THE LUSITANIA WAS CONSTRUCTED OF WOOD, COMPO-BOARD AND CANVAS ON A VACANT LOT IN THE BRONX, NEW YORK CITY

necessary to have light acting here and there to connect up the main action. This light acting or comedy is generally taken care of by the old-time comedians about the studio, who are employed for just such purposes. They have a large number of tricks and space fillers which they bring into play, and in this manner give the leading actors ample time between scenes to rest up and again store up the humor which must be part of them in executing their rôles.

Broadly speaking, therefore, most comedy films are practically produced as they go.

CHAPTER II.

THE ARTIST WHO PAINTS THE FILM SUBJECTS

CONSIDER the photoplay as a painting. The players or figures appear on the screen in various bits of action. The picture, unlike those on canvas, is animated; and it changes from scene to scene in telling its story. But who paints this picture? Who places the figures about and who gives them the proper animation? The artist is none other than the director, who takes the author's script and translates the written story into the animated tableau which we call the photoplay. He is the directing genius of the films. He makes the fame of many a screen player. His imprint is evident in many of his players, long after they leave his fold. All of which is mentioned here in order properly to introduce the big man behind the screen—the director.

SO NATURALLY do the screen players go through their parts that the audience is generally convinced that they are entirely responsible for the success of the photoplay. Indeed, it appears that the players are acting their parts with the greatest of ease; which accounts, in large measure, for the thousands of young men and young women and even little tots who would be screen stars.

But this is all an illusion. The truth of the matter is that the actors have been merely carrying out the directions of a master mind, which in this case is that of the director. In the production of a photoplay the director is entirely responsible for its success or failure, granted that the material he has to work with —his cast—is satisfactory. For his is the task of staging each scene, telling the actors just what they are to do, showing them how to do it in many instances, and then seeing that they do it well before the camera records the action. Contrary to what the screen impression may be, the director is the man who pulls the strings; the actors are generally automatons. Or to use another analogy: they are as clay in the hands of a sculptor or paint at the tip of the artist's brush. He moulds them into any desired shape called for by the scenario in the one case, and places and blends them on his canvas to conform with the story he is telling, in the other.

THE ACTOR AND THE DIRECTOR

But it is not the author's intention to imply that motion-picture actors do not have to think for themselves, and that their qualifications can be of a low order. As a matter of fact the screen requires the best of actors; for the requirements, differing as they do from those of the legitimate stage, are nevertheless just as exacting, if not more so.

What is generally overlooked in this connection is that the legitimate stage player also has at some time or other been entirely under the direction of a master mind. When the play was first rehearsed, the producer carefully took up each line of the production and drilled each player in his or her part until the coordinated efforts of all the players went to make a perfect whole. Once each player mastered his or her part, of course, the direction was no longer required, hence was removed by the time the actors went out before their audience.

THIS IS THE DIRECTOR'S JOB: HE TELLS THE ACTOR WHAT TO DO IN EACH SCENE, AND EVEN SHOWS HIM HOW TO DO IT WHEN NECESSARY

So in motion pictures, the director is necessary in order to coach each player and to co-ordinate the efforts of the entire cast. Out in front of the stage or set, the director can study and arrange the action in order that it will appear to the best advantage when projected on the screen. In truth, part and parcel of the training of every director is a good knowledge of the motion-picture camera; he knows what are the limitations and possibilities of film photography just as well as the cameraman at his side.

Screen players there are who have the ability to act and direct at the same time. But of the hundreds of leading players of the films, one can count on the fingers of one's two hands the players who can play in and direct their own productions.

It is far more common for a talented screen player to aid the director materially in his work. For instance, in the case of a well-known young lady who heads her own producing company, she not only goes over the scenario with her director and suggests changes and improvements here and there, but she actually directs herself in difficult parts of a given photoplay. One of her favorite methods is to have a full-length mirror placed in front of her, so that she can rehearse herself time and again until she is satisfied with her interpretation of the scenario writer's idea. Then the mirror is removed and the cameraman "shoots" the scene.

All of which is by way of making clear that the relationship between director and actor is most friendly. Film actors realize that they can only produce their best work when guided by an experienced director.

WHAT MAKES A DIRECTOR?

There is no sure road to the position of director with a motion-picture organization. Some directors have quite naturally drifted from the legitimate stage to motion-picture acting and then to the direction of productions. That seems to be the most common road to this profession. But then there are others who have drifted right into the directing end from other professions such as engineering or medicine, and even from military life. One of the leading directors of the present time became a director without previous screen experience: he had been conducting a

ABOVE: DIRECTING A SCENE ABOARD A SHIP. BELOW: GIVING INSTRUCTIONS TO THE CAMERAMAN

motion-picture theater when he came to the conclusion that he would rather produce than exhibit films. So he applied to a leading concern, and in a short time was placed in charge of a company of players. His career has been meteoric. Today he is the owner of a large producing concern which bears his name.

A good director must be a capable executive. It is therefore not strange to find many of the present directors ex-Army men. Used to handling men, these directors make out well in their new-found profession. Then again, artists and sculptors make excellent directors, for after all the directing of a screen play is merely the skillful placing and animating of the characters so that they will form pretty and convincing pictures—pictures which will tell their story. Newspaper men and writers, too, make good directors, for they know the elements of story telling. Whether they work with photographs or words, the essentials of story telling remain the same; for it is simply a change in the medium of expression.

The first step in directing a photoplay is to study the scenario. As a general rule the director receives a scenario for consideration; and if, after reading it through, he believes it has possibilities, he reports to the scenario editor to that effect. Perhaps it requires certain changes to improve the action. At any rate, the director exercises considerable authority over the selection and arrangement of a scenario, since he is the one who must convert it into a successful screen play. And the theme is the very soul of any screen play.

There are directors who write most of their plays. Beginning with a simple plot, they work up a series of events which, when joined together, make a good photoplay. The combination of directorial and writing abilities is ideal in the extreme, for then the same mind can conceive of an idea and carry it through to realization. No one will gainsay that this is a far better plan than to have one mind prepare the story and another interpret it. And films written and produced by the same mind are generally proof of the merits of this combination of talents.

Once the scenario is prepared for the director, he has time to study it in detail and make preparations for its production. The practice in most companies is to give the scenario for the next production to the director, several weeks in advance, while he

THE HEROINE DELIVERS THE KNOCKOUT BLOW ON THE VILLAIN'S JAW AT THE BIDDING OF THE DIRECTOR, WHO COACHES THE PLAYERS DURING THE FILMING

is still working on the preceding production. In this way he has plenty of time to turn the story over in his mind, talk it over with his leading actors, and arrange for the indoor and outdoor scenes. If there are special sets to be erected, he can give the order to the technical director who is in charge of this work; and likewise, if special costumes are required, he can give the order to the wardrobe department for such garments as he may need.

Once through with the production he has had in hand, he immediately turns to the new one. By now he has formulated a broad working scheme, so that he is prepared to take his players out of the studio and grounds and to some distant spot or "location" for the filming of certain scenes, or film the indoor scenes first.

It must be perfectly obvious to all who have given some thought to photoplay productions, that all the scenes making use of the same background or "location" must be taken at the one time. Otherwise one could well imagine the difficulty of producing a scenario as written; that is to say, in the order of sequence. For instance: Scene No. 1 might be a room in a flat. Scene 2 might be the corner saloon. Scene 3, say, a railroad yard. Scene 4, the room in the flat. Scene 5, the same background as No. 2. Scene 6, the same as No. 1. Why, then, take them in rotation and oblige the players, director and cameraman to go from place to place when all the scenes with the same background could be taken at one time? Long ago the picture producers came to the common-sense idea of taking all scenes with the same background at one time no matter if, according to the story, there are intervals of many years between any two or not.

The elaborated working scenario generally has a list of backgrounds and the numbers of the scenes which make use of each background. The director decides where and when he will film each batch of scenes. On clear days he takes his company afield or out "on location,' while on cloudy and stormy days he works on the indoor stage, making his "interiors."

THE BUSINESS OF FILMING A SCENE

While the leading man and lady by now have a good idea of the story that is to be produced, the cast as a whole generally has to have the story explained. Right here, however, are to be

THE DIRECTING OF PHOTOPLAYS IS NOT A MAN'S JOB EXCLUSIVELY; THERE ARE SEVERAL VERY SUCCESSFUL LADY DIRECTORS PRODUCING OUR BEST FILMS

found two totally different schools of directors: the average director usually explains the film story to his players in order that they will understand the relation of any given scene to the entire photoplay; but there is another type of director, the absolute disciplinarian type, we might call him, who believes in keeping the players in total ignorance as to the film story. The plea of the latter school of directors is that the players, if uninformed as to the theme of the play, are more apt to follow directions with great fidelity; whereas, if they were told the nature of the play, they would be tempted here and there to introduce some of their own interpretations and thus fail to work in absolute concert with the director. As to the merits of the two schools, the results apparently indicate that it is largely a matter of opinion.

In either event the director informs his players at the beginning of each scene what the immediate action is to be. He tells his players how to act their respective rôles, with particular suggestions when needed. Then he puts the players through the action once, while he scans every move. Perhaps this rehearsal may be satisfactory the first time; but as likely as not he has corrections to make and the action starts all over again. While the players go through their parts he stands behind the camera and coaches them. Sometimes the action is so simple that no rehearsal is necessary; but as a general thing it is rehearsed a number of times before it is filmed.

Once the director is satisfied with the way his players interpret a scene, he calls for the lights (if the scene is in the studio) and gives the order to the cameraman to film the action. At the command "Action! Camera! Go!" the players start work as if electrified, while the cameraman cranks away. "Cut!" is the usual command which orders the cameraman to stop and the scene is considered finished. Even while the filming is taking place the director often coaches his players; and it is a rare tribute to the players that they are able to follow out such suggestions even while acting for the camera, without betraying any signs of coaching on the screen.

Scene after scene the director stages and has filmed, while all the time his negative film is piling up in the fireproof vaults. He keeps careful record of what he has taken and what remains to be taken; and at last, despite jumping from one part of the

ABOVE: DIRECTING A THRILLING WATER SCENE. BELOW: WHEN THE VILLAIN PEEPS "DOWNSTAIRS"

story to the other—producing a scene at the very end, then the opening, then a scene just before the climax, then an early scene —he finally succeeds in closing up the gaps and completing the story.

One thing that must be watched every moment of the time when producing a film is the so-called continuity. By taking the scenes in what appears a haphazard and careless manner and yet, in truth, is the most practical way, errors of the most foolish sort often creep into certain scenes despite the utmost vigilance. As an example: In one scene, an interior, a player is depicted leaving the room in a plain dress, while in the next scene, when the film is joined together, the same player is shown coming out on the porch wearing an apron. Such errors must be avoided, for they are quickly detected by the keen-eyed audience of today and cause no end of ridicule—and loss of prestige.

EDITING THE PHOTOPLAY

Now the director turns his attention to the assembling of his various scenes. Again in this as in other phases of cinematography, there are no set rules. Each company has its own method of procedure, although they all lead to the same results.

No matter how capable may have been the actors and how excellent the direction of the photoplay, its success is nevertheless at stake in the cutting room where it is edited. Every scene must be gone over with a view to trimming unnecessary action, since this only serves to bore the audience, although at the time the scene was filmed the superfluous action may have seemed quite necessary to the director. In the trimming operation much film is thrown away. For the average 5,000-foot feature film at least 10,000 feet of negative film may be exposed; yet the greatly curtailed production which the public sees always appears quite complete. In gigantic productions the wastage is tremendous; in one spectacular photoplay a total of 110,000 feet of negative was exposed, of which but 10,000 feet was used in the screen version.

But all the film thrown out of a picture is not wasted. Progressive producers often make use of the so-called cut-outs in making other features, especially when a well-known player is featured.

ABOVE: DIRECTING A LARGE OUTDOOR SCENE. BELOW: DIRECTING A SCENE "ON LOCATION"

One excellent method of editing film is to give the girl assemblers a layout which they follow, cementing the various strips in their proper order with the titles represented merely by numbers, corresponding to numbered titles on a sheet of paper. The film, either in more or less complete form, is then projected on a screen, while a clerk reads off the title as the corresponding number is thrown on the screen. In this manner the director can view his own work, suggesting alterations here and there and making any changes he wishes in his titles before they are actually set up in type and photographed. In large organizations the film is generally reviewed by other directors, including the head producer, who freely offer their suggestions and criticisms. It is here that any inconsistencies or scenes which fall below the required standard are detected and ordered remade.

Once approved of, the master reel is made up and is then used as the standard for the assembly of the numerous copies by deft-fingered girl assemblers.

THE DIRECTOR IS BECOMING A SPECIALIST

With the gradual improvement in photoplay production, marked changes have perforce taken place in the personnel of producing concerns. That is to say, whereas the director of the early days did pretty nearly everything from painting his own scenery to turning the camera crank, the profession has become highly specialized of late years.

Not so long ago the director supervised the painting and building of every set required in his production. He had to be posted on history, architecture, customs of foreign lands, and other details connected with the accurate portrayal of scenes out of the ordinary. Your director of today, however, leaves these details to the art director or technical director, in whose province these duties naturally fall. He merely tells the technical director what the scenario calls for, and the latter attends to the rest. And if present-day films represent the acme of accuracy in their divers portrayals, it is largely because the technical director is on the job.

Your director of bygone days was wont to ride about in a fast automobile, seeking his own locations. He spent much time in these searches, for he had no elaborate list of locations neatly and

"HOW SHOULD IT LOOK?"—THE TECHNICAL DIRECTOR'S JOB IS TO DIRECT THE ERECTION OF SETS AND TO SUPERVISE THE GENERAL DETAILS OF A PRODUCTION

conveniently indexed. Today he tells the location man what he wants. And said gentleman goes to his files and hunts up his selections of the category in question. Perhaps he has a dozen locations of that particular nature, and as likely as not he has snapshots of each. These he presents to the director, who can make his selection without spending valuable time in searching on his own account.

Then too your director used to select his own players, one by one, from among the hundreds who will forever flock to the studio every day that films are made. If he needed Irish laborers, policemen, soldiers, nurse-girls, nuns, circus hands or butlers, he personally went among the would-be filmites and selected such persons as suited his immediate requirements. Now he goes to a casting director. He tells him what he will require the next day. The casting director looks up his types in a card index system. A post card or telephone call brings the various types to the casting room the next day, and they are sent to the director.

So in every other matter the director has had those extra details taken away from him, until presently his task is purely one of directing the players under his direct charge. There are specialists at his beck and call for all the other phases of the film producing business. And being withal a practical man, he is not slow to make the utmost use of them.

Such, then, is the director, the man behind the screen. He makes the photoplay. Yet how often does the audience give him a moment's thought?

CHAPTER III.

THE REAL RÔLE OF THE PICTURE ACTOR

SCREEN acting and stage acting are two totally different things. There is as much art in one as there is in the other; and accordingly the honors should be about evenly divided. With the development of the photoplay from its crude beginnings to its present high state of perfection, more and more has been expected of the screen actor. Today none but the best artists of the histrionic art is admitted to the screen stage. But the screen star is not the only one concerned in producing a photoplay; nor is he or she entitled to all the credit. The screen player is but a part of the photoplay organization.

ALWAYS will the actor occupy first place in the minds and hearts of the screen audience. It is unavoidable. For, after all, it is the leading player or "star" and his or her supporting players who appear before the audience and public. *They* are the photoplay.

In the pioneer photoplays the actors were generally hired for each picture at so much per day or per week—a sum which, in most instances, would hardly be acceptable to an "extra" today. Players came and went from one picture to the next; and in consequence the screen public never became "acquainted" with individual players. Those were the days when films were known by their trade marks and not by their players.

Then, with better direction and an all-round improvement in the photoplay art, certain accomplished players soon forged ahead to the very forefront of the screen. The public began to take notice. Questions were asked, few at first, but more numerous and persistent as time went on. Everyone wanted to know who was the little blonde in a certain brand of pictures; and who was the tall, slender man in such and such a picture; and who played the rôle of a Confederate Colonel in a certain Civil War photoplay, and so on.

The more progressive producers did not hesitate to give all the information asked for. Here and there certain producers obstinately refused to do so, assuming the attitude that it was none of the public's business in the first place, and in the second it might lead to making certain players famous and hence attractive to other producers.

At about this time the first of the so-called "fan" magazines, or periodicals appealing to the motion-picture devotees, began to appear for the purpose of bringing the screen audience into more intimate contact with the screen players.

So it came about that certain players became famous. The independent producers, as distinguished from the old established companies, operating under license granted by a corporation holding important basic patents which debarred all would-be producers for a long time, immediately catered to the public in the matter of giving information. At a time when only certain foreign films were offered with a cast or list of players, certain of our independent producers came out with casts for each of their

THERE ARE NO FOOTLIGHTS OR AUDIENCE FOR THE PHOTOPLAY ACTOR. BEHIND HIM IS THE SCENERY AND IN FRONT OF HIM IS THE UBIQUITOUS CAMERA

films. The idea was successful from the first, and one by one the producers came around to it.

DIVIDING UP THE CREDIT ALL AROUND

With the advent of the so-called feature film, the "star" of the screen came into existence. Instead of offering a film under a trade mark or name, the practice soon got to be the offering of a photoplay under the name of a well-known player. And this very practice started the great war among producers for "stars," or rather, "names."

A certain young man conceived the idea of producing multiple reel photoplays, each introducing some well-known "star" of the legitimate stage. But he was confronted by the fact that the foremost actors and actresses considered it far below their position to act in the "movies." Finally he made up his mind to induce the greatest player in the world to appear before his camera in order to establish a precedent which every actor and actress could sooner or later take advantage of. So he went to France and induced the great Sarah Bernhardt herself to play the part of Queen Elizabeth in a historical photoplay.

Of course, no player could refuse to appear in motion pictures after the "Divine Sarah" had given her approval in full. One by one of the greatest names in the world of players appeared before the camera. And finally, the public became so accustomed to famous stage names that every photoplay of the feature variety was introduced solely on the drawing value of the leading player; that is to say, Mr. John Jones (in very small type) presents HERBERT COGSWELL APPLEBY (in gigantic type) in the recent stage success, "Married Without Knowing It" (in fair sized type)!

Today we have the "star" system, as it is known among producers themselves. Everything revolves about the "star." Producers scramble over one another, literally speaking, in order to obtain the greatest "stars." True, many "stars" have ability of the highest kind; but it is equally within the confines of truth to call attention to many so-called "stars" who possess little ability. Such "stars" are of the synthetic variety: they have been created mostly through hard working press agents and capable directors.

One result of the present "star" system is to exploit the "star"

ABOVE: DIRECTOR AND ACTRESS TALKING IT OVER. BELOW: A PRACTICAL DEMONSTRATION BY THE DIRECTOR

of a feature play to a point where the photoplay is ridiculous. The supporting players are always kept in the background; and, indeed, the picture becomes nothing more than a plague of animated portraits of the "star." There is also the tendency to "pad" such photoplays to such lengths that the interest lags.

It is the problem of the industry today to find a way out of the "star" evil. For it is recognized that good photoplays could be produced by capable players grouped in suitable permanent companies, under the skilled direction of capable directors, and with the usual talent of all those who go to make the photoplays, such as the cameraman, scenario writer, title editor, scene artist, and so on. Thus photoplays would be based on merit and not on "names"; and everyone in the industry, excepting of course the "stars" who are now asking fabulous sums for their work, would be better off, especially the exhibitor who has to pay high rentals for his films. However that may be, the great question of the art today is the solution of the "star" evil.

Some time ago producers began the practice of giving credit to others besides the players. Now it is common practice for a producer to mention the name of the director and possibly the assistant director, the scenario writer, the art director, the cameraman, and so on. At last the credit is being divided up a bit; and in the future it may be evened up far more than we dare now believe is possible. The practice is commendable: the public should be made to realize that the player is but a part of the producing force and by no means the beginning and end and the whole thing.

HOW SCREEN ACTING DIFFERS FROM STAGE ACTING

Acting before the camera and acting before a theatre audience are two totally different things. The principal difference, of course, is that one is an example of the pantomime art, while the other is conventional acting; one is totally silent, while the other permits the use of speech. Broadly speaking, that is the main difference.

But when the matter comes to be studied in greater detail, the differences increase in number. On the stage the player has a comparatively large space in which to maneuver, while the photoplayer has a very limited space. A stage may measure

ABOVE: WHEN THE DIRECTOR EXPLAINS A BIT OF ACTION. BELOW: "——AND PUT SOME PEP INTO IT!"

fifty feet across and thirty feet in depth and be considered a small stage, while a motion-picture set may measure ten feet across and ten feet deep and be considered plenty large enough for a certain bit of action. Again, the working shapes of the two stages differ: the motion-picture set becomes wider the farther one gets from the camera, while the legitimate stage becomes narrower the farther one gets from the footlights.

For players coming direct from the theatre to the motion-picture studio this matter of working room is quite confusing. A stage player is at first constantly overstepping the limits of the camera field, and is seriously cramped for room. But like so many other things it is a matter of practice, and one soon gets accustomed to the new order of acting.

Then there is the matter of working under a director, who tells the player just what to do as we have learned from the preceding chapter. But directors are exceedingly tactful and skillful in handling players, ranging from the Broadway favorite to the unknown "extra," and as a general thing little difficulty is encountered in this direction.

The absence of an audience is quite trying to some stage players. Particularly is the absence of applause felt by those who for years have appeared on the legitimate stage. It is precisely the same state of affairs as the opera singer who undertakes his first phonograph record. Again the absence of the audience is seriously felt, and more than one singer develops an attack of "phonograph fright," which must be overcome.

As for acting proper, there is considerable difference. It would at first be supposed that the absence of dialogue is a serious handicap; yet in practice it appears to count for little, except in some cases where players have depended unduly on their voice or manner of speech. There is much pantomime in photoplay acting, but it is not precisely "silent" drama, as it is so often called. For the players must "learn their lines" just as they do in legitimate productions. There was a time when they did not speak their parts, and the acting was far from realistic in consequence. Today the players speak their parts, or at least move their lips when they are supposed to speak. And in that way the absence of speech only exists on the screen, and there it is readily counterbalanced by well-handled titles.

PRIVATE DRESSING ROOM OF A WELL-KNOWN OPERATIC STAR AT A LOS ANGELES STUDIO. THE GREATEST PLAYERS OF THE WORLD HAVE BY NOW APPEARED BEFORE THE CAMERA

The profuse employment of the close-up effect has a material influence on acting. On the stage the player is removed by many feet from his audience; but when appearing in a motion-picture close-up he is brought to within a half-dozen feet of the audience —a veritable tête-à-tête, so to speak. The acting must be more restrained than it would be on the stage, where distance makes it imperative to emphasize certain bits of action. The reason why a screen player often appears ridiculous in certain scenes is through his lack of appreciation of the closeness of his audience. There is also the matter of photography—motion-picture photography. If certain bits of action are carried out at normal rates, the player's figure may be partially or wholly blurred when photographed close-up. Slowness of movement must therefore be practiced under certain conditions. The matter of speed is an all-important one in photoplay acting, and is best mastered through long experience.

WHAT IS A CAMERA FACE?

It is given to some persons to photograph well anywhere and everywhere, while others never seem able to secure a good and pleasing likeness of themselves. In motion pictures a player must photograph well every time, for that is precisely what he or she is hired for. So one of the prerequisites of a photoplayer is a "camera face."

What is a camera face? It is hard to define. Persons who know much about photoplay faces claim that they have long ago ceased to attempt an answer. It used to be said that a camera face was that of a person with dark, regular features, and dark eyes; yet so many very blond women with small features have become photoplay "stars," that the riddle remains unsolved.

In everyday life a slightly bent nose or a little droop of the mouth or a peculiar angle of the eyebrows may add charm and character to a face, yet on the screen these lines may have a quite opposite effect. Wrinkles which might go unnoticed in everyday life are accentuated in a most alarming manner by the camera in "close-ups." As to eyes, certain shades of blue will not do at all, and as a general thing black eyes photograph dull and lifeless. Brown eyes are better, while blue-green eyes with a rim

SCREEN PLAYERS DO NOT ACT IN BEAUTIFUL MANSIONS, SURROUNDED BY LUXURIOUS FURNITURE. HERE, FOR INSTANCE, IS THE TAKING OF A CLOSE-UP IN A "RESTAURANT!"

of yellow around the pupil, are best of all, as they retain their expression and animation. Black hair does not photograph as well as brown, red and blond, although much depends upon the shade and quality.

A camera face, or the gift of photographing pleasingly, is a great asset to a person seeking an opening in photoplay acting. Many a well-known "star" of today entered in the industry without previous experience because he or she possessed a camera face. As often as not such persons were singled out from among a crowd of "extras," granted a tryout before the camera, and then taken in hand after proving good photographic types. But a camera face is only a desirable, but not imperative, qualification of the photoplayer; and one well-known director hastens to assure us that the art can make more of a good actor without a camera face than of a wonderful photographic type without any ability for acting.

THE GENTLE ART OF FACIAL CAMOUFLAGE

Makeup covers a multitude of sins or shortcomings or call them what you please. With the aid of a makeup expert any face can be made over until it is more or less of a camera face; at least, it photographs reasonably well.

An interesting problem in makeup arises in certain scenes where a pronounced blond appears with one or more very dark players. Obviously, the blond type reflects more light than the brunettes, hence in the regular course of events a film would be produced which, when developed, would either have the blond correctly depicted, but the brunettes appearing like colored folk, or the brunettes correct and the blond represented by a chalky oval. It is simply a matter of excessive contrast. In such a case it is necessary for the blond to use one of the heavier grease paints so as to render her face less actinic and photographically closer to the brunettes.

Some "stars" refuse to make up according to the cameraman's directions. In which case it becomes necessary to resort to certain lighting effects to secure the desired results. By means of spot lights it is possible to apply the correct illumination for each player, so as to average up all the players in one scene from the cameraman's point of view.

MAKEUP IS AN ART WHICH IS MASTERED ONLY BY THE PLAYERS OF LONG EXPERIENCE. A MAKEUP EXPERT IS GENERALLY ON THE STUDIO'S STAFF TO MAKE UP THE "EXTRAS"

Photoplay makeup cannot be studied in a mirror, despite the very stubborn will of some "stars" to abide by that criterion. All facial camouflage which is to appear before the camera must be translated into the black-and-white language of photography, and until that has been done no makeup is of any value. A beautiful face in actual colors may prove a perfect fright on the screen; and so all questions of makeup are generally decided by the cameraman.

It is really wonderful what can be accomplished by the painless surgery of the screen in the matter of facial beauty. A crooked nose, for instance, need not come in contact with the knife or be puffed up with paraffin in order to be straightened. If one side of the nose is too heavy a little pink grease paint will tone it down. A bent ridge may be straightened by running a straight highlight with grease paint. A flat nose can be made beautiful by shading the sides with pink grease paint and highlighting the ridge. A long nose can be cut down a quarter of an inch or half an inch with the aid of a pink tip.

Round faces and long faces can be altered to suit requirements by the shifting of pink grease areas. Indeed, an entire book could be written on the wonderful makeup of the screen.

And camouflage does not stop with the face. Shortcomings of Nature as evinced in certain imperfections of one's figure can be rectified by various forms of deception, ranging from the art of the wardrobe mistress to the placing of the lighting stands.

There's no use denying the old saying, "You never can tell!" When it comes to comparing the beauty of a certain photoplay "star" with that of your best girl, play "safe." Give your best girl the benefit of the doubt. You see her as she really is: she has no spot lights to wipe out wrinkles, no grease paint to take off some of her nose, no camouflage spots to give her face a pleasing roundness. But in the case of the photoplay beauty, well, "You *never* can tell!!"

HOW THEY GOT INTO THE "MOVIES"

There is no standard formula for getting into the "movies." If there were, a person might make a fortune dispensing the formula to the tens of thousands of film aspirants, ranging from the fourteen-year old school girl in love with a certain film hero

LUNCHEON HOUR WITH THE "EXTRAS". THESE PLAYERS ARE HIRED BY THE DAY FROM SPECIAL THEATRICAL AGENCIES AT A FEW DOLLARS EACH, DRESS SUIT AND ALL

to the grandmother of fifty-odd who has suddenly discovered her latent histrionic talent.

In the early days almost anyone who was expressive with his hands and face could enter the "movies" at a salary of $15 a week or better. But as the art became firmly established, the requirements of screen acting became more severe, until today it is difficult in the extreme to "break into the photoplay game."

Some persons drift into motion pictures merely through chance. The story is told of one young man, who is now one of the lesser "stars," who secured his initial engagement because of his clothes. Always a good dresser, he appeared day after day in the cast room of a certain studio. One day the cast director was in need of a well-dressed young man, and as luck would have it he selected this young man. It so proved that the young man had ability, and he rose rapidly in the art. Others have secured their initial opportunity in equally odd and chance ways.

Some have come direct from the stage to the "movies," and it must be said that they have the one great advantage of knowing how to act. Everything else being equal, a director naturally prefers a stage actor, because his instructions are bound to be carried out more readily.

While not possessing any special talent or experience, a person who is unusual in some one respect can generally get into the pictures sooner or later. An exceptionally tall man, for instance, can find an engagement when a firm is about to produce some fairy story or comedy calling for such a character. A thin man, a fat man, a short man, and any other out-of-the-ordinary man or woman can secure an opportunity to appear before the camera because he or she is a rare "type."

But for plain mortals the road to photoplay success is a long and cruel one. There is no such thing as taking up a course in some motion-picture correspondence school and then going to a studio and securing a position as leading man or lady. All such schools are nothing more or less than quacks.

The only way to enter a studio—barring influence with some one in the industry—is to go to the casting room day by day, waiting for an opportunity as an "extra." If one perseveres in these daily visits, the casting director is almost bound to take such a person as an "extra" sooner or later; and that is the

ABOVE: THIS GIANT GOT INTO PICTURES BECAUSE OF HIS SIZE.
BELOW: REAL PLAYERS IN REEL WORK

opportunity to show one's capabilities. The truth of the matter is that film companies have all the players they need; their waiting lists number hundreds if not thousands of trained and semi-trained players who can be called at any time.

GETTING CHILDREN TO ACT

About the most difficult task a director can expect to undertake is the directing of children. All producing companies have certain children whom they can call upon at short notice, which accounts for the disappointment which is bound to be met by fond mothers who would see their little Billie Boy and blue-eyed Magnolia in the "movies."

There are certain children actors who possess remarkable talent. Generally born of actor parents, these children act with the greatest ease. Still, they are children at heart; and it often requires the greatest tact and diplomacy on the part of the director to urge them to act. Like other children they have their moods and their pouts. All sorts of subterfuges must be resorted to in order to get these children to act at times. So the credit due the director is all the greater in the case of child players.

Some directors have gone in for child plays and with truly remarkable success. Two brothers in particular have directed plays in which the casts have been almost entirely made up of children, and it has been indeed difficult to realize, when viewing these pictures on the screen, that not a single actor, with the exception of a few taking the rather unimportant rôles of adults, exceeded eight or ten years of age.

While dealing with child pictures it is well to add a few words regarding the taking of a child's rôle by an adult player. One is often at a loss to account for the ease and realism with which a well-known adult player takes the part of a little girl or boy at the beginning of a photoplay, and then assumes a grown-up rôle later on. The realistic effect is largely a matter of comparative sizes. If a player is of somewhat short stature to begin with, the rest is greatly simplified.

For it is a fact that we judge size by comparison. When we say a thing is large, it is because it compares that way with some object of known size. And so the matter of largeness or smallness is merely a matter of comparison, and the motion-picture

THE AVERAGE DIRECTOR'S HARDEST TASK IS TO DIRECT CHILDREN. YET THERE ARE DIRECTORS WHO SPECIALIZE IN CHILDREN PLAYS AND WHO SEEM TO HAVE AN EASY TIME OF IT

folk take advantage of that fact. When an adult player assumes a child's rôle, it is merely necessary to have exceptionally tall people appear with that player to make him or her shrink to the relative height of a child, so to speak. The illusion can be carried out still further by using special furniture of exaggerated size —a table can be made four feet high; special forks, spoons, plates and other tableware can be used; and so on. Then, when the player assumes the rôle of an adult, the exaggerated surroundings are replaced by normal surroundings, thus causing the player to "grow" to a corresponding degree.

MAKING PEOPLE LAUGH

After all is said and done, persons go to motion-picture theatres to be entertained. They go with the intention of leaving the worries of the workaday world behind them for a few hours, at least. Certain it is that they do not go to witness the worries and troubles of other persons, as depicted on the screen. And that is precisely what makes the comedy films so popular these days, when picture producers have at last come to understand their audiences and know how to produce good comedy as well as good drama.

It is easier to be serious than to be humorous, and in nothing is this more evident than in photoplay production. For the producer is perfectly safe in assuming that his audience will be sad and very much impressed with a given dramatic production; yet, when he is attempting a comedy photoplay, he is ever fearful as to whether or not the humor of the pictures will be appreciated by his audience. Often the most funny portion of a scenario falls absolutely flat when translated into action and projected on the screen. It is quite one thing to obtain a laugh from written comedy and quite another to obtain another laugh from a film comedy.

Because of the numerous difficulties in the way of creating good comedy on the screen, most producers do not attempt comedy production. On the other hand there are some producers who have made a long and exhaustive study of comedy and who produce nothing else. The same applies to those actors who have the happy faculty of understanding what is really funny and who know how to apply it to the screen.

THIS IS THE PART THE AUDIENCE DOES NOT SEE: "NOW, MR. LEADING MAN, YOU RIDE UP AND GRAB THE LADY, CARRY HER OFF AND——" EXPLAINS THE DIRECTOR

One of the greatest film comedians assures us that there is no mystery about his success in film comedy. He explains his success by merely saying that he happens to know a few simple facts about human nature and makes use of these in his work. Thus he points out to one of the fundamental elements of comedy, which is the exposition of a person being placed in an undignified and embarrassing situation.

Merely to see a man's hat blown off is not funny, provided the man is not embarrassed. But if the victim immediately starts chasing his hat, with perhaps a fall or two thrown in for good measure, the situation becomes most funny. If it is a poor man, the situation is just funny, nothing more; but if it happens to be a wealthy man, official or nobleman, the situation is enhanced many fold. Years ago, when the pictures were still young, the French producers realized this fundamental requisite to screen comedy by showing the gendarmes of Paris subjected to all sorts of undignified treatment. The Parisian policemen were shown falling down coal chutes, receiving the contents of whitewash pails, and so on.

There must be a trace of resentment against dignity and power in the makeup of most individuals, whether they are aware of it or not; for the sudden lowering of dignity as depicted on the screen is always greeted with overwhelming applause. It is one of the main ingredients in motion-picture comedy.

A still funnier situation is when the victim, who has been rendered ridiculous, refuses to admit that anything is out of the way, and attempts to maintain his usual dignity. That is why the intoxicated man who tries to disguise the obvious fact that he is in that condition, is so funny both on the speaking stage and on the screen.

All the screen comedies of the best-known comedian in the world are based on the idea of getting himself into trouble and then attempting to get out of that trouble while still maintaining his dignity with little, if any, success. In the first place, the get-up which has made this comedian's name known throughout the world, is that of a gentleman's, ill-fitting and ragged though it may be. Thus the comedian seems to be trying his best to appear as a gentleman, while all the while the audience is compelled to laugh because his attempts at dignity are so hopeless.

ONE OF FILM-LAND'S MOST POPULAR COMEDIANS IN ACTION BY THE SEASHORE AND IN THE MOUNTAINS

He is forever straightening his derby hat, which is several times too small for his head. His shoes are many sizes too big, and have a way of getting him into trouble. His cane, too, is continually getting him into difficulties. His trousers are baggy and without crease, with sufficient square-foot surface to clothe several more of him. All in all, it is his attempt to take the rôle of a fastidious gentleman that accounts for a good part of his success.

This same comedian bases his photoplays on everyday life. Thus he has appreciated the comical possibilities in a department store, in the life of a fireman, in a prize fight, in a bogus count's courtship, and so on, producing photoplays making use of these possibilities. This comedian is always awake to comical situations, and sooner or later he introduces these situations in his photoplays which he leads as well as directs. He spends many hours in motion-picture houses where his pictures are being shown, for the purpose of learning how the audience takes each "stunt." If the applause is not quite up to expectations for any given "stunt," he at once begins to analyze that "stunt" with a view to finding where the trouble lies—whether it is in the idea or the execution. Even a comedian of his calibre is ever fearful that his comedies may not be understood and appreciated by the audience. Then again, the public is fickle, and new "stunts" must continuously be introduced in order to retain popular interest.

Sympathy is also an important element in comedy. This comedian always tries to have the sympathy of the audience while enacting his foolish rôles. So, if he is being shaken or beaten by an enraged rival, the latter is a very large man in contrast to the small stature of this comedian. Then by assuming a pathetic and martyred expression, the comedian gains the sympathy of the audience in the ridiculous situation. The mob, as he puts it, always sympathizes with the "under dog"; and to gain that sympathy is to gain popular favor.

In the matter of contrast, many comical possibilities are available. Thus in a recent photoplay in which this comedian takes the part of a farmer, he goes out in a field to sow, taking one seed at a time out of his vest pocket and digging a hole for it with his finger. Now when the location director set out to find a suitable

THE CLOSE-UP, WHICH IS A BIT OF LATER-DAY TECHNIQUE, SERVES TO BRING THE PHOTOPLAY ACTOR OR ACTRESS INTO MORE INTIMATE CONTACT WITH THE AUDIENCE

farm for the farming scenes, he settled his choice on a small but attractive farm. However, the great comedian immediately condemned the use of such a small farm, and asked for a very large one in order that the contrast between his method of planting and the extent of the farm would be most ludicrous.

Surprise is another big factor in comedy. Typical of the effect of surprise, are the opening scenes of a recent photoplay of this famous screen star, based on the life of a bank janitor. At first the audience does not realize that he is a janitor, as he comes shuffling down the avenue in the most dignified manner at his command. He enters the bank and proceeds down to the safe-deposit vault, where he is soon engaged in turning the combination knobs, partly from memory and partly by referring to certain notations on his shirt cuffs. Then he swings open the heavy doors of steel, walks into the vault and—well, to the utter amazement of the expectant audience, he comes out with his mops and scrub pails!

The audience enjoy these surprises. They like to be fooled, if it is done in an ingenious manner. Thus in the opening scene of another photoplay based on the life of an immigrant, the audience sees the screen comedian leaning over the rail of a ship, with his back toward them. From the convulsive shudders of his shoulders, there can be little doubt that he is seasick. But when he straightens out a fishing line with a fish at the end comes into view. This total surprise has never failed to bring a roar of laughter from any audience.

Much of the success of a comedy picture depends on not making it too funny. There is a certain amount of physical exertion connected with violent laughing, and this comedian points out that he would rather have one or two big laughs and a continual ripple of amusement, than an "explosion" every minute or two with dull moments between. For this reason his pictures have a fascinating and effective way of swinging occasionally into semi-dramatic situations, which call for much sympathy on the part of the audience. The purpose of these short relapses is merely to give the audience a momentary rest from the strenuous task of laughing, and to afford variety and violent contrast.

Comedy film remains the hardest kind of film to produce. This comedian has been limiting his yearly output to ten or twelve

ON THE SCREEN THE CLOSE-UP SERVES TO CONCENTRATE THE ATTENTION OF THE AUDIENCE. NOT ONLY ARE THE CHARACTERS SHOWN MORE THAN FULL SIZE, BUT MUCH OF THE BACKGROUND IS ELIMINATED

photoplays, in order to have plenty of time for each. He tells us that as many as 60,000 feet of film must be taken for one of his photoplays which require only 40 minutes on the screen; and in the editing of such films down to two thousand feet, much has to be thrown out because it does not prove sufficiently funny, or is irrelevant to the main action of the story.

IS IT "GETTING ACROSS?"

Whether on the legitimate stage or in motion pictures, an actor's chief concern is how the audience is impressed with his rôle. On the speaking stage it is difficult to ascertain the attitude of the audience except by the frequency and volume of applause; and so it is always with great joy that an actor receives applause. There are actors who make it a point to have relatives or friends present on the opening night of a new show, in order that these relatives or friends may inform them how things appeared "out front."

The motion-picture actor has no applause to guide him, and the final test of his work is the projected image. Thus it is the practice of many studios to have all the actors and directors attend the first projection of a photoplay, in order that all can freely criticize or commend the action and direction and scenery. To many in the profession, such gatherings are referred to as the "chamber of horrors"; yet they realize full well that such gatherings are of great help to all who participate in a photoplay. And as a general thing an actor is the best judge of his screen work; for there are few actors who are so self-centered that they cannot pick their screen actions to pieces, criticizing and analyzing the rôles and learning how to better themselves in subsequent photoplays.

And then there is the matter of public opinion. Many photoplay actors make it a point to visit, incognito of course, various theatres where their pictures are being shown, in order to ascertain how the audience is enjoying their work. The general attitude of the audience toward various actions is taken into account; little "stunts" that prove successful are noted for future pictures; actions that fall flat are likewise noted, in order that they may be discarded or replaced by something else.

After all, an actor is like a manufacturer: both must please

A DRESSING ROOM LIKE THIS ONE, A PERMANENT ADDRESS, FIFTY-TWO-WEEKS' WORK A YEAR—IN FACT, THESE AND OTHER FEATURES OF MOTION-PICTURE WORK APPEAL TO THE PHOTOPLAYER

the public in order to dispose of their wares. That is why both of them must always study their markets, keeping in close touch with the buyers of their wares in order to be ever ready to meet the changes of heart and choice of the notoriously fickle public.

No matter how successful an actor may be, he is constantly asking himself, "Am I 'getting across?'" For that is the way with the folk who entertain us in the shadow pictures of the screen.

CHAPTER IV.

THE MOTION-PICTURE CAMERA

THE BASIS of the motion-picture industry is the camera. It is the camera through which the audience sees the work of the players, directors, scenery artisans and others engaged in photoplay production. As the medium between the industry and the public, the camera has received the attention of the leading photographic, optical and mechanical experts of the world. It has been constantly refined from the elephantine cameras of the early days to the highly perfected and readily portable cameras of the present. All manner of optical and mechanical devices have been added to it for producing numerous startling and pleasing photographic effects. That is why the motion-picture camera represents the highest attainment in modern photography.

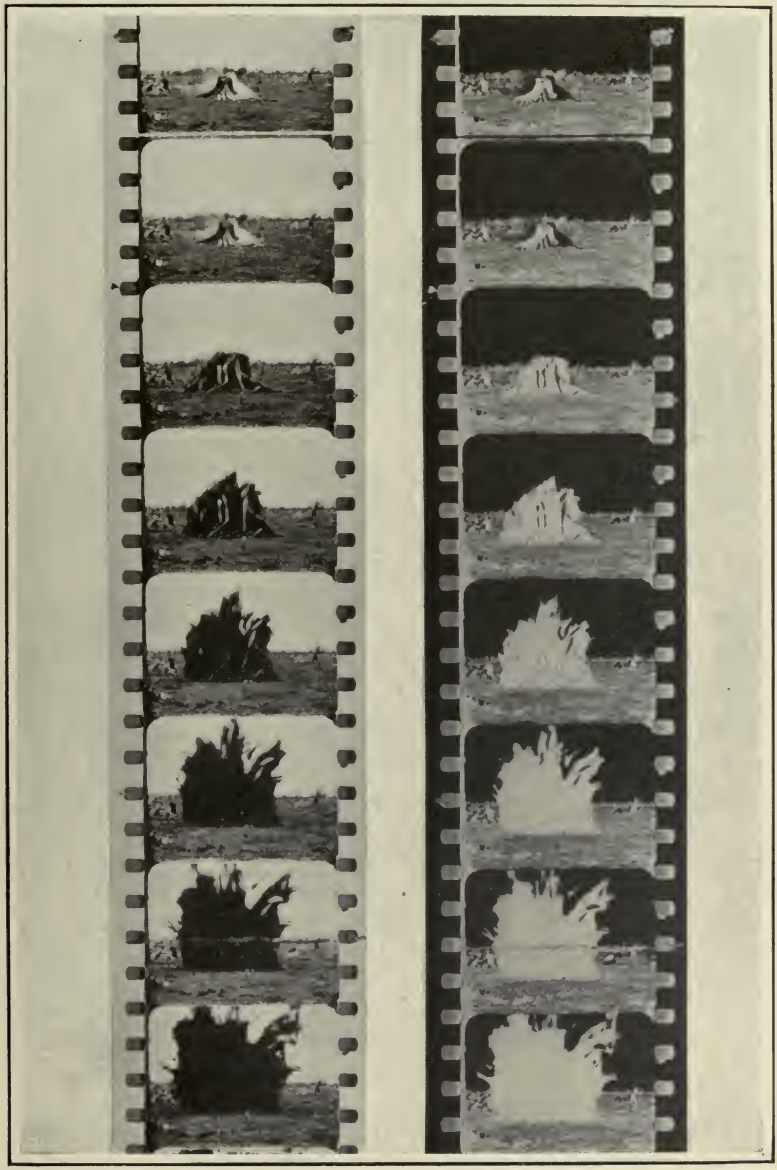
THERE is little difference between your camera and the motion-picture camera. Both employ the same principles. In your camera you make one photograph at a time, and then change the plates or turn the film so as to bring another unexposed negative surface into position. In the motion-picture camera a series of photographs is made, and the shifting of the negative is done automatically. That is the main difference between the two kinds of cameras, the "still" and the motion-picture.

PHOTOGRAPHS BY THE THOUSANDS

It is upon film stock measuring 1⅜ inches wide that motion pictures are made. The standard film has an approximate thickness of .006 inch, of which .005 inch is represented by the celluloid, the remainder being the emulsion. The film is manufactured in lengths of 200 and 400 feet as a general thing.

Now each motion-picture photograph or image measures one inch wide by ¾-inch high. The 3/16-inch margin on either side of the image is occupied by perforations, evenly spaced, with four coming opposite each image or "frame" in most cases. However, there are at least four different arrangements of perforations in use at present. These different frame lines, to give them their professional designation, vary but slightly one from the other: some are opposite the dividing line between images, others are a little off the line, others are still farther off, and finally come those in which the dividing line comes between successive perforations. No doubt the frame lines must be standardized in the near future, just as so many other phases of the motion-picture industry have already been standardized. But in the meantime it is fortunate that the better types of cameras are arranged to take pictures with any kind of frame line, permitting the operator to match up his product with any other existing film.

The average reel of film containing 1,000 feet of celluloid ribbon, includes 16,000 frames in all, or 16 perfect images to the foot. But such a reel is the product of many different strips of film which have passed through one or more cameras, since only 400 feet of film is handled at a time by even the largest cameras in general use. In some cameras the successive frames are separated by a slight hairline, while in others there is an appreciable



THIS IS HOW A MOTION-PICTURE FILM REPRESENTS AN EXPLOSION, IN POSITIVE AND NEGATIVE

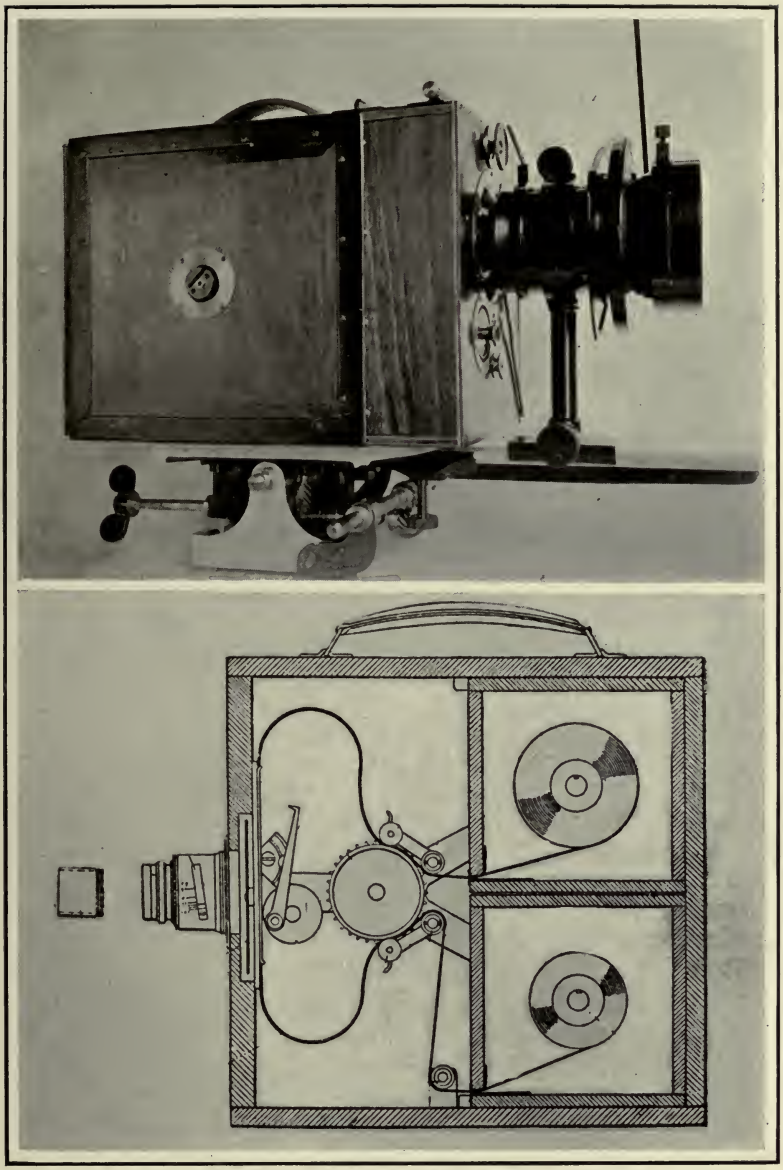
space between; but that is merely a matter of mechanism and in any event the screen results are identical.

As already stated, the motion-picture camera is nothing more than an ordinary camera taking a series of snapshots. The film is exposed by a revolving shutter which has openings, so that as the shutter revolves and the openings come in line with the lens, light passes through and strikes the film. The latter, meanwhile, is stationary. However, no sooner has the light reached the film when the shutter, revolving all the while, brings an opaque section in the path of light and masks the film which is then pulled down in order to bring a fresh section into place. The shutter again brings an opening into line and the light passes through to the fresh film surface, making a second exposure. After which the shutter again cuts off the light and the process is repeated over and over again as long as there is film in the camera and the crank is turned. What makes the camera so complicated is that the shifting of the film is automatically accomplished and with great accuracy. A difference of a hundredth of an inch in shifting the film makes for an appreciable difference when the film is magnified thousands of times on the screen. That is why the machine work must be of the very best; and the high grade machine work, in turn, explains the high cost of such equipment which runs into hundreds and even thousands of dollars.

Examining the motion-picture camera in detail, we come first to the lens, which, like in any other photographic apparatus, is the most important member. Above all, the lens must be of the speediest kind, since there is no such thing as time exposure in the regular run of motion-picture photography; indeed, practically all pictures are made with exposures varying from 1/25th to 1/50th of a second. And since pictures must be made in all kinds of weather and with all sorts of light, the lens must be exceedingly rapid.

A LENS EIGHT TIMES FASTER THAN USUAL

All the better types of motion-picture cameras are equipped with what is known as an f/3.5 lens, which, to the person informed in photographic matters, means that it has a speed about eight times that of the average amateur camera. Thus the motion-picture cameraman is enabled to make pictures in the shadow,



ABOVE: THE DEBRIE MOTION-PICTURE CAMERA. BELOW: DIAGRAMMATIC PICTURE OF A TYPICAL CAMERA

or in the open on a dark day; whereas it is quite outside the realm of the amateur's apparatus, except by having the subject remain still so as to permit of making a time exposure.

In bright sunlight the lens is generally set at f/16 or f/22, corresponding to 16 and 32 on the amateur cameras making use of the U. S. or Uniform System of lens openings. On dark days the lens is used at f/3.5 or f/4.5, which is practically wide open and far beyond the scope of the amateur camera.

Now between the glass pieces forming the lens there is a mechanism known as the diaphragm, consisting of a large number of radially arranged, overlapping leaves. The leaves as a unit can be brought nearer or farther away from the axial line of the lens, so as to vary the opening and thereby control the amount of light passing through the lens. In fact, the lens is like a valve when provided with an iris diaphragm of this sort, and more or less light can be passed by the mere adjustment of the diaphragm. The needs of the negative are met by the iris diaphragm adjustment.

In a special series of night scenes taken in a large New York restaurant, a motion-picture producer had a special lens made by a London optical expert. The lens was rated at f/1.9, or several times faster than the regular equipment. This increased speed permitted beautiful pictures to be obtained with ordinary incandescent illumination in the restaurant. Since then this type of lens, namely, f/1.9, has become quite common and is often employed for interior work and in making night scenes.

The focus of the average cinematograph lens is only two inches, although there are numerous three-inch lenses in use. The lens is generally between one-half inch and three-quarter inch in diameter, which, while seemingly small, is ample when the diminutive measurements of the negative surface are recalled.

It is the short focus of the cinematograph lens which makes for the superb photography of the films. For with short focus lenses it is possible to obtain a great depth of focus, by which is meant that in the average scene every object is clearly delineated, from the foreground to the background. In many amateur snapshots the results are disappointing because part of the subject is sharp or in focus, while another part, either up front or toward the back, is fuzzy. That condition is known as lack of depth of

THE PRESWITCH CAMERA, OF BRITISH MAKE, WHICH IS WIDELY EMPLOYED FOR STUDIO AND OUTDOOR WORK

focus. Which means that the lens, used with the opening for which it was set, did not possess a sufficient depth of focus for the results sought. The longer the focal length of a lens. the less the depth of focus, and vice versa.

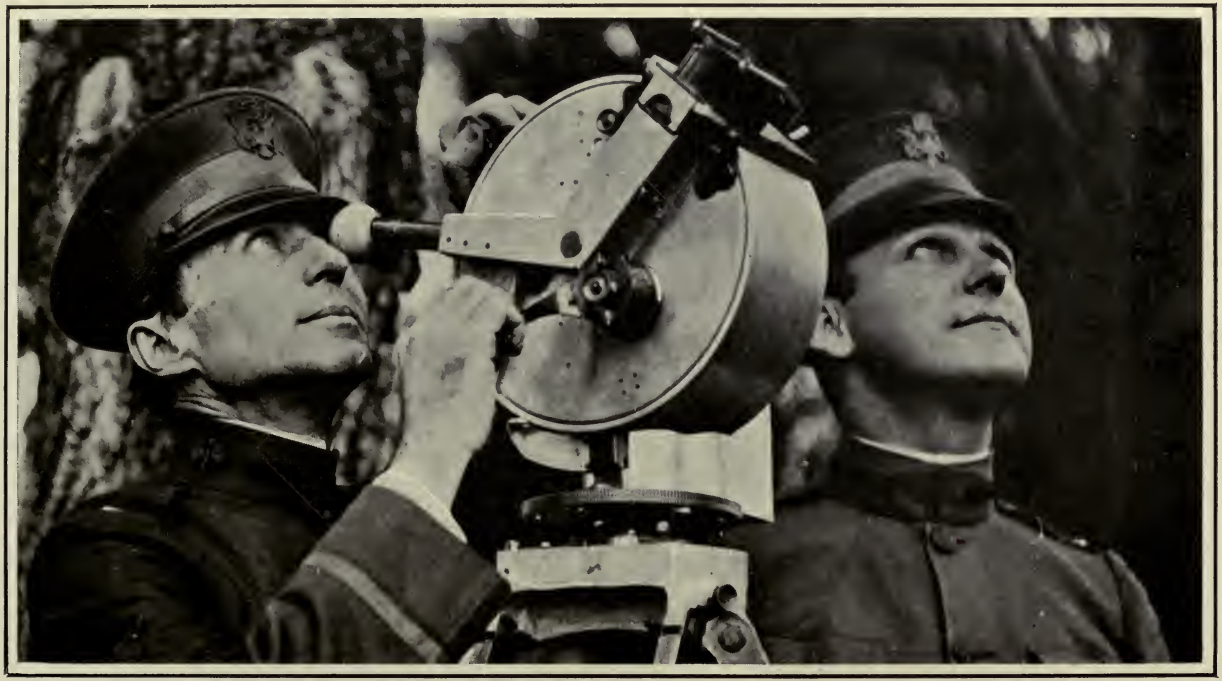
Yet it is not the author's intention here to delve into that interesting but highly technical subject of optics. Suffice it to say that in any good work on photography or optics, the reader can study the phenomenon of focal length and depth of focus. The "hyperfocal distance" of a lens is the phrase applied to its depth of focus at various lens openings.

WHAT MAKES FILM PICTURES NEEDLE SHARP?

So that little term, hyperfocal distance, whatever that may be, has a great influence on the clearness of pictures. With some professional portrait lenses the focal length is so great that in a portrait the front of the face may be in focus while the ears will be out of focus. On the other hand the motion-picture lens has almost universal focus when at all cut down, that is to say, when employed with a reduced aperture.

Short focus lenses have been the entire secret of success of motion pictures. If lenses of five-inch focus had to be employed as in the case of the press photographer making "still" views, the results would be altogether different in the deep scenes. It would not be possible for actors to move about from the forefront of the stage to the rear, or from a distance of five feet to twenty or thirty feet; for if they did, they would only be in focus at either point. Much of the picture would be blurred or indistinct, in consequence. But due to the two-inch focus lenses now available the players can roam about any of the large stages employed for spectacular productions without the slightest fear of getting out of focus.

There are several variations of the mechanism employed for moving the film in the camera, but they all are the means to the same end, namely, the advancing of the film three-quarter inch each time an exposure has been made. The most common type of mechanism is what is known as the claw movement. In this design two claw-like members, operated in unison by a cam movement or eccentric, reach up and engage a pair of perforations and then pull down the film the requisite distance, only to disengage



INVENTED BY DR. AKELEY, THE AFRICAN EXPLORER, THIS CAMERA WHICH IS NAMED AFTER HIM POSSESSES MANY UNIQUE FEATURES WHICH CAUSED IT TO BE USED BY OUR ARMY

and again rise to engage with another pair of perforations, and so on.

In another design of movement the claws are replaced by pins which are moved in and out of engagement with the sprocket holes by a drunken screw device on the shutter shaft, while the up and down motion of the pins is taken care of by an eccentric lever. The moving of the film is intermittent, while that of the revolving shutter, the sprockets and other members is continuous.

In order to compensate between the continuous movement of the film at the top and at the bottom of the intermittent mechanism, loops are left in the film. The film is fed regularly into the top loop and removed intermittently by the film-shifting mechanism, while the reverse operation takes place in the lower loop. For many years the basic patents on the loop arrangement prevented unlicensed parties from constructing a motion-picture camera, for such a camera must make use of loops in the film to operate successfully.

The film is contained in daylight-loading boxes or magazines. The latter are loaded in the dark room, just as plateholders are loaded for a day's work. The film thus becomes daylight-loading in the camera, and by carrying three magazines of 400-foot capacity each, the cameraman has enough film for more than an average day's work.

In the camera, where the magazines are interchangeable, the film passes out of the top magazine, through the camera mechanism, and enters the lower magazine where it is wound up and protected against light which would ruin it, until it has been developed and fixed in the laboratory. The lower magazine is known as the take-up magazine. When the film in the top magazine is exhausted, the lower or take-up magazine is removed, the top magazine is put in its place, and a fresh or loaded magazine takes the place of the empty one.

MAKING SURE OF WHAT THE CAMERA IS TAKING

There are two ways to focus the motion-picture camera, one an approximation method and the other a precise one where the subject requires it, more particularly in "close-ups" because the depth of focus diminishes rapidly with shorter distances. As in the case of the better grade amateur cameras, the focusing

FOR USE AT THE FRONT, THE AKELEY CAMERA IS EQUIPPED WITH A TELESCOPE SO THAT BATTLE SCENES MAY BE FILMED FROM A POINT SEVERAL MILES AWAY

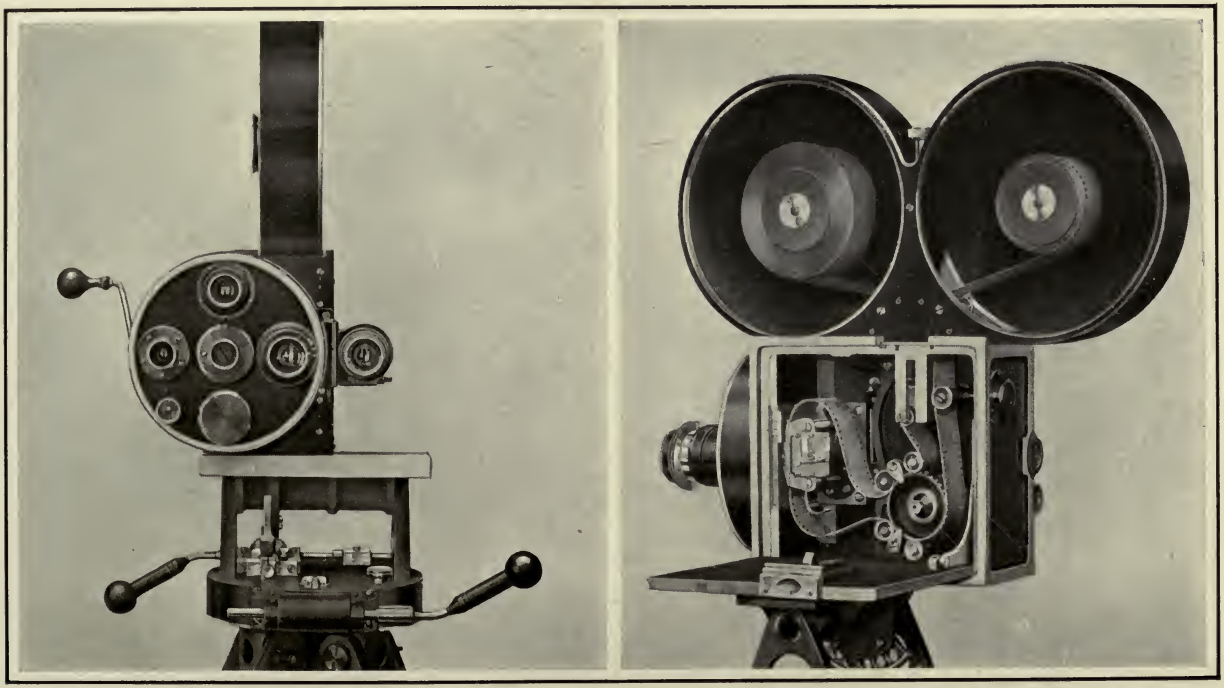
at fair distances is done by estimating the number of feet between the main subject and the lens, and then setting the lens barrel according to a scale engraved on a flange or under a lever. The other method is to focus on a ground glass or on the film stock itself, where great care is necessary.

Some cameras are provided with a peep hole at the rear, in which case focusing is accomplished by looking through the peep hole at the image appearing on the film stock, wrong side up. The film stock acts much in the same manner as ground glass, excepting that it is of a light yellow tint and less penetrable by the light rays, and therefore renders it more difficult to view the image. Nevertheless this method is used every day and seems quite satisfactory when the lens is wide open so as to pass a maximum of light. Other cameras have a peep hole on the side, with a mirror or prism arranged inside the camera so as to permit seeing the film image "around the corner," as it were. There are a few cameras in which the peep hole is arranged to permit of seeing the image on the front face of the film and not through it, thus getting away from the dimness generally prevailing.

Some peep holes are equipped with magnifying glasses so that the image is seen several times its actual size, which is a great aid in making sure of the focus on minute details. Where such magnifying glasses are not incorporated in the camera, the operators generally use a pocket magnifier for checking up the focus of the minute details of the image.

Peep holes are always provided with light-proof shutters, doors, or caps, for it is quite obvious that if they were allowed to remain open during filming, all of the film moving past the peep hole would be light-struck or ruined. Some peep holes are arranged to open by pressing down a lever, and to close by spring or gravity action the moment the pressure is removed. Others are opened by pressing the eye against an eyepiece, and close again when the eye is removed.

While the film is being exposed, the operator can view his subject through a finder mounted either on the top or the side of the camera. The finder is either of the ground glass or the brilliant, direct-view type. In the former the image is shown upside down, just as on the ground glass screen of the usual plate camera, while in the latter it is shown right side up. The finder



DETAILS OF THE BELL & HOWELL CAMERA: AT THE LEFT IS SHOWN THE REVOLVING LENS BOARD AND THE TRIPOD HEAD, WHILE AT THE RIGHT THE CAMERA IS LEFT OPEN TO SHOW THE FILM

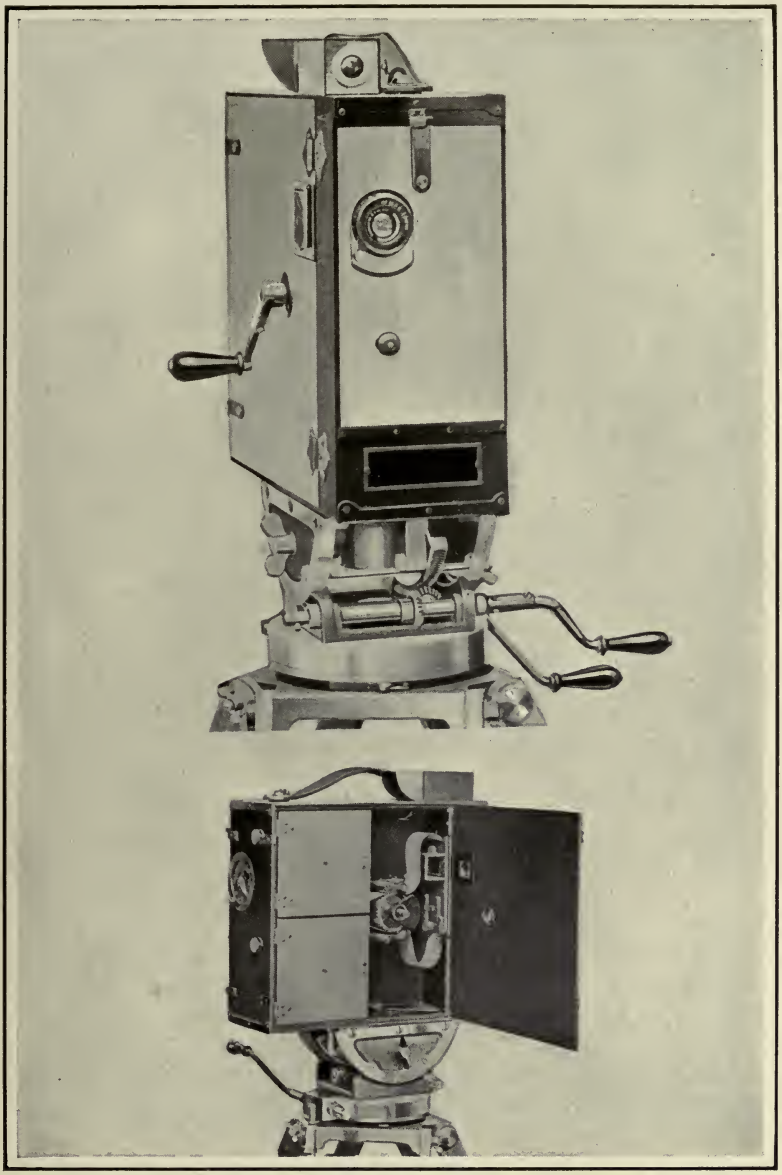
is exceptionally useful—indispensable, for that matter—when it is necessary to follow a moving subject. It is to the camera what the sights are to the rifle.

The usual speed of operation is 16 pictures per second, or a cranking speed of two turns per second. But there are times, as will be explained in a subsequent chapter, when certain trick effects are to be obtained, in which case a slower rate of taking is desirable. For just such purposes every camera is provided with a second movement known as the single-picture or trick movement. The same crank can be removed from the usual crank shaft and placed on the trick shaft so as to take one picture for every turn. All kinds of interesting effects are obtained in this manner.

HOW MUCH FILM HAS BEEN EXPOSED?

As can well be imagined, the cameraman must know how much film remains in his magazines and how much he has taken. The predicament of a cameraman running out of film in the middle of an important dramatic scene, when some well-known screen idol has worked himself into a perfect frenzy in order to register the sublime heights of emotion, is as sad as a soldier run short of ammunition when a Hun is charging him. It usually means another cameraman seeking a position!

At any rate, it is absolutely necessary to know how much film remains in the camera, unexposed. To that end every camera worthy of the name is provided with a counter. This device is merely a dial graduated in feet or meters, over which travels a hand or indicator connected to the camera mechanism by a suitable train of gears. As the film passes through the camera the counter hand revolves and indicates the film exposed. In some cases a counter with two hands is used, so as to keep track not only of the total film exposed, but the film used in each scene. One hand is stationary while the other revolves about the dial. At the start of each scene the stationary hand is moved to the position where it coincides with the active hand, and as the film is consumed the latter moves farther and farther away from the former. The total number of feet consumed can be read directly beneath the active hand, while the footage for the last scene is



THE UNIVERSAL IS A MODERATE-PRICED CAMERA LARGELY EMPLOYED FOR TRAVEL AND "NEWS" WORK

obtained by subtracting the reading of the stationary hand from that of the active hand.

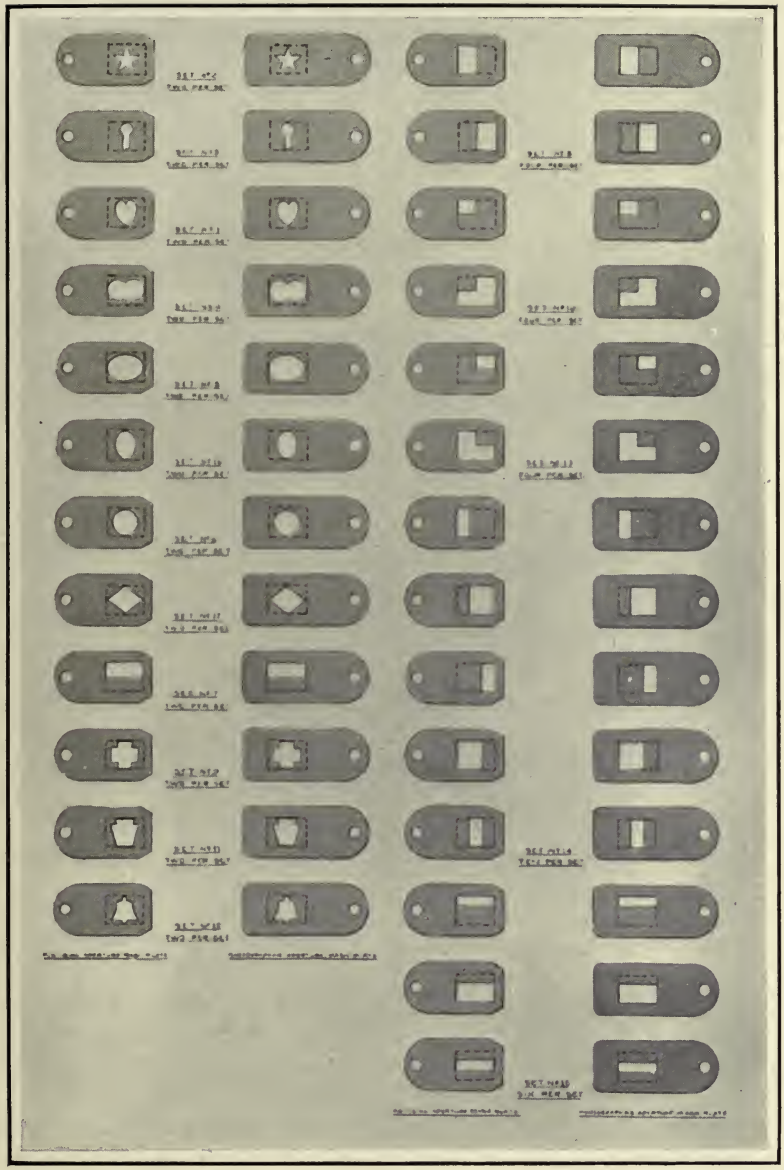
A refinement found only on the most elaborate cameras is a speed indicator. While the correct cranking speed comes as a matter of constant practice, some cameras are provided with speed indicators which give readings over quite a range. To be sure, the exact cranking speed is a valuable factor to know, although any experienced cameraman can tell his cranking speed pretty closely without the aid of an indicator; and since eight pictures are made for every revolution of the crank, the number of pictures per second is soon determined.

Still another refinement is a film punch. The object of this device is to punch a hole at the end of each scene so that the laboratory hands can tell where a scene begins and ends. Obviously this is of great assistance in the developing and fixing process, because for best results each scene requires separate treatment to compensate for varying exposures. At the end of each scene the cameraman merely presses the button of the punch located on the outside of the camera case.

A poor camera it is that does not permit cranking in either direction, for the majority of work requires the film to be moved in either direction as will be explained in the next chapter. So the film handling mechanism is constructed to operate equally well in either direction; and the magazines, being absolutely interchangeable in this respect, serve either as feeding magazine or take-up magazine at the command of the crank. This feature necessitates a train of gears, belt or chain drive between the main driving shaft and the spindles of the magazines.

THE FIFTY-SEVEN VARIETIES OF CAMERAS

Large cameras, small cameras, cheap cameras, expensive cameras, studio cameras, outdoor or "news" cameras—all these are available today. The purchaser of a camera at present is in the same position as the prospective buyer of an automobile, as regards variety. But it has not always been so; indeed, only a few years ago when the industry was still a monopoly, because of the basic patents held by a patents corporation, cameras were scarce and practically unobtainable except by the few licensed film manufacturers. When the courts finally decided the patent



MATTS USED IN REGULAR WORK. TWO OR FOUR MATTS CONSTITUTE A SET, ONE OR TWO FOR FILMING AND ONE OR TWO FOR FOCUSING

litigation in favor of the struggling independent producers, film cameras at once began to appear on the market. Today there is no scarcity of such equipment to fit every requirement and every pocketbook. Cameras for amateur work can be obtained for as little as $35.00, and the best of imported professional models sell for close on to $1,000.00.

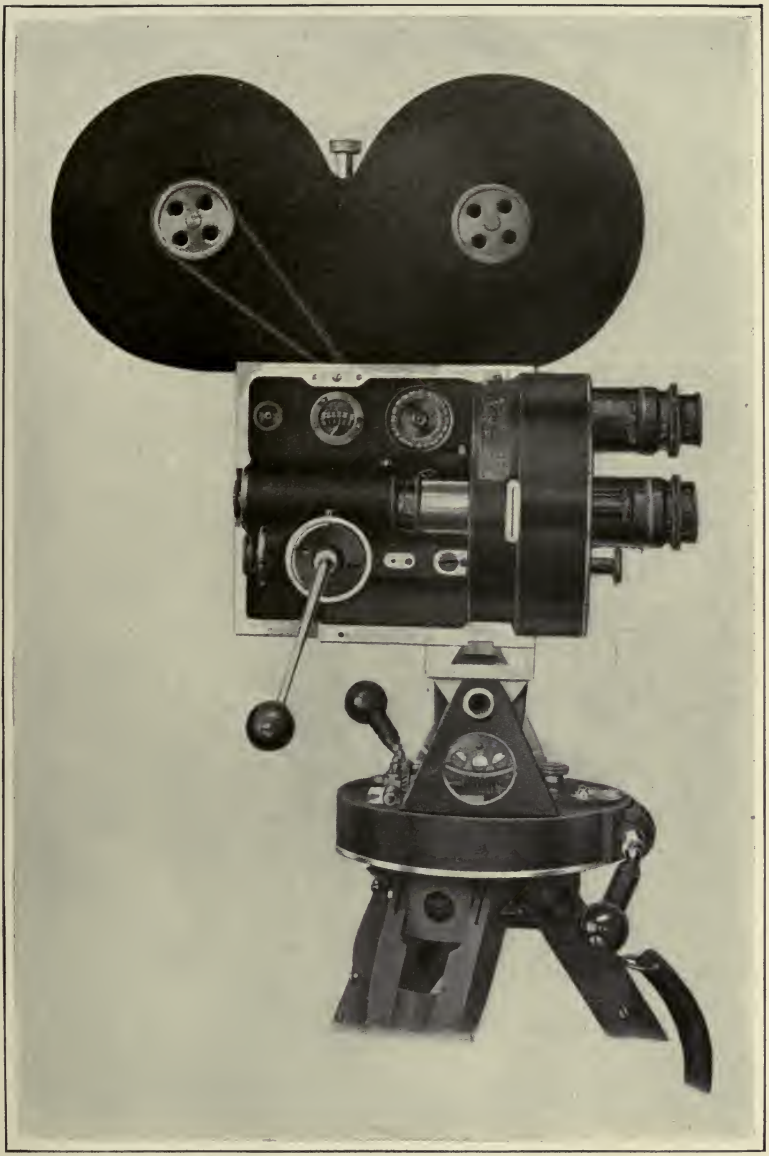
In the East the producers seem to prefer the Pathé studio camera, which is of French design and manufacture, to any other. The Pathé has a substantial case covered with black or brown leather, with the crank at the rear instead of on the side. Its main characteristic, however, is the arrangement of the magazines which, contrary to most cameras, are placed outside and above the camera proper, at right angles to the camera. The Pathé has a peep hole at the rear which permits of focusing the image either on the film stock or on ground glass.

A more recent model of the Pathé camera follows the practice of the majority of cameras by enclosing the magazines. This model is largely employed for outdoor work because of its compactness.

Other cameras of French manufacture are the Gaumont and the Eclair, neither of which is used to any appreciable extent in this country. The Dèbrie camera, on the other hand, is used both in photoplay production and in "news" work, and is a great favorite because of its compactness and excellent workmanship. In fact, it is claimed by many in the industry that the Dèbrie is without peer, although this is a very broad claim in view of the many excellent models now in use.

Of the British cameras the Preswitch, Moy, and the Williamson are the best known and the most widely employed in our industry. They are all very much along the same general lines, being tall, deep, and narrow, with the polished hardwood case bound in brass.

Prior to the war there were several types of German cameras obtainable, chief among them being the Ernemann models with self-contained magazines. However, in the case of the professional German cameras the usual complaint heard in this country was that they were too large and too cumbersome as compared to others. Even in those days "Kolossal" was a creed with the Germans!

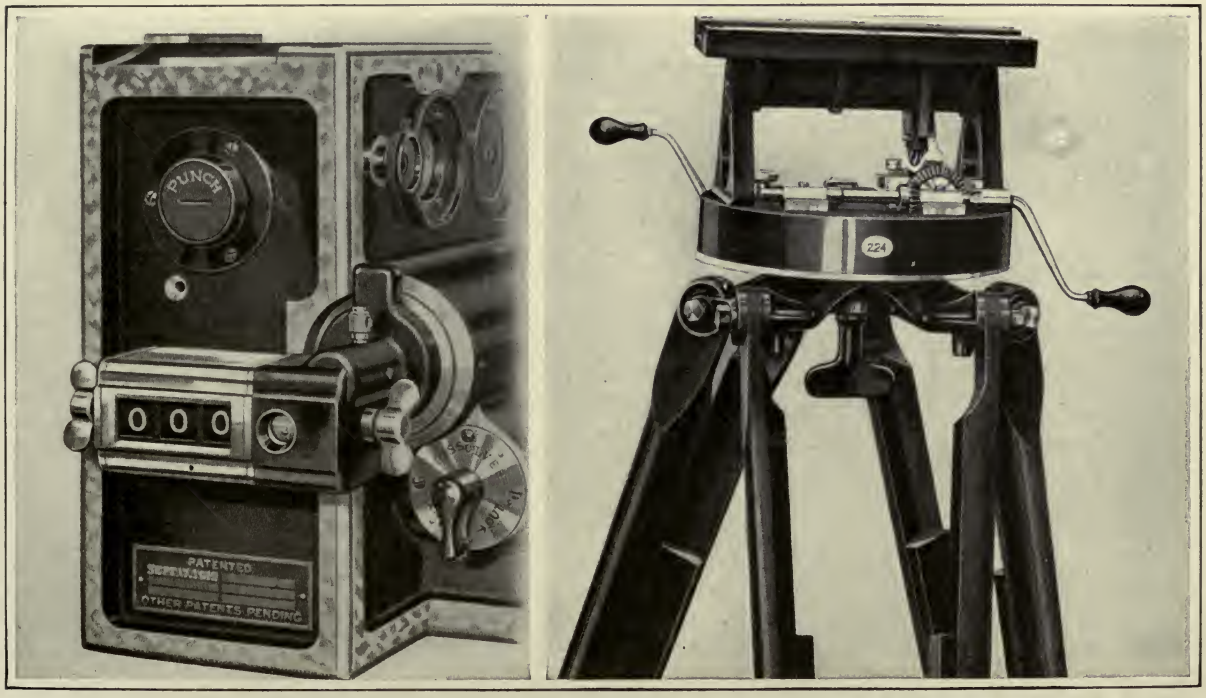


ALL-AMERICAN IN DESIGN AND CONSTRUCTION, THE BELL & HOWELL
IS FAST BECOMING OUR LEADING CAMERA

In these United States we are making a variety of excellent cameras which are becoming increasingly popular with the producers. There is the Bell & Howell, made entirely of metal, with circular, external magazines above the camera proper. This camera has every convenience a cameraman might wish for. There is a speed indicator, counter, outside slot for inserting mats, the use of which is explained in the next chapter, and, most important of all, a revolving lens board in front which carries a collection of lenses of varying foci, any one of which can be brought into action by the mere turning of the lens board. The revolving lens board is quite characteristic of the Bell & Howell model. In studio work this camera is very popular, especially in the West, because of the ease with which the change can be made from a two-inch to a three-inch lens, permitting of making close-up views without budging the camera from its position used in making the general scene.

There are the Universal, Pittman and others, all available for commercial work. Again, some producers make their own cameras in accordance with certain ideas they may have. One producing concern which no longer exists made use of elephantine cameras of its own design and construction. The stand for these cameras when used in the studio was made of steel tubing with an iron base, with various gears and huge wheels for the adjustments. Another producer has made use of a rather large camera which exposes two negatives at one time, so as to avoid defective negatives.

Lastly, this discussion of American cameras would not be complete without a word about the most radical camera of all, that designed by Carl Akeley, the scientist and explorer. It was while on a journey through Africa that Mr. Akeley, equipped with a conventional type of motion-picture camera, discovered its many limitations. So upon his return to this country he set to work designing a camera which could be employed under all conditions. The peep hole of this camera is so constructed that a light trap opens when the eye is pressed against it, and if desired the operator can view his subject on the film stock while making the exposures. The camera is round and compact, with the lens mounted on the rim. By a novel suspension arrangement the camera is self-leveling, and can be aimed in any direction in an



AT THE LEFT: REAR OF BELL & HOWELL CAMERA, SHOWING SOME OF ITS MECHANISM. AT THE RIGHT: A TYPICAL TRIPOD HEAD WITH PANORAMIC AND TILTING MOVEMENTS

instant. It can be employed without a tripod if necessary, through the use of a flexible cranking shaft. And there are numerous other novel features which go to make the Akeley camera the most novel of any.

A SOLID FOUNDATION FOR STEADY PICTURES

The motion-picture camera must be mounted on a substantial base or tripod if steady pictures are wanted. So part and parcel of the equipment is a heavy, firm tripod on which the camera is set.

Much has been done of late in developing rigid yet light-weight tripods. There was a time when it was considered essential to make tripods tremendously heavy in order to secure steadiness; but today the rockbed steadiness has been obtained rather by ingenious construction than by weight. Collapsed, the average tripod weighs about 25 pounds and measures little more than four feet in length. That is an all-round, general utility tripod for indoor and outside work. In the studio where weight is no object, heavier and taller tripods are to be found.

Tripods are made of light wood or metal. The legs are made in sections so that they may be extended or collapsed to make the tripod any height between the minimum of say four feet, and the maximum of six to eight feet. Metal straps and wing-nuts bind the legs in any position.

There is still another important member of the tripod, namely, the head, which serves to mount the camera and to turn it in any direction after the fashion of a cannon. The heads of the commercial kind have two movements: an up-and-down movement, known as the tilting movement, and a horizontal turning movement known as the panoramic. Each movement is controlled by a separate crank, although in some heads a single crank is employed for both movements; and by pushing the crank or pulling it out on its shaft, either movement can be operated with one hand. Both movements being operated by a gear arrangement, the camera is turned or raised at a slow rate. But by releasing the mechanism the camera can be freely swung into position when prompt action demands it.

For following an object moving either horizontally or verti-

TWO BELL & HOWELL CAMERAS READY TO "SHOOT" A SCENE. EACH CAMERA, IT WILL BE NOTED, IS PROVIDED WITH A VIGNETTING ATTACHMENT WHICH IS THROWN DOWN AND OUT OF THE WAY

cally, the tripod head is available. For bringing the camera to bear on a fixed object, the head is also available. Any one who has had experience in aiming a bulky plate camera on a given object by shifting the tripod legs, will appreciate the simplicity and dispatch of doing the work by the turning of two cranks.

Of late there has been developed an interesting form of marine tripod, in which the tripod head is mounted in a gimbal-ring arrangement, like the usual marine compass, and connected to a long and heavily weighted pendulum. The result of this construction is a tripod head which always maintains a true horizontal position no matter how the tripod may be pitched and tossed about. This tripod is now being employed for taking marine views, in which case it makes for pictures on an even keel, so to speak, as distinguished from the pictures made with the plain type of tripod, which dizzily twist and turn on the screen.

CHAPTER V.

THE CAMERAMAN AND HIS ART

IF THE CAMERA has been perfected, so has the cameraman perfected himself in his art. For the camera is but the tool, and the best tools are worthless in the hands of an unskilled worker. Year after year the cameraman has come to know his camera, his light both indoors and outdoors, his subjects, his limitations, and other phases of his work more and more intimately. The old-time cameraman frankly admits that he is ashamed to look back on his work of ten years ago, with the indistinct figures and backgrounds and the general inartistic arrangement of those pioneer scenes. But in the productions of today the cameraman is a big factor; he is the connecting link between the screen folk and the public.

MOTION PICTURES became popular when the cameraman became acquainted with his work. A dozen years ago when the industry was in its infancy the films were of poor photographic quality: they were indistinct; they jumped about on the screen in the most disconcerting manner; and they flickered to such a degree that only the strongest of eyes could attend a performance more than once a week.

Yet the stories these films told were good stories, in many instances comparing favorably with those of today. The fault was clearly not with the stories or the acting. But no audience cares to be discomforted when seeking distraction or entertainment; and so it came to pass that the entire future of the industry—whether it was to be an established, universal form of entertainment, or merely a novelty to be displayed to the curious in museums, beer gardens, and at country fairs—was placed in the hands of the cameraman. To him was assigned the task of producing good photographs, while the industry awaited the outcome of his efforts.

OTHERS WHO HELPED THE CAMERAMAN

Fortunately, the cameraman was not alone in his labors; for the film manufacturer, realizing that the raw film was the very foundation of good photography, worked on his chemicals and methods and emulsions until he evolved a stock that was faster, more reliable, and contained a minimum of grain. The laboratory workers and chemists also contributed toward the progress of the art, perfecting their developing and printing methods and improving the finishing of prints for projection. Further aid came from cinematograph engineers, who turned their efforts to the end of evolving better cameras, better printing machines, and rock-steady, flickerless projectors. Finally, optical experts, wishing again to prove their battle cry that "It's all in the lens," after careful study of the peculiar requirements of motion-picture photography and projection contributed their quota in the form of short-focus, high-speed anastigmat lenses and fool-proof optical systems for projection purposes.

All of which went to place the motion-picture film high in the scale of photographic quality.

One concrete example serves to show what has been accom-

HOW THE CAMERAMAN WORKS IN THE STUDIO: IN EACH CASE THE PATHÉ CAMERA IS SHOWN

plished in cinematography during the past ten years. With but few exceptions the domestic films of a decade ago were so indistinct that the faces of the players could hardly be made out. Today a battle scene including hundreds of players is so clear that every figure can be recognized on the screen. Yet each of these figures appears as a pinhead in size on the film.

In the previous chapter we have learned something regarding the motion-picture camera. But the description of the mechanism was intended merely to outline the equipment as originally furnished the cameraman. If plain cameras were employed today, there would be none of the beautiful effects which characterize our present productions. Wonderful silhouettes, vignetted scenes, vision scenes, trick effects—all these features simply could not be.

Now, if ever there was an ingenious individual it is the expert cameraman; for starting out with the camera as turned over to him by the motion-picture engineers, he has forever been busy improving its mechanism and developing any number of accessories, so that his results exceed our fondest expectations of a few years ago. The fact is that the average good cameraman is an artist; but instead of pigments and brushes he relies on various mechanical contraptions designed and constructed during odd moments. The director, also an artist to be sure, rather poses the scene and animates it to interpret an author's thoughts; but it remains for the artist of the camera to reproduce the scene in all its beauty and even added beauty for the followers of the screen.

So the cameraman is entitled to some credit for the success of a photoplay. And that is why, of late, his name appears at the beginning of film productions.

WHAT THE CLOSE-UP HAS MEANT IN PHOTOGRAPHY

Any sort of photography was good enough in the old days, when the acting and the scenery were so mediocre that poor photography helped rather than handicapped. Seeing an old re-issued film produced prior to 1910 explains graphically what has been accomplished in every branc hof the industry; most important of all, it shows the difference in the technique of then and now. In those early days the actors were shown full length,

FROM THE CAMERAMAN'S POINT OF VIEW: "SHOOTING" A SCENE IN THE FLORIDA EVERGLADES WITH A PATHÉ CAMERA WHICH IS CRANKED FROM THE REAR INSTEAD OF FROM THE SIDE

some distance away from the camera. Their faces did not always show plainly, and even if they did the distance was too great to rely on facial expression to carry the story. Exaggerated arm and hand movements were relied upon to carry the idea; in truth, Italian and French actors, being naturally most expressive with their hands and arms and shrugs of the shoulders, were immediately successful in the films.

Then came the great step in photoplay production—the close-up. Directors had come to the conclusion that too much space was being wasted in full-stage scenes; and, just as the editor of a magazine or book takes a certain portion of a picture for his illustration, which he calls the "meat," the directors came to take the "meat" or essential of each scene. The actors who had hitherto had but little opportunity to act, now found ample opportunity for facial expression and the finest type of interpretation.

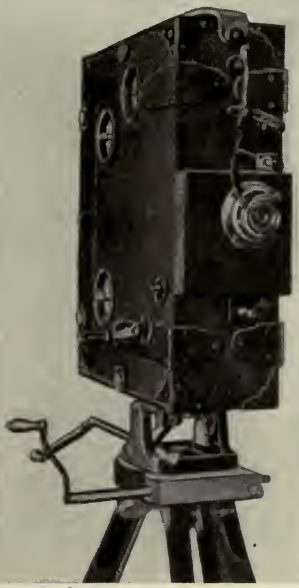
It was the cameraman who was hardest hit by the introduction of the close-up, for it meant that his photography would have to be far better than ever before. In fact, the close-ups were to be veritable portraits of the players, nothing more or less. There would have to be detail—and plenty of it.

Despite the early opposition from directors and cameramen alike, the close-up idea gradually spread till it became common property. Today this photographic device is widely employed in photoplays, and at least half the scenes of a representative photoplay are close-ups.

THE "FADE-IN" AND "FADE-OUT"

Shortly after the close-up came the first effects of the long list of photoplay devices, namely, the "fade-in" and the "fade-out." Originally, the effect was employed to open a photoplay gradually and to close it at the end, the idea being to provide something more pleasing than the rude and unbecoming opening and ending then in vogue.

Simply explained, the fade-in is that effect wherein the film, first black, gradually becomes lighter as it develops into a perfect picture, thus forming a gradual and pleasing introduction to a scene. The fade-out is just the reverse operation, with the film showing a perfect picture which gradually darkens and finally disappears in inky blackness.



No doubt the most common effects in films, the "fade-in" and the "fade-out" can be produced with any camera by means of the iris diaphragm of the lens, as well as by other means. Some cameras, such as the one above, have automatic "fade-in" and "fade-out" devices.

THE "FADE-OUT" EFFECT AND A PITTMAN CAMERA EQUIPPED WITH AN AUTOMATIC "FADE-OUT" DEVICE

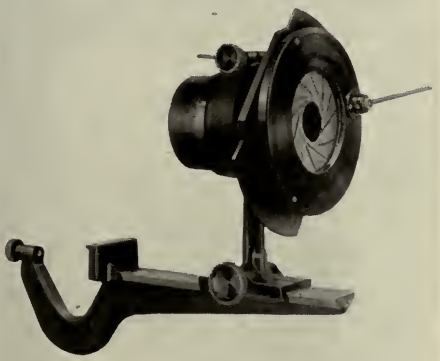
Both these effects are produced by simply using the lens diaphragm of the camera. In the fade-in the diaphragm, which has been explained as a sort of light valve, at first is completely closed but is gradually opened so as to allow more and more light to reach the film until the full amount of light is attained, while in the fade-out the reverse procedure is followed out. Most cameras are now provided with automatic devices that can be set to fade-in or fade-out a scene in 5, 10, or 20 feet, according to requirements. The cameraman merely sets the indicator at the desired footage and cranks away without further attention, knowing that the effect is being produced perhaps more evenly than could be done by hand.

There are cameras, however, in which the diaphragm does not close altogether, hence it is impossible to obtain a complete fade-in or fade-out effect. In which case other means are sometimes employed, among them a screen of graduated transparency which slides in front of the lens, running from transparency to opaque or vice versa, as the case may be. There are also certain chemical means, one of which consists of placing the strip of film on an inclined board and treating it with proper chemicals starting at one end and allowing the ever-weakening solution to roll down to the lower end. This last process is more in the nature of an improvision, when a fade-out or fade-in must be produced in the laboratory.

Now these effects have a most important application in joining two scenes together so that one literally dissolves or flows into the other. This result is achieved by first fading out a scene, noting the footage allowed for the operation, and then winding back the film so as to return it to the top magazine while the lens is masked, only to fade-in the new scene in the same length of film. Thus while one scene is growing gradually weaker the following one is growing stronger; and by adjusting the degree of overlap the dissolving effect can be altered as desired.

THE "CIRCLE VIGNETTE"

Numerous devices have followed the fade-in and fade-out, since director and cameraman discovered that there were other possibilities in film photography aside from the regular run of plain work. Film producers are always ready to try new effects,



The "circle vignette," or "circle-in" and "circle-out" is now a common bit of technique, and is employed in much the same way as the "fade-in", except that it also serves to isolate part of a scene for the purpose of concentration. The above device for producing the "circle vignette" effect is intended for the Bell & Howell Camera.

THE "CIRCLE VIGNETTE" AND A TYPICAL ATTACHMENT FOR PRODUCING THIS EFFECT

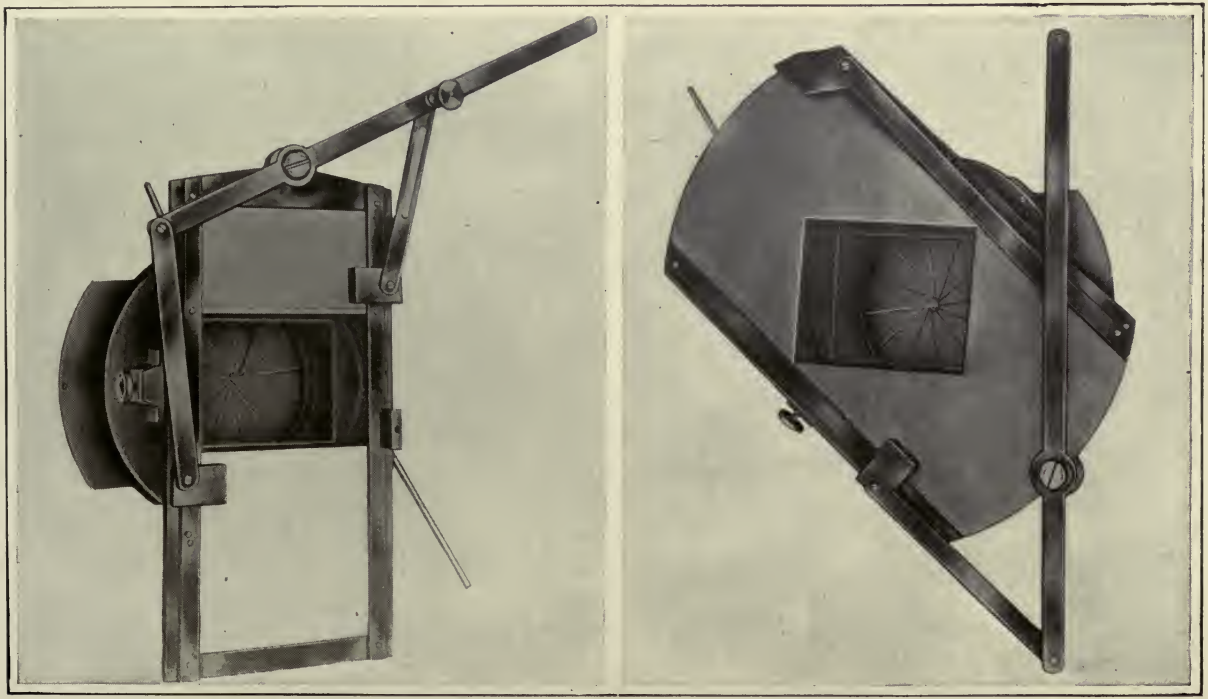
which, when they once appear on the screen, are immediately copied by competing producers whose cameramen, after viewing the novel effects, either deduce the method used or substitute one of their own. In any event, no screen effect can long remain a trade secret.

A recent photoplay device is the "circle vignette," or "circle-in" and "circle-out," as it is sometimes called, by which is meant the fading out of the corners and sides of a scene so that it no longer has the sharp outline or rectangular frame which is often detrimental to an otherwise artistic picture. The circle vignette has the tendency to blend the edges of certain scenes with the darkness of the theatre, with the most artistic results.

While there are several ways of obtaining the circle vignette effect, the most popular appears to be the use of an iris diaphragm in front of the lens, which permits the field of the lens to be altered from the rectangle to a circle of any size. As a variation of the fade-in and fade-out, the circle vignette can be used to circle-in and circle-out a scene. Thus a picture suddenly opens up from blackness to a round scene of ever-increasing diameter until the rectangular outline of the standard frame is attained if carried out to the limit. It is as though the scene were beheld through a hole of steadily-increasing size. The circle-in, as its name indicates, is the reverse effect, with the picture dwindling down to a pinhole and solid blackness.

Hard or soft edges can be obtained with circle vignette scenes, depending on the distance between the iris diaphragm and the lens. By bringing the former close to the lens it becomes so much out of focus that the edges are blurred and soft and produce a highly artistic border for a suitable scene.

Some cameramen prefer to make their own devices for vignette effects, employing various materials which do not cut off all the light rays. The most common of these devices are screens prepared from ordinary portrait film, which is cleared or made transparent and then dipped in an appropriate dye. When the film is cleared and colored, a hole of the required size is cut in the center or at any other selected point. Another method is to employ sensitive portrait film which is exposed to the light and developed to the required point, fixed, washed and dried in the usual manner. It is then shaped to meet requirements. Still



AT THE LEFT: ONE FORM OF CURTAIN VIGNETTE, WITH TWO PARALLEL BLADES. AT THE RIGHT: THE SQUARE VIGNETTE MOUNTED IN FRONT OF A CIRCLE VIGNETTE DEVICE

other screens are made of fine wire netting, so that a soft, blurred edge is produced with a half-tone frame or border.

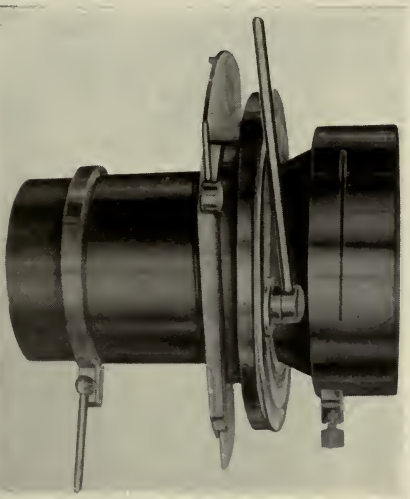
The square vignette accomplishes the same ends as the circle vignette with the difference that it works as a square instead of a circle. Mechanically, it comprises two overlapping blades with a right-angle cut in the facing edges, so that the two form a square opening of adjustable size depending on the degree of overlap. The blades are moved toward or away from each other by a single lever. As seen on the screen the square vignette moves the four sides of the picture toward the center or away from it, simultaneously. Again, by adjusting the distance between the blades and the lens, hard or soft edges can be obtained. The square vignette can be employed for diamond effects by turning its square opening at an angle to the usual rectangular frame.

Still another device is the curtain vignette, in which but two sides are moved. It can be employed to cause the top and the bottom or the sides of a picture to come together or draw apart. By using only one side the effect of a rising curtain or a sliding door is obtained. The curtain vignette can also be used, as is the circle vignette, for isolating and vignetting some object, such as a doorway, a single actor, and so on; in which case just the one object is shown in a delicately vignetted or sharply outlined panel. Mechanically, this device consists of two blades which are simultaneously moved toward or away from each other on the same plane by means of a single lever.

HOW THE CAMERA MAKES TWO ACTORS OUT OF ONE

Double exposures, which are a source of never-ending awe to the layman, are produced in several ways. One of these is by means of companion masks or matts which make it possible to expose certain parts of the film at a time. With matt No. 1, for example, everything is exposed on the film surface with the exception of a small circular patch. When matt No. 2 is inserted and the film has been returned to the top magazine while masking the lens, the film is again exposed with the desired action coming in the small circular patch which is now uncovered by the metal mask. In this manner a vision effect is produced.

The matts come in a wide variety of designs, ranging from the overlapping circles meant to represent the scene through a pair



This is the double-exposure box or split-stage attachment, included in a circle-vignette device, the entire combination being clamped in front of the camera lens. Pieces of glass can be inserted in the slot shown. At the right is a sample of double-exposure film made with the attachment.

ONE FORM OF SPLIT-STAGE BOX AND A TYPICAL STRIP OF FILM SHOWING A PLAYER DOUBLED

of binoculars, to the keyhole matt and star matt. These little metal frames are placed in front of the film in the aperture or "window."

In scenes where the same actor plays opposite himself—the "twin brother" stuff, so to speak—the effect is secured by the careful use of matched matts. First the man is placed on one side of the stage, and his actions filmed in half of each frame by means of the first matt; and then the second matt is substituted, the lens covered and the film wound back, and the actor takes his place on the other half of the stage. The film is again exposed, this time with the fresh half bared and the exposed half masked by the second matt.

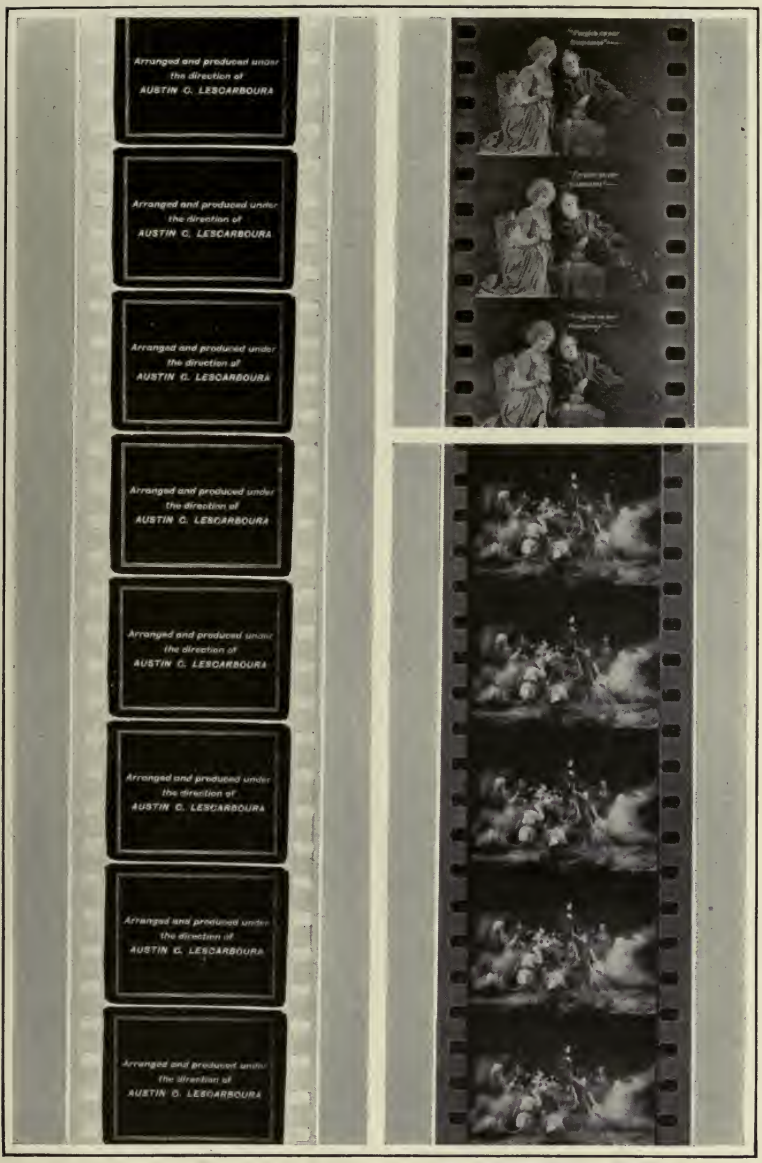
The proper synchronizing of the two halves is all-important. The director has to time the first action and then coach the second so that the two halves will match up. This is referred to as "acting by counts." Otherwise the screen effect is apt to prove ludicrous.

Another method of obtaining double exposures is by means of the so-called double-exposure box, which consists of a light-proof holder which takes a sheet of transparent glass that is used for holding opaque disks and other forms for blocking out certain sections of the film during two or more filmings. The same procedure is followed as with the matts, the main advantage of the double-exposure box being that soft and not hard edges are produced between the subsequent exposures, as contrasted with the matt method.

If a black space can be retained in the first filming, the matts and double-exposure box can be dispensed with. In the second filming the subject is registered in the unexposed section of the film, producing a vision, dream, or other effect. If figures only are to be shown in the vision or dream, these are photographed against a black velvet or non-reflecting drop, making the use of matts unnecessary in the second filming, and eliminating the danger of a dividing line between exposures.

RETOUCHING PLAYERS AND SCENERY FOR THE CAMERA

In film work everything is considered in terms of black and white. To this end the sets are generally prepared in black,



SAMPLE STRIPS OF FILMS SHOWING TITLES AND SINGLE AND MULTIPLE PRINTINGS MADE IN THE LABORATORY

brown and blue, although there are many cases where sets are in full color.

White—dazzling white—is generally avoided in sets because of its strong reflection and consequent fogging of the film, known as hallation. Instead, a sky-blue or lemon yellow is substituted for white; so that in reel life we find sky-blue or lemon yellow sheets and pillows, table cloths and napkins. Even the players wear sky-blue or yellow shirts and collars and ties and cuffs. And the motion-picture bride is dressed not in spotless white but in a brilliant yellow gown!

Motion-picture makeup is also in a class by itself, differing totally from that of the legitimate stage. The possibilities of color and the wonderful lighting effects of the stage are big factors when playing to an audience sitting many feet away. Distance never fails to lend enchantment. But in the case of the screen star there are no colors, no flattering colored-lighting effects combined with distance to help out. The camera must be faced at short range, and it is always ready to exaggerate every defect in the player's complexion during the telling close-ups. Hence it boils down to a matter of facial camouflage.

Carmine must be sparingly used in photoplay makeup because it photographs a dead black. Beautiful pink cheeks must often be toned down for picture purposes by the liberal application of yellowish creams and powders. Your buxom screen beauty photographs best when her makeup would brand her in real life as a victim of jaundice, with her greasy, yellow face. Then the face must be outlined here and there with blue pencil where the features are weak, while the eyelids, to show at all, must be thickly coated with cosmetic and lamp black until they are heavy and beaded.

Makeup in photoplay production is largely a matter of the individual player. Some players require practically no makeup, while others have to spend much time before appearing before the camera, lacking as they do a "camera face," or a face that "photographs like a million dollars," to fall back on studio parlance.

The beauty of screen players is greatly enhanced by artistic lighting. By means of the so-called back lighting, whereby the light is thrown on the back of the player, the outlines and hair

SOME OLD TIMERS: THE MIDDLE CAMERA, MOTOR DRIVEN, WAS ONE OF THE FIRST, THE LEFT ONE CAME NEXT, AND THEN THE RIGHT ONE. THE FIGURES INDICATE WEIGHT IN POUNDS

of a player can be beautifully illuminated. Screens of special reflecting cloth are also used to reflect light onto the players so as to avoid sharp shadows.

The final authority on makeup and lighting is the skilled cameraman, for he knows the limitations of his camera and film and understands what any makeup and lighting mean when translated into black and white. Makeup to him is a purely mechanical process, and illumination is but a means to the end.

THE BUGABOO OF THE CAMERAMAN

Talk to a cameraman for a while and he will come around to the subject of "static," which is the *bête noir* of most knights of the crank. Static is a form of electricity which exists as a charge on a body. The most familiar form is no doubt that which causes paper to stick to the hands or to stick together during cold, dry weather. In the motion-picture camera a static charge is often generated in cold and dry weather by the moving of the celluloid film through the mechanism. Tiny, lightning-like streaks, invisible to the naked eye but nevertheless having full effect on the sensitive film emulsion, play about on the negative with the result that when it is developed it is found covered with tree-like streaks. There is no way of eliminating the static once it has left its mark on the film. The streaks are photographed on the film just as permanently as the regular exposures.

And so it is that tens of thousands of feet of film is spoiled every year because of static. Many scenes are more or less ruined by this phenomenon without the knowledge of the cameraman until the film is developed at the laboratory.

There are about as many ways to eliminate static as there are skilled cameramen. One will explain one sure way, while another explains another but totally different sure way, while still a third explains the only way; and so on without end. One of the schemes used is to keep a moist sponge within the camera when there is danger of static, so as always to create enough humidity to prevent static; for static is generated in dry weather. Another method is to employ a small steam boiler and alcohol lamp, which introduces small quantities of steam into the camera so as to provide the necessary moisture. Another method is to "ground" the static; that is to say, the electric charge is carried

PHOTOGRAPHING A PAGE IN A BOOK. TWO ASSISTANTS HOLD THE BOOK WHILE THE CAMERAMAN, WITH HIS DÈBRIE CAMERA, GRINDS OFF A FEW FEET OF FILM

off to the earth before it can do any damage. For this purpose an all-metal crank is employed and the static is presumably grounded through the operator's hand to the earth.

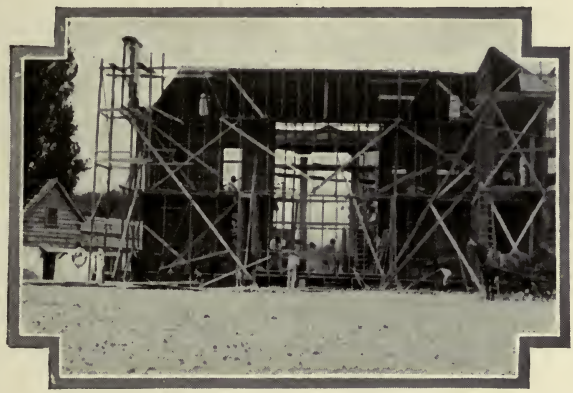
Film manufacturers have tackled this problem of static and have brought out certain kinds of negative film which are more or less proof against static markings. One manufacturer calls this special film X-back, and it is coated on both sides of the celluloid base. Such film is used almost exclusively by companies working in cold, dry climate.

But if you would interest a cameraman, always start by asking him what he knows about static. That is bound to be the opening wedge.

CHAPTER VI.

IN THE LAND OF MAKE BELIEVE

REALISM IS one of the main stocks in trade of the screen production. Compared with the speaking stage, with its highly artificial scenery which lacks correct perspective and general impressiveness, the motion picture makes use of backgrounds both natural and artificial which have depth as well as height and breadth. The absence of colors is more than made up by the general realism of the black-and-white picture. The scenery of the entire world is available for the picture play; and all the world's scenery can be brought to the studio in these days of skilled screen artisans to whom nothing seems impossible. Realism has made the success of present photoplays; and the screen artisans have made film realism what it is.



THE audience is tense with excitement as the hero in the film play struggles frantically with the control apparatus of a submarine that is fast sinking to the ocean bottom, because of the constantly rising water in its hold. And as he struggles at his post the water pours in on him through an ugly gash made in the conning tower of the craft by an enemy destroyer.

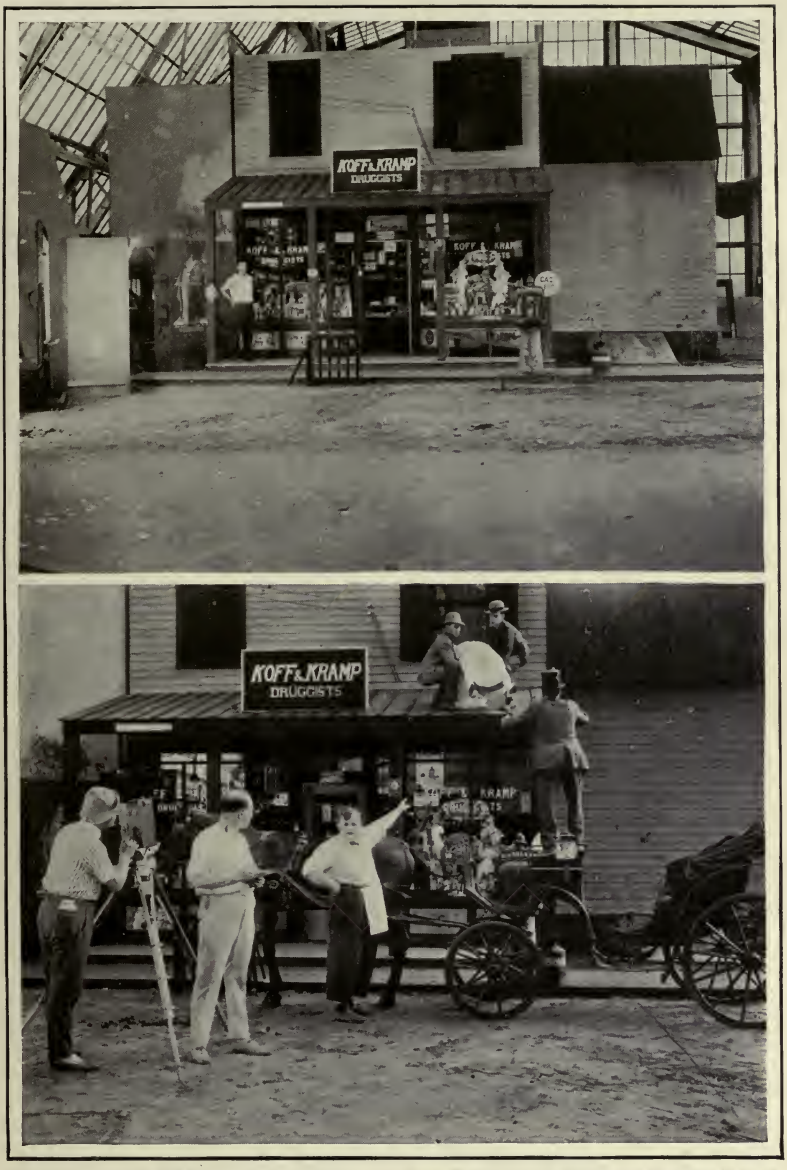
Perhaps it is the climax in a gripping drama; then again, it may be the big scene or "punch" in a hilarious comedy. But however that may be, the realism of the scene has had the desired effect with the audience. What dangers these motion-picture folk incur! is the general comment of the unsuspecting public.

A SUBMARINE THAT NEVER SAW THE SEA

For weeks the artisans of the studio workshops had worked in building this pseudo submarine; and before the camera crank was turned the technical director had gone over every detail of its construction to make certain that it emulated successfully the interior of a modern submarine. Then the studio hands built a tank around the scenery. The "set," as the scenery for a motion-picture scene is called, was now ready for the players.

The director, being unable to carry out his program of photographing certain outdoor or "location" scenes on that day because of rain or poor light, decided to stay at the studio and photograph the interior scenes called for in the scenario. After rehearsing the action of this particular scene several times, the lamps flashed up and the cameraman took his place by the side of the camera.

At the command of the director one of the stage hands climbed up on the deck of the "submarine," pulling a heavy hose after him, which he placed in the opening of the conning tower. The water was turned on and it flowed through the hose and passed down in a heavy stream on the back of the actor playing the part of the hero-sailor, struggling with the control mechanism of a balky underwater craft. Now the water, bounded on all sides by the improvised tank of wood and rubberized canvas, slowly rose in the "submarine" interior. The camera, which all the while was recording the action, was naturally so focused as to



DURING INCLEMENT WEATHER AN "OUTDOOR" SCENE CAN BE MADE IN THE STUDIO WITH REALISTIC RESULTS

take in only the desired portion of the setting—the sides of the tank did not show in the film.

And the scene was a success, because it was convincing.

Typical of the striving of all American producers for realism is the foregoing. A half dozen years ago the audience of the average picture theatre was not so critical as the audience of today. Then motion pictures were still a novelty. The mere fact that the pictures moved was alone worth the admittance fee. Then a director depended solely upon a mediocre story and mediocre acting to make a film production a success; whereas today the director strives to reinforce these essentials with the utmost realism of scenery. It is imperative, claim the producers, that the pictures be replete with realism; the audience must not be permitted to recall the camouflage nature of the backgrounds, for that would destroy their receptive state of mind. Indeed, there are many photoplays in which the wonderfully realistic backgrounds have unduly contributed toward their success. In brief, the audience must be made to forget the mechanical end of picture production; and to this end every effort is made to have even the most insignificant details accurate and confidence-inspiring.

JACKS—AND MASTERS—OF ALL TRADES

No motion-picture studio would be complete without its carpenter shop and staff of expert workmen. There are so many things that must be specially built for the pictures that a complete equipment of woodworking and metalworking machines and a skilled gathering of artisans are an absolute necessity.

It would be impossible to describe with any pretense to thoroughness the range of work turned out by the studio workshops. It is only by offering a few examples of what they do regularly that a general idea can be gained of the scope of their toil. One day they may be building a safe of light wood or compressed paper—accurately made even to the bolt mechanism—which may bring forth roars of laughter from an audience at some later time when it is dropped on the head of a comedian in a film play. They may be called upon to build an airplane, closely following the lines of a genuine machine that is to be used in the scenes of actual flying. The workmen may perhaps spend one or two

WEEKS ARE SPENT IN ERECTING SETS SUCH AS THIS TYPICAL VILLAGE. YET IN NINETY-NINE OUT OF EVERY ONE HUNDRED CASES THE SET CAN ONLY BE USED FOR ONE PHOTOPLAY

weeks' toil in building the airplane, exercising much ingenuity in its construction. As likely as not the tires of the landing gear may be made from short lengths of rubber hose or canvas tube, filled with sawdust. And the same degree of ingenuity may be repeated a dozen times or more in the construction of this one machine; all this work to appear for a few seconds on the screen, and probably doomed to be blown to pieces or burned to ashes. The men may turn to the construction of a mirth-provoking hose-cart or fire-wagon for the fire department of some imaginary rural community. Again, historical or so-called period plays may keep the artisans busy building a replica of the first steamboat, or making an old stage coach, or a Roman gladiator's weapons, or even an ancient catapult to batter down Roman fortress walls built of wood and plaster.

It's all in the day's work!

In a recent war play, four huge siege guns figured conspicuously in the battle scenes between defenders and invaders. Each gun was a faithful reproduction of the famous Krupp 28-centimeter siege howitzers, mounted on caterpillar wheels. When this artillery was shown on the screen, even a military man undoubtedly had to take a second look in order to learn their true nature. But to the lay audience the effect was perfect.

Made of wood and provided with an iron-lined barrel to withstand the flash powder used to simulate discharges, these guns probably stood for the highest attainment of studio artisans up till that time. At the detonation of a little powder in the iron-lined barrel, the gun moved back with its recoil cylinders in the most realistic manner. Ten thousand dollars each is said to have been the cost of building these guns; yet what a convincing touch they lent the photoplay!

The producer of a submarine story which in its main essentials closely follows the theme of Jules Verne's "Twenty Thousand Leagues Under the Sea," recently endeavored to secure the loan of a United States submarine from the Navy, but without success according to the story. Whereupon he set to work building a submarine of sheet iron, with a length of over 100 feet, a beam of 15 feet, and a draft of four feet. The shell had to be of sufficient strength to withstand a submergence of over forty feet. By means of ballast tanks the submarine could take on water in

HERE ARE THREE EXAMPLES OF THE FILM ARTISANS' HANDIWORK OUT IN THE OPEN

order to settle down to the shallow sea bottom, while compressed air tanks permitted of blowing out the water ballast when the craft was to be brought up to the surface again.

The submarine, to continue the description, was also fitted with a torpedo tube taking a regulation torpedo. In all, six months' time was expended in building this submarine, which closely followed the lines of the "Nautilus," the famous craft of Captain Nemo. In fact, that may have been one reason why the producer set to work building his own submarine, which followed the description of the French author and was provided with a lock in its bottom through which divers wearing self-contained suits, could pass out to the ocean floor.

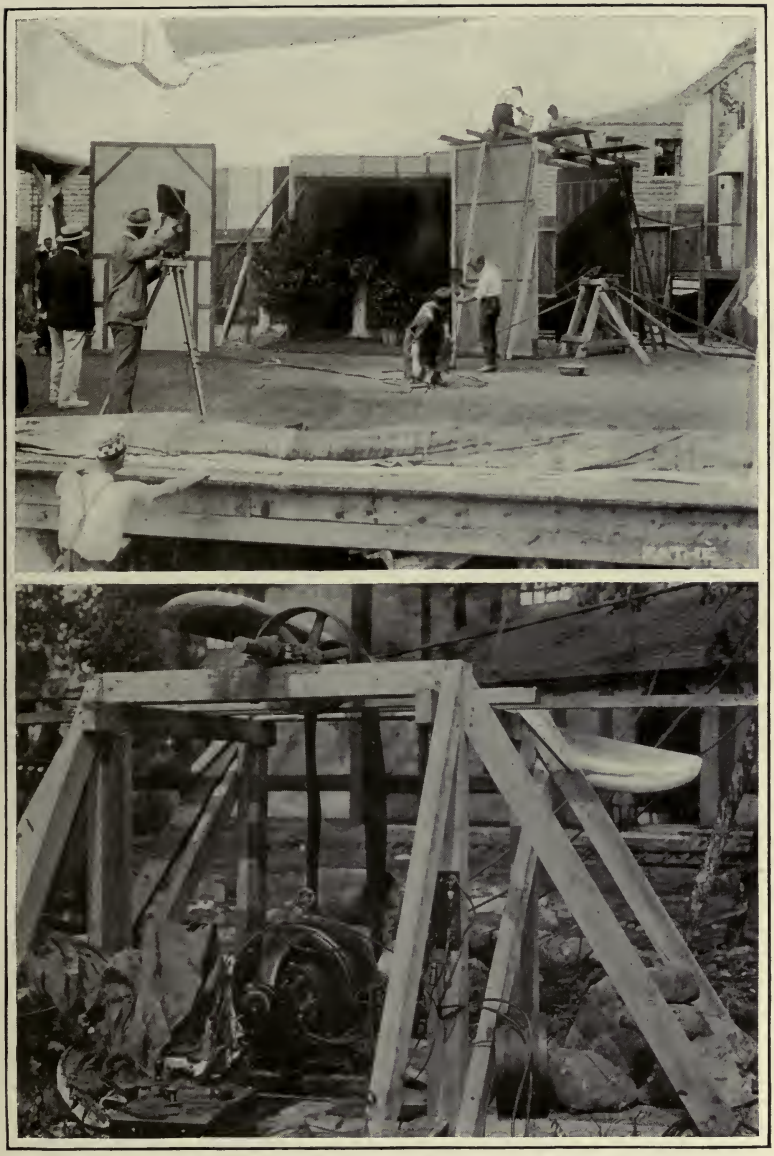
RAINSTORMS AND THUNDERSTORMS TO ORDER

In a certain production of the usual drama category, there was to be a garden scene during a thunder storm. One of the features of the scene was a driving rain; another, a flash of lightning. The scenario called for these things: there was nothing else to do but get them.

But this was comparatively simple to men who must build whole cities and fortresses and bridges and mountains. An airplane propeller was mounted on a substantial support, and to it was applied through belting the power of an electric motor. An artificial garden set was soon arranged and housed in a suitable shelter to make it dark—the photographing took place on the roof of the studio, on a bright, sunny day. Above the set was arranged a trough, perforated with many holes to allow water to drop below.

When everything was ready, the electric motor was started, causing the airplane propeller to blow up a veritable hurricane through the set. Stage hands with watering cans began to pour water into the trough and rain began to fall on the shrubbery below. Caught by the wind, much of the man-made rain was violently blown across the stage, simulating a powerful, angry gale. Then at the propitious moment another stage had set off a flashlight, giving the desired effect on the film.

Which bespeaks well of the skill of the artisans of the screen. Most of their work is done in wood and canvas, although occasionally they resort to metal, as witness the submarine already



A PERFORATED TANK ABOVE THE SET AND A MOTOR-DRIVEN AIRPLANE PROPELLER MAKE A SCREEN STORM

mentioned. Papier maché, plaster of paris, compressed fiber and clay are also employed in profusion, especially in the making of statues, ornate panels, and other work of a similar nature.

The equipment of most motion-picture studios is usually such as would do justice to a thriving wood-working shop and machine shop combined. A typical comedy-producing studio in southern California, for instance, has over $2,000 worth of woodworking equipment in its carpenter shop, while the stock of lumber constantly on hand and other items are said to bring the total up to $4,000. The concern employs regularly over seventy-five carpenters.

BUILDING INTERIORS TO FIT THE STORY

The interior settings of a film play require the closest attention on the part of the producers. For here again the constant demand for accuracy and realism is paramount. The smallest details must be watched. If the director calls for a tenement house scene, the stage carpenters must build him a dilapidated hall and stairs, and small, squalid rooms. The scene must appear much the worse from wear and old age—the steps must look worn; the walls must be marred, with here and there an ugly crack and a gap showing the lath; and dirt there must be a-plenty.

Again, if the director calls for the home of a rich man, it is necessary that he state what kind of rich man the film author had in mind. Is he a wealthy man from a family of long standing? Or is he a *nouveau riche?* If he belong to the former class, the furnishings are to be of a quiet, harmonious design, with the paintings and other ornamentation going to reflect good taste and wealth. If he belong to the latter class, the furnishings and other details of the interior must be of the garish sort.

It does not necessarily follow that in *real* life a man of the *nouveau riche* class must have garish taste, or a man born of wealth, good taste, or a tenement must always have a run-down appearance. But it is so in *reel* life, for there are certain well-defined conventions in motion-picture production. Furthermore, exaggeration is a necessary tool where nothing can be left to the imagination of an audience.

ASKING THE TECHNICAL DIRECTOR HOW IT SHOULD LOOK

Obviously, it would not do to leave the selection of furnishings

ALL LEADING STUDIOS MAINTAIN LARGE PROPERTY ROOMS CONTAINING THOUSANDS OF DOLLARS WORTH OF FURNITURE AND FURNISHINGS, BECAUSE SETS MUST BE ARRANGED WITHOUT LOSS OF TIME

and their proper arrangement to stage hands and carpenters, and accordingly the demand for accuracy and realism has brought into existence a new type of executive in the film industry—the technical director, or art director, as he is sometimes called. To him falls the task of reading through the synopsis or scenario of a film story, followed by the planning and the supervision of the erection of the sets. He is responsible for the arrangement of the furnishings, even down to the smallest details, as well as for the costuming of the players. However, he is not responsible for the work of the actors; that task remains, as ever, in the realm of the director.

The technical director must be a veritable human encyclopædia. His must be a remarkably broad knowledge, acquired through travel, reading, and a wide range of acquaintances. And what he does not know he must be able to "dig up" at short notice. Here is a typical case of how his knowledge is applied:

If a scene is laid in a certain country and the time is different from the present, he must know what garments the players are to wear, the accouterments of the soldiers, the etiquette of the period and country, the furnishings of the interiors, the headdress of the women, and a thousand-and-one other details.

Perhaps actual incidents are most convincing in illustrating how the directors strive for accuracy, and how the absence of technical direction may be fatal to an otherwise flawless production. The story is told of how Irvin Cobb, the noted American writer, was visiting a prominent Los Angeles studio while a director was rehearsing a scene of a war play in which a regiment of German soldiers were marching through a Belgian village. To add what he considered a touch of comfort and naturalness to the scene, the director had the men leave their coats unbuttoned.

Mr. Cobb, then only recently returned from the war zone, was horrified at this gross misrepresentation of facts. He did not hesitate to tell the director that at no time do the Germans have their coats unbuttoned while actually on the march or on duty. The director was grateful for the information, for he realized the humiliation that might have been his if the otherwise perfect scene were held up to ridicule by the better-informed of the millions who would ultimately view the picture. At the same time the author commented on the wearing of the Iron Cross decora-

HERE IS THE ART DIRECTOR OR TECHNICAL DIRECTOR, WHICHEVER YOU CHOOSE TO CALL HIM, ON THE JOB, DIRECTING THE FINISHING TOUCHES OF AN IMPORTANT SET

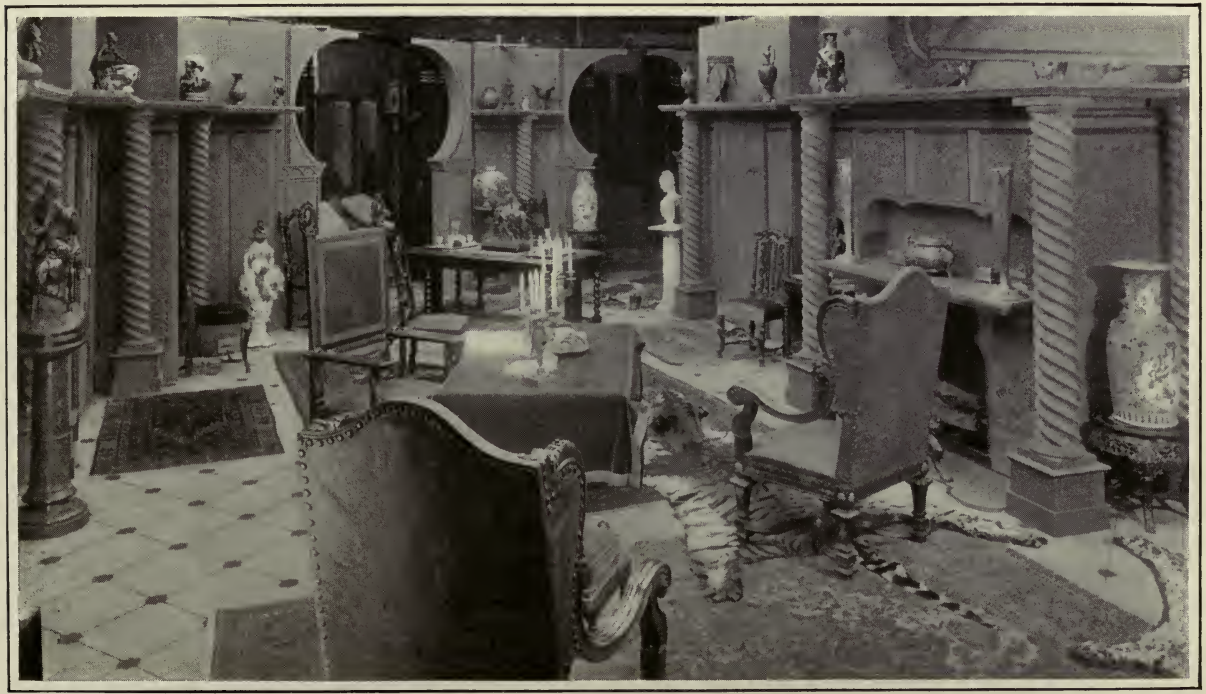
tion, which the director had insisted the men should wear conspicuously, whereas it is actually tucked away with only its characteristic black and white ribbon showing. In view of these two instances, can there be any doubt of the necessity of a technical director?

THE COST OF REALISM

To return to interior settings: These represent one of the big items of expense in the production of a film. One reason is that the average set can be used for one production only, after which it must be dismantled. In the earlier days the audience might not have commented on seeing the same pieces of furniture used several times. But today the audience is more observing and will soon detect any attempt to use the same lamp, settee, or other furniture and furnishings repeatedly. Conspicuous repetition has got to be avoided by the producers. And as in the instance of the garments worn by the players, the furniture must be in keeping with the last word in interior furnishings. This means that every large studio maintains a large storage room or several rooms in which an almost endless variety of furnishings are always on hand.

The walls of an interior set are generally built of compressed paper or light board, backed up with framework and props, to facilitate the work of erection and destruction. Tremendous quantities of the necessary materials are employed in the course of a year, as witness some 50,000 feet or more of compressed paper board used by a leading comedy producer, together with over 500,000 feet of lumber. The same concern spends over $1,800 for some 15,000 rolls of wall paper each year, with which to cover the walls of its sets.

The cost of even the most modest set runs up into the hundreds of dollars, for it must be remembered that practically every set must be built and decorated to order, and filled with the necessary furniture, which may not be used for a long time to come. Elaborate sets run up into the thousands of dollars. A good restaurant or carbaret scene may cost from $2,000 to $5,000, depending upon its elaborateness and size. A setting calling for intricate electric lighting effects sometimes exceeds the $5,000 mark; for instance, the witches' scene in a certain produc-



THE FURNITURE SHOWN IN THIS TYPICAL STUDIO SET MAY NOT BE USED AGAIN FOR MANY MONTHS, REPRESENTING SO MUCH IDLE INVESTMENT AS IT RESTS IN THE PROPERTY ROOM

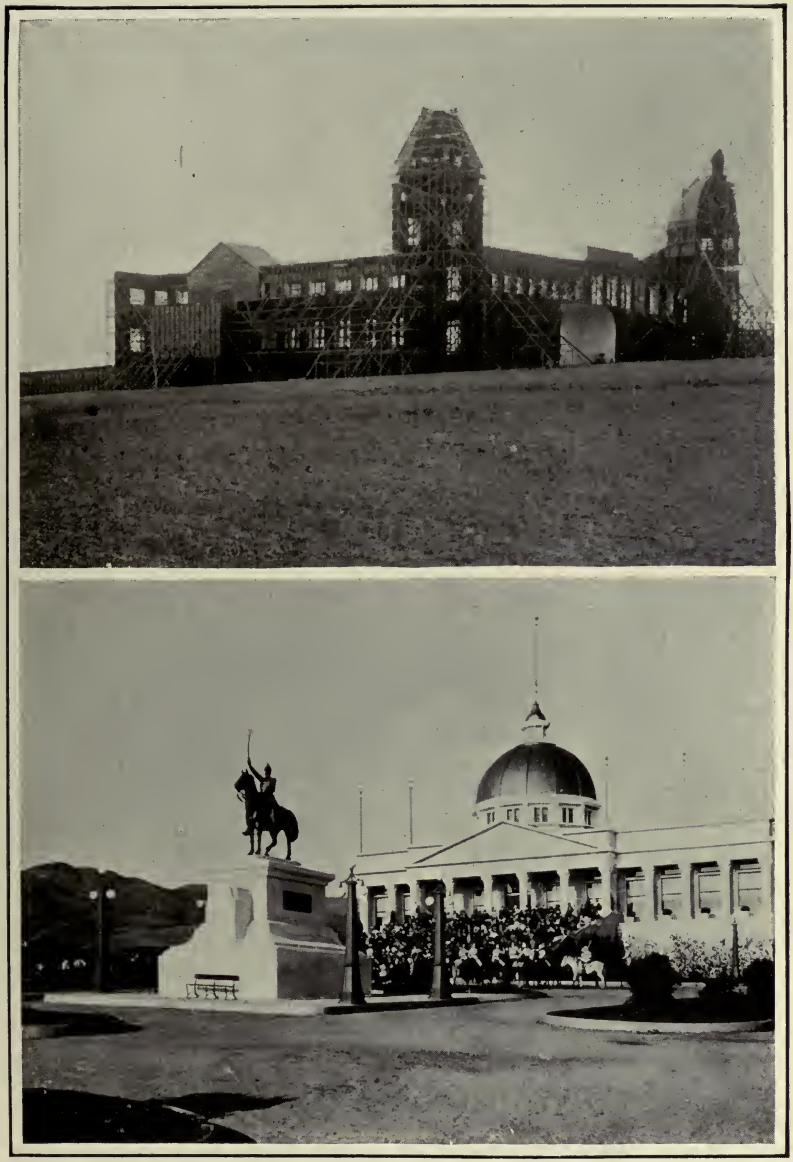
tion of "Macbeth," is said to have cost over $10,000 because of the elaborate apparatus for producing the wierd fire effects.

IN THE LAND OF TWO-DIMENSIONED STRUCTURES

It is in the outdoor sets, however, that the film artisan finds his biggest field of endeavor. For under the open skies his undertakings are not hindered by space limitations and can therefore assume the most gigantic proportions. Here again, however, the question of realism is the first consideration; here, too, the technical director must exercise his knowledge, but in this case it is architectural design in particular that he must know.

Perhaps the greatest set that has ever been constructed up until the time of writing was one representing the ancient city of Babylon, used in a gigantic production. On the front of this huge setting—the side that faced the motion-picture camera—there rose high walls painted to simulate stone, 100 feet in height and adorned with reliefs of strange winged creatures and standing elephants. The towers in this set stood 135 feet high, and the various structures covered a ten-acre tract of land in Hollywood, California, just outside of Los Angeles. For more than six months the carpenters, masons, concrete workers and painters were busied with the set, and the cost of the work is reported to have been in excess of $50,000.

But slightly less pretentious was the set erected at an approximate cost of $35,000, representing the palace, house of parliament, prison, royal court, and adjacent buildings in a mythical capital featured in a war photoplay. The first spadeful of earth in preparation for the erection of the set was turned in May, 1915. The completed set was ready for use in November of the same year. Into its construction went thirty carloads, or approximately 600,000 feet, of lumber. Glass valued at a total of $4,000 was necessary for the several hundred windows, while tons upon tons of cement and plaster were used as the other principal materials. For the steps of the largest building alone, ten tons of cement were used. The sidewalks, with their curbings, measured some 1,200 feet, and twenty men were employed for three months laying them out and arranging the parking between. Trees, shrubbery and lamps were among the ornaments placed within the boundaries of the set. In sum, covering an area of over six



BEHIND THE SCENES AND WHAT THE CAMERA REALLY SAW IN THE CASE OF A SET WHICH COST $35,000 TO BUILD

and one half acres, the set has stood atop one of the hills in southern California, enduring the elements successfully as though it were intended as a permanent structure. Like most motion-picture sets, it is primarily a "front"; for the rear view is not unlike that of an outdoor advertising sign.

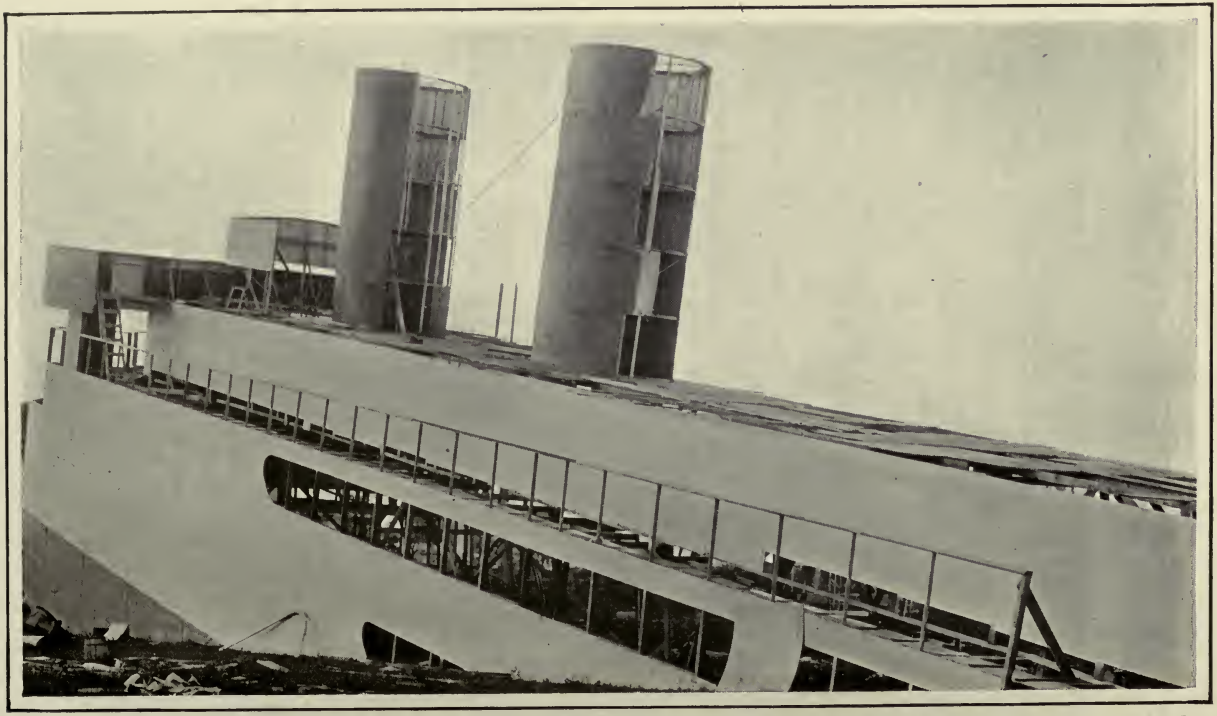
It is principally in portraying foreign scenes that the film artisans are called upon to build elaborate sets. Years ago when the industry was very young and very crude, companies traveled abroad in order to produce plays at the actual locations called for in the scenario. That was their way of securing realism. Today, in marked contrast, the producers find it easier to bring the foreign or distant spots to the studio, literally speaking. By paying extra attention to minute details and sparing no expense, the producers are able to convince any audience no matter how critical it may be.

So all parts of the world have been brought to the foothills of California, the shores or Florida, and the Palisades of New Jersey, where producers have better laboratory facilities, understand the light conditions, can secure all the experienced players they require—and save time and money.

Typical instances of foreign sets erected "somewhere in America" have been the barracks of Delhi, India, and a street scene in a village of a mythical country, both of which were recently erected and used by a Western producer. The former consisted of seven individual structures and entailed an expenditure of $3,000; the latter represented a street lined with houses of solid construction. The houses were made of plaster-covered timbers, while the stone walls and trees were handled with great care to obtain correctness of detail. The entire set required about six weeks to build and involved an outlay of perhaps $5,000.

There is practically no end to the elaborate outdoor sets erected by motion-picture producers. Of the film production of "Ramona," it is said that over 1,800 sets were erected; the Spanish monastery built for this photoplay alone cost some $10,000.

A commendable piece of work was the set representing the temple of an Aztec monarch in the sixteenth century, which was used in a recent production. Its framework was built of timbers, but the body was of plaster plaques. About 7,000 pieces were required, and the total cost of the set is said to have been $3,000.



IN ORDER TO DEPICT THE DRAMATIC SINKING OF THE LUSITANIA, THIS HUGE SET WAS ERECTED ON A VACANT LOT IN THE BRONX, NEW YORK CITY, AT A HEAVY EXPENDITURE

A set representing a border town on the line separating Mexico from the United States and used in a typical Western drama was recently erected at a cost of $1,500. It consisted of fifteen buildings, each entirely of frame construction. While the cost of the village was not great, at the time it was regarded as one of the most realistic sets ever built for the screen, because it was more than a mere "front."

There is no end of sets which might be described; but enough has been said to convey a fair idea of the work of the film artisan or camoufleur of the screen.

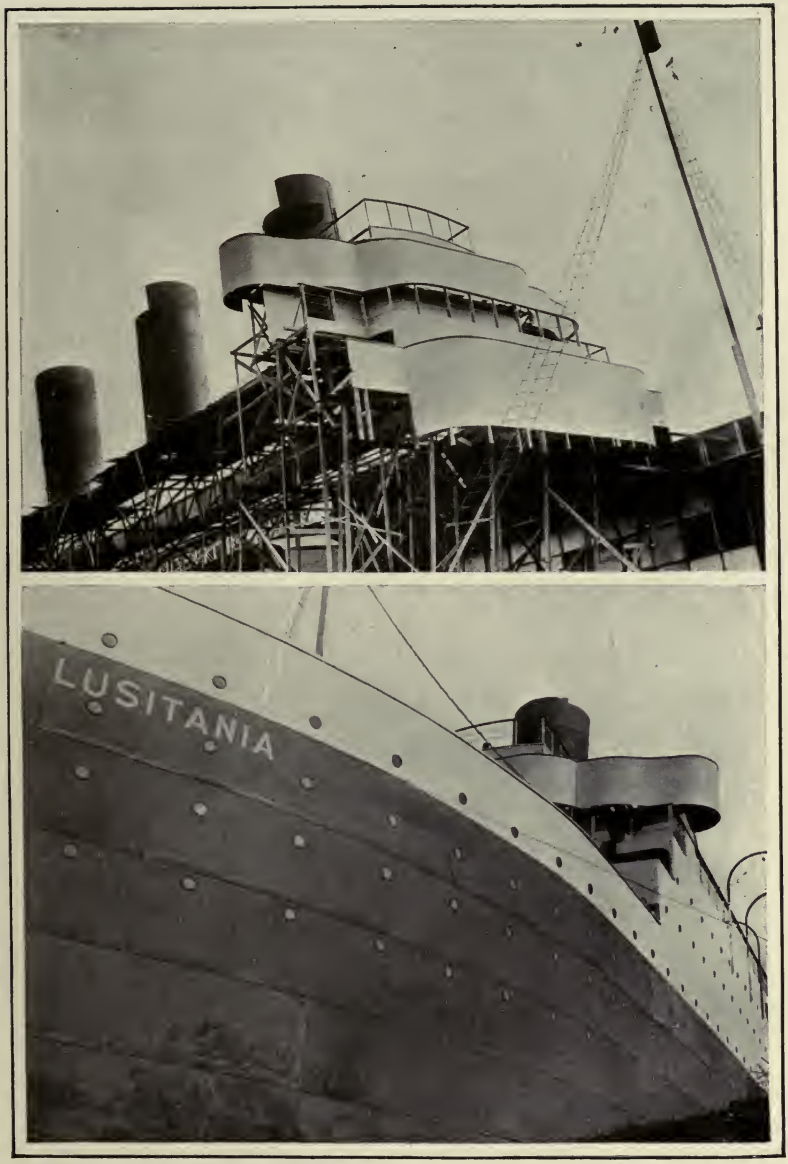
MAKING THE MOST OF EXISTING THINGS

Most assuredly, the building of a convincing set is an accomplishment. But is it not more of an accomplishment to make the most of existing things—to change a hill into a pyramid, a row of telegraph poles into a line of polar trees to simulate a shaded road so typical of France, and a farm house into a Norman castle?

When the film artisan can do otherwise, he does not go to the trouble and expense of building a set. Although huge sums of money are expended in picture production, to be sure, still, every cent is saved that can possibly be saved. Popular belief to the contrary notwithstanding, motion-picture production is like any other business: there must be a certain ratio between expenses and revenue. So wherever money can be saved by making use of existing scenery, so much the better.

It requires considerable ingenuity and an artistic eye to convert prosaic things into motion-picture settings. For instance, for a recent picture a little hill in southern California was converted into an Egyptian pyramid. How was it done? Well, quite simply—when you know how. The scenery men merely built steps on opposite sides so that when the hill was photographed against the setting sun, a perfect silhouette of a pyramid some 200 feet in height, resulted. Of course, to make a conventional picture of this camouflage pyramid would have been to expose its improvised nature; but in this case as in many others the cameraman came to the rescue.

In a film production dealing with the life of Joan of Arc, the director required a road bordered with tall, stately poplar trees,



TWO MORE VIEWS OF THE LUSITANIA SET, SHOWING THE SHIP IN COURSE OF CONSTRUCTION AND AS SHE LOOKED COMPLETED

so typical of certain parts of France. He wanted the road in a hurry; most directors want the most unreasonable kinds of sets in a hurry, giving the scenery hands but a few hours' notice!

Fortunately, the location director knew of a straight road lined with tall telegraph poles. And he also knew of a place where stately poplar trees could be obtained. A few hours later there was a poplar tree lashed to every telegraph pole on that road; and from the camera's point of view, when the filming took place, there was no sign of those ugly reminders of the ubiquitous telegraph.

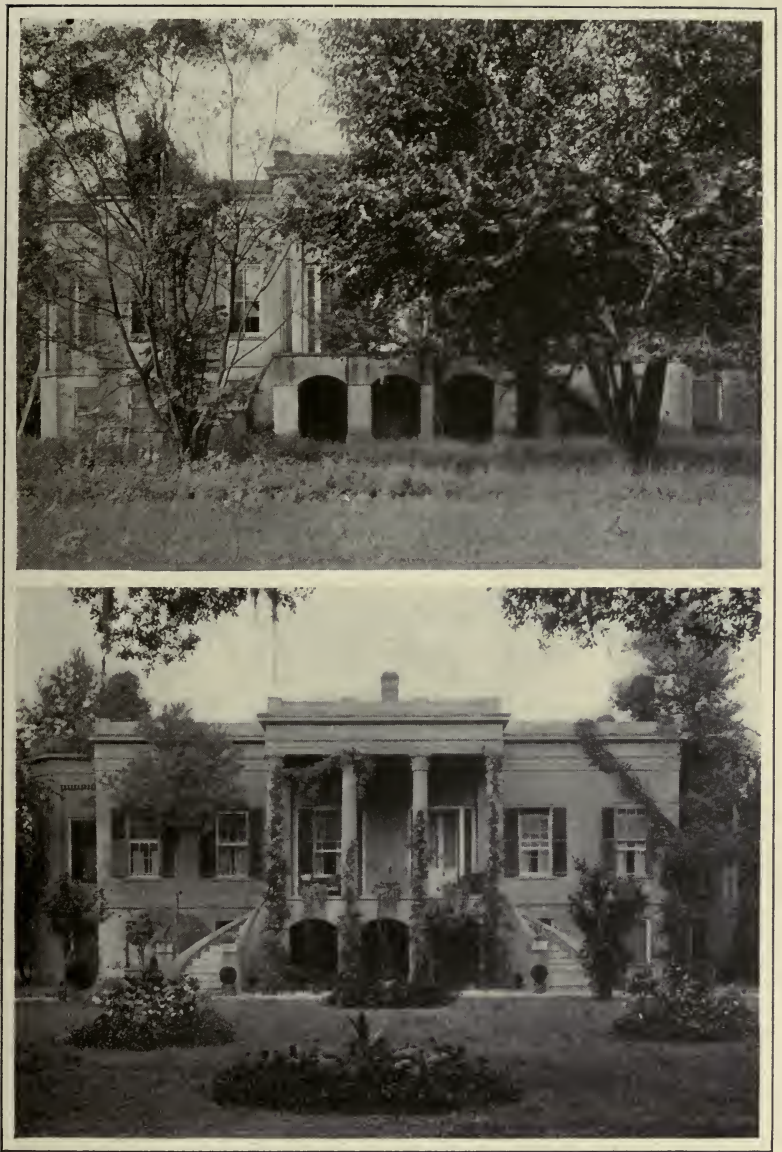
Another director one morning discovered that his scenario called for a Southern dirt road passing by a corn field. The scene was to be "shot" that afternoon. He so notified the film artisans, who, despite their calm demeanor, were in this instance quite worried. Where were they to find a dirt road? Where a corn field in this part of California? They could build a road, to be sure; but corn could not be faked or grown in a few hours' time.

The location director looked up his records and discovered a certain corn field some distance away, situated on a concrete highway. A short time later a motor truck was speeding toward that rare thing—the corn field, carrying a load of dirt surmounted by a squad of laborers. Arriving at the corn field, the laborers set to work dumping and spreading the dirt over the concrete highway until it disappeared under a perfectly convincing Southern dirt road. Then the director came and "shot" the scene; after which the laborers removed the dirt and restored the road to its former status.

Another trick of the camoufleurs of the screen was to convert a farm house and water tower into a Norman castle. Crowning the top of a hill, these homely structures stood out in bold silhouette against the setting sun. By the addition of some apple boxes about the roof and water tank, and some canvas to hide the skeleton framework of the tower, an excellent silhouette was obtained of a medieval castle.

DECEIVING THE OTHERWISE TRUTHFUL CAMERA

Were the motion-picture camera permitted to tell everything concerning motion-picture settings, there would be no such thing



IN ORDER TO USE THIS IMPOSING RESIDENCE FOR THEIR PICTURES, THE FILM FOLK DID SOME LANDSCAPE GARDENING AS SHOWN

as convincing backgrounds. But that's just it: the camera is fooled!

A multitude of sins can be covered over with a little smoke or haze when making a picture. For instance, in many a battle scene the audience perceives the action through a heavy haze which if anything lends a real martial touch to the picture; when, as a matter of fact, the director, not finding all the details quite up to the mark, ordered yellow smoke pots to be burned so as to subdue the details. Yellow smoke is a first-aid remedy in filming some sets, especially when making use of improvised backgrounds; for the keen eye of the camera is then sufficiently blurred so that the imagination of the audience must supply what is lacking in the way of details.

Silhouette photographs, too, are a great aid in making use of improvised backgrounds. Whereas the entire set would have to be properly built and colored if the usual photograph were made, in the case of a silhouette only the outlines count: the mass in black against a light background has little detail. And what is more, the audience generally imagines it is receiving a genuine treat when a silhouette is included. In some cases it is; but most of the time the reason is utilitarian rather than esthetic.

After all, the cameraman, knowing the peculiarities of his camera, can be of big help to the sorely tried film artisans.

Essentially, a photoplay is a picture; and all pictures require backgrounds. Pretty backgrounds make good pictures. Hence it is small wonder that the subject of sets and locations enters so extensively in the production of films.

CHAPTER VII.

THE BIRTH-PLACE OF THE MOTION PICTURE

BECAUSE motion pictures are something of the nature of art, even if a manufactured product in a business sense, they are produced in a studio, not a factory. A queer thing indeed, this motion-picture studio. It is a meeting place for the artistic and the commercial; the temperamental director works in perfect harmony with the hard-headed producer who thinks of a photoplay in the terms of production costs and sales revenue. Raw film enters the studio and is subsequently converted into animated film which brings the work of many players to theatres far and wide. Everything is at hand in the studio for the canning of dramas and comedies.

BACK in the early days of motion pictures almost anything served as a studio. What is claimed to have been the first studio in America, for instance, was erected by the Edison Company in 1905. It was a roughly constructed building measuring about 20 by 25 feet and covered with tar paper. It was placed on a revolving stage so that it could be swung around to follow the sun; and it was also mounted on a truck so as to be transportable from place to place. This pioneer studio was familiarly called the "Black Maria" by members of the company.

Then there was the early Vitagraph studio on the roof of a New York office building. In fair weather the scenery, painted by one of the proprietors of the company, was hastily assembled so as to form a "corner" covered by the field of the camera, while the light was furnished by the sun.

Other concerns had studios little more elaborate. Many of them had platforms standing next to barns or tumbled-down buildings that served as a storage place for the scenery and furnishings, and as a shop for the scene painters, a laboratory for the cameraman, an office for the producers, and dressing rooms for the players.

THE STUDIO—A PLACE TO KEEP OUT OF THE RAIN

But all that was in the early days of the industry, when a producer got out a film whenever the spirit moved him—and when his pocketbook permitted. There were no release dates in those days: a producer could issue his film at any time, knowing full well that there was a hungry mob of motion-picture theaters waiting to grab his film and grind it through their machines.

So the early producers made pictures whenever and wherever they pleased. During rainy weather or when the light was poor, they stopped work; and when they were blessed with beautiful weather they hurried through as many scenes as the crudeness of their handiwork permitted. When the industry issued from its infancy, however, and became a robust and full-grown and universally-recognized business, producers soon had to get down to a schedule basis. Motion-picture theaters, dealing through exchanges or film brokers, insisted on having films at regular intervals; and rain or shine the film producers had to turn out a specified number of films each week or each month.

"BLACK MARIA"—WHAT IS CLAIMED TO HAVE BEEN THE FIRST MOTION-PICTURE STUDIO IN THE UNITED STATES, ERECTED IN 1905 BY THE EDISON ORGANIZATION

To keep out of the rain, so to speak, film producers built themselves special structures or studios in which to carry on their work, irrespective of the weather. These structures are generally of steel framework, covered on all sides and on the roof with sheets of translucent glass, so as to admit the maximum diffused daylight. In fact, the average studio is more like a hot house than anything else, and acre after acre of glass surface is represented in the so-called daylight studios of many a motion-picture colony.

One's first visit to a motion-picture studio is almost bound to be a disappointment. For some reason or another one expects to find a comfortable and orderly sort of a place, with the players alternately lounging about and acting amid comfortable surroundings. But to the horror of the visitor the studio is a rather cold kind of a place: it is vast in area and the ceiling is high; the sets, to his great disappointment, are only fronts, and end abruptly in crude wooden braces and ugly lamp stands where the vision of the camera ceases; the actors hurry through their parts and then sit about watching the director go through another scene, or disappear to their dressing rooms; the sets are arranged—or rather disarranged—any which way, with here and there and everywhere a pile of discarded scenery; and, lastly, huge batteries of lamps pour out a ghastly and trying light on the sets and players, while one has to be careful not to stumble over the maze of electric cables. Indeed, the average studio is far from the cozy place one would imagine by the films.

Yet all this is perfectly correct. After all, a studio has but one *raison d'etre,* and that is to produce pictures. Pictures, on the other hand, call for backgrounds and for action, and if those prerequisites are at hand all is well with the producer.

DAYLIGHT AND NEAR DAYLIGHT

The glass studio affords ideal light for motion-picture photography during clear weather, for the daylight, passing through the translucent roof and sides, is so diffused as to eliminate shadows and produce even illumination. In order to control this light curtains are arranged along the sides and above the sets, so that any degree of illumination may be immediately obtained.

When daylight fails him, however, the producer merely

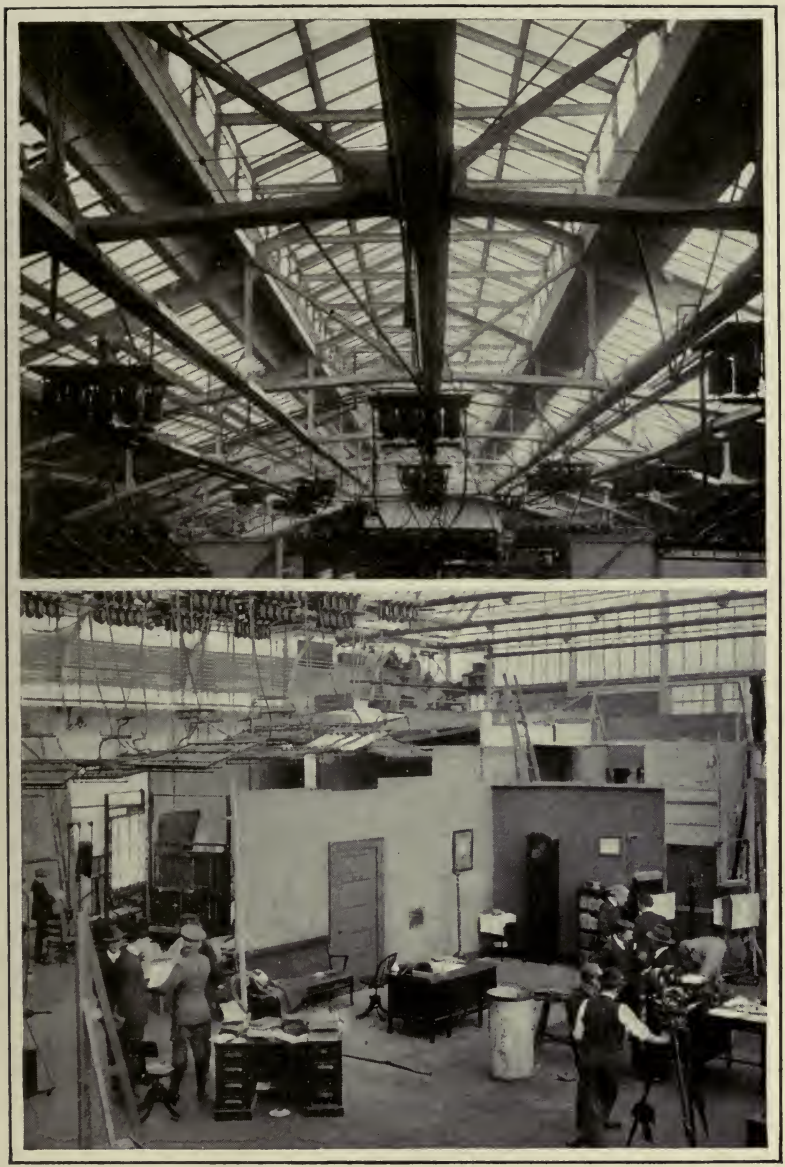
HERE IS A TYPICAL EASTERN STUDIO AND ITS "YARD," LOCATED IN THE MOTION-PICTURE COLONY AT FORT LEE, NEW JERSEY, PERCHED ON THE PALISADES ACROSS THE RIVER FROM NEW YORK

switches on as many electric lights as may be required. Indeed, the greater part of the time electric lamps are employed because of the ease with which they can be arranged and controlled so as to produce those wonderful lighting effects which play such an important part in present-day photoplays.

There are many different types of electric lamps in use to-day. Perhaps the earliest type of all, and one that is still used to some extent, is the arc lamp, which gives a blue-white light of great intensity. Such arc lamps are arranged in batteries of five or more above the set, and in batteries of five or ten at the sides and in front. The pioneer producers troubled themselves very little with the arrangement of the lamps, for their only concern was whether there was sufficient illumination to produce a properly exposed negative. To-day, however, the cameraman and directors are most particular concerning the placing of the lamps, for the illumination, as we have read in the chapter dealing with actors, has much to do with the beauty or ugliness of the players. Lighting, at present, is an important phase of producing, and every day the directors and cameramen are learning something new along this line.

The arc lamps employed are, of course, self-feeding; that is to say, as the carbon pencils which they burn become shorter through consumption, they are fed toward each other in order to maintain the proper gap. So from the time the arcs are switched on until they are shut down, they require no attention whatsoever. But the flicker of the arcs is at times troublesome, as is also the great volume of heat which interferes with the players.

It is the mercury-vapor or Cooper-Hewitt lamp, therefore, that is the most generally employed to-day. This lamp is the familiar slender tube which emits a greenish or bluish light, often seen in public buildings, photographic studios, and in factories. Why the mercury-vapor lamp should be first in the motion-picture field is simple to understand, when once its light is examined with the spectrum, an instrument which analyzes the various colors contained in any given source of light. It is a fact that the mercury-vapor gives out a light that is especially rich in blues, ultra-violet and other colors rich in actinic properties, while it is remarkably free from those colors approaching the red end of the spectrum, which are very poor photographic rays. All in all,



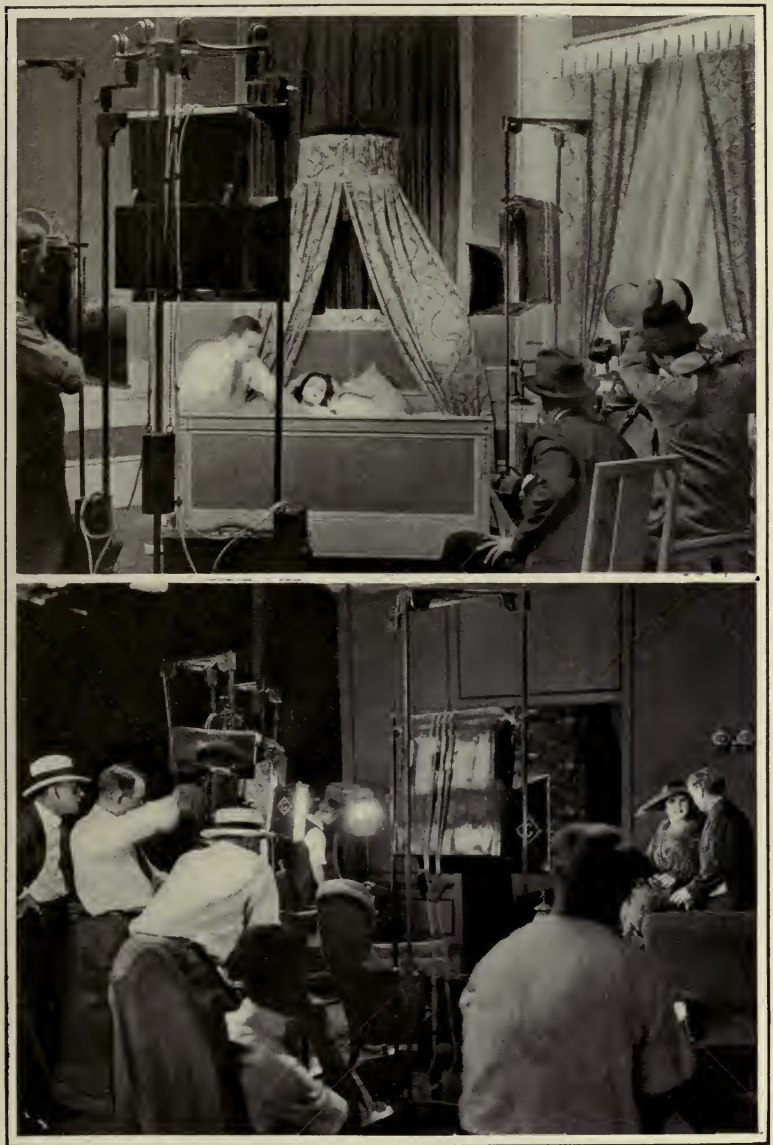
THE CEILING AND FLOOR OF A MODERN EASTERN STUDIO, SHOWING THE LAMPS ON TROLLEYS AND THEIR RELATION TO THE SETS

then, the Cooper-Hewitt light of a given strength contains the maximum actinic or real photographic value, and at the same time the illumination is not as trying on the eyes of the players as are other types. Furthermore, mercury-vapor lamps require little attention, and there is nothing that can get out of attention. Mounted in batteries these tube can be readily shifted about.

Of late years experiments have been made with incandescent lamps of the nitrogen-filled tungsten-filament type, and while these lamps are good for motion-picture work, they possess no real advantage over other types already in use. In order to secure the maximum actinic light with the minimum glare, blue-glass bulbs are used, giving a light that approximates daylight. Again, the lamps are overloaded; that is to say, the voltage is ten volts or more higher than it should be, in order to secure a white-hot filament and to reduce still further the small percentage of red rays. The one advantage that can be claimed for incandescent lamps is their low first cost, although it is true that their installation calls for the least amount of trouble, as does also their upkeep.

No matter what type of lamp is employed, the arrangement is generally the same. There are the floor stands, carrying a battery of lamps and provided with casters so that they can be readily moved about from one part of the studio to another. Electrical connections are made by means of heavily insulated flexible cable, with connecting sockets and plugs at either end. The lamps above the set are also mounted in battery, and in the more modern studios are arranged on a sort of trolley so that they can be moved to any place on their steel-girder tracks.

Vast quantities of electricity are required in providing illumination for the average set, which may not measure more than 20 by 20 feet in area. But it should be remembered that we are dealing with instantaneous photographs—snapshots—of from 1/25th to 1/50th second exposure, and that powerful light is necessary for this purpose. In fact, we are replacing the good old sunshine, and it is only when we try to replace that great source of light that we appreciate how powerful it is. To be definite, a small set may require as much as 80 kilowatts to illuminate it, depending upon the size, of course, and the color of the objects and scenery. Needless to say, motion-picture studios



THE WONDERFUL LIGHTING EFFECTS OF THE FILM PICTURES ARE OBTAINED BY LAMP STANDS SUCH AS THESE

are the very best customer a power supply company can hope for. They burn up current by the wholesale, as it were; and they work during daylight, when power companies have the least call for their product and when they are most in need of customers.

A MATTER OF FLOOR SPACE

The various directors of a producing company work inside and outside, as explained in a previous chapter. As they require certain interior sets they give their orders to the studio hands who erect the desired sets or stages, under the supervision and direction of the art or technical director, if the organization is a particular one. Once the set is ready, the director proceeds to make full use of it, "shooting" all the scenes calling for that particular setting.

Floor space is at a premium in most studios, and sets must be removed as soon as possible. Usually this is feasible, but there are certain productions whose preparation extends over many months, in which it is not feasible to dismantle the sets until the films are completed. In one instance of this kind, namely, a famous serial film of the mystery variety, the final episode of which was to be suggested by the public, the sets were left standing for the better part of the year. Now the producing studio, while of fair capacity, had over half of its floor space tied up with these sets; yet so important was it to the director to have his continuity perfect throughout the episodes of this serial that the sets were left standing.

In another studio the matter of clearing sets is considered a paramount one. To this end the cameramen are provided with individual dark rooms, so as to test their "takes." As soon as a scene has been "shot," the cameraman films a few feet of negative over the required amount, which he cuts in the dark room and develops. If the photography is satisfactory, the director orders the set dismantled. In this manner the floor of the studio, big as it is, is never cluttered up with numerous sets. On the other hand, it would not be safe to dismantle a set before the negative was developed and found perfect.

The various sets in a studio are suggestive of small stalls, with here and there an occupied one where a director and his assistants, together with a cameraman, are putting several actors

BECAUSE SPACE IS LIMITED IN EVEN THE LARGEST STUDIO AND BECAUSE SETS TAKE UP SO MUCH ROOM, THEY MUST BE DISMANTLED AS SOON AS POSSIBLE AFTER SATISFACTORY SCENES HAVE BEEN FILMED

through their parts. There is generally litle privacy, for electricians and carpenters and visitors flock about the front or camera end of the set and watch on. The heroine may be acting the rôle of the child-wife alone with her brute of a gambler-husband in a log cabin ten thousand miles away from the nearest civilized post, yet ten feet away her spectators are watching and audibly commenting on her work. But she must be so intent on her work that she can concentrate and act, forgetting about her motley audience.

In certain studios, however, the matter of privacy has been considered carefully. Instead of permitting onlookers to stand about, each set is entirely closed in by a folding screen about the front end, shutting off the players, director and cameraman from the outside world. Again, other studios either do not permit visitors in their premises, or provide sight-seeing balconies from which the visitors can view the work without in any way interfering with the personnel.

CALIFORNIA WEATHER AND DOLLARS AND CENTS

The first producer to go to California was at once struck with the ideal climatic conditions existing there for motion-picture work. He soon told others, and one by one film producers found their way to southern California until Los Angeles became the Mecca of all film men. To-day that city is the center of the industry, for over 75 per cent of the domestic films are produced in and about Los Angeles.

California weather has a certain dollars-and-cents meaning to the film producer. For it is a fact that he can count on good weather more than three hundred days out of each year, and that means not only plenty of opportunity for outside work, but his studio need consist of little more than a wooden outdoor stage with a few light diffusers. Compared to the Eastern glass-enclosed studio costing tens of thousands of dollars, the California film plant is an inexpensive proposition. And that is why so many producers are located out there.

Still, there is a vast field of usefulness for the Middle-West or Eastern studios, because of the better facilities for finishing and distributing the films. Much time is saved by having the studios and laboratories close at hand. Again, by using the Eastern

IN MARKED CONTRAST WITH THE GLASS-ENCLOSED STUDIO OF THE EAST, THE CALIFORNIA STUDIO IS AN OUTDOOR PROFOSITION, WITH THE GOOD OLD SUN FURNISHING ALL THE ILLUMINATION NECESSARY

studios in the summer the players have a complete change of locale.

The workings of a California studio are practically the same as a studio in the East. Of course, the elaborate electrical equipment of the Eastern studios is not required under the Western skies under normal conditions. The sets are erected in the open on large wooden stages, while canvas strips travelling on beams under the pull of ropes can be adjusted to diffuse the bright sunlight falling on the sets.

Even so, California studios generally have a small glass-enclosed studio for use in adverse weather, rare as it is. Also, in instances where a film must be completed within a limited time and night work is necessary, the glass-enclosed studio with its batteries of lamps is employed.

Practically every studio, unless it is situated in the heart of a thickly populated city, has its yard or extensive grounds, where certain outdoor sets can be erected. The grounds are generally termed the "lot," and directors and players are said to be at work "on the lot."

The stages, while the most conspicuous part of a studio, in reality are but a small part of a motion-picture plant. To begin with, there are the rooms where are kept the various furnishings for the sets. These rooms, known as the property rooms, vary in size according to the magnitude of the producing organization. The average large studio often has $25,000 worth of furniture on hand, not to speak of the almost endless stock of bric-a-brac, frames, draperies, glasses, bottles, curtains, and so on.

Little by little real system is finding its way into the motion-picture industry. The small studios of ten years ago were thought by their operators to be efficiently run. In those days they went out and bought such furniture as they needed for a picture setting, and used the same furniture as often as they could. Five years ago the producers again bought furniture for a set, but when it was stored away in the property room it stayed there as often as not for a mighty long time. And the sole reason was that no one knew just what was in the property room save the property man, and he didn't bother to tell the directors what was available unless they took particular pains to ask him.

To-day things are being run far more systematically. The

THERE IS NO END TO THE COLLECTION OF THE PROPERTY MAN. YEAR AFTER YEAR HIS "PROPS" BECOME MORE NUMEROUS

more modern studios have every piece of property carefully photographed and indexed. The director or art director, when planning a scene, orders his property by number. Such items as vases, for instance, are all photographed in groups and each piece is numbered. Thus the director asks for vase No. 16, pictures Nos. 534, 682, 4 and 16, table No. 82-A, couch No. 43-C, Victrola No. 3-V, and so on.

That, in brief, is system. It is fast invading every studio, for the day has come when film producing no longer can be carried on in a haphazard manner and still make a profit for the producer. Leaks must be stopped, because stern competition has made the motion-picture business a matter of dollars and cents, the same as any other legitimate industry.

A SHOP WHERE NOTHING IS IMPOSSIBLE

Then there is the workshop of the studio, where special property is constructed. Here toil perhaps the most clever and ingenious artisans in the world, for no matter what may be asked of them they never fail to make good. Thus the director may call for a section of a sewer, a dummy automobile, a Roman chariot, or a model battlefield, to be ready the next morning at nine o'clock. And at nine o'clock the next morning it is ready for him. Indeed, the film artisans, of whom the author has had much to say in a preceding chapter, know absolutely nothing of the word "can't."

Generally the film artisans are under the supervision of an old-time theatrical set builder, for to conceive and execute the multitudinous and diversified sets of a motion-picture studio calls for the greatest of ability and experience in stage effects. Orders come to the property man in all sorts of shapes, varying from ten words of a leading director to the elaborate drawings and sketches of the art director. In the case of elaborate scenes where a great deal of money has to be spent, the set is generally worked out in cardboard for the study and approval of the art director, after which it is executed full size. At times the work of the artisans is in miniature, such as a model of the French city of Orleans with two thousand miniature soldiers of Joan of Arc walking in on invisible webbing running on rollers—a model so cleverly made that no one would suspect it to be anything but genuine when

FROM MODEL BATTLESHIPS TO DUMMIES AND AGAIN TO PLASTER STATUES EXTENDS THE WORK OF THE FILM ARTISANS

flashed on the screen, although it so happened that the film story of Joan of Arc did not require this scene. At other times the work is outdoor and on a vast scale, such as the erection of a village at a cost of tens of thousands of dollars.

Plaster is one of the favorite methods of the film artisans—or shall we call them camoufleurs? For they seem to be able to do almost anything with plaster of paris. One reason why this material is so largely used is the ease with which a large number of duplicate parts may be turned out. Supposing, for instance, that an Egyptian temple is to be constructed, calling for a large number of huge stones. The camoufleurs set to work making a wooden mould for the facing of the "stone," and when this is made they are ready to turn out the plaques in large numbers. The plaster, in liquid state, is first poured into the mould, after which shredded fiber or hairy consistency is placed on the liquid mass and gently pressed in. More plaster is poured over this, and after allowing the mass to harden for half an hour, the plaque may be removed and allowed to dry out thoroughly in the sun.

There are other ways of making moulds, especially in the case of complicated designs, such as ornamental corner posts, column tops, and so on. The design is first worked up in clay, after which the model is enclosed in a plaster casing so as to form a mould. Melted glue or gelatin is then poured in between the model and the plaster casing. When hardened to a rubbery consistency, the glue mould is carefully stripped from the clay model and then used for casting as many plaster replicas as may be desired.

Sometimes the artisans work directly in plaster with sculptor's tools, producing all manner of beautiful work. Obviously, all their efforts are doomed to be temporary, for plaster at best is but a passing material. But as soon as their work has appeared in the sets for which it was intended, its *raison d'etre* has been realized. It is then doomed to destruction, either immediately by the makers themselves or in the course of a short time by the elements.

Scene painting is part of the work of the film camoufleurs. Most studios set aside a small section of the studio for the scene painters. This section, or slice, to use a better term, is often a room

REALISM ALSO EXTENDS TO THE GARMENTS WORN BY PLAYERS, AND PERIOD PLAYS KEEP THE WARDROBE DEPARTMENT BUSY. HERE, FOR INSTANCE, ARE THE CLOTHES OF CLEOPATRA IN THE MAKING

measuring five feet wide by one hundred feet long and twenty or more feet in height. The scenery, in the form of canvas nailed on wooden framework, is mounted on a carrier which may be raised or lowered through a slot in the floor; in this manner the scene painters, while remaining on the floor, can reach any part of the huge canvas by raising or lowering the scenery.

Aside from the scene room, huge storage space is required for the storing of the scenery. It often happens that the same scenery can be employed again, or, in the case of a serial film, the same scenery is called for some months later. So hundreds of old sceneries are to be found stored away in some out-of-the-way corner of the studio.

To those not familiar with studio activities it may be of interest to know something of the quantities of materials used in the course of one year. Earlier in this book such a list was given, but only for a few of the more common materials. Here is another list, applying to fifty-two pictures produced by a leading organization: 1,500,000 feet of lumber, 12,000,000 nails, 100,000 screws, 5,000 locks, hinges and door knobs, 75,000 feet of wall paper, 1,500 gallons of paint, over 100,000 pieces of furniture, and 300,000 props. There was consumed in lighting these sets 1,000,000 amperes of current, also 1,500,000 feet of film and a countless number of horses, cows, sheep, goats, birds, goldfish, dogs and oxen were employed. As for bears, snakes, racoons, lions and elephants, the number of these animals used would equip the Barnum and Bailey circus several times over.

In the matter of interior scenery, system is again encountered. Only a few years ago directors called for elaborate wall paper which they selected from the catalogue of some expensive wall-paper manufacturer. Perhaps the paper would cost $1.00 a yard, yet when it came to be filmed the results were miserable, because the design or color scheme did not lend itself to being photographed.

But all this has changed in the more progressive studios. Perhaps not more than a dozen wall paper designs have been chosen after careful photographic trials, and these are photographed again and indexed and cards so that a director can get just what he desires, knowing at a glance just how the wall paper will appear in his film scene. There is no ground for disappointment

ELECTRICIANS AND CARPENTERS PLAY A LARGE PART IN ALL PHOTO-PLAY PRODUCTION

later. And the wall paper may cost 15 cents a roll instead of $1.00 as before!

WHERE CELLULOID STRIP IS ANIMATED

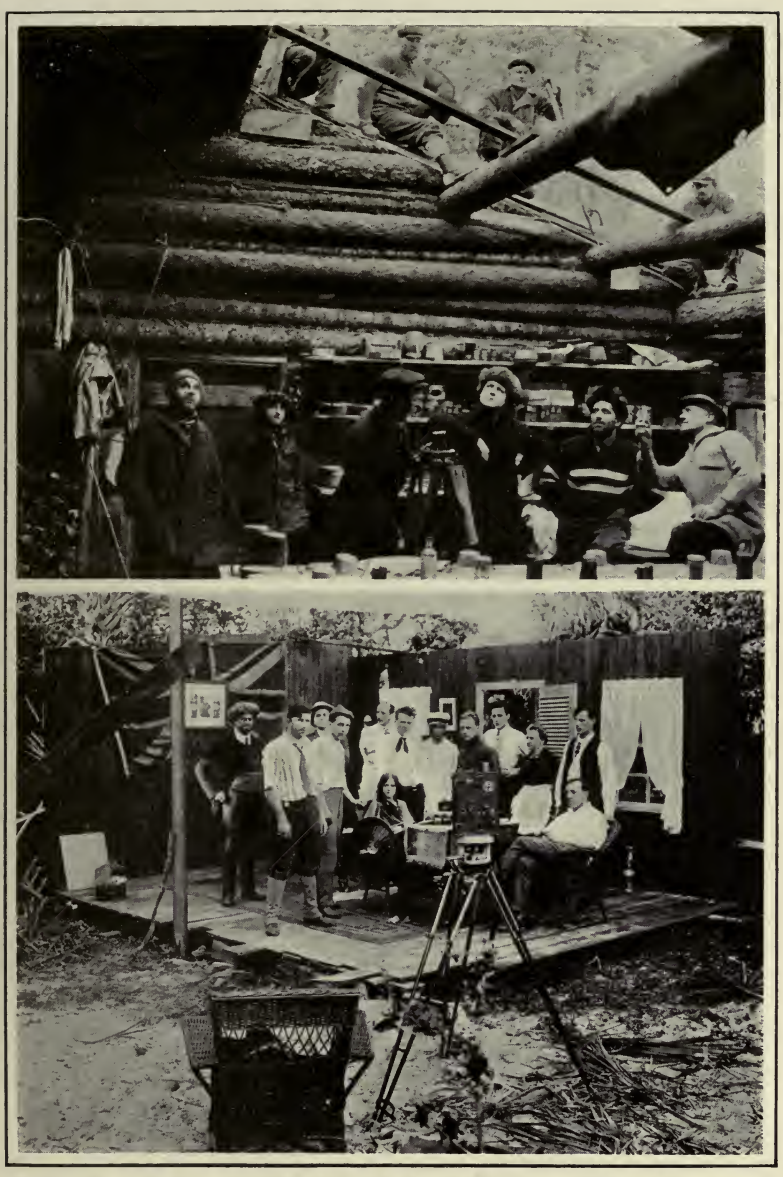
So far this description has only taken us through those departments directly connected with the staging of the films. There still remain the dressing rooms for the players, which vary from the spacious and elaborate dressing rooms for the stars to the small rooms of the "extras." But in almost every studio worthy of the name there are all kinds of accommodations for the players, from the highest to the lowest, such as baths, showers, electric light, hot and cold water, and proper dressing quarters. For the film producer, like any other business man, long ago came to realize the fact that the players are his mainstay: he cannot get along without them, and to treat them right is to secure the best results.

Practically every studio of any size has its own developing and printing departments, unless it is but a branch or an isolated company of players far removed from the parent organization, when the film is generally developed on the grounds, projected, and if found satisfactory shipped to the home laboratory for printing. In this manner the director can tell whether his work is satisfactory before proceeding with the other work in hand.

So much for the regular run of studios. But there is one city in the world which is entirely devoted to the producing of motion pictures—a city of 15,000 souls and extending over some 800 acres. It is the only one of its kind in the world, yet it has no characteristics since it can turn into Rome, Athens, Petrograd, Paris, Madrid, Cairo, New York, or any other city over night. In brief, it is but a collection of backgrounds.

A CHAMELEON CITY—THE BACKGROUND METROPOLIS

A short trolley ride out of Los Angeles brings one to the gates of a motion-picture city, or call it chameleon city, if you please. It is located in the beautiful San Fernando Valley of southern California with every climatic advantage a director could wish for. Indeed, within an hour's ride the director has the entire range of climates from the tropical to the temperate and then to the arctic. The latter, strange as it may seem, is to be found on



INTERIOR SCENES CAN READILY BE MADE BY THE COMPANIES OUT IN THE FIELD, WITHOUT A CONVENTIONAL STUDIO

top of lofty Mount Lowe, which is readily accessible by trolley car.

But the main object of this motion-picture city has been to keep the directors on the "lot"; that is to say, almost every kind of background is at hand in the studio grounds. To that end every building has been designed with a four- or five-fold usefulness in mind. Every side is of a different type of architecture and usually represents a different kind of usefulness. For instance, a shelter designed primarily for a saddlery shop and a blacksmithy has a front elevation that is in keeping with the nature of the building. From the other three angles, however, it has the appearance of a Gothic hunting lodge, military barracks, and a Wild West ranch house. In addition to this, any one of these front elevations can be changed over night to represent an entirely different kind and character of building. And the same idea has been carried out throughout the city.

There are numerous waterways through the grounds, including a large lake; and where the natural ones have not proved of sufficient pictorial value, others have been constructed by the film camoufleurs for the convenience of directors and cameramen. The bridges which cross the waterways are, following the general rule of the city, convertible. That is to say, any bridge at short notice can be converted into any type of bridge that may be desired by the director, whether it be a high-arched Japanese bridge, a steel bridge, a wooden bridge, or a Venetian bridge. Again the same thing applies to the numerous roads leading through the grounds, hardly two of which are alike, for they run the entire gamut from plain dirt roads to high grade macadamized roads, so as to offer any kind of background sought by the director. The main boulevard through the grounds is over six miles in length.

Some idea of the magnitude of this wonderful motion-picture city is obtained from the water system. Every building is supplied with water 99 per cent pure, fed to a reservoir from seven artesian wells at the rate of 300,000 gallons a day.

There are two distinctive sections of Chameleon City: the ranch section, which was the first to be completed, and the city section. In the main the ranch section is used in the making of Western life, Indian subjects and other photoplays that require

NOT A ROW OF BATH HOUSES BUT THE DRESSING ROOMS FOR THE "EXTRAS" EMPLOYED FOR IMPORTANT MOB SCENES BY ONE OF THE LEADING STUDIOS

rugged backgrounds. On the other hand, the city section is employed in producing pictures that require special and elaborate backgrounds.

The main feature of the city section is no doubt the enormous outdoor stage which is built entirely of reinforced concrete and steel framework. It covers a ground space of 156 feet by 320 feet. The concrete of the floor is six inches in thickness, as are likewise the walls of the buildings adjoining it. At the rear of the stage are the dressing rooms, directors' offices, toilets and shower baths. Hot and cold water, electricity and all other modern conveniences are features of the stage. In the space for acting there are three pits, twelve feet deep, which are intended for water and basement pictures. The stage has two scene docks 50 by 120 feet, the roofs of which are used to house the light diffusers which move on steel girders above the stage. The acting space measures 65 by 320 feet, and can accommodate upwards of ten sets at one time, depending on their size.

The principal building in the new section of the city is the administration building, which contains the manager's office, directors' offices, reception hall, bank, business office, telephone and telegraph booths, and literary rooms, while above the center of the main floor is the observation tower from which the manager may see all sections of the ranch.

The carpenter shop is directly to the left of the administration building, where all of the accessories needed by the motion-picture city are made. In this building are also located the plumbing shop, electricians' quarters, drafting rooms, dark rooms and camera rooms. The restaurant and refreshment stand are located at the right of the administration building, and there is also an open air and closed café close at hand.

The production of thrilling motion-picture dramas often results in accidents, for that is the price of realism at times. So there is provision made in this bizarre community for the unavoidable injuries to actors, in the form of a well-equipped hospital which has a trained nurse and doctor always in attendance. There are two wards available, one for the women and one for the men, each having two beds.

Near the hospital in one of the canyons is a Roman theater and a stadium, having a seating capacity of about 1,400 people.

LOOKING DOWN ON A CALIFORNIA OUTDOOR STAGE, SHOWING THE DIFFUSERS WHICH CAN BE REGULATED OVER EACH SET SO AS TO VARY THE INTENSITY OF THE SUNLIGHT

The grounds before and behind the buildings are laid out in lawns, there being a Roman bath with pool and fountain. There is also a building measuring 50 by 200 feet, known as the electric studio, where pictures may be made during rainy weather and at night, with artificial illumination as in the Eastern studios.

The ranch or Wild West section also has its stage, behind which are dozens of dressing rooms and property rooms. Farther on is a fully equipped carpenter shop and a scenery department. But the main feature of this section is the large zoo, containing a large number of animals. At the time this is being written the zoo contains twenty camels, two elephants, several lions, seals, tigers, leopards, snakes, bears, wolves, and so on, all available for "animal stuff."

Other features of the ranch are the blacksmith shop and the arsenal. The latter contains large stocks of firearms of all sorts, to meet the requirements of almost any scenario. There is also a corral containing over one hundred fine horses. Bunk houses, clubs and other structures conclude the list of interesting points worth visiting if a person chances to pass through this community.

IN THE GOLDEN WEST

While the community just described is perhaps the largest institution of its kind in the world, other California studios are very much along the same general lines, even if they do not compare with it in magnitude. Thus other producers have large yards or "lots" where they can stage outdoor scenes, and the staging accommodations are almost unlimited, thanks to the outdoor stages. At least one other producer maintains a very fine zoo, and well does he make use of it in specializing rather heavily on "animal stuff" in his thrillers.

In the East, where property is in general far more expensive to acquire, studios do not have very large yards, hence their activities on the "lot" must necessarily be limited. One studio, however, in the vicinity of New York has a fair sized yard which includes a pool, good use of which is made in many of the pictures coming from that plant. But the large yard is strictly a Western characteristic, as is also the outdoor stage.

With hundreds of thousands of dollars represented in many of the studios of the leading producers, it is seldom that the directors

ANOTHER CALIFORNIA OUTDOOR STAGE IN THE FOREGROUND, WITH A GLASS-ENCLOSED OR SO-CALLED ELECTRIC STUDIO FOR MAKING PICTURES DURING INCLEMENT WEATHER OR AT NIGHT

are unprepared to handle any given scenario. For the scenario writer may call for a street scene in Shanghai, a naval battle, or a charge in No Man's Land, and the director will go ahead and produce it; that is, provided always that the story is worth the expense and the trouble involved. Such is the scope of the modern motion-picture studio.

CHAPTER VIII.

THE GENERALS OF SHADOWLAND

ALL THE WORLD is the stage of the photoplay producer. He can think big things, and yet still bigger things are always possible of execution. For the motion picture has all outdoors for a stage, and thousands upon thousands of players can be used in a single scene if the production is worth the expenses involved. Mechanically, there is no limit to the size of the photoplay stage, save, that if the dimensions are forever expanded a time comes when the players are of microscopic proportions when shown on the screen. So it is not surprising to find photoplays in which hundreds or thousands of actors appear in certain scenes. The handling of this class of film, or "mob stuff" in the parlance of the profession, finds the director at his very best.

WITH all outdoors for its stage and with Nature as the scene painter, the motion picture will always possess a tremendous advantage over the legitimate drama which must necessarily confine even its most grandiose efforts to a comparatively small stage and artificial scenery. Yet it would not be true to claim every advantage for the motion picture; indeed, its disadvantages are often evident and at times troublesome, although constant improvement has done much to eliminate the better part of them. Nor would it be true to claim that the natural scenery and the unlimited stage facilities have played a most important rôle in making the shadow-play what it is; for quite apart from these features the present photoplay could still hold its own.

Nevertheless, the stirring scenes of thousands of soldiers engaged in realistic battle; of thousands of strikers menacing an industrial plant; of thousands of men, women and children marching to the palace of a despotic emperor to demand his abdication; of thousands of people fleeing from the oncoming streams of molten lava pouring down from a volcano in full eruption—all these belong, and are only possible, in the realm of shadowland. Realizing this fact full well, the motion-picture director works largely in the open; and when a story justifies the expense and trouble, he does not hesitate to gather an army of players and make use of a natural stage whose dimensions are measured neither in feet nor yards but in miles.

Big scenes are rather the exception in motion pictures because of their expense. Nevertheless, it is becoming increasingly common to employ big scenes even in the regular run of feature productions; and in many instances the photoplay is produced around the big outdoor scenes in which many people appear.

SELECTING AND PREPARING THE OUTDOOR STAGE

A motion-picture director does not build or paint his outdoor scenery: he selects it. As has previously been stated in this book, not so long ago the director personally attended to the selection of outdoor sites or "locations," usually employing a fast automobile for the purpose of scouring the country for many miles about the studio. But with the advent of efficiency methods in the industry there has come a new order of things: the present

THIS IS WHY A PRODUCING COMPANY NEEDS "EXTRAS" FROM TIME TO TIME: A MONTE CARLO, RESTAURANT OR BALL-ROOM SCENE OFTEN CALLS FOR A HUNDRED OR MORE PERSONS FOR "ATMOSPHERE"

tendency is to break up the work into different and distinct classes or departments, each of which is handled by a specialist.

In a large producing organization the director generally leaves the matter of locations to the location director who has data and other facilities for finding a suitable background for the big scene.

Once the location is settled upon, the outdoor stage must be more or less prepared before the actors are brought out, for with a few hundred or a few thousand players getting anywhere from two to five dollars a day it is quite an easy matter to waste hundreds and even thousands of dollars in useless delays. Sometimes it is necessary to build elaborate structures, such as entire villages or fortresses or public buildings, as the case may be, and anywhere from a few weeks to a year may be spent in the erection of such sets. Battlefields, on the other hand, also require considerable time for the preparation of the terrain, especially if modern warfare is to be depicted with its trenches and dugouts and barbed wire belts.

Now the preparation of the terrain is only a part of the work, for there still remain the construction and concealment or camouflaging of camera platforms and directing stations, so that the action may be directed and photographed simultaneously from a number of different points. Also, if the scene is quite extensive, a telephone system must be installed, connecting with the various parts of the outdoor stage. In order that the action of various groups of actors may be synchronized and at all times remain under control of the head director, a telephone system joins up assistant directors and cameramen scattered about in concealed posts, with the director and his own cameramen atop the lofty platform at one end of the landscape. For it is a fact that the telephone is practically indispensable in handling mob scenes scattered over a wide territory, although other systems of issuing orders are feasible and are frequently employed by some directors, as we shall learn presently.

Still another feature of the preparations is the planting of mines to simulate bursting shells and land mines in the case of modern battle scenes. Some companies employ a specialist for this end of the undertaking—a man who has had wide experience in the handling of explosives and pyrotechnics. Following the general instructions of the director, this man plants his mines at specified

MOB STUFF FROM THE DIRECTOR'S POINT OF VIEW: HUNDREDS OF "EXTRAS" ARE USED IN SUCH OUTDOOR SCENES AT A GREAT COST, SO THAT THE DIRECTOR MUST GET HIS "SHOTS" WITHOUT DELAY

points, and places an inconspicuous stake above each mine, finally making a chart of the arrangement for reference purposes. The mines are electrically fired during the filming of the production, which calls for considerable concealed wiring and some sort of firing station.

And when all preparations have been completed, the army of players and cameramen and directing staff arrive bright and early one day to film the big scenes. They come in all sorts of vehicles, ranging from big motor buses capable of carrying a dozen or two of the "extras" to the stream-lined racing car of the leading lady. If the director knows his business, and it is presumed that he must when his organization entrusts the production of a big scene to him, he has already instructed his players as to the work to be done so that they quickly take their places and soon the action is in full swing.

THE HEADQUARTERS OF THE REAL COMMANDER-IN-CHIEF

Perched on top of a wooden structure which towers high above the outdoor stage, the director and his entourage usually enjoy an unobstructed view of the landscape and players. Depending upon the magnitude of the production, there are under his immediate command two or more cameramen with their cameras, and a number of assistant directors or lieutenants stationed not only on the elevated platform but also scattered about the field at various vantage points. The handling of so many people cannot be undertaken by one man alone, especially when it is recalled that the bulk of the players are "extras" or unskilled actors; so the practice is to assign the assistant directors to various groups of players who, while immediately under the direction of these lieutenants, are really under the general direction of the director-in-chief.

In issuing orders to nearby groups of players, such as in close-up scenes in the fore part of the field, the director and his assistants employ megaphones; but in handling actors a few hundred feet away this means becomes totally inadequate. It is then that the telephone system comes into play, and messages of instruction to the men at various telephone posts are transmitted to the players through megaphones by the assistant directors. But the telephone is not always employed; in some cases a

PERCHED ON A HIGH PLATFORM, TOGETHER WITH ONE OR TWO CAMERAMEN, THE DIRECTOR KEEPS A GENERAL EYE ON WHAT IS GOING ON IN THE BIG SCENES, WHILE LEAVING THE DETAILS TO ASSISTANTS

system of wig-wagging is used, and it has to recommend it the fact that the players themselves can read simple signals if necessary.

The main battery of cameras is usually stationed near the director so as to obtain a clear sweep of the stage, but at various points hidden cameras are lying in wait to film glimpses of the action or what might be termed details. In the storming of a medieval fortress, for instance, a battery of cameras is employed to film the entire scene, while a hidden camera may be used to record the struggle in the moat, another for the fighting on the parapet, and still another for the struggle at the portcullis. True, these scenes might be taken by the same cameraman, one after another, but the players would then have to be engaged for a longer period with proportionately greater expense; and what is more, the various bits of action would not interlock to the nicety that is realized with the multiple camera method now practiced. And "continuity," as has already been brought out in a preceding chapter, is the *bête noir* of all productions.

In no small degree the skill of a director is shown by his ability to issue orders to the various cameramen, who "shoot" or "cut," filming and resting, as directed over the series-connected telephone system. "Camera three, shoot," starts said cameraman filming the bit of action immediately in front of his camouflaged post, and a few moments later the message "Camera three, stop," brings the cranking to a halt. Of course, the telephones being connected in series, so as to save the additional work of installing a switchboard, causes every message to be heard by all the men connected in on the line, so that numbers are given to designate the men for whom the instructions are intended.

HOW THE BIG SCENE CAME INTO ITS OWN

One of the earlier American productions on a large scale was produced in California some four years ago under the direction of our best-known director. In this production over 1,000 players and 300 horsemen were employed. Many expensive sets had to be constructed, foremost among them being a replica of the ancient city of Bethulia, the mammoth wall that protected the ancient city, a faithful reproduction of the army camps with all their barbaric splendor and dances, and chariots, battering rams,

WHILE THE DIRECTOR IS TAKING CARE OF THE GENERAL SCENES, THE ASSISTANT DIRECTORS BUSY THEMSELVES MAKING CLOSE-UPS AND CERTAIN DETAILS WHICH LINK UP WITH THE MAIN THEME

scaling ladders, archers' towers and many other machines of warfare of that period of long ago.

Prompted no doubt by the success of his earlier production, this director undertook America's first motion-picture classic, based on our Civil War and the period of reconstruction. In the battle scenes of that production thousands of actors afoot and on horseback were employed, and in all it is claimed that something like 15,000 people took part. The direction of the big scenes was facilitated by the use of a telephone system, and the director, perched high above the field, was able to talk with his cameramen and sub-directors in all parts of the field, ordering out the cavalry at the right moment, the artillery fire at another, and the various attacks where and when desired in conformity with his reconstruction of Civil War battles. One cannot help comparing this task to that of a painter working on a battle scene; for the director, even if he does not wield the brush and pencil and pigments, none the less creates the beautifully finished picture which is ultimately presented on the screen.

FIGHTING BLOOD AND FILM REALISM

When viewing the average battle scene the question invariably arises in the mind of the spectator: Are they really fighting? And the question is perfectly justified, for the striking realism of the scenes is at once apparent and even alarming at times. The answer is that the men do fight—sometimes too earnestly, although every precaution is taken to the end that they will not inflict serious injury on one another in their zest. The battles must be kept in the sham state.

The story is told of how 3,000 colored players taking part in some of the scenes of a Civil War photoplay were thoroughly alarmed by the vicious charges of the Ku-Klux-Klan men, and as a result of these over half their number deserted and refused to finish the scenes in which they were slated to appear. Coaxing having utterly failed, a new lot of men had to be sought and hired, causing a serious loss of time and money.

But this occurrence is by no means unusual, for the players often take a keen, almost too keen, interest in their work, forgetting that they are fighting not for king and country but for a few hundred feet of celluloid ribbon—and two dollars or so per day.

FILM REALISM OFTEN BECOMES TOO REAL, FOR EVEN THE "EXTRAS" ARE APT TO TAKE THEIR WORK QUITE SERIOUSLY

Prior to our entrance into the European war certain directors had experienced trouble in staging battles based on the war, especially when contending nationals met in sham battles. On a certain occasion Italian pseudo-soldiers came in contact with Austrian pseudo-soldiers in a Chicago studio, and there raged a battle which was bloody even though waged with blunt bayonet and blank cartridge. Too much realism is worse than none, so directors have had to be careful in their selection of extra players for battle scenes.

Accuracy is an essential in the high grade production, and in producing his first classic motion picture one of our leading directors paid particular attention to the small details. During a big battle scene a dispute arose among the actors as to the color and kind of horse ridden by the famous commander-in-chief of the Confederate forces when he was campaigning at the head of the Army of Northern Virginia. The director was away at the moment:

"Better stop 'taking,'" suggested the cameraman, "till we telephone in and have the facts looked up and verified."

A high-powered touring car had glided up behind the group. In it sat the director himself.

"What's the fuss about?" he inquired. When told, he smiled tolerantly. "Why, Lee's dappled gray charger 'Traveler,'" he remarked, "is one of the three most famous horses in history. Bucephalus' and Napoleon's nags were the other two, and I've got a horse as near like 'Traveler' as possible waiting in that stable yonder. Go on with your 'take.'"

In a more recent classic production, the director secured his idea from a Federal Industrial Commission report, which stated that a large number of men had gone out on strike owing to insufficient pay in the face of the rising cost of living, and that when the strike was quelled by exceptionally "strong arm" methods, 19 strikers were missing—the victims of the corporation's guards. With little else to work from except this report and historical accounts, the director set about producing his master play which depicts four big epochs in the history of mankind; in fact, it is said that he did not employ a scenario. Thousands of actors appeared in the various scenes, and the accuracy of the historic events has been highly praised by connoisseurs.

THESE GERMAN SOLDIERS ARE FIGHTING NOT FOR FATHERLAND AND KAISER BUT FOR THE FUN OF IT AND A FEW DOLLARS A DAY, UNDER THE BALMY SKIES OF SOUTHERN CALIFORNIA

In a war photoplay produced in California, the wig-wag system of signaling was employed in the big mob scenes. Instructions were given over a large area by flag signaling, in much the same manner that the Navy and Army units converse with one another at a distance. In order to obtain several spectacular rain scenes a 300-foot hose was stretched from the ocean to the plateau on which was stationed the camera. At a given signal the pumps were set working and two nozzles played even streams on the assembled players, while the camera recorded the action from under a large umbrella. While this feature has little to do with the handling of mob scenes, it shows that there are times when the director even directs the weather—man-made weather, in this case.

TELEPHONE, WIG-WAG AND WIRELESS

Among the recent productions, one based on the life of the immortal Joan of Arc and produced in California, contains a number of inspiring battle scenes of those days when men fought at close quarters with spear and mace and battle axe, each carrying a hundred pounds or more of steel protection in the form of a suit of armor. Fourteen hundred men took part in the battle scenes which extended over a field one hundred acres in area. The director was assisted by twelve sub-directors stationed with cameras at various vantage points about the field. Each sub-director, as well as the director, was equipped with a standard telephone operator's set, an arrangement enabling the director-general to control the movements of the participants and to direct the entire action from his post at the center camera stand. Everything that the director said here could be heard by the twelve sub-directors at their respective stations. Although it is usual to spend at least two days in rehearsing a big battle scene, by means of the telephonic instructions as given by the director-general it was found possible to start taking pictures after less than one hour's preparation.

Over 2,700 men, among them 1,200 soldiers belonging to the California National Guard, 325 horses, several batteries of field guns and 25 airplanes, and one armored tractor or "tank" figured in the battle scenes of a recent serial picture. Various means were employed in transmitting the director's instructions to the play-

FROM THE MASSACRE OF BELGIAN CIVILIANS TO THE FRENZIED WALL STREET SPECULATORS IS ALL IN A DAY'S WORK

ers, among them being the telephone, wig-wagging, and even wireless telegraphy. The latter was necessary in directing the airships which could not be reached in any other manner quite so effectively. All the latest phases of warfare were depicted in these battle scenes, and something like three months was required for the battle episodes of the serial.

Another modern battle story was made some time ago in the vicinity of New York. In it are included a number of good fighting scenes. These were staged in Staten Island, across the bay from New York city. Three weeks were spent in preparing the ground, and one week in taking the actual scenes. Over one thousand soldiers of the Coast Defense Corps, New York National Guard, took part in the picture.

In this production the wig-wag system was employed for directing the distant action, and the megaphone for close-up work. In order to keep the spectators from wandering into the picture, that is to say, into the range of the camera, a system of telephones was installed to facilitate communication with the outpost guards. In all, six orders were issued before actual pictures were taken of these particular scenes, which illustrates in a way the complexity of a typical big battle scene.

The entire field was mined and the location of the charges indicated by inconspicuous stakes driven in the ground. The director, provided with a map of the mines, was in a position to issue orders for the electrical firing of the various mines, thus giving the utmost realism to the charge of the troops through a pseudo-barrage of bursting shells.

There were numerous "realistic" scenes in this war photoplay, such as bomb-dropping, Zeppelin and airplane fights, destruction of enormous battleships in dramatic sea fights, and so on. But these were not as destructive as they appear. The studio yard at that time was the battlefield and the high seas in miniature.

Still another recent production includes a number of fighting scenes of the house-to-house and street-battle character during the invasion of Flanders by the Germans. These scenes were staged in a village erected for the purpose near Sheepshead Bay, Brooklyn. Because of the proximity of the players to the director, the megaphone method was used almost exclusively by the director. Among the startling scenes in this production was

MOUNTED ON A CHARGER AND SURROUNDED BY HIS ASSISTANTS, AND KEEPING IN TOUCH WITH PLAYERS AND CAMERAMEN ALL OVER THE FIELD, THE DIRECTOR IS INDEED A GENERAL OF SHADOWLAND

the shelling of a cabaret room used at the time for hospital purposes. In producing this scene explosives were placed at various points in the walls and fired electrically at the propitious moment to simulate bursting shells.

A VILLAGE ON A CLOCKWORK BASIS

A director recently achieved a signal success in a New England village scene which he was directing for a feature photoplay. The street of the village was built especially for him on the grounds of the studio, and the whole village with its various side streets and residential districts was more than a quarter of a mile long. At the extreme end of the main street was placed a lofty camera platform, built so that the director might raise or lower his camera to any height desired.

In the scene were depicted the usual little groups of village loiterers. At one spot two men were "pitchin' horseshoes"; at another, the itinerant peddler was selling his wares back of a wagon; at still another the village drunkard was haranguing the usual crowd of village loafers. At the end of the street farthest from the camera, a wagon loaded with hay swung into vision and passed down the main street. When it reached a certain cross street, a throng of children ran laughing and playing into view. It was evident that "school was out." The youngsters swarmed over the hay wagon, while some of them climbed on top for a ride.

To have these bits of "atmosphere" coördinated required careful preparation, especially as the difficulties of rehearsing each group in its work were great. From his vantage point on the camera platform the director commanded a clear view of all the action. Masked by buildings and doorways, six assistants under the charge of the director's lieutenant, or right-hand man, each started his own group of actors in their particular business. At the foot of the camera platform was a telephone switchboard temporarily placed so that the director could call out his instructions to the operator who relayed them to each assistant over field wires.

Now in the film scene the line of wiring which stretched down the main street in reality carried the telephone lines through which the director kept in touch with his assistants. The whole, as is so often the case with big mob scenes, takes but a few

THE VENICE OF ITALY TRANSPLANTED IN CALIFORNIA, THANKS TO THE SKILL OF THE CARPENTERS AND PAINTERS

minutes on the screen; but here again the effect was well worth the hours of preparation which had been expended on it.

WHEN THE PUBLIC ACTS FOR THE PICTURES—AND DOESN'T KNOW IT

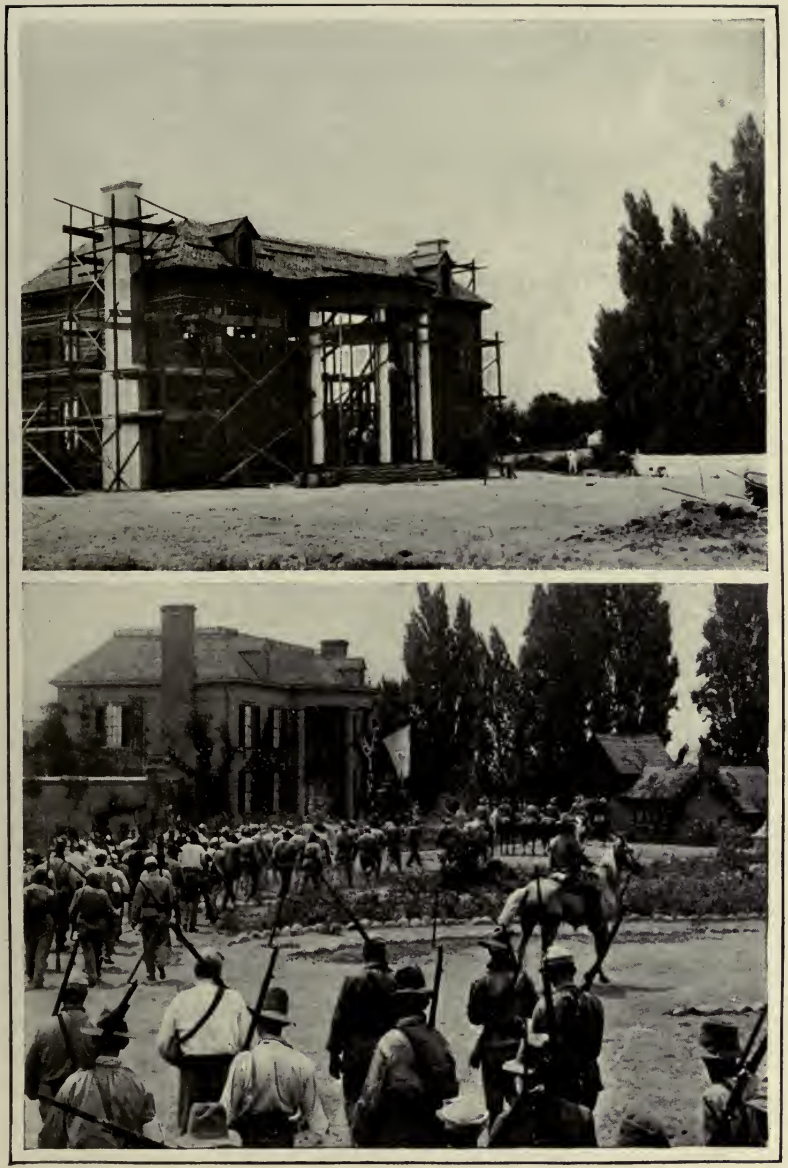
Just one instance will serve to demonstrate how a director sometimes secures a splendid mob picture without letting the involuntary players know of it. A director was recently confronted with the difficulty of securing a scene in which many persons crowd about several newsboys who are announcing an important "extra." According to the film story, the "extra" tells of the election of a disliked candidate for office. And the populace show their dislike to the point of violent anger.

After considerable thought the director decided on a somewhat unusual and bold scheme, although others of a similar nature are resorted to regularly by different directors. He had several boys don the garb of newsboys and sent them out on the boardwalk of Venice, California. Meantime the cameraman and this director concealed themselves in a nearby building, within full view of the pseudo-newsboys.

Soon the large crowds passing up and down the boardwalk were startled by the cry of the newsboys to the effect that England had declared war on the United States. Only one thing could happen: everybody within hearing rushed up to get a copy of the "extra," and then stood about while intently searching through the pages for the item the newsboys had announced. One by one they began to realize that a joke had been played on them, and their astonishment changed to wrath.

It only remained for the cameraman, director and newsboys to escape the angry crowds. This they did successfully, after having obtained the desired picture.

There is still another way in which persons pose for mob pictures without ever being aware of the fact. This is in connection with the work of the "weekly" films or "current events" films. Scenes taken at race tracks, army maneuvers and camp scenes, college games and contests, fires and explosions and other catastrophes, and similar scenes are always available in dramatic films some day or other. If a director is putting on a race track picture it is generally possible for him to make use of sections of a film made at some well-known racing event. Clever editing



PREPARING THE "STAGE" FOR THE MOB: SOUTHERN MANSION IN COURSE OF CONSTRUCTION AND DURING FILMING

causes these scenes to dovetail to a nicety with the pattern of the film story, and no one is any the wiser. The same can apply to all manner of topical film, and this fact the "weekly" men always have in mind. Indeed, they never hesitate to photograph wrecks, fires, explosions, society events and other similar material, for who knows when one director or the other will be able to use this material and thus save thousands of dollars on a feature production?

But it takes skill, to be sure; for the director must know just how to insert these extraneous scenes without losing the continuity of his story. There have been numerous instances where a film play has been produced merely to fit around a certain collection of scenes made years before.

Such is the work of the generals of shadowland warfare—the directors of photoplays. Hundreds of instances might be cited if space permitted, but no greater credit to these men could possibly be done.

One moment finds the director handling a highly emotional actress in a close-up scene, where the stage is measured in feet; another moment he is directing a thousand or more untrained, unemotional extra players in a stage five miles deep with the infinite blue of the sky for his ceiling. In the first instance he must handle his subject with consummate skill so as to bring out the foremost characteristics of the player, yet tone down the tendency to overact which is so often to be contended with. In the second instance he must secure plenty of action and enthusiasm, despite the poor material in hand and the difficulties presented by the magnitude of his stage.

But done it must be. For there is no such word as "can't" in the language of the film man.

CHAPTER IX.

TRICKS OF THE SCREEN

THE OLD SAYING that "the camera never lies" should be revised. It may have been so in the days before the motion picture; but from the earliest times the screen art has made the camera lie and lie persistently and interestingly. "Tricks" are the more polite name for camera lies, and "trick pictures" are pictures which do not tell the truth. Yet tricks are a big asset in photoplay production; and in the vast bag of tricks rests one more advantage of the motion picture over the stage. Today there are few pictures of the strictly "trick" category. Tricks are used rather sparingly, because there are so many prosaic themes which can be produced with straight photography. Still, tricks are used to obtain pleasing effects, and often in comedy productions to obtain a hearty laugh.

BECAUSE of the illusions and wonderful tricks that can be performed in cinematography, the screen will always possess a tremendous advantage over the legitimate stage, aside from the matter of limitless scenery. All manner of things come within the scope of pictures portraying real life, and there is still another field opened up through the possibilities of mechanical contrivances, photographic manipulations, and ingenious scenery effects. Whereas the audience of the legitimate stage view the production directly through their own eyes, the motion-picture audience really sees through the single eye of the camera —and because of that fact it only sees what the producer has deigned that it should see. Which, of course, facilitates tricks and effects and illusions of all kinds.

THE MAGICIAN OF THE SCREEN

Back in the early days of motion pictures when the photoplay had not yet come into its own, the trick picture was the mainstay of the industry, and it took its place beside the travel picture and science film. Children and adults alike were entertained by mysterious pots and plates and tableware that danced about as if possessed of life, by tiny fairies, by startling conversions such as from a man to a rabbit, and by no end of similar subjects. With the advent of the photoplay, however, these films practically disappeared, for the reason that their production is time-consuming and expensive, and the demand for such films is too small to warrant the trouble involved in their manufacture.

It was a French magician, M. Melies, who first saw the possibilities of the trick pictures and immediately set to work applying his stage experience in this newly found field. He devoted much time and thought to the production of such films, and was amply rewarded by the signal success of his products. Later his work was emulated by others, among them Mr. Robert Paul of England. Then came the photoplay, and the trick picture was no longer a necessity. And while it passed out of existence as a class, many of the tricks used in those early subjects have been retained by present-day producers.

To give an account of every trick employed in screen production would require a book in itself—a loose-leaf book, for that matter, since new tricks are being applied almost every day.

HANGING FROM THE TWENTIETH STORY OF A SKYSCRAPER AS IT LOOKS IN THE FILM AND BEHIND THE SCENES

There is no end to new ideas in motion-picture production, hence the impossibility of covering all tricks. So it is the author's plan here to cover only the basic and more important tricks, which, in some form or another, are the basis for practically all the tricks now seen on the screen.

Much of the trick work is done photographically. Among the devices employed are the "fade-out" and its reverse effect, the "fade-in," already described in a previous chapter. Aside from the regular employment of these effects to open and close scenes, and for dissolving one scene into another, there are many trick possibilities. A fade-out followed by a fade-in, so timed that the image on the screen does not darken perceptibly because the two scenes overlap almost entirely, serves to introduce new characters in a gradual and pleasing way. Indeed, the new characters sort of "materialize" as we are told spirits do at a seance. The fade-out is accomplished in the usual manner, and when it has reached its end, the characters are introduced and the film is wound back again, after which the camera still pointing at the same scene in which the additional characters have now been introduced, starts filming with a fade-in.

The sudden stopping of the camera is a source of many surprises. Any old-time film "fan" recalls the trick pictures in which characters would suddenly disappear from a scene in a cloud of smoke, or would suddenly turn into something else. These are the simplest of tricks, notwithstanding the baffling results. In the first class of effects the camera is stopped short, the character or characters step out of the scene, a smoke pot is ignited and placed on the spot formerly occupied by the player or players, and the camera again starts taking pictures. In the second class the character or characters leave the stage after the camera has stopped short, and the desired object is placed where the character or characters stood last. Of course, the camera cannot always stop short and the substituted subject does not always coincide on the negative as made. For this reason some cutting is required on the negative in order to match up the two strips of film made in the camera.

Many tricks can be accounted for by stopping the camera. Where a player suddenly changes into another character or into a statue, the stopping of the camera and the substitution explain

TRICK PICTURES DEPEND A GREAT DEAL UPON THE ART OF THE SCENE PAINTERS, WHOSE ABILITY TO PAINT BIRD'S-EYE VIEWS IN CORRECT PERSPECTIVE MAKES MANY A SEEMINGLY DARING FEAT POSSIBLE

the result. If the conversion is gradual and mystifying, it is done by a fade-out and fade-in, as already described. In either case the players proceed with their work until the director issues some such command as "Hold!" or "Rigid!" whereupon they stop further acting instantly and hold their postures. The substitution is then effected, and with the continuation of the filming the players come out of their rigid postures and continue with the action.

WHY BREAK GOOD NECKS WHEN DUMMIES ARE AVAILABLE?

The hair-raising scenes where the villain is cast from the top of a tall bluff by the curly-haired hero are largely possible because of the sudden stopping of the camera and the substitution of a dummy. The fight, for instance, proceeds up to a certain point where the unlucky villain is about to drop over the brink. Then the camera stops short, and a dummy, dressed exactly like the villain, takes his place in the hands of the pseudo hero. Then the camera starts up again, and the hero, with a final heroic effort, pushes the dummy over the brink. Another camera "shooting" the scene from some vantage point, secures the action of the life-like dummy hurtling to its doom. And finally, when the dummy has reached the bottom, the cameraman sets up his machine while the real villain takes the place of the dummy. The "close-up" of the real villain lying in a heap concludes the thrilling fight. Much depends on the cutting and matching up on such scenes, for the camera does not stop quite short enough, nor does it start quite soon enough, to join up the scenes. There is some waste at the end and the start of adjoining "takes," which must be eliminated in the cutting room.

One of the trick pictures turned out by a French producer some years ago depicted a man being run over by an automobile, after he had fallen asleep in the street. His two legs were cut off completely; yet, undaunted, this inveterate sleeper picked up his severed limbs and signalled with them to a passerby who happened to be a surgeon. In a few moments the surgeon succeeded in replacing the limbs, whereupon the inveterate sleeper arose, shook hands with his benefactor, and went his way. All in all, the effect was most convincing on the screen.

But the picture was a painless proposition, to be sure. In the

COLLISIONS SUCH AS THIS ARE A MATTER OF DUMMIES, AN OLD CAR, AND CAREFUL TIMING. THE ENGINEER OF THE LOCOMOTIVE TIMES HIS SPEED TO STRIKE THE CAR CONTAINING DUMMY FIGURES AND—

first place two actors took the same rôle, one of them a normal individual and the other a legless man. By ingenious makeup the two actors were made to resemble each other. Lastly, two artificial legs were provided.

Now then, the normal actor was first filmed up to the point where he went to sleep in the roadway, while an automobile was shown coming up to where he lay. The acting was slow and so was the rate of travel of the automobile; in fact, to reduce the danger in all scenes of this nature the vehicles move quite slowly and the acting is slowed down in like manner, so that everything can be carried out without trouble or undue danger. Yet when the film is projected at the standard rate the action is speeded up to the normal point and the illusion is convincing.

When the automobile reached the first actor, the camera was stopped and the second legless actor took his place, with the artificial legs placed on the other side of the wheel about to pass "over" the sleeper. Then the camera started and the automobile passed on. Then the legless player picked up his limbs and waved them and continued in the picture until the time came to rise and shake hands with the surgeon. Here the second substitution took place, and the normal actor carried the picture through to the end.

ANIMATING DISHES AND OTHER THINGS

Another prolific source of screen tricks is the stop-motion or single-picture movement of the camera. As was explained in the camera chapter, the camera takes images either at the standard rate of sixteen per second, or one image for every turn of the crank. This being the case, the possibilities of the stop-motion movement are at once apparent. Any subject posed between single exposures can be represented on the screen as doing no end of humorous and startling things.

Practically anything can be animated in this manner. The earlier trick pictures generally showed household things, such as pots and dishes and tableware, jumping about in a most convincing manner. Again, a little boy was shown fast asleep, dreaming of his toy soldiers which immediately sprang to life and engaged in military maneuvers. There was no end to the pictures of this kind.

—AFTER THE COLLISION THE DUMMIES ARE REPLACED BY ACTORS WHO ASSUME NATURAL POSTURES ABOUT THE WRECK OF THE CAR. ON THE SCREEN THIS TECHNIQUE MAKES FOR A CONVINCING EFFECT

Much patience and weeks and months of work are required on the part of the producer of this class of pictures. One picture is made at a time, with an occasional "string" of several pictures; and the subjects must be slightly altered between each picture or "string" of pictures. When thrown on the screen at the regular rate of speed, the successive images depict quite an animation without signs of the hands which rearranged the subjects between images.

Animated cartoons, animated sculptures, and animated dolls are produced in this manner, as described in a subsequent chapter. The same principle applies to animated titles, in which the letters go through various evolutions and capers before taking their regular places.

One of the most interesting effects of the stop motion is the reduction of time. For example, it is possible to show the growth and development of a rose in ten minutes, so that the audience beholds the flower passing through its life of several weeks in as many minutes. This is accomplished by setting up a camera which makes an image of the rose every ten minutes or half hour or hour. And when the film is projected at the usual speed, the time is reduced accordingly. This effect has also been employed in showing how a building is constructed.

The stop-motion, when combined with other effects, such as the reverse, has many possibilities. One of these is the mass of clay which develops into a perfect statue on the screen, without any aid whatsoever. In this effect a statue is first modeled in soft clay, after which the camera makes a certain number of feet of it and then switches over to the stop-motion shaft. Then after each image is made the soft clay statue is struck with a stick, until at the end it is reduced to a shapeless mass. If the film is projected in the usual manner, the statue dissolves into a shapeless mass. If the film is reversed, which can be done in the first place by mounting the camera upside down on its tripod, the effect is the forming of a statue from a shapeless mass of clay.

THE MIRACLES OF DOUBLE PRINTING

What cannot be done with the camera in the way of trick pictures can be done in the laboratory by clever printing. Thus

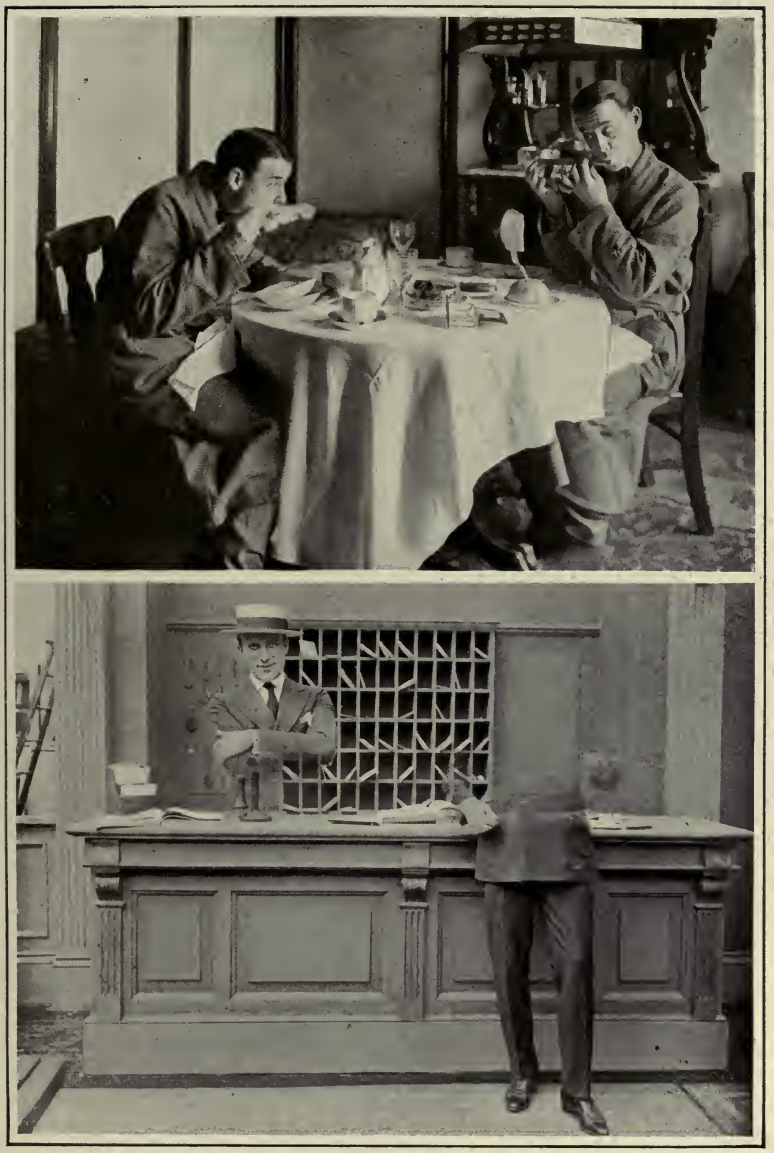
SPIRIT EFFECTS SUCH AS THESE ARE OBTAINED BY DOUBLE EXPOSURES ON THE SAME NEGATIVE

some of the most remarkable effects are the result of double and even triple printings in making the positives.

The earlier fairy pictures used to depict diminutive players in the same scene as full sized players. For instance, a fairy would appear in the bottle of a heavy drinker and dance about to his amazement. Startling as the effect was on the screen, its production was nothing more than a plain piece of photography. In such a case the full-sized player was first filmed in a close-up, with a dark bottle which photographed poorly; that is to say, its reflection was so slight that it left a black or blank space on the negative. Then another full-sized player, dressed as a fairy, was photographed against a dead-black drop at a sufficient distance away to bring down the size of the image to that required to fit the bottle. Generally the full-sized figure of the head and chest was filmed at three to five feet, while the fairy was filmed at a distance as great as 150 feet. Then the two films, with their subjects carefully registered, were printed on one positive with wonderful result.

Cloud effects and submarine effects are produced by double printing, as a general thing. In those scenes where the action takes place below the surface of water, the simplest procedure is to make a strip of film of an aquarium with the fish and other denizens swimming about, and another film of the action against a suitable background in the studio. When these negatives are completed a positive is made by double printing, producing a most realistic effect. Sometimes an aquarium is interposed between the subject and the camera lens, but this is not always satisfactory for the reason that the water, acting as a supplementary lens, distorts and blurrs the subjects. In the case of sea nymphs which appear to swim about with utmost ease, the effect is secured by placing the players on a suitable background resting on the floor of the studio, while the camera "shoots" the scene from above. This negative, in conjunction with another made of an aquarium, produces the realistic positive.

Cloud effects are obtained by double printing. A negative is prepared of pretty cloud effects and kept as regular stock in the studio vaults. At any time such stock negative can be used in conjunction with another of some action, say of an allegorical or religious nature, to make a positive.



SPLIT-STAGE WORK, AS ALREADY DESCRIBED, PERMITS OF DOUBLING OR CUTTING UP AN ACTOR

Where titles are introduced in a scene, especially in instances where a thought, moral, or dialogue is represented by one or more lines of type, the effect is produced by double printing. The scene is filmed in the usual manner as well as the title on another piece of negative. Then the two negatives are double printed, producing the desired result.

The various methods of splitting a scene so that the same actor can appear twice at a time—"twin brother" stuff, so to speak—have been described in the chapter dealing with the cameraman and his work. The use of matts and the double exposure box were described at length. It is well to add here, however, that some of these effects can also be produced by double printing, wherever the two halves of a scene are separated both with regard to time and place. Where visions or thoughts or dreams are depicted, the effects are obtained either in the camera or in the printing operations, according to which is the most convenient and the most realistic.

A STUDY IN BACKWARD MOVEMENT

The most ludicrous and startling results are obtained by operating a camera upside down on its tripod. Several types of camera are provided with tripod holes on top as well as on the bottom, permitting their use upside down. In this manner it is possible to photograph a subject quite conventionally, yet when it is shown through a projecting machine the action is backwards; that is to say, the action starts from the rear end and runs toward the beginning. The results are easily imagined. If a man is photographed jumping into the water, the film when shown on the screen shows the water opening up (the reverse of the splash) and the performer jumping up to the spring board (the reverse of the dive) and finally the performer jumping a few times on the tip of the spring board and then running backwards off the board.

In comedies the backward movement is employed to a great extent, such as in showing automobiles racing backward, barrels rolling uphill, and so on. In the instance of a comedy villain throwing knives about his victim who is strapped to a post, the effect can be produced by first placing the knives about the victim and then pulling out the knives one by one with invisible threads as the camera is operated upside down. The villain,

MANY PHOTOPLAYS, WHERE THE LEADING RÔLE CALLS FOR TWIN BROTHERS OR SISTERS, ARE ENACTED BY AN EXPERIENCED ACTOR OR ACTRESS BY MEANS OF THE SPLIT-STAGE CAMERA ATTACHMENT

however, is photographed in a separate scene while throwing the daggers or knives, which action, obviously, is photographed in the usual manner, with the camera right side up.

It is also possible to make a print so that the action will be backwards, where the effect has not been produced in the camera. This applies particularly to photoplays in which the action is first shown one way, and subsequently is shown backwards. In order that the two actions may coincide to perfection, the same negative is copied both the right way and reversed.

Another device of the comedy film is high-speed action. Some scenes may show certain characters working with the speed of lightning, or a vehicle tearing along a road at express-train speed. This effect is produced by taking pictures at a rate of speed slower than the usual sixteen images per second, and then when the same pictures are projected at the standard speed the action is accelerated proportionately.

The simple example of accelerated action—or shall we call it electrified action?—is where everything in a scene is moving at about the same gait. In this case the film was simply made at a slower rate of speed. But in those scenes where only part of the performers move at the accelerated speed while others appear quite natural, the effect calls for some care on the part of the slow-moving or normal performers. These must act very, very slowly while the other performers act in the usual manner, the action being filmed at ten or twelve images per second. Then when the film is projected at the standard speed, the effect is to speed up the slow-acting performers to the usual, natural gait, while the performers who acted at the normal speed are accelerated to ludicrous actions. Film that has been made at the regular rate of speed can be accelerated in the laboratory by eliminating certain parts or images at regular intervals. But in this procedure all the characters in the scene are uniformly accelerated.

THOSE ATHLETIC COMEDIANS!

It seems to be quite the accepted thing among film "fans" to expect a favorite actor to climb the fronts of houses and do all manner of other daring feats. Yet if they stopped to analyze some of the "stunts" performed by their screen heroes, they would

THOSE SCENES IN WHICH THE AUDIENCE RIDES MILE AFTER MILE WITH THE PLAYERS ARE MADE IN EITHER WAY SHOWN

soon realize that these men could not possibly do the things they apparently do. And here is where we unearth the close alliance between property man and actor especially in comedy productions.

Your hero who climbs up the front of the house can do so in several ways without being a champion climber. In the first place, and where realism is essential, a "front" representing a house can be erected on the studio grounds, provided with ornaments which in reality, are nothing more than staggered rungs of a ladder These ornaments make it quite a simple matter for the hero to climb or descend the house front.

Then there is another method, with even greater possibilities. That is the "front" that is laid on the studio floor while the cameras "shoot" the scene from above. The hero climbs up the front of the house by crawling on his hands and knees along the studio floor. And the same equipment makes it possible for the "human fly" effect, the dog or horse running up the side of a house, or even the automobile dashing up a wall. The work is quite harmless and simple, to be sure; but so effectively painted is the canvas laid on the floor that it is often a perfect illusion when shown on the screen.

There used to be a certain brand of comedy films which made a great name for itself because of its wonderful action. The audience was held by some bit of clever action every moment of the entire film. The acting was largely in the nature of the so-called "slap-stick" comedy, but it was perhaps the highest class of such comedy turned out until that time.

Now the performers of that brand of film did the most startling things. They smashed into walls and went through houses on motorcycles and in automobiles; they ran mile after mile at hair-raising speed; they went through the floor of one apartment and into the rooms below, along with a deluge of lumber and plaster and what not.

In this case the property man's work was apparent at every turn. In the case of those dashes through walls, the studio carpenters merely constructed a suitable scenery on the "lot," which was so arranged as to break away at any fair provocation. Thus the wooden "bricks" were built into a wall, and the various materials were lightly held together. The same applies to those

BY TOWING AN AUTOMOBILE AND MOUNTING THE CAMERA AT THE REAR OF A SPEEDY MOTOR TRUCK AS DEPICTED, MANY A THRILLING RACING SCENE OR CHASE IS FILMED FOR THE SCREEN

scenes where performers crashed through a floor. The construction in all such scenes was of the "breakaway" or "break-apart" variety, cleverly got up so as to make it seem quite the real thing.

Where a vehicle or a performer is shown dashing along at a righ rate of speed, with the scenery flashing behind him, the effect can be secured in two ways. First, the effect may be the real thing, in which case the vehicle or performer is filmed from an automobile or motor truck moving in a parallel direction. Secondly, and most likely, it may be faked in the studio yard by means of a merry-go-round arrangement. This consists of a circular platform with suitable scenery on its inner edge, suitably mounted so that it can be revolved. Now then, with the performer or vehicle placed on the platform and with said platform in action, the vehicle or performer merely has to simulate rapid travel while the stationary camera films the subject which does not move very far from a fixed point in the range of the lens. Meanwhile the scenery flashes by at the rear in a convincing-enough manner.

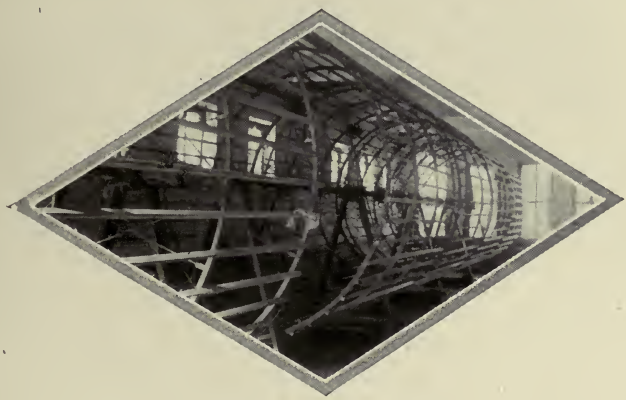
Where an automobile is shown riding along a road for mile after mile, the screen audience obviously traveling along with the vehicle, the effect has been produced by mounting the camera either on the car itself, such as on the hood or on a platform extending in front of the hood, or on a separate car or motor truck in front. In the latter case the motor truck or car generally tows the automobile where fairly close-up action is to be shown, the hauling cable being hidden from the camera in some suitable manner. By hauling the automobile a definite distance is maintained between the camera and the subject, and there is no danger of a collision.

Papier maché bottles, plates, clubs and so on, hinged lamp posts, rubber prison bars—all these things are but a few of the many contributions of the property man to the film comedian. The dishes which the comedians smash on each other's faces with such apparent abandon are certainly of the breakable variety, arranged to smash at the slightest coaxing. Yet a custard pie is always a custard pie: it must be real to produce a reel laugh!

CHAPTER X.

FROM THE CAMERA TO THE SCREEN

IT'S A LONG, long journey from the camera to the screen—from the exposed negative film in the camera to the finished positive film ready for projection. And all the work of players, scene carpenters and painters, director and cameraman is in the balance while the film is passing through the various phases of its laboratory career. If the film is ruined, then all the work expended thus far is irretrievably lost. But film producers have always seen to it that their work would not be ruined in the laboratory; the best photographers and the most skilled photographic chemists are employed in the work. Far from endangering the films placed in their hands, the laboratory staff often reclaim the poor work of the cameraman and avoid the expense of sending an entire company to a distant location for a "retake."



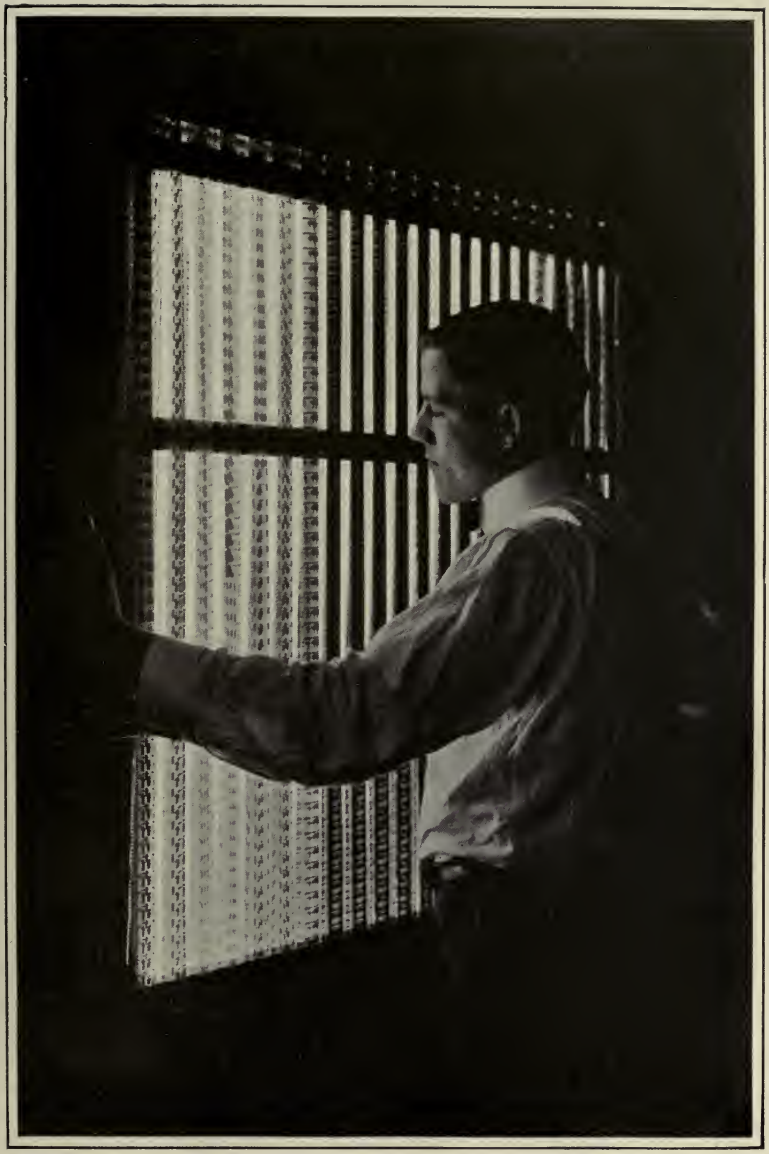
A GRAIN of dust, a slight variation in compounding a chemical solution or in its temperature, an impure water supply, an otherwise insignificant fluctuation in the voltage of the current supply for the printing lamps, a trifling rise or fall in the temperature of certain rooms, an inconsiderable shrinkage of the film—all these factors can mark the difference between a clean, clear and steady picture on the screen, and a spotty, indistinct, and jumpy film unfit for use. Which means that once the film leaves the camera, the work of the actors, director, and cameraman is entirely in the hands of the laboratory man; and upon his experience, skill and care depend the screen results.

DUST, THE MOTION PICTURE'S ARCH ENEMY

At regular intervals the raw stock is received at the motion-picture laboratory in such quantities as always to insure a fresh supply. Usually the film is unperforated when received for economical reasons and also because of the fact that, to ensure accurate perforations, it is best to perforate it where it is to be used. So the very first step in the laboratory is the preparation of the raw stock, either negative or positive, in the perforating room.

To perforate the plain film, great care must be exercised, for upon the accuracy of this work depends the steadiness of the picture on the screen. The machines employed for this work perforate one set of holes at a time, after which the film is moved forward the required distance in order to perforate another set. The perforators are operated with scrupulous care, and special attention is given to maintain rigid and uniform conditions of both humidity and temperature. Above all, the perforating room must be devoid of dust and dirt, for tiny specks on either negative or positive stock loom up big when magnified hundreds of times on the screen; indeed, all film operations must be carried out in the form of a constant combat with the dust menace.

Still another phase of perforating is to condition the air properly, so that static electricity will not develop and spoil the film by permanently marking it with lightning-like streaks. As can well be imagined from what has already been said, this work, from first to last, is carried out in almost total darkness, such light as is permissible being supplied by ruby "safety" lamps.



FILMS ARE WOUND ON RACKS AND DIPPED IN LARGE TANKS FOR THE VARIOUS DEVELOPING OPERATIONS

DEVELOPING FILMS BY THE MILE

The developing of motion-picture negatives is much the same as that of amateur films. The film is received in either the camera magazine or in a sealed tin case, and upon being removed from the container in the dark room, it is wound on a wooden rack, emulsion side out. The rack is then placed in a narrow, vertical tank containing the developer. Taking the necessary precautions against the formation of air bubbles on the film, the developing process is allowed to proceed.

Now while the amateur photographer has merely to place the contents of a packet or vial into so much water, and then deposit his film in this solution for so many minutes, the motion-picture worker handling thousands of feet of film has to make certain that his solution is in constant motion. To this end the usual practice is to keep the developing solution in constant circulation, while to ensure perfect results the temperature is carefully maintained at a fixed standard.

The film racks are occasionally lifted from the developing tanks and brought in front of dim ruby lamps to ascertain the extent of the development. This, however, is not the practice of a well-known laboratory expert, who has his time of developing prearranged with such great accuracy that after the shaking up and down of the rack to avoid air bubbles, the film is left for a predetermined length of time. His assistants are trained accordingly.

Great care is required in preparing the developing solutions. Hundreds of gallons of developer is required daily in the larger laboratories, and in each case a skilled chemist determines the proper composition. Formerly these solutions were prepared by a sort of rule-o'-thumb: the workers placed a half-barrel of this constituent, three scoopfuls of that, and a handful of a third into five barrels of water! And if the work did not turn out quite right, they unblushingly blamed it on some unknown condition.

But to-day such procedure is no longer tolerated. The industry has reached the highest standards of photographic achievement. The developing solutions to which miles upon miles of film is entrusted every day, with its imprisoned hours and days of work on the part of expensive actors, directors, camera-

ABOVE: SCENE IN A MODERN FILM DARKROOM. BELOW: SCENE IN THE WASHING ROOM, WHERE FILMS ARE RINSED

men, scene painters and carpenters, have simply got to be watched and tested at intervals; and when the first signs of exhaustion appear they must be replaced with fresh lots. Any other procedure would be suicidal in a business sense.

THE QUESTION OF PURE WATER AND PLENTY OF IT

When the film has been developed to the required degree, it must be fixed and then thoroughly washed so as to remove all traces of hypo. For this purpose the film, still on the wooden rack, is placed in a large tub through which passes a constant stream of fresh water. As in the case of the chemicals, every drop of water must be filtered and known to be free from any injurious ingredients before it is allowed to come in contact with the film. This means that a pure water supply must be available in the first place, and that batteries of filters must be employed to remove all particles of foreign matter.

Several years ago a film laboratory experienced considerable trouble with its work: films were never quite up to the required standard, although the same staff with the same equipment had turned out an excellent product when located in another part of the city. Chemists were called in; and they immediately set to work analyzing the water supply, since that is generally the most likely source of trouble. They found that the water, taken from a nearby river, contained considerable quantities of an undesirable and, indeed, injurious substance, and advised the laboratory man to that effect.

Whereupon the producer had a special well sunk to a depth of over a thousand feet on his own property, in order to tap a virgin supply of water, which, fortunately for him, proved to be ideal for film purposes. And this example is also the story, with but few minor changes, of numerous film laboratories; for above everything else the developing of film calls for water—pure water, and plenty of it.

The celluloid ribbon, still on the original racks, is ready to be sent to the drying room. Here it is taken off the racks and wound on wood or metal drums which are revolving at a fair rate of speed. This drying operation is carried out in a room whose temperature is such as to ensure a high degree of dryness; and the air too is carefully adjusted so as to aid this condition. It

TWO VIEWS OF TYPICAL DRYING ROOMS, WHERE FILMS ARE TRANSFERRED FROM THE RACKS TO THE HUGE DRYING DRUMS

goes without saying that the drying room is barred to dust and dirt.

Time was when the film producer had to depend on the weather in drying his films; and on rainy days it was next to impossible for him to make any headway. He decided, at last, to sever all connections with the weather man; and to-day the work goes on whether it is wet or dry outdoors. For the drying room is in reality a little world by itself, where the dryness and the temperature are regulated by the mere twist of an electric controller. Thousands of feet of film can be dried at one time on a battery of drying drums, and this method prevents the film from developing troublesome bends or twists.

Drying, however carefully it is done, is never perfect; that is to say, the film always comes out of the drying room with numerous water spots which are generally the solid matter left after the water evaporates. To remove these spots the dried film is passed through a special polishing machine in which an arrangement of soft buffers polishes the gelatine and the celluloid sides of the film. Formerly, this polishing phase was done by girls, using their soft palms for the purpose.

WORKING YEAR AFTER YEAR IN DARKNESS

With the negative in its finished form, we are ready to make positive prints. As in the case of amateur photography, the negative film shows the image in reversed order, with the whites black and the blacks in white. And just as in the case of prints on paper, it is possible to make any number of prints from the motion-picture negative.

Positive stock is not as sensitive to light as the negative stock, hence can be handled in a room provided with numerous ruby or orange lamps, as compared to the almost total darkness of the perforating and the developing rooms. Still, to the stranger the room is uncomfortably dark when it comes to making a way through the maze of tables and benches and chairs and machines; and it is with marked surprise that he notes the ease with which the operatives carry on their work. It appears that these workers, toiling day in and day out in semi-darkness, develop their eyesight to a point where they can see almost as well in the dim

WORKING YEAR AFTER YEAR IN SEMI-DARKNESS, GIRL OPERATORS BECOME QUITE EXPERT IN HANDLING THE PRINTING MACHINES WHICH PRINT THE POSITIVE FILMS FROM THE NEGATIVES

red light as they can at twilight outdoors. In any event, they appear to have no trouble in this direction.

The negative film is run through a printing machine face to face with positive stock, emulsion sides in contact. Each time a negative image comes into position in front of an aperture, a shutter opens and allows a flash of light to pass through the aperture and the negative and on to the positive stock behind, after which the two films are pulled down the space of one picture so as to bring the next image into position. Thus the printing operation proceeds one picture at a time until the entire negative is run off.

That method is known as the step-by-step method of printing. It is the one most commonly employed for commercial work. But there is another method known as the continuous method, in which case the negative and positive films are moved continuously past a source of light. A continuous printer is far less expensive than the step-by-step printer with its elaborate intermittent movement. Yet for reasons well known to the profession the step-by-step method has won out by a vast majority.

Now if negatives were all of one density the printing of positives would be a simple matter. But negatives vary to a large extent, and almost every one requires a different printing time. So the preliminary step in running off a print is to determine the density of its negative. Some laboratories simply run off a foot or two on the printer with different adjustments of light and then develop the strip so as to note the tones and select the proper one. Other laboratories have a set of negative films of varying densities, arranged in front of a lamp. By comparing any negative with the standard samples, it is but the work of a few moments to determine the printing time. In either case the density of the negative is obtained and marked on the negative roll; in this manner the girl operators at the printing machines know how to adjust the intensity of the light or the speed of the printer when the film comes to them.

When you hear a film man speak of "dupes," make sure of the kind of dupe he means. Most likely he has in mind a piece of negative film obtained not by exposure in the camera but by contact or projection from a positive print, often the sole survivor of a ruined or lost negative.

EDITING A FILM REQUIRES GOOD JUDGMENT AND A KNOWLEDGE OF THE PHOTOPLAY AUDIENCE. THE AVERAGE 5,000 FOOT FEATURE IS OFTEN MADE UP FROM 10,000 FEET OF EXPOSED FILM

As previously explained in this chapter, the negative film shows in white those parts which are to appear black in the positive. It is thus obvious that if by copying white one gets black, it is just as easy to copy black and get white. So from a positive it is merely a matter of printing to produce a negative, from which any number of positives can be run off.

SMUGGLING A FILM OVER THE BORDER THROUGH A BEAM OF LIGHT

An interesting case of film printing occurred some years ago in connection with certain prize-fight films which had been barred from the United States. The promoters of the films, having paid a vast sum of money for the rights to film the big event in Havana, Cuba, were greatly disappointed when their product was denied entrance to this country. It meant the losing of the principal market—it threatened to make their venture a loss instead of a gain.

Then the producers conceived of an idea whereby the law could be evaded. They would not bring the film itself into the United States. They would merely project it into the country and copy it on another film.

To this end a tent was erected astride the boundary between the United States and Canada. In Canada a special projecting machine was erected, and its rays were focused on a special printing machine several feet away, but in the United States. Then the work of printing the film got under way, while the promoters prided themselves on successfully evading the customs officials who were present to see how the work was being carried on.

But despite the ingenuity shown and despite the fact that the film was not being imported into the United States in a material sense, the officials ruled against the print made under such novel conditions.

Anyone who has made prints on fast, gaslight papers realizes how important are the light intensity and the printing time in this kind of work. And he can therefore appreciate how careful must the motion-picture workers be to maintain a constant and known intensity of light in their printers, and a flawless mechanism. In the more up-to-date laboratories each lamp is tested daily with a photometer to ensure standard and uniform intensity.

IN SOME STUDIOS THE DIRECTOR, WHILE VIEWING THE FILM ON THE SCREEN, DICTATES HIS TITLES AND DIRECTIONS, AND—

Like other industries the film industry has secrets of its own. It makes little difference whether they are real secrets or just *"tours de main,"* for either way the fact remains that there are things that can be done by one and not by another. Among all the film operations which the author had witnessed up to the time of writing the present chapter, the following two instances made the greatest impression:

He happened to be in a laboratory one morning when two cans of film were brought there, a large one containing various rolls of negative film and a smaller can in which was a piece of positive stock to be duped, the negative having been lost. After examination it was found that the negatives in the large can were all of different densities, and, moreover, had been ruined by underdeveloping and overdeveloping by some one who had tried to correct bad exposures in the developing tank, without having the slightest idea what he was doing. The piece of positive print for duping proved to be so badly overdeveloped that it seemed a hopeless case indeed.

But the laboratory expert smiled. "Zat's nothing; nothing at all!" he said; "if you will only stay here another two or three hours, I shall show you how I am going to do it." The author waited—and was well rewarded. For the positive prints were even and pleasing to the eye and no one could detect the good from the bad parts of the negative from which they were made. Nor could one distinguish the duped piece from those printed from original negatives. Of course, this was the work of a master: such services make it possible to save many a scene which, owing to some error or mishap in the filming, would otherwise be slated for a retake.

Positive film is developed, fixed and washed much after the manner of the negative film, after which it is dried and polished in the ways already described. But there are occasions where certain strips are to be tinted or toned, in which event special treatment is required before the final operations.

A vast difference exists between tinting and toning, although the layman usually considers these terms as being perfectly interchangeable. Still, tinting has to do with making the gelatine of the positive film take on any desired color, so that the entire picture appears in that one color and black. Toning, on the

—AN ASSISTANT, FOLLOWING THE PHONOGRAPHIC DIRECTIONS, INSERTS TITLES, AND MAKES ALL REQUIRED CHANGES

other hand, has to do with converting the blacks into any desired color, but leaves the high lights untouched or colorless. By combining the tinting and toning operations many beautiful effects can be obtained, such as *tinting* the film a light amber after *toning* it a dark blue. Tinting is carried on with dyes which, during the great war, have been quite scarce. In either tinting or toning the treatment consists of dipping the film, as it comes from the washing tanks, into vats of coloring matter, and removing it only after the desired shade is obtained, after which it is given a final washing or rinsing.

HOW MOTION-PICTURE TITLES ARE MADE

Again with titles, diversity of methods is by no means lacking. Some laboratories prefer to print the copy for titles on plain pieces of paper, in bright red ink or black ink, thus obtaining a positive of solid black with the letters and design in white. In other words, the copy is photographed on positive stock so that no printing is necessary, as many feet being exposed in the camera as are required. This method is known as titles "in camera" or direct positives. Another method is to print the titles in white on black paper, thus obtaining copy for negative film which must afterwards be printed on to positive stock. In either case the services of a printer-compositor are required, and also a skilled pressman who can secure clean and perfect impressions on a small job press. For with the magnification to which motion-picture titles are subjected, poorly jointed rules, bad alignment, fuzzy printing—all these things are exposed in exaggerated form on the screen.

It is well to add that the type faces must be selected with care. Heavy faces of type, known in the printing trade as bold face, are generally employed for the reason that they make for clear titles. Type with hair lines, on the other hand, is a constant source of trouble in title making. The fine lines, if slightly overexposed, fill in and disappear in the blackness of the background, causing a chopped up and unsatisfactory screen title. Hence the advisability of avoiding the so-called "old-style" types in favor of the bold faces.

A method of title making which has passed out of favor of late is to lay out the titles with movable ornamental borders and

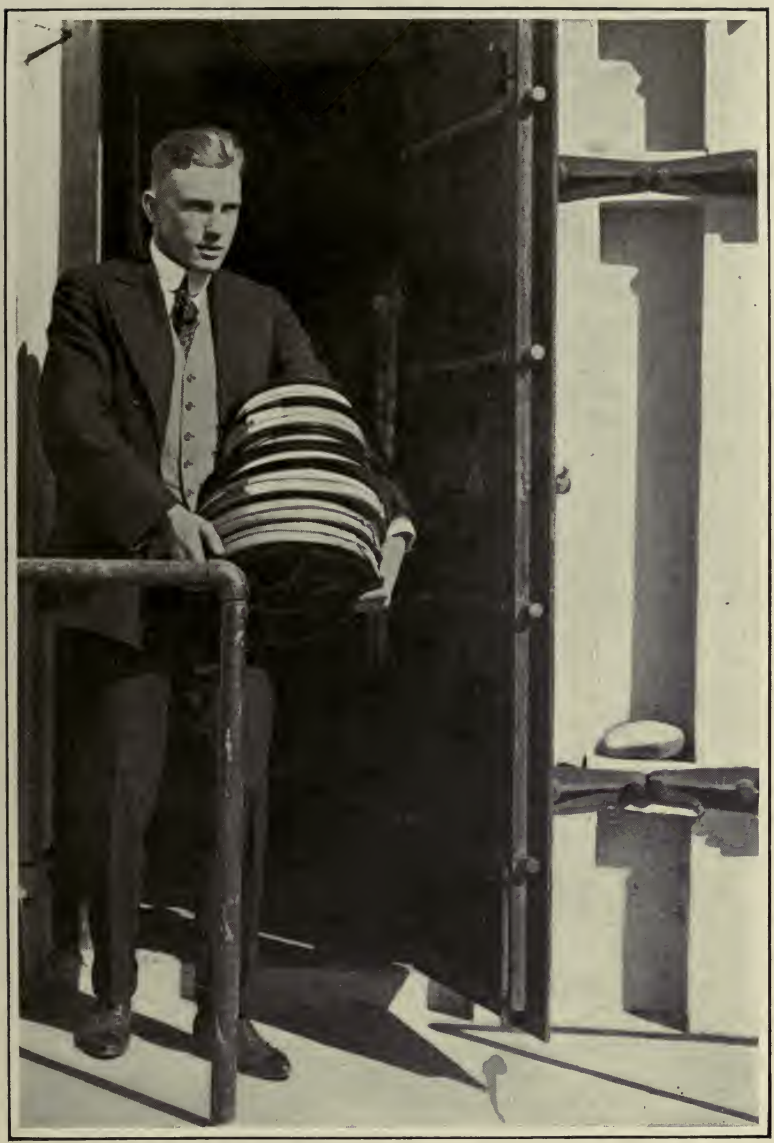
POSITIVE FILMS ARE ASSEMBLED AND CEMENTED BY GIRL WORKERS WHO BECOME QUITE ADEPT AT THIS WORK AFTER LONG EXPERIENCE. SUCH WORK REQUIRES NEATNESS AND CARE

letters on a flat background of black plush, with the camera pointing straight down from an overhead stand. This scheme, of course, has to recommend it the ease with which titles can be arranged even by an inexperienced person. But American producers almost invariably use the so-called "card system" already described, for the reason that the printed titles produce good, clean-cut titles on the screen, while the cards can be filed and rephotographed at any time.

Some producers photograph their titles directly on small glass plates, which are then used in the printing machines for running off the required footage of positive film. This method has in its favor the comparatively slight cost of the glass plate as compared to a long strip of negative film; in fact, such a system makes possible the saving of thousands of feet of negative film a year.

Practically all feature films to-day make use of highly ornamental titles with elaborate hand-lettering. A motif is included in the border or subdued background of the principal sub-titles, for the purpose of carrying a certain thought along with the wording of the title, as well as to carry the eye over the changes from picture to title and back to picture. The last-mentioned factor is most important. Formerly, when next to no attention was paid to eye fatigue in the production of pictures, a bright scene would suddenly give way to a black title, only to flash back to the said bright scene. The eye, under such circumstances, received a severe jolt or strain; and when this effect was multiplied many times in the course of a performance the audience experienced severe eye strain.

The more progressive producers have given due thought and attention to eye fatigue. As a result the titles are now being prepared with a view to carrying the audience over from one scene to a title and back again with the minimum variation in light. And to this end the title with a picture background or motif is ideal, because it lends itself to any treatment as regards shade. One producer makes use of a black panel which carries the title, while the border contains the motif and the required shade.



THE FILM IS STORED IN THE FIRE-PROOF VAULTS OF THE STUDIO UNTIL IT LEAVES FOR THE CIRCUIT OF THEATERS

ASSEMBLING SCENES AND TITLES INTO FILMS

By this time small rolls of positive film containing anywhere from several feet to several hundred feet have made their way to the assembling or cutting room, where they are ready to be examined and cut and assembled into finished productions. Although it is not generally known to the public, we never see but the abridged film of any given production; that is to say, the average five-reeler is actually made up from ten thousand or more feet of film, trimmed down to five thousand. Many scenes have to be retaken and many are found unnecessary to the story when examined on the screen. Furthermore, every scene as taken can usually stand some cutting; in fact, it is the clever cutting of the scenes which makes a successful photoplay so direct and appealing.

The footage thrown out in cutting a production is not necessarily wasted. Many a progressive producer makes good use of these cuttings in subsequent photoplays, either running them in as scenes of a new photoplay, or working the cuttings themselves into a production based entirely on them. Thus there are releases issued of famous actors long after they have left a certain company. The public is told that these releases are positively new. Cuttings are the answer to this mystery. The film company has merely looked over its collection of cuttings and by no mean ingenuity has constructed some sort of photoplay from the odds-and-ends of former action.

Editing a film is perhaps the most interesting phase of moving-picture work. The editor, usually the director himself in the case of dramatic and comedy productions, directs the cutting and assembling of the various strips of film into the complete production; and just as the editor of a magazine reads the printer's proofs and makes his corrections, so does the film editor view the assembled film on the screen and make corrections and changes. Finally, when the film is approved of, it is employed as a standard for the assembly of duplicate films by skilled assemblers.

Packed in round cans the film reels find their way to the exchanges throughout the world, and from the exchanges they make their way to the projectors in thousands of motion-picture theaters, there to entertain the millions of devotees of the screen.

CHAPTER XI.

REPORTERS OF THE SCREEN

THE PUBLIC does not depend wholly on the newspapers for its news. It also looks to the screen for its information. A given event is first reported in the newspapers, thanks to the rapidity of the modern means of news gathering, with such space annihilators as the telegraph, cable, and wireless. But a few days or a week or two later, the same event is pictorially reported on the screen. The lifeless words of the printed newspaper are eclipsed by the animated report of the screen news; in fact, it is virtually the same as if the audience were actually carried to the scene of the event in question. It is the curiosity of seeing what one has already read that makes the news films so popular.

WITH the advent of the newspaper-on-the-screen and the magazine-on-the-screen kinds of film, the screen reporter came into his own. There was little if any need for him so long as the screen only presented dramas and comedies, industrial and travel pictures, his only contribution being an occasional collection of foreign views or the pictorial story of some industry. But when the American public began to lose interest in motion pictures some years ago, when motion-picture men really began to wonder if, after all, theirs was but a temporary industry or a novelty, among other changes and improvements and innovations the screen newspaper or "weekly" film made its initial bow. And the public took to it from the very start.

The screen "weekly" called for an army of intrepid cameramen —men who not only understood the essentials of cinematography, but knew how to tell a story in pictures. For it was appreciated early in the game that it is quite one thing to know how to tell a story in words, and quite another to tell it in photographs. But the men were found; and they grew with the newspaper-on-the-screen idea, learning week by week how to produce better pictorial newspapers.

More recently the magazine-on-the-screen type of film has come into being, extending the field of the screen reporters to subjects other than those of passing interest. In fact, the latest class of film calls for the "writer" type of cameraman who can dig deep into any given subject, sift out the really interesting features and then treat them pictorially so that they will be understandable and interesting to his audience. Like the "weekly" film reporters, the magazine-on-the-screen men have grown with their product. To-day they are turning out an animated magazine which is not only enjoyed but even sought by an interested army of screen devotees.

"THEIR'S NOT TO REASON WHY; THEIR'S BUT TO . . ."

Like the newspaper man, the screen reporter is sent out on certain "assignments" to "cover" a given event. For instance, one day he may be detailed to an incoming ship on which is a famous opera singer; the next day he may be sent out to the wilds of New Jersey's coast line to film a wrecked steamer being pounded to bits by an angry surf; the third day he may be called upon to

IN THESE DAYS OF SCREEN NEWSPAPERS, THE SCREEN REPORTER IS ALWAYS TO BE FOUND WHERE SOMETHING IS HAPPENING

film a parade; and the fourth he may be told to attend a demonstration of a new automobile. By co-operative agreement with some newspapers, the editor of a screen weekly is kept in touch with all that is going on in this world of ours; and it is for him to decide what to "cover" and what to disregard.

Generally, the editor of a screen weekly is an old-time newspaper man; for above all else he must have a keen sense of news and know how to appeal to his audience numbering in the millions. Again, he must know not a little about the possibilities and the limitations of motion pictures; for his is the task of telling his stories with short titles and animated pictures rather than with columns of type. Lastly, he must be a good executive; for he is required not only to handle a large staff of men under his immediate orders, but also to keep in touch with correspondents throughout the world. All of which requires a really big man.

When a certain event is to take place, the editor details or assigns one of his photographers to cover it. If the event is unusually important, two or more cameramen are assigned, but that is only in very rare cases. As a general thing a single cameraman is counted upon to get about the scene of action and secure sufficient views from all angles to tell the story.

In the screen cameraman's vocabulary, the word "can't" is strikingly conspicuous by its absence. He simply has no use for that word, because it is not understood in his line of business. When he is assigned to cover a certain event, he goes about his task with the determination to get the coveted pictures no matter what the obstacles may be. He knows that his job depends upon it; and he acts accordingly.

WHEN IMPOSSIBLE PHOTOGRAPHIC CONDITIONS BECOME POSSIBLE

It is interesting to contrast the "news" photographer with his brother working in the studio or with a company in the field. The latter, to begin with, has all the equipment he requires because facilities are near at hand. His subject is arranged to please his fancy: the players and scenery are painted and illuminated so as to photograph properly, and only when they are so is the cameraman obliged to start cranking. And supposing the film is not quite up to standard or supposing he desires to photograph the scene twice in order to make sure of his results, there

RAIN, SNOW, DARKNESS—NO MATTER WHAT THE CONDITIONS, THE SCREEN REPORTERS MUST GET THEIR PICTORIAL STORIES

is nothing to prevent him from asking the director to repeat the entire performance for a "retake." Indeed, everything is done for the cameraman in the conventional drama or comedy film, for the reason that everything depends on good photography as a first consideration.

Now let us take up the case of the screen reporter. He goes to cover an event. The day is dark, with occasional showers; but needless to say the event will take place no matter what the weather may be, and the world is not going to halt so that he may take advantage of better light. His first difficulty, then, is that he must contend with the poorest photographic conditions.

Arriving on the scene, he must make his way through crowds and other obstacles and secure a position of vantage. Naturally, there is no telling just how the subject may be when the moment arrives as in the case of a parade or similar event, and often he finds himself "high and dry" when the moment of action arrives. In such event he must hurry with his bulky apparatus to some other suitable location, set up his camera and grind a few feet of film.

Speed is the very essence of success in film reporting. An event takes place so quickly that the cameraman must act swiftly and positively. If he has not selected the proper location in the first place, he must quickly size up the situation and dash off to a more favorable spot before it is too late. And even if he is fortunate enough to secure a good position to begin with, there are generally other views required, such as details or close-ups of the event calling for speed and good judgment.

Above all, be it remembered that he must "get it" the first time. There is no such thing as a "retake" in screen reporting. It's either a case of getting it the first time or losing it; and to lose it means one more cameraman without a job.

A REPORTER WHO TELLS HIS STORY WITH PICTURES

The regular newspaper reporter, to be sure, also has to "come home with the bacon." But how much easier it is in his case! He can go about the scene gathering his facts from any number of persons; and even if he is somewhat tardy in getting about he can depend upon his fellow reporters to supply him with the necessary facts from which he can weave an interesting story. In

IF AN EVENT IS AT ALL WORTH NOTICING, IT IS BOUND TO DRAW A CROWD OF MOVING-PICTURE CAMERAMEN

fact, he can even improvise where necessary; and surely it is not betraying any confidence to say here that such practice is by no means rare in American journalism.

But with the screen reporter it is a matter of reporting the real thing: there can be no substitutes.

What to photograph and what not to photograph is largely a matter of practice or experience. At first the cameraman is bound to film many unimportant features and occasionally leave out some salient one; but with increasing familiarity with his work, the telling of a story becomes a sort of second nature. Skilled screen reporters have acquired the knack of sizing up any given event, getting a general view of the entire scene and then going straight for the features that require special treatment. Naturally, the cameraman is at the same time the director, for there is no one to guide him in his work.

Take a typical instance, the inauguration of the airplane mail service between Belmont Park, N. Y., and Washington, D. C. The first thing a trained cameraman would do would be to secure a general view of the airplane used, including some action such as the mechanics walking about and inspecting the various parts. Next, he would ask the authorities to stage some suitable action, such as the handing of the mail bags to the aviator, and the aviator or his assistants placing them in the mail compartment. If no mail bags were yet on hand, dummy bags or anything resembling a mail bag would be used. Then he would secure some human interest snapshots, such as the aviator receiving a good luck horseshoe from some foreign aviation officer, the strapping of a map to the aviator's knee, or the wife of the aviator affectionately bidding him good-bye. Lastly, the cameraman would determine the probable direction of flight and place his camera so as to obtain a view of the airplane running along the ground and taking the air.

Another case is perhaps of equal interest, namely, the filming of the unearthing of historic remains. We have in mind the remains of a Hessian camp on the eastern slope of Inwood Hill, at the northern end of Manhattan Island, New York City. The first thing the cameraman would probably do would be to take a panorama of the eastern slope of Inwood Hill, showing the various holes where digging has been done. Next, he would show

WORKING UP TO THE VERY FRONT AND IN THE FACE OF THE ENEMY, CAMERAMEN ASSIGNED TO THE VARIOUS ARMIES HAVE BEEN ABLE TO CONTRIBUTE EXCELLENT WAR SCENES TO THE SCREEN

the diggers at work with exploring rod, pick and shovel, and sieve, with a close-up view, perhaps, of what remained in the sieve after sifting a lucky batch of earth and stones. Then he would show the men at work on a reconstructed Hessian hut, finally turning his lens to a close-up view of the man who directed the undertaking.

So it goes with other subjects. The general order is always about the same: first, the general subject, and then the details; or, to put it another way, first the "where," then the "how," and finally the "why." It is generally considered good policy to take more film than is to be used, leaving the matter of cutting or editing to the editor.

TOOLS OF THE CAMERAMAN

Any kind of camera is available for "news" reporting, although as a rule the heavier types of cameras are religiously avoided in favor of the smaller and lighter varieties. The tripods, too, are of the lightest and most compact design, so as to facilitate traveling. Some cameramen have an assistant who carries the tripod, but the less fortunate ones have to work alone, in which event they get along with the smallest kind of camera and with a tripod that packs to less than four feet.

Under the adverse conditions encountered in filming many happenings, the conventional hand-cranked camera leaves much to be desired. It is clumsy in the extreme, and much action is lost in shifting it about. Hence it is not surprising that inventors have been at work on the problem of evolving a better camera for so-called "topical" work, and among the results have been several types of hand cameras which do not require a rigid tripod support, thanks to automatic driving means and gyroscopic stabilizers. Some of these cameras operate from a portable storage battery, and are held firmly by two handles. Another type comprises a number of compressed-air flasks and a pneumatic motor which replace the hand crank, as well as a gyroscopic arrangement for maintaining the camera on an even plane.

The advantage of such hand cameras can well be imagined, for they place motion-picture photography on the same level as regular photography. Films can be exposed while holding the camera high above the heads in a crowd, or when the photog-

SCREEN REPORTERS USE THE LIGHTEST AND MOST COMPACT PARAPHERNALIA IN THEIR WORK AFIELD

rapher is in the most hazardous positions. In fact, there does not seem to be any limit to motion pictures once the tripod is shed, as it is in the case of these special cameras.

The name of "pirate camera" has been associated with some of the tripod-less instruments, and for good reason. The following stories ought to make clear the meaning of piracy as applied to motion pictures:

THE REAL PIRATE OF THE SCREEN

When screen newspapers were still new and the competition was keener than it is at present, competing "weeklies" vied with each other in obtaining exclusive rights for filming certain events. Thus important ball games and other athletic events were contracted for by one or the other of the "weeklies," and the managers turned over the film rights to that company in consideration of a fair sum of money.

It was usually left to the film company to defend its rights to the event. Which meant that precautionary methods had to be followed to make certain that competing concerns did not secure the coveted views, thus making the "exclusive" rights nothing but a name or, to use a well-known term, a mere "scrap of paper."

Such a case was a big ball game played in New York City. One of the "weeklies" paid a big price for the exclusive film rights, and immediately set to work organizing a pseudo-detective force to guard its rights when the day arrived. Everyone entering the ball grounds was carefully scrutinized, for word had been received that one of the rival concerns had recently acquired from France a number of hand type or "pirate" cameras, which might readily be smuggled into the grounds.

The game started; and meantime the would-be detectives of the film company mounted guard. It was a warm day, so that a heavy, bulky blanket on the lap of a spectator sitting in one of the front seats soon attracted the attention of one of the film men. He decided to risk a quarrel, for he felt that there might be a camera hidden in that heavy blanket; at any rate, there was no reason for carrying a blanket on a day like this. A few moments later he was confronting the suspicious one, and unwrapping the blanket before the latter knew what was happening. The amateur detective's guess was quite correct: a "pirate"

COMPARED WITH THE SCREEN REPORTER WHO MUST TAKE THINGS AS HE FINDS THEM, THE STUDIO CAMERAMAN'S LOT IS AN EASY ONE HERE, FOR INSTANCE, IS A CAMERAMAN GETTING HIS FOCUS FOR A SCENE

camera was brought to view, and the first attempt to "steal" the game was foiled.

But luck was not with the film company holding the exclusive rights to the game. Elsewhere a "pirate" camera was at work, hidden inside a large press camera of the reflecting type then so much in vogue among press photographers. By pressing a button and starting the pneumatic motor, the competing cameraman secured all the views he desired. And the first time the legitimate film company knew of the piracy was when they saw the pirate film on a Broadway screen, 24 hours ahead of their own release!

However, the story reads like a novel, for the villain of the piece is punished good and proper in due course. It happened some time later, when the second company, which had succeeded in pirating the big ball game, tried its hand at exclusive rights by contracting for a momentous ball game in Brooklyn, at a field overlooked by a row of tall flat houses.

Now the first company was intent on getting scenes of this game, and consequently dispatched a cameraman and a few assistants to one of the flat houses overlooking the enclosed field. Everything went well—until the cameraman in the ball grounds suddenly espied his rival grinding away on the flat-house roof a block away. With rare presence of mind he gave a pocket mirror to his assistant, with the orders that he flash a reflected ray of sunlight into the rival's lens. This was immediately done; and to the dismay of the pirate cameraman he had to give up cranking. Try as he would he was unable to avoid the beam of sunlight which followed him about. He tried sun shades and even shifted his position, but every time the sinister beam got through to his lens.

"Why not come back at this fellow," he thought. So he dispatched one of his assistants downstairs in search of a mirror. The first call was on a benevolent old lady on the top floor, who soon understood the situation and helped out with her husband's shaving mirror. The triumphant assistant returned to the roof and soon was shining a beam of sunlight into the lens of the cameraman in the field, who stopped short. Perhaps he cursed long and loudly, but he was too far away to be heard.

He too tried to avoid the troublesome beam, but with no success; for the mirror manipulator on the roof had plenty of room

FILM CONTAINERS AND PRINTING MACHINES WHICH FIGURE IN THE "PRINTING" OF THE SCREEN NEWSPAPER

in which to maneuver and place his spot of light in almost any part of the field from which suitable views could be "shot."

Precious minutes were being wasted. The cameraman below soon saw the futility of this mirror battle and decided to surrender. With a wave of his hand signifying unconditional surrender, he made his assistant stop shining the mirror. The man on the roof did likewise. Both sides resumed their interrupted grinding. And the first company—the one which had been on the roof—secured just the pictures it wanted to the dismay of the original pirate concern.

The activities of film pirates soon made it unwise to contract for exclusive film rights at exhorbitant figures; and the practice has long since ceased. Nowadays all film companies participate in the general run of events and count on winning out by getting their pictures first before the public, or establishing what is called a "scoop" in newspaperdom.

Nothing is more perishable than news films. They must be rushed through the developing and printing processes in order to reach the screen in record time. Some remarkably fast time has been made, such as the filming of important boat races in the afternoon, the developing and printing of the film while en route, and its exhibition on the screen 75 miles away that night.

WITH A VIEW TO THE FUTURE

Not only has the cameraman his assignment in view, but he also keeps one eye open for any possible scenes which may be available in future productions. Thus, if on his way to an assignment, he comes across an important fire, he may stop if time permits in order to film a hundred feet or so. Again, if he happens to come across an important racing meet, he may film many scenes not required for the weekly in order to secure "stock" for his firm. Indeed, it is these very "stock" films which often furnish an idea for a feature production. We have in mind a series of excellent views of a big race down in Kentucky, which furnished the theme for a five-reel production which was made two years later. It is for the director of a company of players to decide just how he can work the "stock" material into his pictures so that dove-tail continuity will result.

With the introduction of the magazine-on-the-screen class of

HERE IS THE EDITORIAL ROOM OF A SCREEN NEWSPAPER, WITH THE EDITORS AT WORK ARRANGING AND CUTTING AND TITLING THE VARIOUS STRIPS OF FILM THAT GO TO MAKE THE FORTHCOMING EDITION

film the field of the cameraman has been widely extended. As far as difficulties are concerned, subjects for the "magazine" film are perhaps easier to obtain for the reason that haste is not an essential factor. The cameraman can go about his work with plenty of time to spare, so long as he tells his story properly. It is simply a repetition of the newspaper man and the magazine writer: the former must hustle about to get his story in on time, while the latter, while more leisurely in his work, must be more thorough and more painstaking.

Both the screen "newspaper" and "magazine" have their correspondents scattered throughout the world. These correspondents are generally local photographers or amateurs who have taken a liking to motion pictures and have purchased a complete outfit. They take pictures of local happenings and things of wide interest, both on their own initiative and on telegraphic order from film editors. The exposed film is usually forwarded to the film editor in the undeveloped state, and is rushed through the developing room and drying room so that the negative can be examined with a view to purchasing it. Accepted film is paid for at rates varying from thirty-five cents to one dollar per foot, depending upon its importance and timeliness. Obviously, leading "news" events command the highest rates.

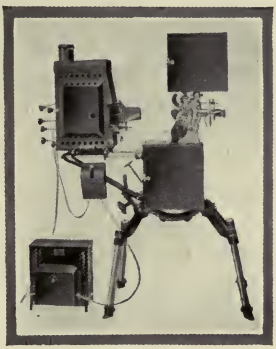
The out-of-town correspondent is as indispensable to the film editor as the contributor is to the magazine editor. For no matter how big one's organization may be, it is simply impracticable and impossible to cover this whole wide world at all times. So local happenings in remote sections are left to the tender mercies of "free lance" photographers who are only too anxious to make the most of every opportunity which may mean a sale of film.

The "newspaper" and "magazine" films are only in their infancy. There is in store for both of them a future equally as brilliant as that of the other films in which tears and laughter and intrigue are pledged to our entertainment.

CHAPTER XII.

PUTTING IT ON THE SCREEN

THE FINAL LINK in the motion-picture process is the operator in the theatre. Equipped with a projector and several reels of film comprising the day's "program," the operator is the whole company in a motion-picture performance. Upon him rests the success of a photoplay; for, even if the producer has turned over to him the very best feature that can be made, the operator can ruin it before the eyes of his audience by faulty projection. And there is much to be learned about projecting pictures. The skilled operator must understand his work thoroughly, and be a more or less handy man with tools. He must be conscientious; for hundreds and thousands of dollars' worth of films pass through his hands every working week—films which must go on to other theatres before they have served their full purpose. So here is an opportunity of giving due credit to the last link in the motion-picture business—the operator.



THE final destination of all motion-picture film is the projecting machine. For it is in passing through the projector that the film is transferred to the screen, where it can be seen and enjoyed by the millions of film devotees.

And the operator of the projecting machine is the final man in the film industry, occupying a position somewhat similar to that of the salesman in business. Both stand between the manufacturer and the consumer. But there is this vital difference: the salesman passes the product to the consumer as it is; the operator takes the product and handles it in such a manner that it may be excellent or poor. The best photoplay ever produced can be ruined before the eyes of the audience. So, in the final reckoning, the operator is as important as other links in the film chain; and every producer is at the mercy of the operator who handles his film, and the projector employed in projecting it.

THE MOTION-PICTURE CAMERA REVERSED

Although the motion-picture pioneers in many instances made use of their camera for projection purposes, that does not mean to say that the camera is ideal for the purpose. Indeed, while the projector and the camera may have much in common, their respective functions are sufficiently different to require a wide divergence in design. In each case, of course, the intermittent movement is used for the film; each image is brought into position behind the lens, a shutter opens and then closes, and the film is shifted to the next image, and so on. In the camera the shutter is behind the lens, while in the projector it is usually in front of the lens. In one case the virgin film is exposed, while in the other the finished film is thrown up on the screen in greatly magnified form.

The modern projector consists essentially of a feed reel magazine or upper magazine, a take-up reel magazine or lower magazine, a film gate and lens system, a revolving shutter, a powerful source of light, an intermittent movement, and the film sprockets, idlers, presser rollers, springs, belts, pulleys and other accessories.

Feeding out of the top fireproof magazine or container, the film unwinds from the reel and passes through a pair of tightly pressed rollers which constitute what is known as a magazine fire trap or fire valve. It then passes over a constantly rotating

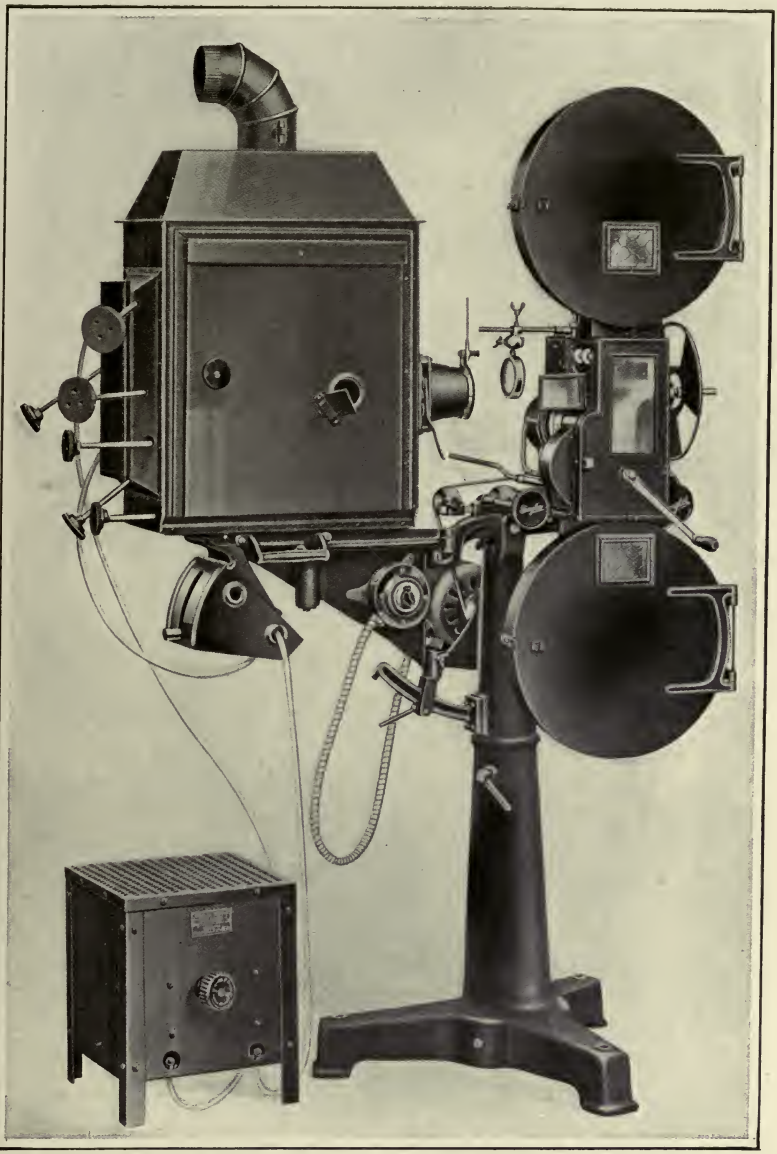
THE FINAL DESTINATION OF THE FILM IS THE FIRE-PROOF BOOTH IN THE THEATER, WHERE, AT THE HANDS OF THE OPERATOR, IT IS PASSED THROUGH THE PROJECTING MACHINE AND SHOWN ON THE SCREEN

sprocket and a film-steady drum or film steadier to the film gate, where it is in the path of the powerful light source and the lens system. Thence it passes over the intermittent sprocket and the lower steady-feed sprocket, through the lower magazine fire trap and on to the take-up reel, as depicted on page 251.

As in the camera, the film is provided with two loops, one before it passes through the film gate and one after it has passed. The object of these loops is to provide for the difference between the steady feeding or constant movement and the intermittent movement. Obviously, if the film were threaded through the sprockets without loops, the intermittent movement could not operate without danger of tearing the film. So loops are provided; at one end of the loop the film is fed or taken up, as the case may be, continuously, while at the other it is fed or taken up intermittently. The loop shortens and lengthens each time the intermittent movement operates, but the same amount of loop is maintained. In this connection it is interesting to note that the patents covering the loop arrangement of the film, for years controlled the film industry. So important is the loop that it is practically impossible to design a camera or a projector without that simple device. Possessing the Latham Loop patents, the motion-picture trust enjoyed a monopoly to the exclusion of all others until a few years ago, when the courts finally decided in favor of the independent producers who had been spending the better part of their time in the courts.

HOW A HIGHLY INFLAMMABLE MATERIAL IS HANDLED

Film is highly inflammable; indeed, it is but another form of gun-cotton. If by chance it is left for a second or less in the powerful beam of the projector, it bursts into flame. It must be kept moving at 12 or more "frames" per second. So in its handling all manner of precautions must be taken to prevent fires. As already stated, the two metal magazines of a projector are provided with fire traps or fire valves, usually consisting of a pair of metal rollers close to each other and between which passes the film. All of the approved makes of fire traps have been subjected to fire tests, and they have proved entirely satisfactory. That is to say, a piece of burning film is extinguished before it attains the interior of a magazine fitted with fire valves.

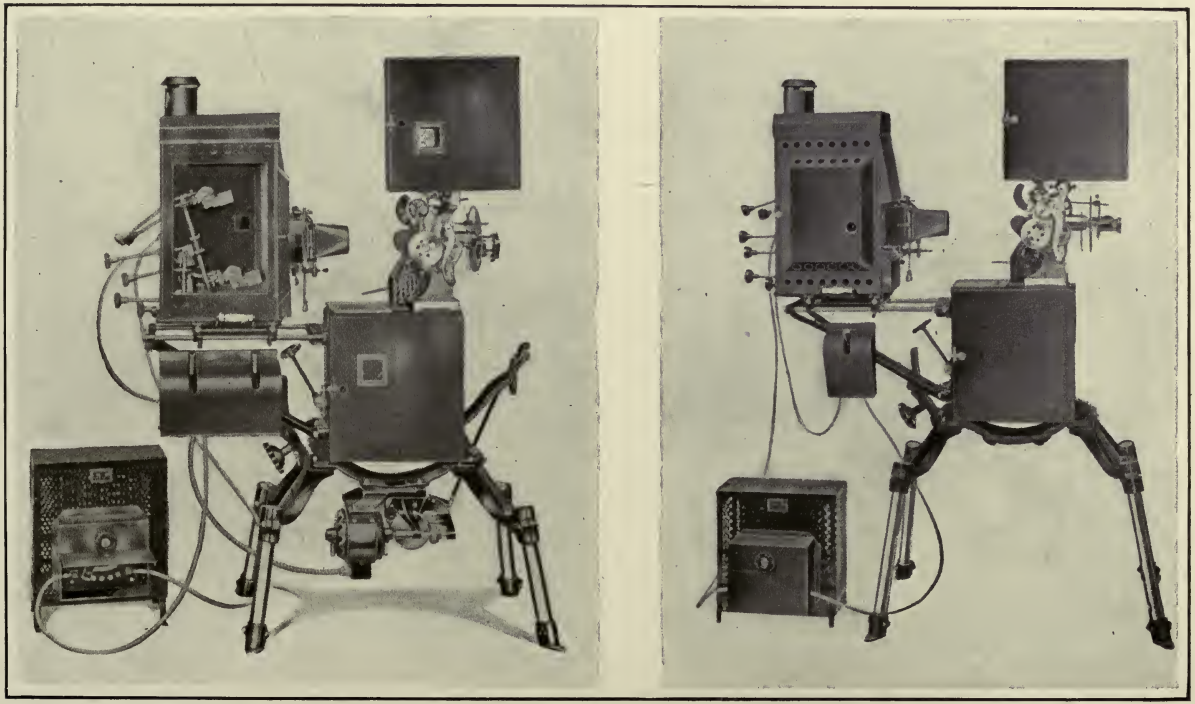


THE PROJECTING MACHINE IS NOTHING MORE THAN THE CAMERA REVERSED, AS FAR AS PRINCIPLE IS CONCERNED

Now in addition to the fire valves there is another safeguard against fire on practically all commercial projectors. An automatic fire shutter or safety curtain is provided for the purpose of shutting off the powerful beam of light when the machine is not operating at the standard speed. This device is required by most city ordinances. The ideal fire shutter is one that is so controlled by the mechanism that it remains up or clear of the beam of light as long as the film is passing through the film gate at the proper speed, but drops down and masks the rear side of the film when the speed diminishes to a point beyond which the film is apt to get overheated. The fire shutter, when in proper working order, is no doubt a great protection, although it should not be relied upon entirely. Most fire shutters depend upon the movement of the projector mechanism; and in instances where the film comes to rest through ripped sprocket holes and the mechanism operates all the while without affecting the film, the shutter does not function. The result is a film fire, unless the operator is alert for just such a contingency.

A film fire with a good projector is generally a passing incident, without serious consequence other than the ruining of a foot or two of film. On the screen the fire may sometimes be detected, when the film is seen to melt away, as it were. The fire traps prevent the fire from attaining the film reels in the magazines, and the operator promptly throws the light over to one side, clear of the film. Rethreading the end of the film from the top magazine, through the various sprockets and idlers to an empty reel in the take-up magazine, the operator is generally able to start up again in a minute or two. After the entire film has been run off, he cuts the burnt ends of the film evenly and cements them together. Of course, some of the action is missing, which accounts for jumps in certain films. Generally, the missing action is so small that its absence is really insignificant, and the film is but slightly impaired.

It is because of the fire hazard that the fire underwriters oblige projectors to be employed in fireproof booths of asbestos. In large theaters these booths are elaborate sructures of asbestos board and steel framing, with all the fixtures of fireproof design. For temporary purposes tent-like asbestos booths are available, which can be pitched up in a few minutes' time. With such a



HAND-CRANKING HAS GONE OUT OF DATE IN PICTURE PROJECTION, THE MOTOR-DRIVEN MACHINE SHOWN AT THE LEFT HAS LARGELY SUPPLANTED THE HAND-CRANKED ONE AT THE RIGHT

structure about a film projector, the fire hazard is reduced to a minimum; in fact, even with the modern projector alone the fire hazard is quite slight because of the various safeguards on the machine itself.

MULTIPLYING FLICKERS TO ELIMINATE THEM

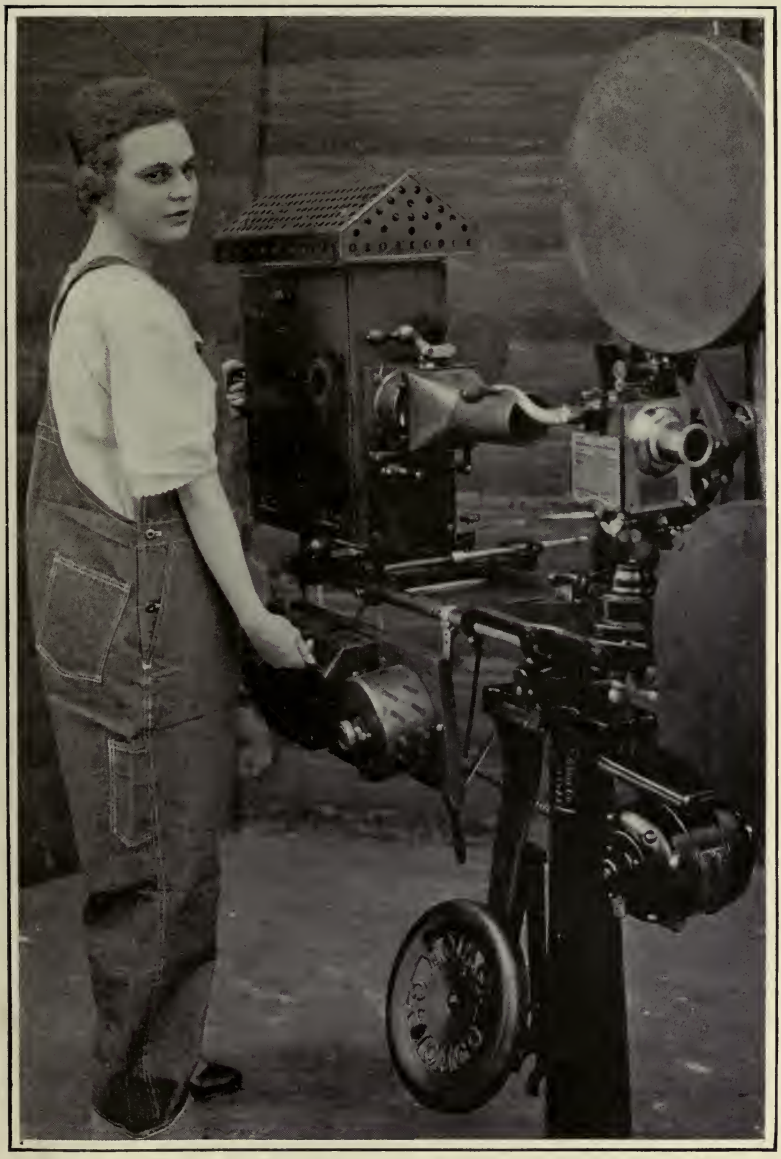
It is not so many years ago that motion pictures were photographically poor and trying on the eyes. Aside from every conceivable photographic fault, the films flickered in a most annoying manner. Yet to-day the animated pictures are practically flickerless. Audiences no longer complain of tired eyes and oculists have ceased preaching about the harmful effects of cinematography. Why?

In the early pictures the rate of taking was usually twelve per second, although sixteen was by no means unheard of. And when sixteen became the standard rate, the films were still full of flicker. The shutter, revolving in the path of the light, chopped off the beam sixteen times per second. But the eye can easily detect light variations that slow, and so the pronounced flicker resulted.

For years pictures flickered, when suddenly projector designers gave mathematics a cruel blow. By multiplying the flickers they produced a zero effect. That is to say, they replaced the single-blade shutter by a two- or three-blade shutter. Or in the case of a single-blade shutter they geared the shutter to make two revolutions for every film image, so that the light beam was cut off once while the film was moving, and once while the image was held stationary. In the case of the two- and three-blade shutters, the light was cut off while the film moved, and once or twice while the image was at rest. The result of increasing the flickers has been to cut up the light interval so as to make a less marked contrast between the dark period, when the light is shut off entirely, and the light period when the image is being projected.

TRANSLATING CONSTANT MOVEMENT INTO REGULAR JERKS

In the case of the motion-picture camera various mechanical movements are employed for shifting the film one image at a time, while the shutter masks the lens. The most common movements are the claw, which consists of two claw-like or hook mem-



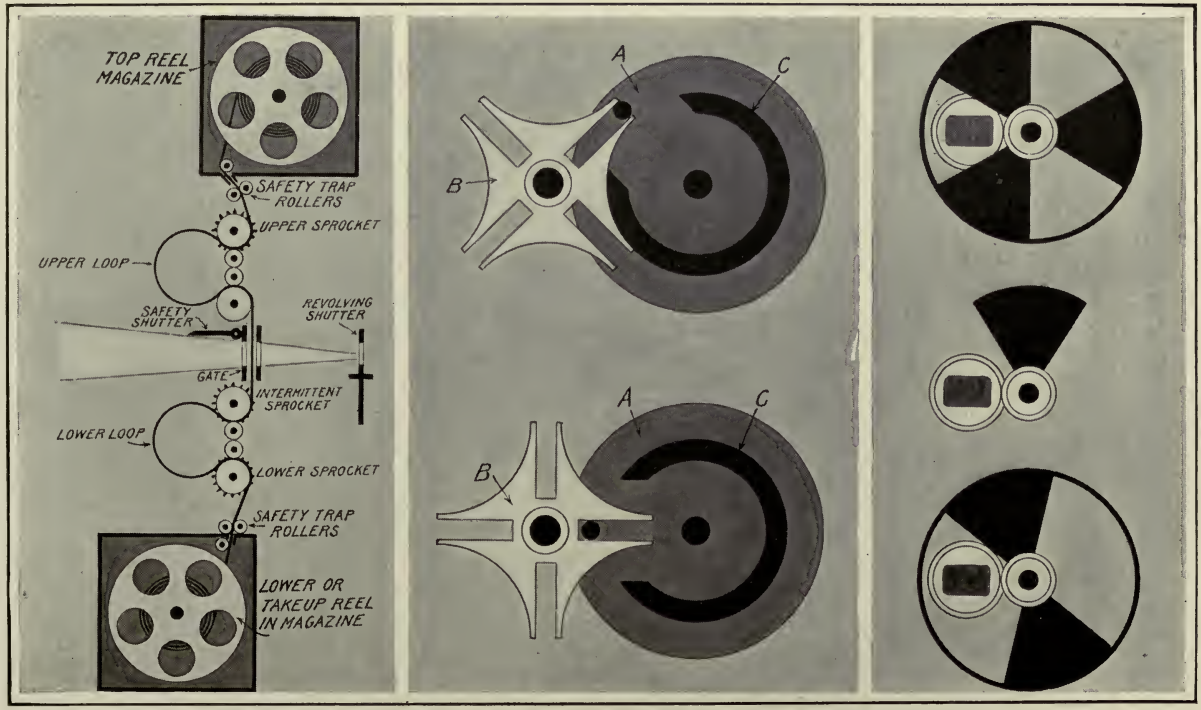
THE EXIGENCIES OF THE GREAT WAR PROVED THAT OPERATING WAS NOT BARRED TO THE GENTLE SEX

bers engaging with the film sprocket holes, and the so-called drunken screw movement, in which a pair of pins engages with the sprocket holes. In either case the film-engaging members are moved into a pair of sprocket holes, then moved down a definite distance, and then disengaged, only to be shifted up and pressed into another pair of sprocket holes in time to pull down the next image.

In the projector a similar movement is employed, although the mechanical details are somewhat different. Instead of claws, the projector makes use of the intermittent sprocket, which receives its intermittent movement through its mechanism. The latter is generally of two types: the Geneva Cross and the Cam and Cross Pin. The object of these movements is to shift the film very rapidly so as to allow the greatest possible length of time for the stationary picture. This feature, too, makes for a minimum of light required. What is more, film is not an extra strong material, especially when the purchase is merely two sprocket holes with a thin strip of celluloid between them. Hence it becomes necessary to jerk the film with great care—it should be started slowly, then increased in speed, and then brought to a gradual stop.

The Geneva movement fulfills these conditions so well that it is largely employed to-day. By referring to the accompanying drawings, it will be noted that it consists of a "pin wheel," *A*, which is geared to the mechanism and therefore has a steady rotation, and the Geneva Cross, *B*, with its four deep slots engaging with the pin wheel. The cross, it will immediately be obvious, is connected to the sprocket, so that its movements are directly transmitted to the sprocket. Now the pin wheel is also provided with a cam band, *C*, which is cut away sufficiently to permit the cross to make a quarter revolution and no more. In this manner the film is positively moved the same distance each time.

It does not require much of a mechanical mind to grasp the operation of this device. As the pin wheel rotates, its pin enters one slot of the cross and carries it along until the cross has made a quarter turn, by which time the cam band is in position to prevent further movement while the pin disengages itself from the slot. The pin, turning with the pin wheel, comes around again and



DIAGRAMMATIC PRESENTATION OF THE OPERATION OF A PROJECTOR, THE FUNCTIONING OF THE CONVENTIONAL GENEVA CROSS MOVEMENT, AND THREE COMMON TYPES OF REVOLVING SHUTTER

engages the next slot, repeating the cycle as often as the projector continues to be operated. This movement is ideal for the purpose, for the film is moved slowly at first, rapidly toward the middle of the cycle, and then slowed up before the disengagement. The film is thus subjected to a minimum wear and tear.

A form of intermittent movement which is of more recent conception than the Geneva Cross is the Cam and Cross Pin, which is shown in another set of sketches. Here the mechanism comprises four prime members, namely, a diamond-shaped cam, a locking ring, a pin cross, and a sprocket. The cam and locking ring are formed together on the face of a solid steel disk. The four pins of the pin cross are formed from the end of a solid cylinder of steel. The remainder of this cylinder is turned down to the proper diameter to act as a spindle upon which the sprocket is securely fastened. These details are only mentioned by way of illustrating the great care exercised in making an intermittent movement; for after all is said and done the intermittent movement is the very heart of the projector. It is the weakest link, so to speak, inasmuch as the success or failure of the projector originates in this movement.

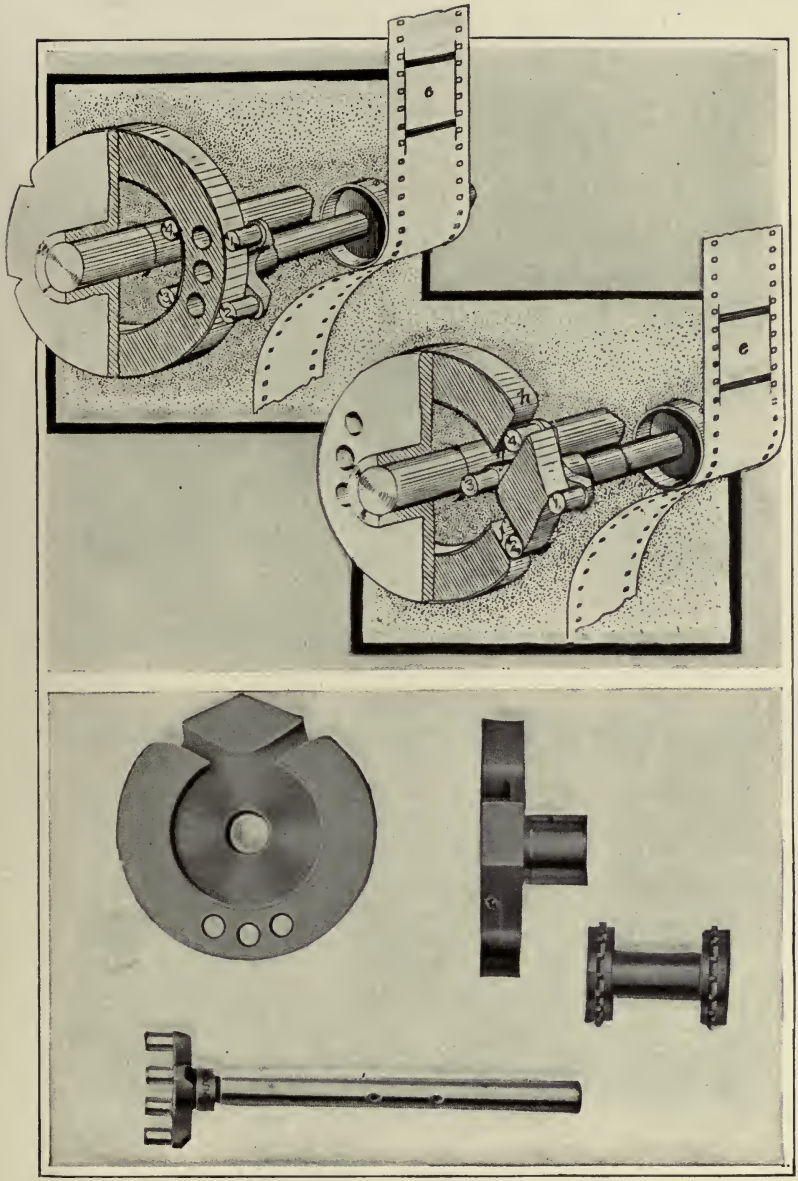
The operation of the Cam and Cross Pin is also readily followed. At every revolution of the driving disk, the cross makes a quarter of a revolution because of the diamond shaped section of the cam, while the remainder of the cam locks the pin cross in position during movements. It is claimed for this intermittent movement that it moves the film in the shortest time of any.

No matter what the type of intermittent movement may be, it is generally contained in an oil or grease bath, so as to reduce the wear and tear to a minimum, and to reduce the noise of clashing parts.

HAND AND MOTOR CRANKING

The turning of a single main shaft operates all the mechanism of a motion-picture projector. The main shaft, by means of gears and belts, turns the film reels, operates the intermediate sprockets and idlers, twirls the shutter, and drives the intermittent movement.

The first projectors were hand driven, the operator cranking the handle hour in and hour out while at work. But this is tire-



ABOVE: FUNCTIONING OF THE CAM AND CROSS PIN MOVEMENT. BELOW: COMPONENTS OF THE CAM AND CROSS PIN MOVEMENT

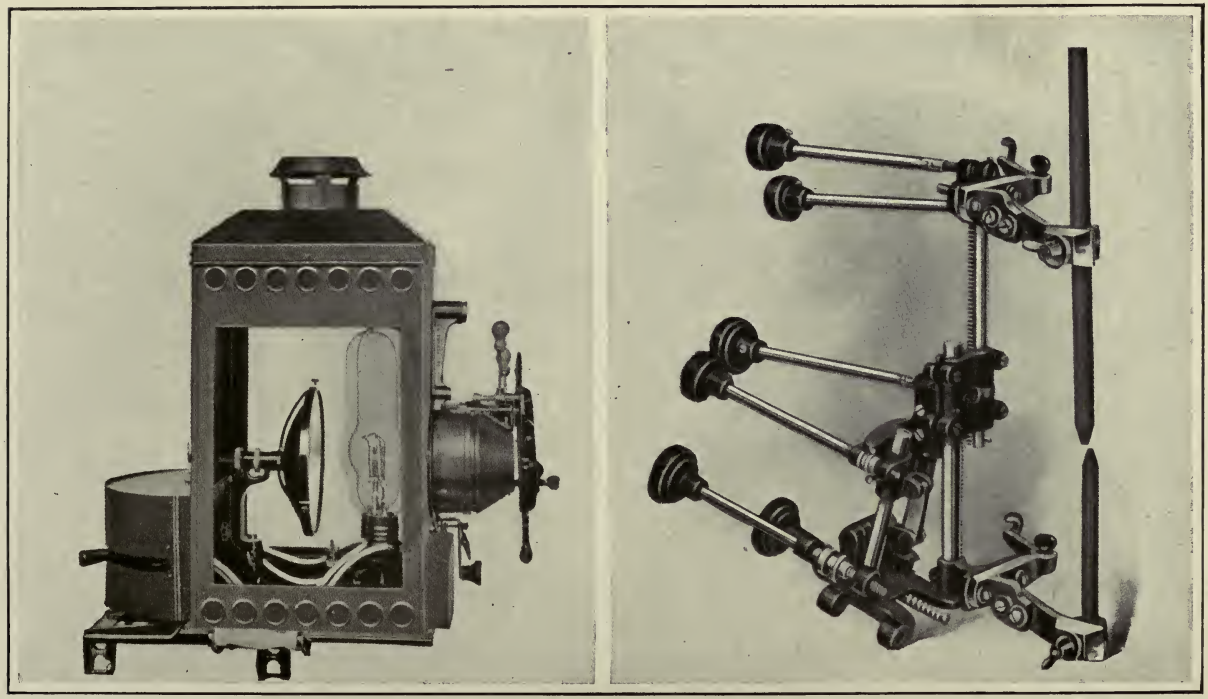
some and unnecessary labor; and it was not very long before motors were attached to the projector, leaving the operator free to supervise the projection, unhampered and unimpaired by the erstwhile cranking. The electric motors employed for projection machines are small ones, driving the main shaft through the medium of a variable-speed friction drive and belt transmission. After loading and threading the projector, the operator has but to turn on the light and snap the switch to start the picture, after which the work practically takes care of itself.

When two films of different frame lines or when films of uniform frame line are carelessly patched together, the image or picture is said to be "out of frame"; that is why it sometimes happens that a house is cut in two horizontally, the lower part being on top of the roof; or a man is cut in two, with his feet resting on his head. The remedy for this trouble is any one of the numerous systems of framing, which enable the operator to set the image in frame again, almost immediately, by means of a lever.

So far the projector has been completely covered with the single exception of the source of light. Hence a short survey of the various methods of furnishing light for film projection is now undertaken.

It is no simple matter to pass a large volume of light through such an opaque object as a film image, especially when the transmitted light is to be enlarged thousands of times on a distant screen. Indeed, tens of thousands of candlepower must be used for the purpose, and the consumption of current is necessarily great.

The most satisfactory light for motion-picture projection has been the arc lamp, consisting of two carbon pencils between which plays an electric flame or arc of bluish-white hue. The arc proper is due to the vapors of volatilized carbon or other materials forming the electrodes, which are slowly consumed by the action of the electric current. In order to form the arc, the electrodes must first be brought together, and then separated a short distance. The flame or arc when adjusted the proper length, is practically silent in the case of direct current, although it hums in the case of alternating current. If the arc is too short, it sputters or "fries," and the light is unsatisfactory. When the proper arc



AT THE LEFT: LAMPHOUSE EQUIPPED WITH THE MODERN GAS-FILLED INCANDESCENT LAMP WHICH REQUIRES NO ADJUSTMENT. AT THE RIGHT: TYPICAL ARC LAMP, SHOWING THE VARIOUS ADJUSTMENTS

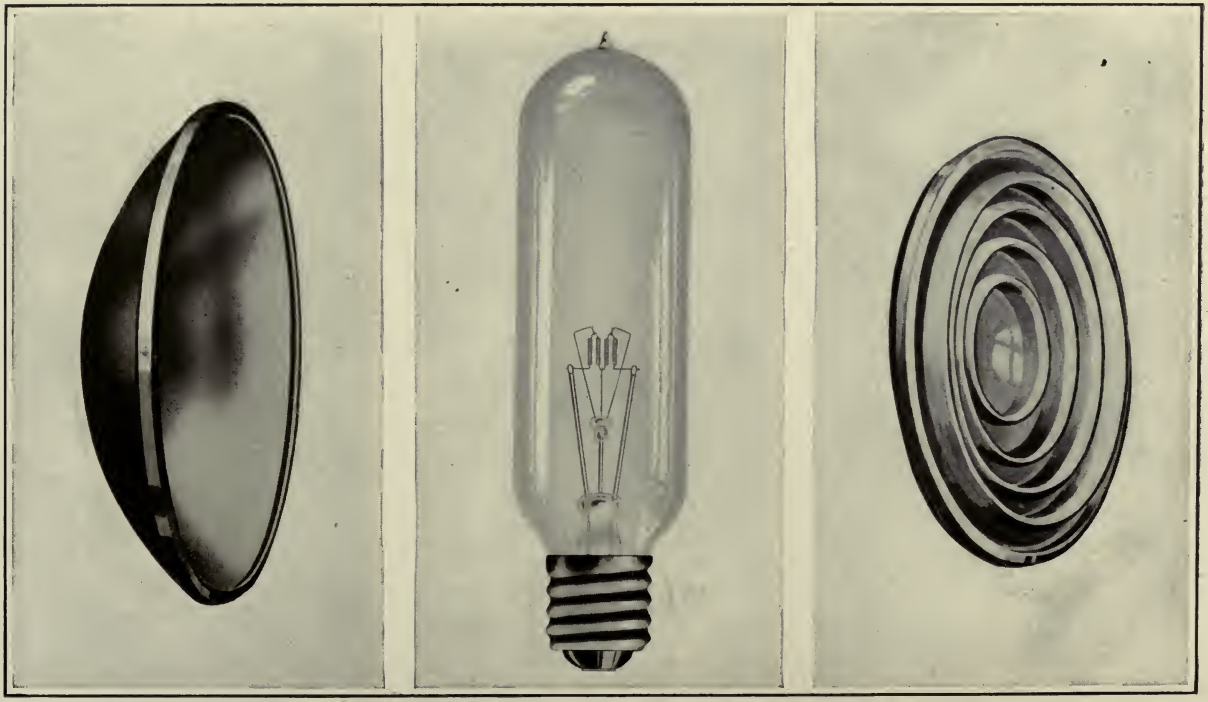
has been struck, means must be taken to feed the carbons toward each other, since they are constantly consumed, tending to lengthen the arc. If the carbons are not fed toward each other at regular intervals, the arc soon increases to such a length that the current can no longer bridge the gap and the arc is extinguished.

Various mechanical methods of feeding the arc are in use, the most common being a gear and ratchet arrangement of the design shown, wherein the two carbons are fed toward each other so as to maintain the arc always opposite the center of the lens system. Other adjustments for the arc lamp, or what goes to comprise the arc stand, shift the arc to the right or left, up or down, and forward or backward, so as to obtain the best projection.

There have been attempts to feed the carbons mechanically, making the work of the operator still less trying. One very ingenious arrangement comprised an electric motor operating the carbons through an elaborate transmission system. The motor was started and stopped by the varying resistance of the arc: as the arc increased in length and the resistance mounted, the motor was started; and when the carbons were again brought to the proper distance, reducing the resistance of the arc, the motor stopped. Successful as the device was in operation, it does not seem to have met with universal favor, probably due to its great cost in comparison to that of the entire projector. So for the most part the operator has to feed his arc by hand, watching it every little while during the projecting of a picture to see that the screen image is well illuminated.

More recently an attempt has been made to replace the arc light with an incandescent bulb of the gas-filled, high-efficiency sort. Leading research engineers have succeeded in evolving successful illuminating means for motion-picture work, and it is now possible to obtain a brilliant white image on a 10 by 13 foot screen, at a distance of 80 feet. Better projection results from the use of the incandescent lamp. When once adjusted it requires no further attention, thus permitting the operator to devote his entire time and thought to the actual projection of the picture. Constant adjustment is eliminated and a steadier illumination is assured, especially in cases where alternating current is used.

Economy is the watchword of the incandescent lamp. It



COMPONENTS OF THE GAS-FILLED INCANDESCENT LAMP FOR MOTION-PICTURE PROJECTION, CONSISTING OF A SILVERED CONCAVE REFLECTOR, INCANDESCENT BULB, AND SPECIAL CONDENSER

effects an approximate 25 per cent reduction in operating expenses. A further saving, which can hardly be estimated, is also made through decreased condenser breakage due to the fact that an incandescent lamp does not generate the excessive heat of the arc. Thus the condensers are not subjected to such extreme temperatures, which greatly increases their life.

Best results are obtained when the incandescent lamp is used in its proper sphere of duty. To expect it to project a 16 by 20 foot picture will only result in disappointment. Constant experimentation is under way to produce a still higher wattage incandescent lamp that will stand up under practical usage. While it is only a question of time before such a lamp is perfected, it is obvious that the incandescent lamp equipment cannot be used under any and all conditions until the higher wattage lamp has become a certainty.

In conclusion, the incandescent lamp is unexcelled in its proper sphere, which is a limited sized image for a limited throw. But when it comes to large images with large throws, such as for the use of large theaters, the arc is still the only satisfactory illuminant.

THE MAN BEHIND THE PROJECTOR

As was stated in the opening paragraphs of this chapter, the ultimate success of a photoplay depends on the operator of the projector. He can present the photoplay film as it really is, or he can ruin it before the eyes of the audience.

While it is true that the projection of film is largely a matter of routine, the operator must be something of a mechanic. Projecting machines are elaborate mechanical contraptions and there are numerous adjustments that require attention from time to time. And the operator must know his business, for much depends on his skill and experience in the success of a show. Again, he must be conscientious, because with each reel of film representing an investment of one hundred or more dollars, much property is placed in his care. The exchanges, or film brokers, are to a large extent at the tender mercies of the operators, who handle the reels which are hired out by the day. Some careless operators ruin many a reel of film beyond repair, but these men are few and far between. As a general thing, however, the operators respect the trust that is placed with them.

CHAPTER XIII.

PICTURES IN NATURAL COLORS

IT IS NOT because natural-color films are impossible or impractical that black-and-white films persist. There are today numerous systems for producing natural-color films of the practical sort, which may be shown in any theatre equipped with standard apparatus. These natural-color films reproduce all the colors of Nature with utmost fidelity. In fact, the screen picture becomes an almost perfect reproduction of the prototype, whatever it may be. Still, black-and-white films continue to be shown. Producers have not taken very kindly to natural-color films for good and sufficient reasons. Scenic and scientific subjects are worthy of natural-color reproduction; but when it comes to the photoplay, they prefer to continue with black-and-white, for the time being at least.

REPRODUCTION in natural colors is the goal of modern photography. Of that there can be no doubt; for at best the black-and-white reproduction is a makeshift or substitute, in lieu of the more realistic reproduction which must come in time. And that is precisely why numerous inventors in many lands have devoted time and energy and purse to the solution of the color photography problem. Wonderful results have been obtained, to be sure; huge sums of money have been invested in some of the processes, which proved so successful in the laboratory and at the public demonstration; but as a whole the color picture has been slow in attaining commercial realization.

THE LABORATORY AND THE WORKADAY WORLD

It is quite one thing to obtain wonderful color pictures and quite another to make a business success of a process. With money as a secondary consideration, it is possible to develop wonderfully faithful pictures in natural colors. Time and again that has been done, and the press has been free in its praise of the results obtained. But pictures are a business after all, and sooner or later the matter of dollars and cents comes up. How much does it cost? How much extra equipment has to be installed? Is any extra help required? What do the films cost to hire? Those are but a few of the questions asked by the exhibitors; and it depends entirely on the answers whether the process in question is to be a commercial success or failure. Many a color-picture inventor has made promising progress until he encountered those questions, and his hopes have been dashed to pieces against that impenetrable wall isolating him from the public—and fortune.

A color picture process must be realistic, in the first place. Its value as a picture must be such as to make it worth its difference in rental or cost over the black-and-white film. Then it must be inexpensive, both for the film and the equipment required. If the process requires an elaborate projector in addition to the usual equipment of the theater, its chances of commercial success are then and there greatly reduced. Most exhibitors are slow to install additional equipment unless it is quite imperative; and it is obviously difficult to induce the purchase of several hundred or several thousand dollars worth of

DIRECTOR, PLAYERS, CAMERAMEN, SCENE PAINTERS—EVERYONE IN THE INDUSTRY WOULD BE SERIOUSLY AFFECTED IF PHOTOPLAYS WERE TO BE PRODUCED IN NATURAL COLOR INSTEAD OF BLACK-AND-WHITE

equipment just for the occasional showing of a color picture. It is exactly the same as if a man, owning say a Victorila, were asked to purchase a Jonesola just for the sake of being able to play the special records made by the King of Timbuctoo. The question would be: Are the records of that king worth the price of a machine only good for those records? Decidedly not; and so with the special projector.

To be a commercial success, then, a color picture must require the minimum of special projection apparatus, preferably none at all. The films must be foolproof, and not too expensive to purchase or rent. And it is because so few processes have been able to meet those requirements that natural color pictures are still a rarity.

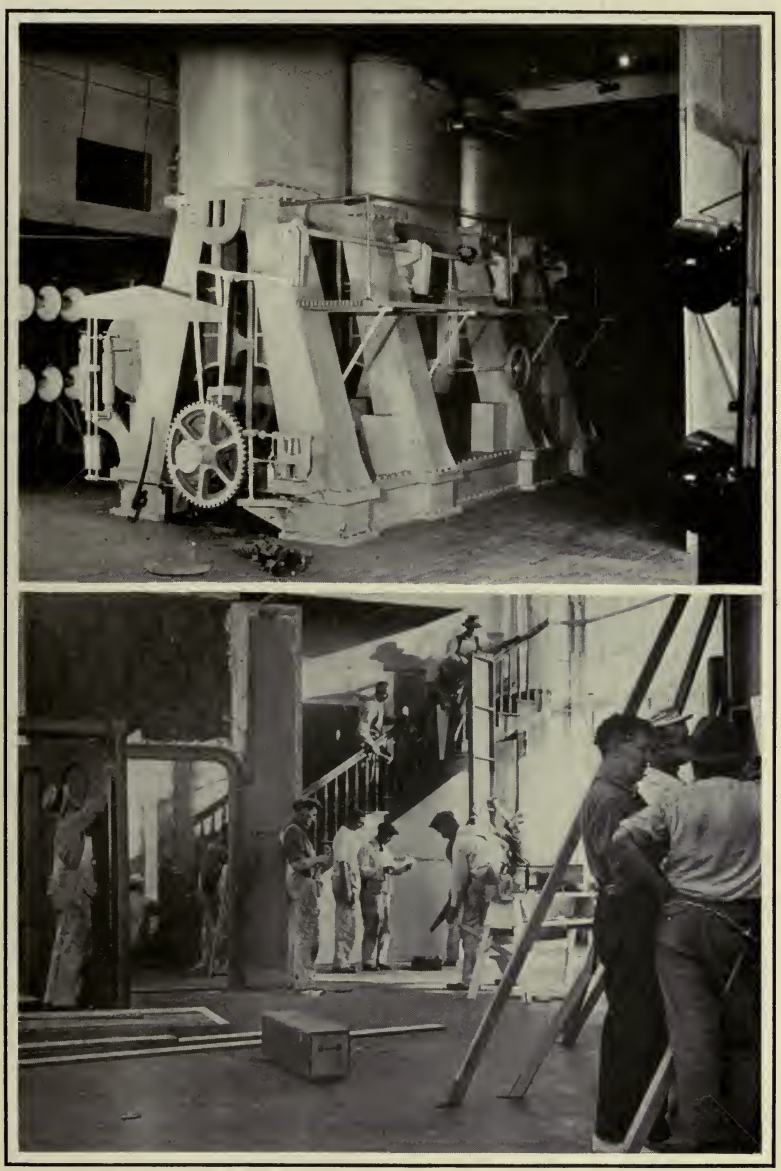
WHAT ARE NATURAL COLOR PICTURES?

There exists a general misunderstanding concerning natural color pictures. The public is ready to accept all colored pictures as natural color ones, whereas there is a vast difference.

Early in the motion-picture industry colored films made their appearance. These films, which in nine cases out of ten were produced in France, were delightfully and realistically colored. But they were not natural color films. Each little image, measuring but one inch by three-quarter inch, was painted by hand. It was a tedious handiwork to be sure; and it required the skill and patience of hundreds of French girls to tint the films for the entertainment of world-wide audiences.

In order to save time, various labor-saving methods were introduced, although the work perforce remained a slow and painstaking one. The general practice was for one worker to go through one scene, painting just a single character, tree, house, sky or other background, in each image, in successive order, in one color. Thus the minimum of time was required, since it was not necessary to pick up various brushes for various shades, with the ever present danger of making mistakes. And when one little detail had been tinted throughout a scene, the same worker or another worker began on another detail, and so on until every image became a fully colored picture.

Wherever possible, stencils were employed for reducing the



PROPERTIES AND SCENES ARE NOW PAINTED IN PLAIN PHOTOGRAPHIC COLORS, WITH A MINIMUM OF WORK

time and labor required. But even so, the work was at best quite expensive, although most pleasing to audiences.

Coming to natural color pictures, however, it must be made clear from the very start that there is no painting of any kind connected with them. Photography, and photography alone, is depended upon to reproduce any scene or object in its natural colors. Dyes and toning chemicals are employed in some processes, to be sure, but there is no painting in the accepted sense of the word.

MIXING COLORS TO OBTAIN PURE WHITE

Almost everyone has at one time or another become acquainted with the glass prism and its peculiar properties, among them the breaking up of a ray of white light into red, orange, yellow, green, blue, and violet. These colors, mixed in varying degree, produce any shade known to the human eye. And these same colors, when mixed in the proper proportions, produce pure white. The three primary colors are red, blue, and yellow, and it is the proper use of these colors upon which natural color photography is based.

In photography there are certain devices known as color filters or ray filters. These devices, consisting generally of strips of colored glass made to fit in front of a camera lens, have the peculiar property of allowing certain colors to pass quite freely while barring others. Thus if a red ray filter is employed, the print resulting from the negative will bring out the red values of the object to the detriment of the other color values. But if we photograph the same object through a blue ray filter and then through a yellow filter, making separate lantern slides of each, we have the three primary color values of that object. If we could possibly project these three lantern slides, all of the one size, so that their images would coincide, using a red light for the red image, blue for the blue, and yellow for the yellow, we would obtain a natural color image. In brief, that is the principle of color photography.

Before entering the subject of natural color films, it is necessary first to explain a peculiar property of the human eye, namely, that known as the persistency of vision. We believe our eye to be quick to see, and so it is. But we may be disappointed, perhaps, to be told that the eye responds comparatively slowly.

MAKING A NATURAL-COLOR FILM OF AN AQUARIUM. IN THIS CATEGORY THE NATURAL-COLOR FILM IS A NECESSITY

In fact, motion pictures of the black-and-white variety depend upon the persistence of vision for their illusion. The eye retains one image until the next is projected in its place, and before the eye can forget the second a third is projected, and so on. To the eye the images appear as one, for the dissolving effect of one into the other is produced in the eye because of the rate of projection. And so with color pictures. In reality, the images may not be in full color. Each one is of a distinct shade in most systems; but the successive images are so arranged that the red and blue, or whatever colors are used, follow each other with such rapidity that the eye retains two or three images at a time, giving the full color effect.

One of the earliest commercial natural color film processes made its appearance in December, 1907, in England, as the result of the untiring efforts of an Englishman and an American. This method dispensed with one of the components of white light, namely, blue-violet, and used but two, red and green, of the required colors. The red, of course, contained some yellow, being more on the orange, while the green contained blue and yellow, and in this manner it was possible to dispense with the yellow, generally speaking. The images were made at the rate of 32 per second, through red and green color filters arranged on a wheel turning in front of the film. Thus one image was photographed with the red filter, while the next was photographed with the green, and so on.

The positive film made from the negative was black-and-white in appearance, but it contained the latent color values. It only needed a special projector adapted to the speed of 32 per second and equipped with a color wheel working in synchronism with the images to produce the illusion of full color pictures, thanks to the persistency of vision phenomenon. The red images were projected when the red sector of the color wheel was in the line of projection, and the green images when the green sector was aligned.

The inventors at first met with considerable success. Their pictures were remarkably clear and realistic, although when rapidly moving objects were presented there appeared a red or green fringe about the outlines, indicating that successive images did not coincide or register, although in black-and-white this would

THESE BLACK-AND-WHITE FILMS ARE USED WITH COLOR-WHEEL ATTACHMENTS. NOTE THE DIFFERENCES IN TONE

pass unnoticed. American audiences have never forgotten the splendid color productions made in this country, as well as the Durbar films made in India and the Coronation of King George V. in England.

The process required a special projector, which made its employment rather prohibitive in small theaters. Again, twice the footage of black-and-white film was required, adding materially to the cost of the film. But for the larger theaters where the cost was but a small consideration, the film was available.

INGENIOUS COLOR PHOTOGRAPHY SCHEMES

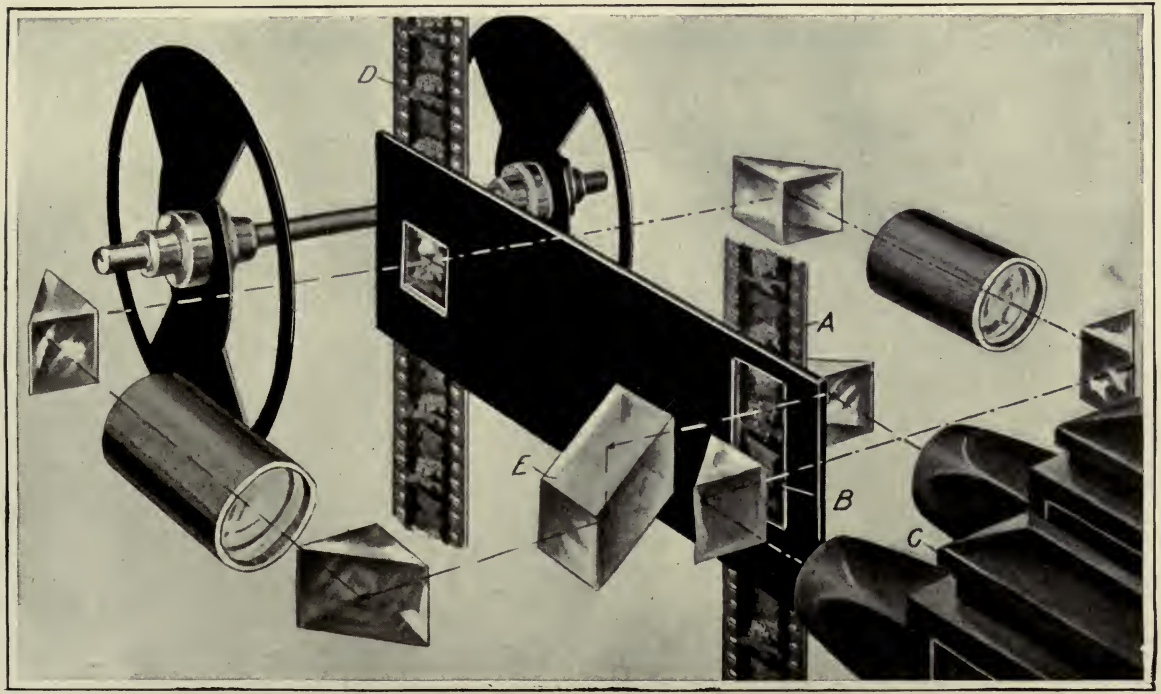
This color photography system was the first commercially exploited natural color film. But ever since its initial bow before the public there have been no end of others, some good, some poor, but most of them for one reason or another not available for commercial exploitation.

Among the more elaborate schemes have been those depending on the simultaneous projection of all the color images forming a single "frame." One of these made use of an extra wide film on which were photographed "red," "blue" and "yellow" images simultaneously, through one lens but with the rays of light split so as to pass through various ray filters. In projecting the reverse process was employed: the various images were projected on the screen by means of red, blue, and yellow lights.

The results obtained with this system were well-nigh perfect. Why shouldn't they be? The principle was technically correct. But when the process left the laboratory and the private demonstration room it met with rather a cold reception on the part of the trade. The special equipment and the great cost of the extra-sized film made it a poor commercial proposition.

Working on an entirely different reasoning, other inventors have tried to produce film which could be used in the standard projector. Thus they have had the small exhibitor in mind as well as the largest. One of these schemes which is typical of most of them is to use both sides of the positive film, thus projecting two images in a common frame at one time. The method is as follows:

In the camera two negative films are exposed at one time. One negative records the "red" image, while the other records

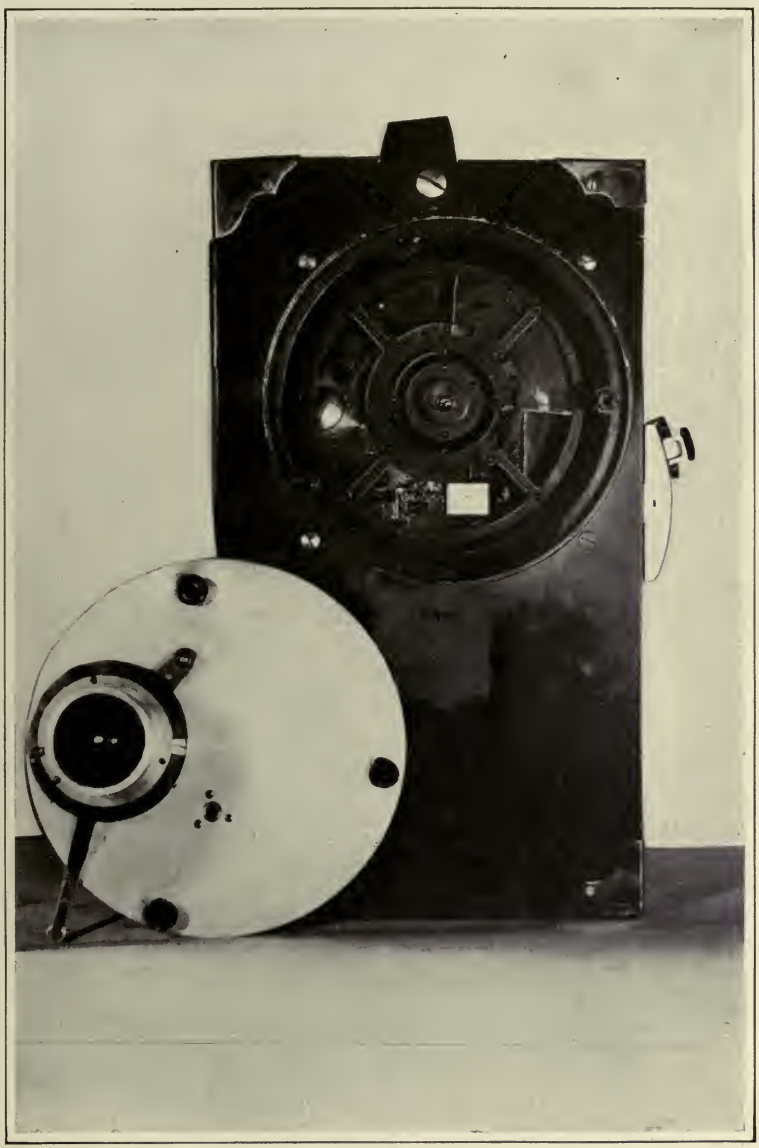


THIS ARRANGEMENT PERMITS OF PRINTING COLOR-WHEEL FILM IMAGES ON TO EITHER SIDE OF A POSITIVE WHICH IS THEN DYED GREEN ON ONE SIDE AND RED ON THE OTHER

the "blue-green." A prism is employed for splitting the light rays passing through the common lens. When the negatives have been developed, they are printed on to either side of a double-coated positive film which has a yellow celluloid stock. The object of the yellow is to prevent actinic light from passing freely through the celluloid and interfering with the images on the other side. The "red" negative is printed on one side, while the "blue" is printed on the other. Then the positive is developed and tinted red on the "red" side and blue on the "blue." The positive, obviously, contains the image in color: by holding it up to the light the coinciding red and blue images appear as one full color image, the yellow of the celluloid supplying the yellow required to obtain all shades. Of course, it is not possible to obtain pure white with such film, but white is obtained by contrast. An example of what is meant by contrast is to be found in the daily newspaper: offhand, we all say that a newspaper is white—white because it appears so in contrast with the black printing. But if the newspaper is placed on clean snow it is soon evident that it is anything but white. So with the film mentioned; the white is obtained by contrast.

Another scheme makes use of either the 32-pictures-per-second negatives already described, or negatives made in the same manner; that is to say, at a high rate of speed with alternate "red" and "green" images. These negatives are printed on both sides of positive film which is then tinted red and green, and can be employed in standard projectors.

Still another scheme makes a "red" and a "green" image at a time, by means of a prism arrangement using the common lens. The images are arranged in the usual order, but instead of being made successively as in the first-mentioned process, a pair is made at one time, and then another pair, and so on. The film is moved at the rate of 16 pairs, or 32 images, per second. The positive, which is printed from the negative, is then arranged for dyeing. Little blocks are placed over each "green" image and the film placed in the red dye, after which the blocks are shifted over the "red" images and the film placed in the green dye. In projecting this film a special machine is required, projecting two images at a time and shifting by pairs instead of by single images.



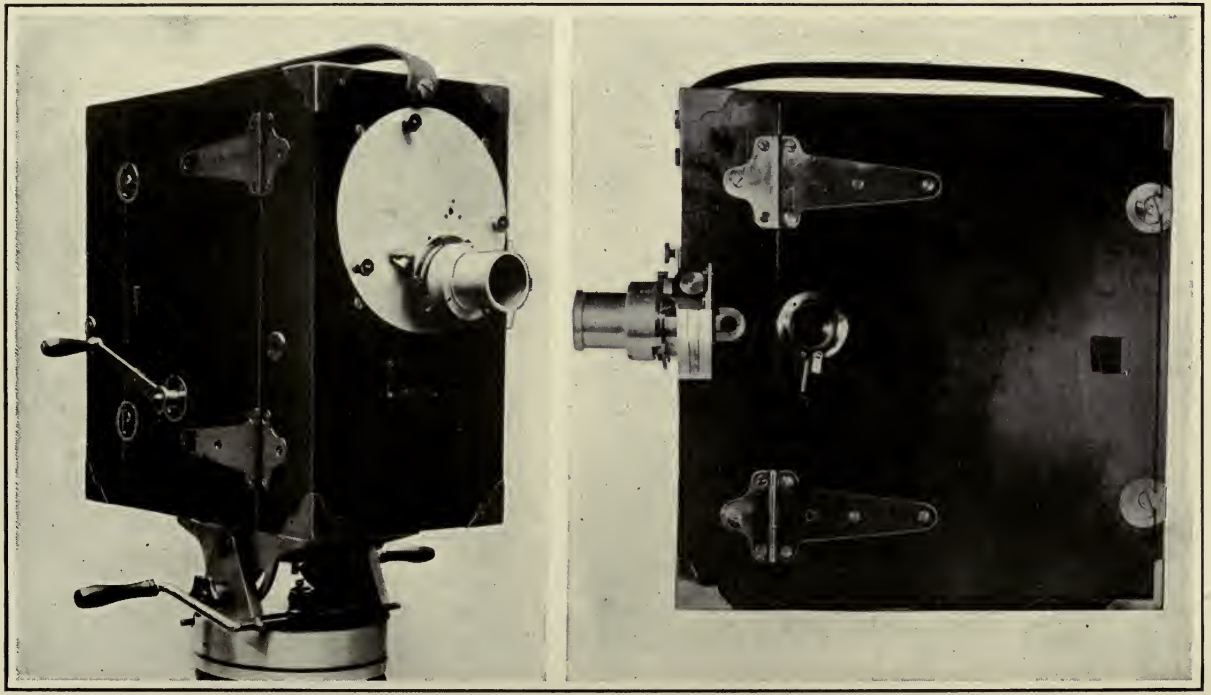
TYPICAL NATURAL-COLOR CAMERA WITH LENS-BOARD REMOVED, SHOWING COLOR-WHEEL AND RAY FILTERS

Of late there has been developed a new process which in many ways appears to be an improvement on other processes. Indeed, this process reproduces objects at rest and in motion, and in nearly all shades and colors found in nature. The detail is just as complete as that of the black-and-white film. Aside from the faithful reproduction of the subjects, the new pictures display an almost complete absence of the objectionable color fringe found in some of the other processes, when fast moving objects are portrayed. But its main advantages are simplicity and wide applicability: the film can be handled by the ordinary operator in the standard projector, by means of a simple and inexpensive attachment which in no way interferes with the projection of black-and-white film at will. Thus it is possible for the smallest theater to show color pictures as part of its usual program.

A STUDY IN COLORS AND COLOR COMBINATIONS

Four colors, made up of two pairs of complementary colors, are involved in the new process. The first pair is composed of red and blue-green, and the second of orange (or yellow) and blue. These four shades photographically cover the entire range of visible colors. The reduction to a substantial white from each pair of images and the fact that all colors overlap, enable the pictures to be made with but little apparent differences in densities; and this feature is further brought about by the addition of other elements in the making of the film. These factors render unnecessary special laboratory equipment other than that used in black-and-white cinematography.

In taking the new pictures the camera controls a single strip of panchromatic film—film whose emulsion is sensitive to all color rays—of standard width and perforation, this being pulled down step by step back of a single lens as in usual practice. Between the lens and the film, however, two shutters are employed, the usual one to cover the film during the period when the film is moving, and another to bring into position the color filters through which light rays must pass before reaching the film during exposure. As each ray filter comes into alignment with the lens, one image or frame is exposed on the film. The camera is operated at a speed of 24 frames per second. Opposite each image made through the red filter a black stripe or mark appears



VIEWED FROM OUTSIDE, THE NATURAL-COLOR CAMERA IS NO DIFFERENT FROM THE CONVENTIONAL BLACK-AND-WHITE CAMERA. IT IS GENERALLY GEARED TO OPERATE AT HIGHER SPEED THAN STANDARD

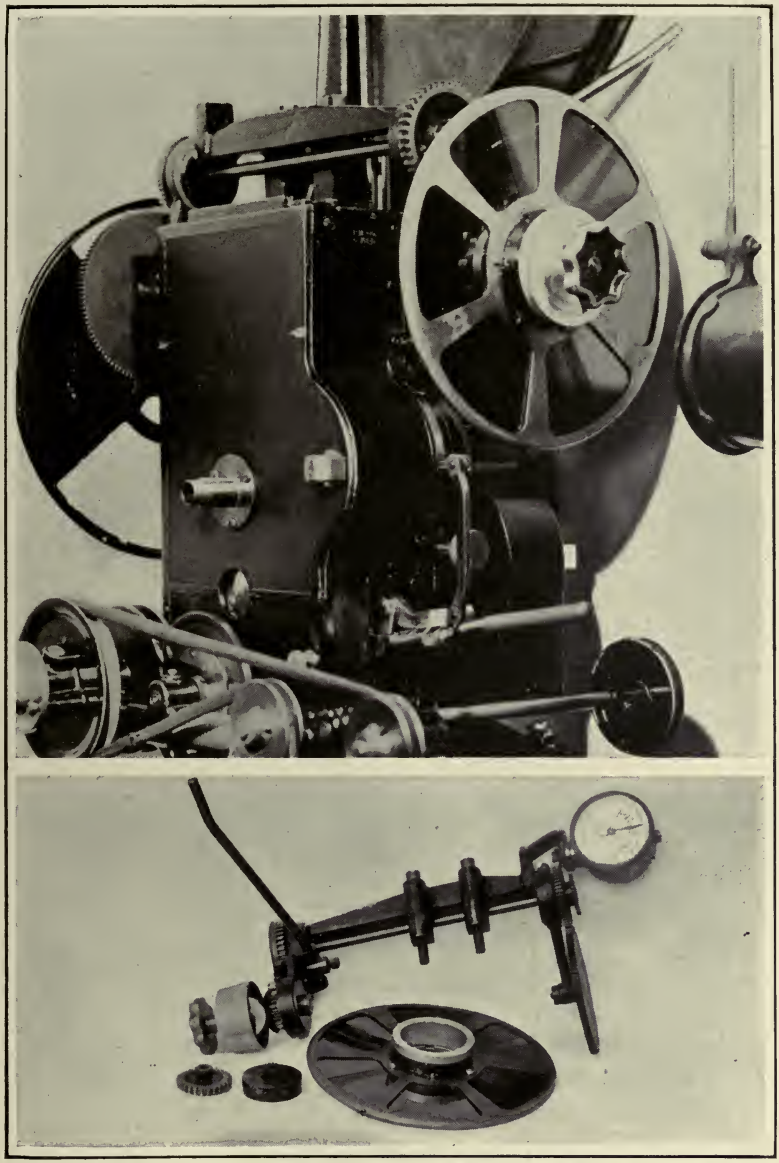
in the perforated margin of the film, to serve as a guide at all times; for with the position of the image thus indicated, the laboratory staff, the operator of the projector, or anyone else can immediately locate the "red" image of the negative or positive, or any other image, for that matter, since the order of the various "colors" is always the same. The black stripe or mark is made in the camera by allowing a ray of light to pass through a small tube mounted on the lens board, at the moment when the "red" image is being recorded.

The positives are printed in the usual manner, and although the finished film is in black and white and does not materially differ from ordinary film, it nevertheless carries latent color values, just as does other similar film. Some strips of positive film indicate the color separation to a greater degree than others, depending on the subject, so that adjacent images may often be of somewhat different densities.

At this point the question naturally is asked: By what magic is this monochrome, lifeless film translated into living, colored photography?

The process of reproducing the original is simple when once explained. A color wheel composed of colors similar to those used in taking the pictures, is geared to the projector. For certain reasons, however, the selection and arrangement of the colors differ slightly in the projector and the camera. The projector makes use of a six-segment color wheel or color screen shutter, three segments being in graded shades of red and three in blue. It will be noted, further, that each image on the film remains in position long enough to be projected on the screen with three shades of red or blue, as the case may be. The red and orange images are projected with light passed through three red segments, and the blue and blue-green images with light passed through the three blue segments. The speed of projection is 24 images or "frames" per second, and the persistency of vision is depended upon for the full color effect.

The concern which introduced this system has lately developed a modified one, in which the film is tinted red on one side and green on the other, so as to eliminate the special attachment. After all, that film is best which can be shown on any standard machine without attachments or additional experience on the



STANDARD MOTION-PICTURE PROJECTOR EQUIPPED WITH COLOR-WHEEL ATTACHMENT SHOWN IN LOWER VIEW

part of the operator. The former system of this concern has been described only to explain how apparently black-and-white film can be converted into colors on the screen.

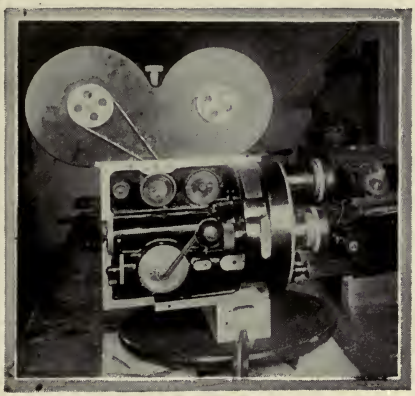
For scenic films and industrial films and educational films, the color film has no doubt a large and useful application. When it comes to photoplays, however, its application at present must necessarily be slow. Millions of dollars are invested in equipment for black-and-white photoplays, and to throw away the better part of all this for the production of color photoplays would mean something like a complete revolution of the industry. In fact, directors and producers have pointed out time and again the difficulty of producing pictures in color. New technicalities are immediately met with when color photoplays are attempted: color schemes must be watched; backgrounds have to be artistically painted; actor makeup must be revolutionized; lighting schemes have to be changed; camera difficulties multiply, and so on.

The truth of the matter is that color photoplays are being sidestepped by the leading producers. They admit that color photoplays are better than black-and-white; but why borrow a big bag of unknown troubles when the public appears so well satisfied with the present films? they ask.

CHAPTER XIV.

FILMING THE WORLD INVISIBLE

THE PARTNERSHIP of microscope and motion-picture camera has contributed no end of marvelous subjects to the screen. Years ago the first microscopic subjects were filmed at the Marey Institute in Paris—that institution which has contributed so much toward the development of motion pictures and the broad field of science. Since then similar pictures have been made in various countries, particularly the United States of late. Typical of this class of film is the work of the young American producer whose work is about to be described. His is an unusually interesting work. He directs microscopic players on a stage varying from 1-64 to ¼ inch square! And his players only have to "act natural;" for it is their normal selves and mode of living in which the audience is interested.



A DROP of water taken from a stagnant pond is rich in motion-picture possibilities. To be sure, it does not present extraordinary promise when viewed with the naked eye, but under the critical gaze of the microscope a new world is thrown open to the camera. For, with the drop of water as the "location," and with the myriads of micro-organisms for the cast, there are comedies and dramas and educational features without end for the motion-picture screen.

For us the filming of micro-organisms is a novelty. Previous to the war this class of motion-picture photography was practically a French and Italian monopoly; and from the splendidly equipped laboratories of the French and Italian producers there issued reel after reel of wonderful subjects depicting the activities of the invisible world. The demand for such films in America was inconsiderable then; certainly out of all proportion to the expense and trouble involved; hence our producers gave no further thought to the micro-photoplay. But with the increasing interest in popular scientific films conditions have changed. Indeed, we have been obliged to undertake the task, difficult as it is; and to-day the presentation of American-made micro-photoplays in many of our theaters is ample evidence of our success.

DIRECTING AMOEBAE, RHIZOPODS AND THE LIKE

One would suppose that the micro-photoplay studio would be located in the country, with Nature close at hand. As a matter of fact, however, the majority of films of this kind are being made in a glass-encased studio on the roof of a New York skyscraper, far from any trace of Nature unless it be the sun and clouds above. To this studio are brought the various samples of stagnant water and insects and other subjects to be filmed. They arrive in small vials, test tubes, large bottles and pill-boxes; in truth, the transportation problem is so readily solved in the case of these little performers that the studio can be located almost anywhere. That is why it is found in the metropolitan district, where other advantages are greatest.

The first qualification of the micro-photoplay director is that he must be a born naturalist: he must not only be intensely interested in all forms of animal life, but must be intimately familiar with the subject. He must be ingenious, too, for the filming of

THE PRODUCTION OF MICRO-PHOTOPLAYS IS A LABORATORY JOB AND SHOULD BE HANDLED BY NATURALISTS WHO UNDERSTAND THEIR SUBJECT THOROUGHLY AND KNOW HOW TO MAKE GOOD PICTURES

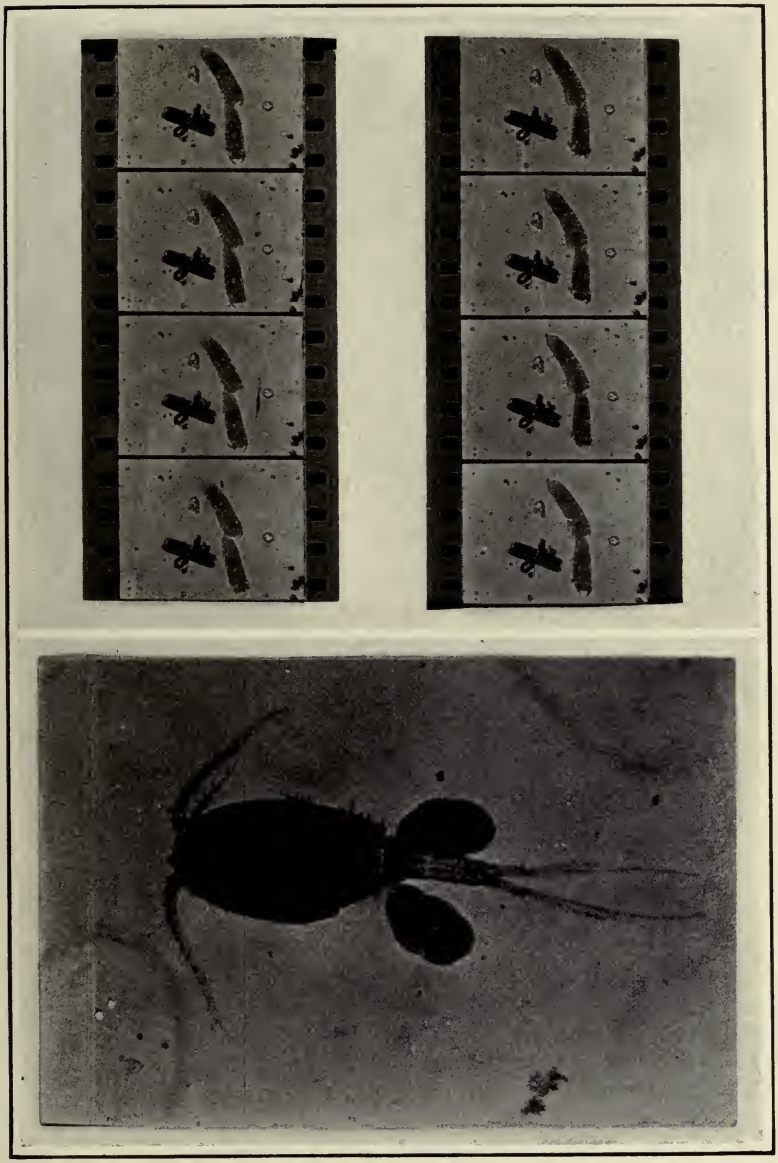
the little performers calls for no mean ability at times. He must be a skilled photographer, for in the main the work is one of photography. And, of course, he must know what is interesting to the public and know how to tell a story in pictures so that it will be entertaining and instructive.

All of these qualifications are possessed by a certain young man of New York City, who is directing the micro-photoplays in the skyscraper studio. Born and raised on the farm, a student of natural history, a press photographer for many years, a magazine correspondent, a motion-picture cameraman, this young man happens to be the fortunate combination for such work. Most important of all, his hobby is natural history.

For some time past our friend has been filming micro-organisms for the lay audience. Starting with the simplest form of animal life, namely, the amœba or simple cell, he and his assistants, in coöperation with the American Museum of Natural History, have been progressing with a series of films which, when completed, will represent all stages of animal life. All indications at present are that the work will require years, for it is perforce exceedingly slow and painstaking.

The day the author called on the micro-photoplay director he happened to have three small aquaria on the laboratory table. One of these contained water taken from the Bronx river, another from a pond near Flushing, L. I., the third from a pool in the woods near Tenafly, N. J. Beyond a doubt the last was the pride of the laboratory; for, as he explained, he had walked five miles along the Palisades the previous Sunday in search of this particular fluid—a slimy water, rich in animal life.

Plunging a glass tube into the Tenafly sample, he explored some silt at the bottom until he evidently found what he was after. Then placing a finger on the free end of the tube, he removed it from the aquarium and released its contents on a microscope slide. A moment later he was studying the same under a microscope. Then he asked the author to examine a splendid specimen of rotifer vulgaris, which at that moment was working its paddle-like head so as to suck food into its mouth much after the plan of a vacuum cleaner passing over a dusty carpet.



STRIPS OF FILM AND A SCENE FROM A MICROSCOPIC MOTION PICTURE PRODUCED IN NEW YORK CITY

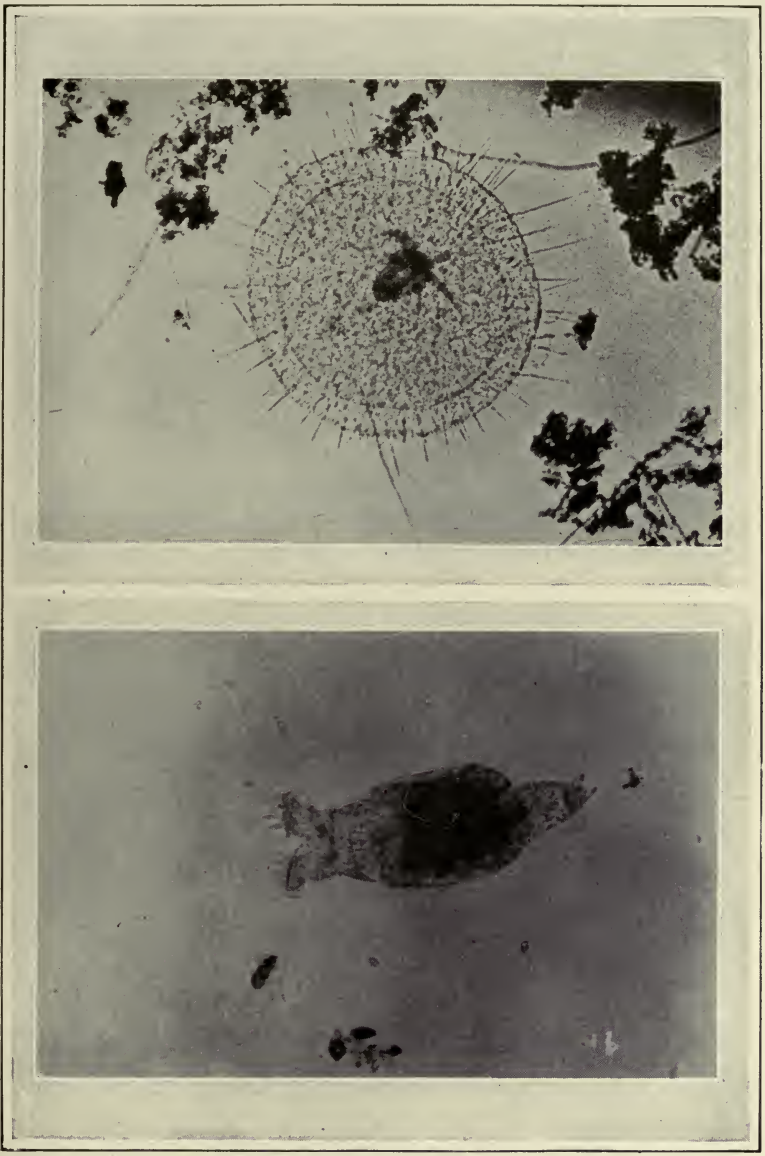
LIGHT!—CAMERA!—ACTION!

It is a long step from examining a specimen under the microscope to making a motion picture of it. The mechanical difficulties are many fold, though in principle one simply replaces the reflecting mirror with a powerful source of artificial light, and the human eye with the camera. In practice, however, the work is carried out in this manner:

The director, after preparing the microscope slide in the usual manner and placing it on the stage of the microscope, which is then in position on the steel bench or photographic stand, adjusts his instrument until the desired view is obtained. The slide, of course, is provided with a cover glass so that it can be tilted to any position. Then the microscope is turned horizontally, and its eye-piece and reflecting mirror are removed. The former is replaced by a motion-picture camera the lens of which has been removed, while the reflecting mirror is now represented by a powerful lantern fitted with condensers, supplementary condensers and special color filters.

For this interesting and unusual work a Moy camera is employed, which is provided with a peep-hole at the back through which the image can be seen on the film, in greatly magnified form. So by providing the camera with a light-proof hood or cover it is possible for the camera operator to watch the subject while the pictures are being made and to focus at any instant if conditions are altered. What is more, by means of this method it becomes possible to follow a performer about the slide by the usual movements of the microscope stage, just as the outdoor cameraman can follow a player about the scene by turning the cranks of his tripod.

So sensitive are the animalcules that they can be left only for a short period in the strong light necessary to photograph them. As a general rule a film must be made in forty to fifty seconds, and an extension of the period generally results in killing the little performers. In one case, however, 200 feet of film was made at a stretch, but this is exceptional. Obviously, this fact makes for quick action once the actual filming is started; and our young director is of the opinion that once he attempts to film still more sensitive micro-organisms, it will be necessary to use a shutter in the path of light so as to provide intervals of rest for the



ABOVE: THE ACTINOSPHERIUM DIGESTING WHITE WATER MITE. BOTTOM: ROTIFER VULGARIS. BOTH ARE ENLARGED 400 DIAMETERS

subjects. The French in some of their work, particularly films showing blood corpuscles and disease germs, have made use of a shutter operating in synchronism with the camera shutter, so that the specimens have intervals of rest instead of being subjected to continuous light and heat.

Special types of condensers of the liquid variety, making use of different chemicals, have also proved a great help in bettering the photographic conditions and increasing the longevity of the micro-organisms by absorbing some of the heat of the light.

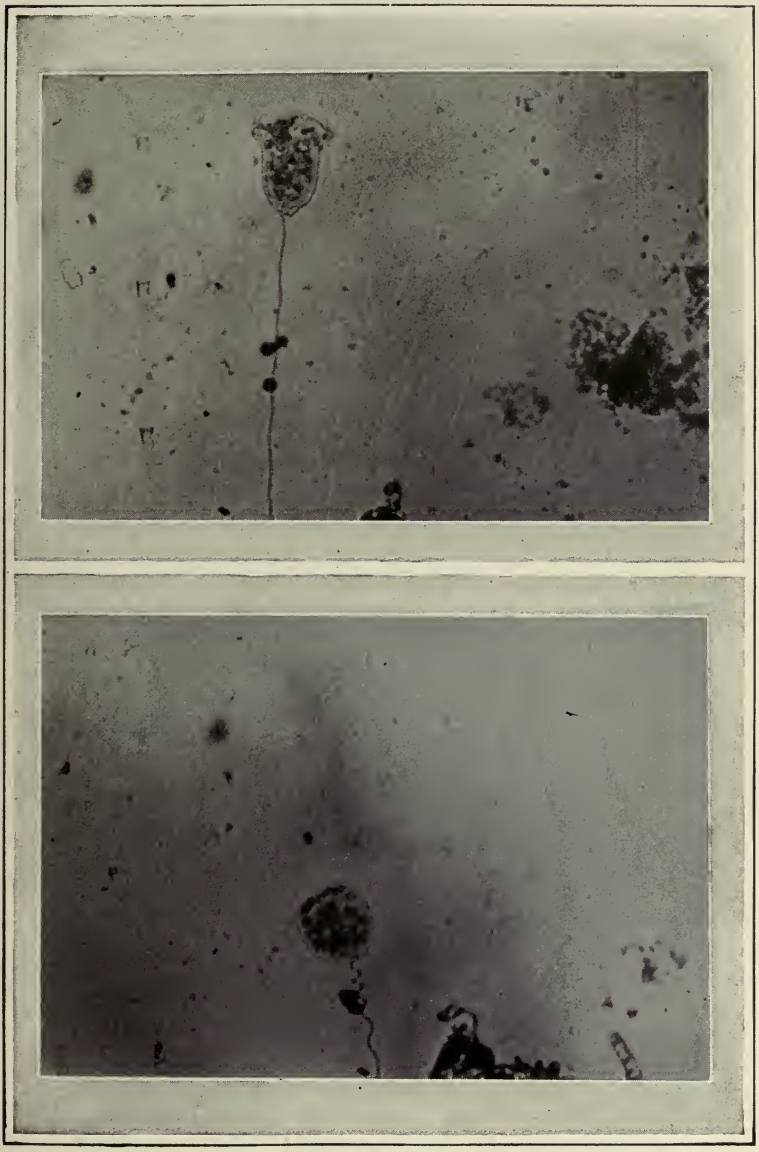
PRISON CELLS AND STRAIT-JACKETS FOR FRIVOLOUS PLAYERS

In justice to animalcules as a class be it said that they are usually willing enough to be filmed; for being slow of movement it is a simple matter to keep them in the field of the camera. And even if they should suddenly succumb to an attack of the wanderlust, their movements can be readily followed by shifting the stage of the microscope as already described, all the while watching the image through the peep-hole of the camera. But occasionally the director is confronted with a frivolous performer—one that insists on scampering about in the most disconcerting manner.

While it may be true that a drop of water is not a very large area in the usual sense of the word, when the high power microscope is applied to it the area is magnified until it corresponds to a pond of respectable size as seen with the naked eye. So when the animalcule decides to saunter off to parts unknown the search is not unlike that of trying to locate a small fish in a large pond, or the proverbial needle in the haystack.

Right here, however, is where the director's ingenuity comes into action. For he provides for just such an occasion by keeping on hand a number of thin aluminum strips in which he has punched a square or round hole. By placing an aluminum strip on a slide so as to box in the specimen, he effectively limits the field of operations to the field of camera vision when the actual filming takes place. No matter where the performer's fancy may then take him, he is still within the range of the camera, securely penned in by an aluminum fence.

Again there are times when the anatomy of a specimen is to be filmed. In this case it is essential to have the specimen remain



THE VORTICELLA OR BELL ANIMALCULE EXTENDED AND THEN CONTRACTED AFTER BEING DISTURBED. 400 DIAMETERS

in one position. Some specimens are quite docile in this connection, while others are not. The latter are soon tamed, however, by the resourceful director. He makes use of a special slide which has two glasses—a fixed bottom glass and an adjustable top one. The latter is mounted in a threaded ring which screws on a hollow stud, so that by turning the top glass it is brought closer and closer to the bottom glass while maintaining at all times the parallel arrangement. The obstreperous performer is placed in this chamber of horrors, so to speak, and as in the familiar lithographs of by-gone melodramas the moving wall gradually closes in on him. But in this case the movement is stopped when the specimen is slightly squeezed, there being no desire to crush him.

In photographing mosquito larvæ a little trough was constructed in which to place the specimens. This consisted merely of the usual slide on which was cemented another sheet of glass provided with a half-circle notch, and then another glass to cover the notch. In this manner a pond-like section was provided for the stage setting, and when filled, the mosquito larvæ, swimming about the water and coming up to the surface for air, were followed by the adjustments on the microscope stage.

One of the micro-photoplay director's invariable habits is to look after the welfare of his invisible performers. After a scene is filmed he dismantles the stage or microscope slide and returns the drop of water with its charges to the aquarium whence it was originally drawn. Obviously, it would be simpler to shake the drop of water on the floor or to wipe it off with a towel or handkerchief. That would be the common procedure. But not so with this director. Perhaps it is sentiment or perhaps it is force of habit which moves him to return the micro-organisms to their glass-bound world; but however that may be, the fact stands that the performers, none the worse from their appearance before the motion-picture camera, are kept alive and ready for another call when this humane course is followed.

The micro-photoplay has a big field to draw upon, aside from studies of animal life. In chemistry we may exhibit the formation of crystals and other marvels. Just as the French and Italians have already done, it is possible to show various disease germs and how they affect the human system. The circulation

IT IS A WIDE STEP FROM MICRO-PHOTOPLAYS TO THESE GIGANTIC ELEPHANTS AND TOWERING WALLS EMPLOYED IN A RECENT FEATURE PRODUCTION, YET THEY MARK THE SCOPE OF THE SCREEN TODAY

of blood can be filmed as well as other micro-organisms which enter into our lives. Surely, we have but scratched the surface. Much can be expected in this latest field of American cinematography in the no distant future.

CHAPTER XV.

PICTURES THAT TALK AND SING

THE TALKING picture has always labored under an unlucky star. It was introduced to the public long before it had developed to full maturity in the laboratory; crude makeshifts, incorporating the phonograph with its metallic and poorly articulated speech, and the standard motion-picture film, were widely advertised and exhibited in theatres to a curious public. The phonograph and pictures failed to work in harmony, in many instances; consequently, the talking picture scored an ignominious failure. The public, which always judges by the first impression, became possessed of the idea that talking pictures are a crude experiment, an interesting but impractical scientific toy. But the talking picture, in more recent forms, has vast possibilities. It is gathering strength in the laboratory. When the proper time comes, it will soon live down its unfortunate past.

A CLEAR, stereoscopic, flickerless image on the screen, in natural colors, accompanied by a true and convincing reproduction of the sounds emitted by the subjects appearing before the eyes, the successive images and sound waves being in perfect synchronism—that, in brief, describes the eventual goal of cinematography. In other words, absolute realism is the ideal; and everything that does not quite come up to the ideal is but temporary and can only be considered as a milestone in the steady progress of the art.

Inventors certainly cannot be accused of not having devoted sufficient thought and energy and resources to the talking picture; for after the natural-color motion picture the coupling of the phonograph with the motion picture has attracted significant numbers of ingenious inventors in every leading country. And why not? Given a more or less perfect means of reproducing action on the screen and a more or less perfect means of reproducing sounds, inventors have been encouraged to couple the two into a successful and revolutionizing form of entertainment.

But the problem, simple as it seems at first, is a most difficult and baffling one. For one thing, there is the question of developing suitable means of synchronizing the pictures and the sounds, for it is quite obvious that they must be in perfect step, so to speak. And even if the question is satisfactorily answered, the greatly amplified sounds from the conventional phonograph, which would be required to fill a large theater, are far from realistic. Lastly, how is one going to secure a continuous sound record for a film 1,000, 2,000 or even 5,000 feet long? In these days of feature productions of five reels or more, with scene after scene flashed on without a break or delay of any kind, there can be no such thing as changing records. A "One Minute to Change the Records" sign would not be tolerated.

SOME SCHEMES THAT HAVE BEEN TRIED

The simplest talking picture is obviously the combination of a simple phonograph and a motion-picture projector. The phonograph, placed near the actors, registers the sounds while the camera is recording the action. The difficulty of securing good sound records is great, since in the usual phonographic recording studio the singers are placed but a foot or so away from the sound

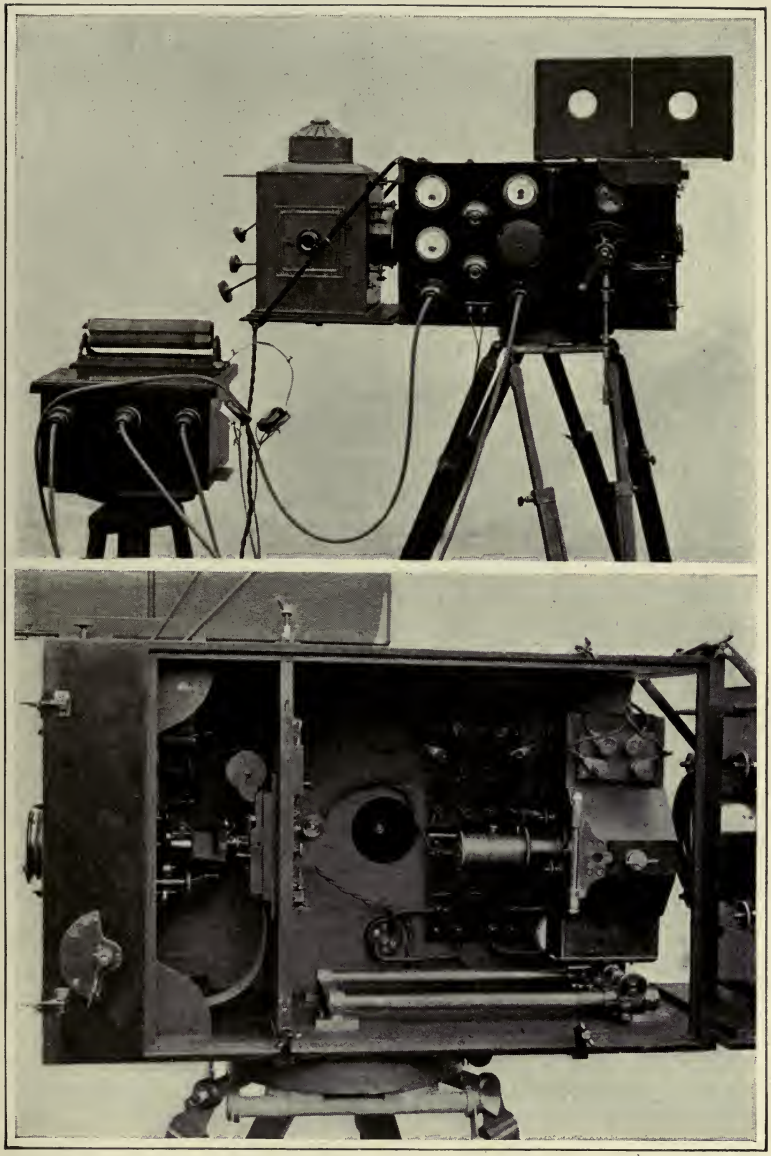
BY MEANS OF THE CINE-PHONO OR TALKING PICTURE, IT BECOMES POSSIBLE TO RECORD THE VOICE SIMULTANEOUSLY WITH MOTION PICTURES OF THE SUBJECT, IN THE MANNER HERE DEPICTED

horn of the recorder. But in talking pictures the recorder would perforce have to be placed many feet away so as not to interfere with the pictures.

Again, there is the matter of synchronism, and therein lies the main difference between the hundreds of schemes which have been suggested from time to time in the past, with the phonograph and motion picture for the basis. The picture and the sound record must be kept in step, for otherwise the effect is ruined and the entertainment soon becomes ludicrous. The writer has in mind a talking picture produced some eight years ago. It was a scene from Julius Cæsar—the quarrel scene, to be exact. One of the characters suddenly sheathed his sword, and a few seconds later came the commanding voice from the phonograph somewhere behind the screen, saying: "Sheathe thy sword, Brutus!" The audience roared, of course.

At some time or other the film must have been torn and then mended; and in the latter operation several feet had been omitted. But the sound record remained unaltered, for the reason that there was no practical way of deleting a certain portion to correspond with the deleted section of film. The result was the loss of synchronism: the action got considerably ahead of the sound record.

So it has been with many phonograph-projector schemes. One of the reasons for their poor showing in the workaday world has been the necessity of placing the phonograph close to the screen, in order to have the sounds come from the front of the theater where the pictures were being shown. The projector has been placed at the rear of the theater, following the usual practice. Now with the two components of the system separated by several hundred feet, the difficulty of synchronizing them has been very great. Elaborate timing arrangements, synchronized motors, loud-speaking telephone circuits and other schemes have been tried with poor results as a general thing; for even with fair timing it has not been possible to take care of the break in the film which, as is at once apparent, could not be compensated because it was not practicable to eliminate a corresponding portion of the sound record. Jumping the sound record a bit in order to keep up with the film has not always been feasible, and lagging the film in order to have the sound record catch up with it has



GENERAL AND CLOSE-UP VIEW OF THE CAMERA USED IN MAKING TALKING-PICTURE FILMS

called for much skill on the part of the operator. And that is a matter of introducing the human element—the questionable factor which is constantly being reduced in motion-picture practice —on a vast scale; and that feature alone has counted heavily against such systems. Above all, the successful talking picture will be fool-proof; nothing will be expected of the operator.

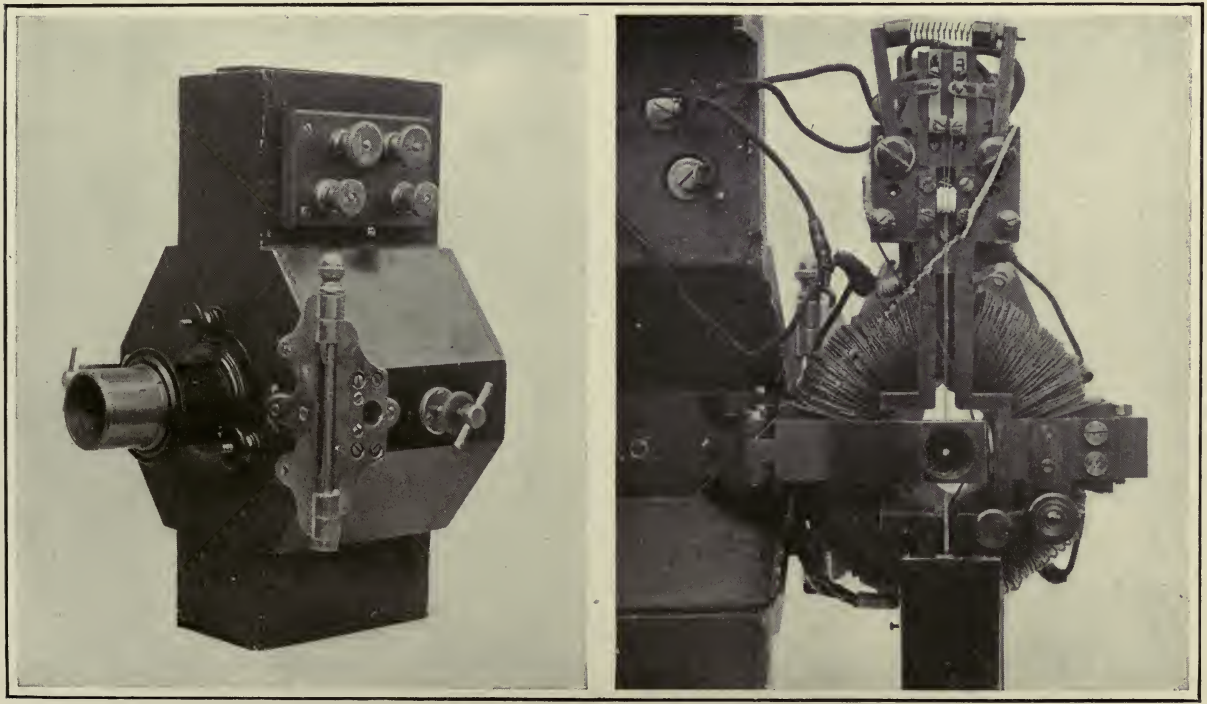
Aiming at the elimination of synchronizing separated components, several schemes have been tried in which the sound record and film are combined. One of these schemes makes the film carry the sound record along one edge, side by side with the pictures. A stylus travels in the groove on the film, so that the matter of synchronism at least is solved. A similar scheme carries the sound record along one edge of the film. But both these systems have proved quite unsatisfactory from a phonographic point of view, for the sounds thus reproduced are of poor quality and rather weak in volume.

Talking-picture systems have come and gone, one after another. Some have been brilliantly successful in the laboratory, under the skilled and patient hand of the inventor; but their commercial life when at the mercy of the average picture operator has been short indeed.

Still, the talking picture must come some day, and when it does it may be largely based on the principles incorporated in a typical system about to be described in some detail. This system, which is a composite of many ideas suggested by numerous inventors in the past, has been tried out in England and in France with fair success. But complicated it is, and much remains in the way of refinement before it can ever become a commercial success.

TRANSLATING SOUNDS INTO BLACK AND WHITE

The typical talking-picture system we have selected to illustrate the cine-phono possibilities replaces the usual phonograph with a photographic method of recording sound; and a selenium cell and telephone system act as the reproducer for translating the photographic record back into sound waves. No stylus of any kind is employed; in fact, there are no mechanical movements employed in reproducing the sound other than the constant travel of the film past the selenium cell. The sound waves can be reproduced with the utmost fidelity; and since they are placed on the



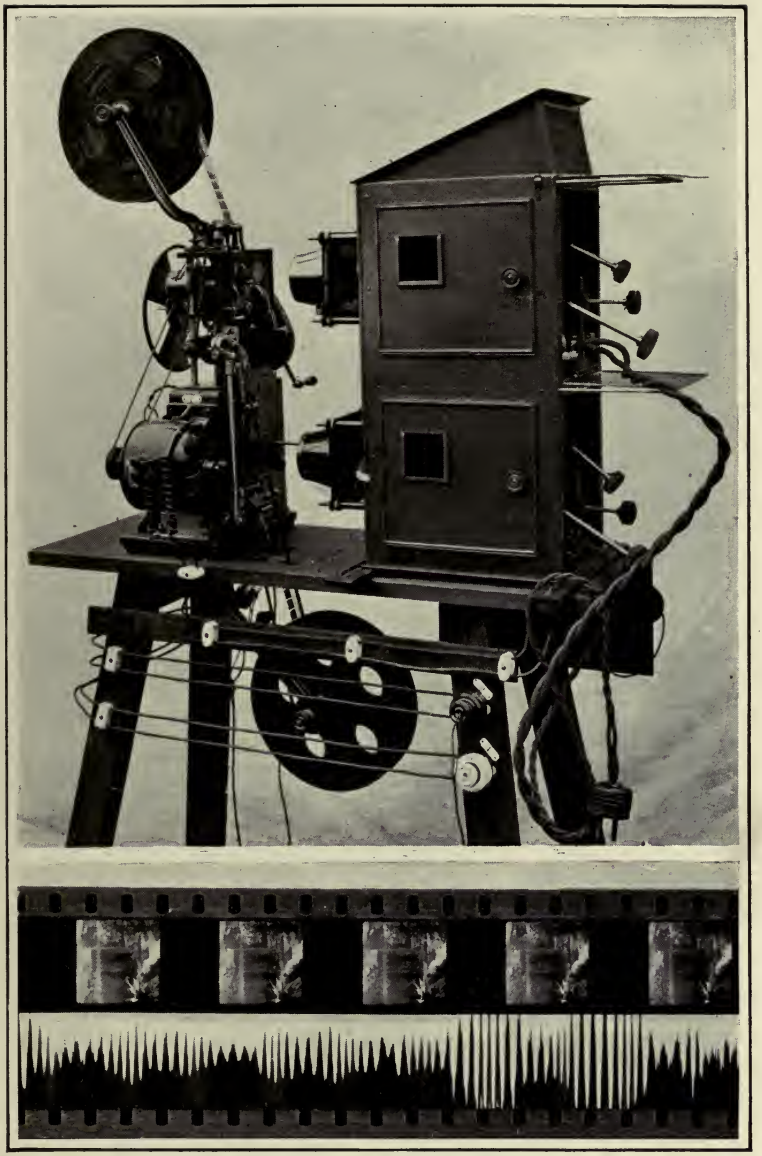
EXTERIOR AND INTERIOR VIEWS OF THE STRING GALVANOMETER, WHICH SERVES TO REGISTER THE VOICE RECORD ON THE FILM AND WHICH IS VIRTUALLY THE HEART OF THE RECORDER

same film as their corresponding images, the synchronism between the two is absolute and rigid. Furthermore, the sound records can be made in any length, just as motion-picture films can be made in practically any length by cementing separate strips together.

In making a talking picture of a scene with this method, the players are not obliged to talk into a horn, as is customary when phonographs are employed. Sensitive microphones are distributed about the scene, either out of range of the camera or artfully camouflaged by a bouquet of flowers, under a lamp shade, behind a picture frame, under a table, or in any other suitable manner, to record the sounds; and the players not being constantly reminded by a huge horn that they are being "registered" for utterances as well as for actions, retain greater freedom for their work. Then, too, the actors are not limited to a small stage, as must be the case when the usual phonographic recorder is employed.

The sound waves, impinging on the microphones, are transferred to a circuit which includes a storage battery and a highly sensitive string-galvanometer. The string or wire of the galvanometer is suspended in the field of powerful electromagnets, and the slightest fluctuations in the current passing through it causes an immediate and considerable distortion. A beam of light from a powerful arc lamp rigidly mounted at the rear of the camera passes through the galvanometer and, in greatly magnified form. throws a shadow of the wire on a steadily moving film behind a narrow horizontal slit. The wire being so arranged that one side of the exposed film is always in the shadow, the developed film shows a straight edge and a series of "peaks" quite suggestive of a profile map of a mountain range.

The camera for making talking pictures is of necessity much larger and more complicated than the standard apparatus, for it must record the pictures and the sound waves at the same time. The front part of the camera is devoted to the usual camera mechanism, while the rear includes the arc lamp and the galvanometer. The movement of the film through the camera mechanism is intermittent, at the rate of 20 pictures per second, while through the sound-recording member it is continuous, and for that reason it is not feasible to reproduce the images and sound record exactly



EXPERIMENTAL PROJECTOR FOR TALKING PICTURES, AND A STRIP OF TYPICAL FILM WITH SOUND RECORD

opposite each other. As a matter of fact, the sound record is some six inches ahead of the image it represents. This, however, is not a disadvantage in practice, for even when splices are made in the film the same amount of both pictures and sound record are deleted so that the synchronism is not affected.

The galvanometer is the heart of the sound recorder, hence much attention has been centered on this member. In the earlier forms a single wire was employed, which made a record similar to that shown in the accompanying strip of film. The upper part of the wire passes through an oil bath, which dampens the movements to the required degree. Means are provided for opening the instrument and readily replacing the wire should any harm befall it, and there is also provision for adjusting the wire to the pitch best suited for the sound record to be made.

In a more recent form of galvanometer two wires are employed. When current passes through these wires their usual parallel arrangement is disturbed as they move away from each other in direct proportion to the strength of the current. The resulting sound record is a double row of "peaks," with the points facing each other. Presently the advantages of the double row will be discussed.

A MATERIAL THAT IS AFFECTED BY LIGHT

Given a film of varying intensity, or of constantly changing proportions of opaque and transparent sections, one has but to pass it continuously before a selenium cell in order to vary the strength of the electric circuit in which is included some form of telephone receiver. At least, so runs the theory; and in practice it is about the same except that certain difficulties have to be met and mastered. Selenium, it may be added, is a metal that possesses the rare characteristic of altering its electrical conductivity according to the amount of light falling upon it. In various ways the selenium material can be prepared into so-called selenium cells, thereby becoming extremely sensitive to varying degrees of light.

In projecting the talking pictures the film is first passed intermittently through the usual motion-picture projector at the rate of 20 images per second instead of the usual 16, and then in a continuous movement through the sound reproducer. A powerful

WOULD ACTUAL CONVERSATION HELP OUT THIS SO-CALLED SILENT DRAMA SCENE? THE BEST DIRECTORS ARE AGREED THAT IT WOULDN'T HELP AND IF ANYTHING IT MIGHT DETRACT FROM THE RESULTS

source of light, preferably an arc lamp, is gathered into a narrow beam and projected through the sound-bearing section of the film and upon the selenium cell, thus throwing a shadow on the latter. In the present apparatus a remarkably sensitive selenium cell is used. It has a range of resistance of from 1,000 to 100,000 ohms, and this characteristic has much to do with the faithful reproduction of the sounds. As the film is rapidly moved past the selenium cell and the beam of light, the resistance of the electric current passing through the selenium cell is altered in proportion to the amount of light and shadow cast by the film.

With a single row of sound "peaks" it was found that only a small portion of the selenium cell was called upon to do the work, the other portion being always in the shadow. By using two rows, however, a larger area of the selenium cell is utilized, making for better results.

The remainder of the reproducing process is simple. A sensitive telephonic relay is employed in circuit with the selenium cell and battery, while a loud-speaking telephone with its own battery is operated in the secondary circuit. Thus the sound record of the film is converted into sound waves which are propagated throughout a theater while the pictures are appearing on the screen.

That, in brief, is the basis of a practicable talking picture. It may be that the principles involved will some day form the basis of a commercial system; then again, inventors may hit upon a new combination that may hold far more promise, thus causing this one to be abandoned. But to-day, with what has already gone before in the way of talking-picture systems, the typical method described seems to be the nearest approach to the ideal sought. At any rate, it may serve as a model for all who would work on the talking picture.

CHAPTER XVI.

CARTOONS THAT MOVE AND SCULPTURE THAT LIVES

IT IS generally said that we as a people have little patience; we seek the most profit from the minimum effort in business undertakings. However that may be in other industries and arts, it fails to hold true in the motion-picture field. For no country in the world has gone into the production of animated cartoons, sculpture and dolls as have American film folk. Some firms specialize exclusively in animated subjects, which require weeks upon weeks of tedious and painstaking work to complete a single reel. Yet, despite all the tedium involved in such productions, the Americans lead the world in this category of films, both in volume and in ideas.

TO prepare thousands of pen-and-ink cartoons, each a separate and distinct drawing, and then photograph them one at a time on a strip of motion-picture film, is the task confronting the cartoonist who would amuse theater-goers by animating his work. And this is only the mechanical part of his newly found work; there remain numerous other details in the making of animated cartoons which, together with those mentioned, make the undertaking anything but a sinecure. Perhaps the film requires a month or more in the making; yet on the screen it may take less than a third of an hour to put the cartoon characters through their antics. But why the vast amount of work?

FIRST THE IDEA, THEN THE WORK

Somewhere in the downtown section of New York city is the home of many miles of animated cartoons produced by a well-known cartoonist whose work in the daily press alone is known to hundreds of thousands of newspaper readers the world over. Years ago he might have enjoyed the distinction of being alone in his work; but to-day there are many other cartoonists working for the screen. However that may be, the methods of this cartoonist are so typical of those of his fraternity that they may well serve for all.

Ideas are the big thing in any kind of cartoon work, we are told by the New York cartoonist. Everything else is secondary—a means to an end, as it were. For, given a good idea, the remainder of the work is little more than a matter of routine, with occasional calls for ingenuity in the way of either reducing the work involved when such is possible, or of securing unusual and clever effects. So it is primarily a matter of getting a good idea, then working out the story with its many details and situations, and finally entering into the mechanical processes.

Because an animated cartoon film tells its story by means of drawings, its production is a matter of preparing thousands of drawings to carry out the creator's idea. The animation of a picture calls for a large number of separate drawings, each a trifle different from its predecessor so as to represent progressive action; and it is in knowing just how different to make the successive pictures that much skill and experience and ingenuity are called upon. This, the all-important task, is entrusted to one

THOUSANDS OF DRAWINGS MUST BE PREPARED FOR THE ANIMATED-CARTOON FILM BY SKILLED ARTISTS, AND A LIST MUST BE PREPARED INDICATING THE ORDER OF FILMING

who is the master artist; the other work is relegated to a large staff of assistants.

The various backgrounds of an animated cartoon are drawn but once wherever possible, for it would obviously involve a great volume of unnecessary work if each drawing included its own background. On the other hand the moving figures must each be drawn over and over again in progressive positions, with each successive drawing slightly different in order to convey the proper illusion when flashed rapidly on the screen in the proper order of sequence. The sheets, on which are drawn the animated objects, are used in conjunction with the different backgrounds so as to make a complete cartoon. Sometimes the background is in the form of a sheet of transparent celluloid, especially if the animated figures pass back of the objects pictured on the celluloid, or keep in the center of the picture, free of the scenery. More generally, however, the background is in the form of a border covering certain parts of the sheet carrying the animated objects. Often the latter is cut out more or less so that the figures can be made to overlap portions of the background, so as to give the appearance of passing in front of the background.

TRANSLATING ACTIONS INTO SUCCESSIVE DRAWINGS

Considerable artistic talent and knowledge of motion are requisites in the proper and successful animation of a drawing, despite the seeming simplicity of the cartoons when viewed on the screen. The movements of the characters in an animated cartoon must be convincing and at the proper speed. If a man is walking down a street, for instance, the artist must know how many sketches are necessary to have his character cover the distance at the proper gait. If he uses too many sketches, the picture lags; if he uses too few, the movements become very jerky and quite trying on the eyes of the audience. It is therefore necessary for the master artist to know how to make each drawing with relation to its companion sketches; and his is the part of indicating the difference between one drawing and the next with a few bold strokes of his pencil, leaving the detailed finishing of each drawing to other members of the staff.

The master artist works on an easel consisting of a slanting piece of frosted or ground glass held in a suitable frame and

FOLLOWING THE CAREFULLY PREPARED LIST OF SCENES, THE ANIMATED-CARTOON CAMERAMAN TAKES THE DRAWINGS IN THEIR PROPER ORDER AND PHOTOGRAPHS THEM ONE BY ONE

through which pass the rays of an electric lamp placed below it. Thus it is possible for him to lay a clean piece of paper over the last drawing and indicate on the former the new or progressive lines for the animation. And by rapidly waving one end of the new drawing while it is still in place over the preceding one, he can tell at a glance the extent and correctness of the animation.

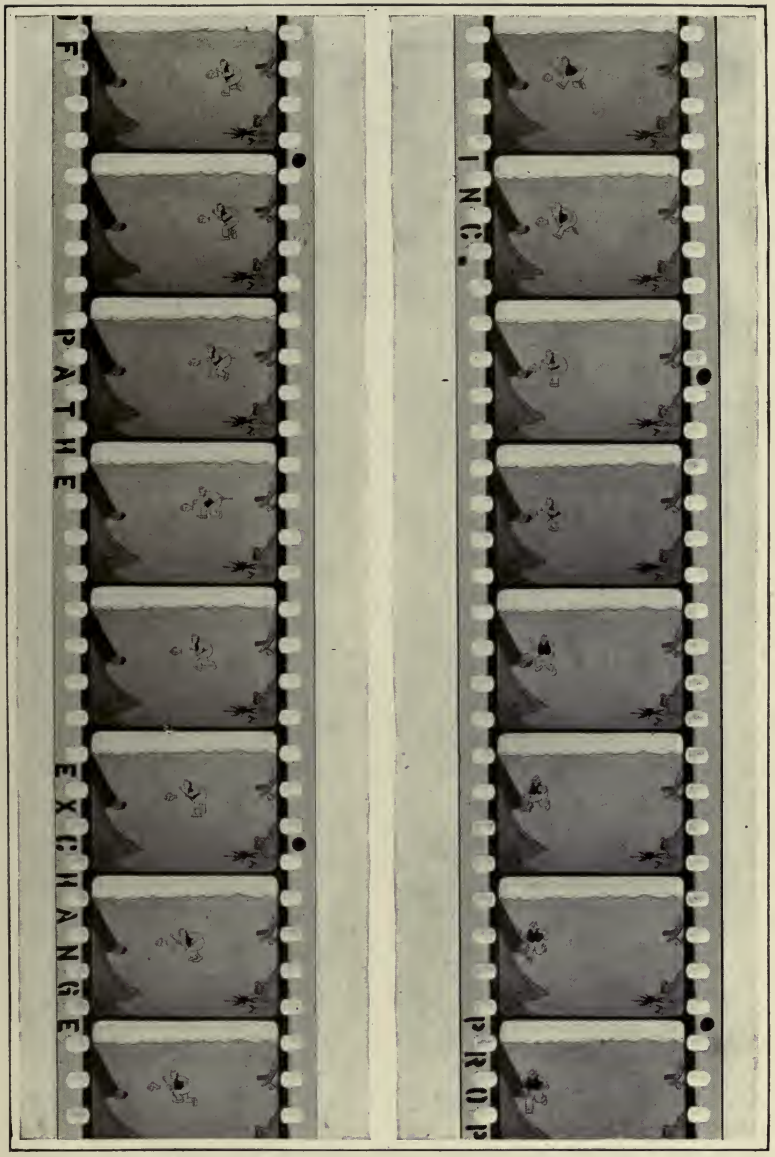
A considerable amount of thought must be devoted to the audience's understanding of the picture. The center of interest in a cartoon must always be played up prominently by subduing other features. For instance, if one of the characters throws a missile, it is necessary that there be no further movement of his arm after the missile begins to travel across the picture. The character—and every other character in the drawing, for that matter—must remain absolutely rigid so that the attention of the audience will not be distracted from the missile which at that moment is the center of interest. Then again, when a character is made to speak by the introduction of what is known as a "balloon" within which is hand lettering, there must be no motion in the cartoon until the audience has had time to read the legend which then disappears.

AGAIN THE MATTER OF PERFECT REGISTER

Perfect register is a vital consideration in the preparation of animated cartoon drawings, because the tremendous magnification of the films on the screen makes even the slightest lack of register loom big. The pictures, thrown at the rate of sixteen per second, jump about in the most disconcerting way, and eye-strain results among the audience, if improperly registered.

So it is quite natural that the animated cartoonists should pay strict attention to register. This they do by having the easels and the photographing apparatus arranged always to maintain the different sheets of paper in the same relative position. In some instances the sheets are perforated with two or more holes so as to engage with pins or pegs on the easels and on the photographing stand.

It is the preparation of the drawings that requires time. After the master artist or animator has indicated the changes from one drawing to the next, his assistants work out the drawings. Sometimes these are quite simple and can be done in a few minutes'



SIXTEEN "FRAMES" OR IMAGES OF ANIMATED CARTOON FILM, SHOWING THE PROGRESSIVE CHANGES IN THE MOVING FIGURES

time, while at other times they are quite involved, calling for special shading and even special tints or "wash." Especially is the work tedious and time-consuming when several animated figures appear in each drawing, and the process calls for a complete drawing each time. While no set of figures could be offered which would apply to all animated cartoonists, one of the men engaged on the staff of the New York cartoonist in question turns out on the average about one hundred feet of film per week, or approximately sixteen hundred finished drawings. That, we are told, is a fair average.

The photographing of animated cartoons is a simple matter, so to speak. It is accomplished by using a motion-picture camera mounted on a substantial wooden frame, with its lens pointing straight downwards. A framing or registering device is placed on the table directly below the camera, while on either side are mercury-vapor lamps which supply the necessary illumination. The camera is electrically-operated by pressing a push button at the side of the photographer. By means of an electric motor which is running all the while, and an electro-magnetic clutch, each time the push button is pressed the camera is given one complete turn on the trick movement, or enough to make one exposure.

The photographer assembles the backgrounds and animated drawings in their proper order, making successive pictures of them on the strip of film by pressing the button once for each scene or assembly. With a pile of drawings to be photographed to one side of him and the background on the framing device before him, he takes the drawings one after the other and places them in the field of the camera lens, presses the button, places the used drawing to one side and puts the next one in place, and so on. The work progresses at a fair rate of speed and in a way is strongly suggestive of the job press feeder, although necessarily slower.

By the clever manipulation of a set of drawings it is sometimes possible to avoid making a large number of drawings for conveying a certain idea. For example, a long freight train moving past one point may be represented by a locomotive and tender and several freight cars, after which the same freight cars are repeated over and over again until the desired length of train

MODELING THE LITTLE MEMBERS OF THE CAST IS THE FIRST STEP IN THE PRODUCTION OF ANIMATED SCULPTURE FILMS. AS IN ALL OTHER FORMS OF THE PHOTOPLAY, THE IDEA OR PLOT IS THE FOUNDATION

has been represented. Or if a figure is shown doing the same thing for a few seconds, such as jigging or exercising or running in a circle, it is only necessary to draw the complete action once, after which the same set of drawings is used as often as necessary. These measures or short cuts are rather fortunate, to be sure; for they go far to reduce the amount of work involved in producing a full reel of animated cartoons. Theoretically, a full reel of one thousand feet should call for 16,000 separate drawings; but because of the fact that certain drawings are used for several "frames" in order to prolong a certain scene, and that certain sets of drawings can be employed several times as already pointed out, the number of drawings is generally in the neighborhood of 8,000. Titles, of course, also cut down the required number of drawings.

It requires no little experience to plan a schedule for the cameraman. Indeed, the man who compiles a list of exposures, telling what drawings are to be used, how they are to be used, in what order, and how many exposures of each—who does the thinking for the cameraman, in brief, is the real director of an animated cartoon production.

With the negative once exposed, there remains little else to do but to develop, edit, insert titles, assemble the negative, and then run off as many positive prints as are required to meet the demand.

SCREEN COMEDIES IN CLAY

Possessing every feature that goes to make a good comedy on the screen, and having in addition a distinct touch of novelty, the animated sculptures introduced some time ago have proved a pleasant change from the usual run of film subjects. The appeal is much along the same lines as the animated cartoon film; in fact, the two can be considered as twin brothers.

The principle of the new films is precisely that of the animated cartoons: the photographing of successive subjects or positions of the same subject, each a trifle different from its predecessor so that the proper animation will result when the strip of film is projected on the screen. The photographs are made one by one and projected at the standard rate of sixteen per second. Due allowance must be made for the rapidity of projection as compared to the slowness of the photographing process.

MODELED IN PLASTIC CLAY, THESE LITTLE FIGURES REPRESENTING SCRUB WOMEN CAN BE PROGRESSIVELY ALTERED IN CONTOUR SO AS TO ANIMATE THEM WHEN REGISTERED ON THE FILM

Like the production of animated cartoons, the making of animated sculpture films is something that cannot be undertaken without some preparatory study. It requires many months' preliminary work or experimentation before the actual start is made. The skilled sculptor who would have his work appear on the screen must develop a certain screen technique; like the animated cartoonist he must make a special study of motion and learn how to reproduce it in steps so as to put life into the little men and women and other objects of clay, gauging and timing each move correctly so as to obtain the proper screen results.

Judging from the experience of one producer of animated sculpture films, the early efforts are usually bound to be discouraging. In the case of this producer the clay figures went through their antics so fast that the spectators could not follow them on the screen. Then, after mastering this, the mechanical phase of the work, this producer was confronted with the study of screen action, or the story-telling phase. At first the stories or scenarios called for several characters, each highly animated, appearing in groups in many of the scenes. But this producer soon discovered one of the fundamental principles of animated cartoons, namely, the centering of the action so that the audience is not confused. Before that there appeared a number of characters in a single scene, each doing something or other so that the audience failed to be attracted to any one bit of action.

The successful animated sculpture film uses simple plots and limits the main action or point of interest to one figure, although this does not mean to say that only one character can be shown at a time. Quite often a group of characters are introduced in a single scene, but nearly always the main action is centered on some one character while the remaining ones are rigid or only slightly animated so as not to distract the audience.

PUTTING SCREEN LIFE INTO LUMPS OF CLAY

The work of the animated sculpture producer runs about as follows:

First, the film story is worked up, much after the fashion of the regular scenario, although of course the plot is simple and the action is reduced to a minimum. Then the cast is assembled in the form of the required number of clay characters. As far as pos-

ANOTHER POSE OF THE SCRUB WOMEN ENGAGED IN A HEATED CONTROVERSY, SHOWING HOW THE FACIAL EXPRESSION AS WELL AS THE CONTOUR OF THE LITTLE FIGURES CAN BE VARIED

sible these figures are made entirely of modeling clay of different shades, painted when necessary to make them more attractive. Occasionally the little figures are dressed in real clothes and have real hair. When the design is mechanically weak, the clay is reinforced with wood or wire.

With the completion of the clay figures of the cast, the photographing process is entered into. The sculptor proceeds to alter the poses of the figures in the scene, step by step, as the camera records each change by a single image or more. The single-picture or trick movement of a standard camera is employed, as in the instance of animated cartoons. The Cooper-Hewitt tubes that supply the necessary illumination are so placed as to accentuate the high lights and shadows, bringing out the figures in bold relief.

One would naturally suppose that the photographic process is slow in this case, considering that the sculptor must alter the pose of the little figures many times to produce a foot of film. Yet we learn from one producer that 200 feet of finished film is by no means an unusual day's work. To one who has mastered the production of animated sculptures it is a simple matter to give the required twist to the little figures, or a touch here and there on their soft clay faces in order to alter the facial expression. Compared with the obvious ease with which this work is carried on, the drawing of sixteen separate and finished pen-and-ink sketches seems considerably more laborious.

Some productions require more time than others, as for example a playette in which three chorus girls, a full orchestra, and a "bald-headed row" took part. Here it was necessary to have the three girls move in unison in their dances and to animate the orchestra to a considerable degree, particularly the leader, while the "bald-headed row" had to receive some if slight attention to add life and realism to the scene as a whole. Each picture required as many as two dozen changes to secure the desired effect on the screen.

But it must not be supposed that the animated sculptures are simpler throughout than the animated cartoons. While the latter can allow of crudeness in certain details of the action, such as the simulation of walking, in the former the walking process and other action must be somewhere near the real thing. That means

IN THE PRODUCTION OF ANIMATED DOLL FILMS, TOO, THE FIRST STEP IS THE CREATION OF THE CAST. SPECIAL DOLLS ARE EMPLOYED, CAREFULLY DRESSED FOR THEIR RESPECTIVE RÔLES

much study; and the producer may have to spend hours studying how persons walk, how a cat looks when scared, how a dog looks when barking, and so on with again as many or even more hours in applying the acquired knowledge to clay figures.

TOYLAND IN THE FILMS

It seems probable that the stars of filmdom are going to have some competition in the near future, and from a most unexpected source. Their rivals will not be of flesh and blood, however, but dolls; wonderful little people of wood and wax which under the skillful guidance of their creator act with ease and grace. In other words, a Chicago director has recently discovered how to put the right sort of "move" into dolls, so that when their histrionic efforts are projected on the screen they have all the appearance of being alive and of acting of their own volition. This director has recently finished a five-reel play in which his little players have been given opportunity to perform almost every "stunt" that falls to the lot of the real "movie" folk, and they have acquitted themselves so creditably that it seems certain they will score a distinct hit when the play is formally released for exhibition.

This director's five-reel play represents the highly concentrated efforts of himself and his assistants during a period of six months. This will be better appreciated when it is understood that the filming of even the simplest scenes which, when projected at normal speed, may be run off in a few seconds, may require perhaps an hour or more to pose the dolls and photograph the individual movements. This is the substance of the whole matter:

A doll is posed for the beginning of a movement, and the cameraman, turning the crank of his machine once, makes a single exposure. Then the director moves the doll a fraction of an inch and another exposure is made, this process being repeated until the action is completed. This means that an interval of several seconds at least elapses between each exposure—in the case of difficult actions the time is longer—and as even the simplest action, such as the mere raising or lowering of an arm, is composed of anywhere from ten to twenty separate movements, it will be seen what a long drawn out job it is. Contrast this with the filming of real actors. The latter go right along with their

ABOVE: GOLDILOCKS AND THE THREE BEARS. BELOW: A SCENE WHEREIN A FULL-SIZED ACTOR AND A DOLL TAKE PART

acting and the movement of the camera is continuous, so that an action such as the one mentioned would be executed and photographed in a second or two. In the case of a doll it may take from fifteen minutes to half an hour.

But simply moving the dolls about and photographing them is not all of the job by any means. To produce natural movements the director must know just how far to move them between each exposure and how many times to do it to secure the effect desired. This requires a vast amount of study and experimenting, as in the case of the animated cartoons and sculpture. As a matter of fact the director in question almost invariably goes through every action to be performed by his dolls himself and counts the number of pictures it will take to complete that action. In addition, he must observe the proper angle at which an arm, a leg, or a head must be moved to make the entire action seem continuous and true to life when it is projected on the screen. For this reason this director uses only the finest jointed dolls, capable of much flexibility, and even these he finds it necessary to have made to order under his personal supervision.

That the work of posing dolls to act before the camera requires infinite patience and care goes without saying. This director experimented for several years before he felt qualified to attempt a production worthy to offer the public. During this time he turned out a number of short plays, which, however, were not for general exhibition. Furthermore, his earlier efforts were confined exclusively to dolls, whereas in his latest efforts he has introduced living characters in some of the scenes. This means that the difficult problem of synchronism had to be solved. That is to say, while he could control the movements of his dolls well enough, he had to figure out a way to make the human actor's movements occur simultaneously and in proper tempo with those of the dolls.

This he succeeded in doing in a most realistic manner. For instance, he has a scene where the hero and heroine dolls have lost their way in the country. We first see them climbing a six-foot embankment to the road, while down the road comes a farmer afoot. Reaching the road the dolls hail the farmer, who has arrived opposite them, and ask the way home. To move the dolls up to the embankment required 30 minutes, and while this

THE DIRECTOR AND HIS ASSISTANT MUST ANIMATE THE DOLLS BY LITTLE PROGRESSIVE STEPS, BETWEEN FILM EXPOSURES

was going on the actor-farmer had so to regulate his speed that he would cover the required distance in the same time. Of course the scene had to be rehearsed several times for the benefit of the actor-farmer, until the whole thing was mathematically correct.

This brings out an advantage, and perhaps the only one, that the director of the dolls enjoys over the director of real people. The dolls do not have to be rehearsed, but are ready to go through their paces the moment the director gives the word, and without any preliminary training. Generally they do it, too, without the slightest objection. The word "generally" is used advisedly, for, startling as it may sound, the dolls occasionally seem afflicted with "temperament," just like a thousand-dollar-a-week star. At any rate, they sometimes refuse to do what the scenario calls for and then it is necessary to work up new business for them. It may be the weather that affects their joints, or it may be that same inexplicable thing which causes a fish line to become hopelessly entangled; but the fact remains that they have their fits of contrariness The only consolation is that under the circumstances the director may express his opinion freely without any chance of a come-back from his actors. Furthermore, the doll actors do not keep on collecting a large salary while out of sorts, or at any other time, for that matter.

Our doll director always writes his own scenarios because they must fit the peculiar requirements of this work, which are totally different from those of ordinary photoplay production; and no one not familiar with this class of production could furnish a script of a practical nature. The plays are not made with the idea of catering to children in particular; the bare fact that this director makes dolls act like live people is enough to interest them, and so he tries to make his subject matter appeal to the older mind, thereby amusing both the young people and the grown-ups at the same time.

To tell much of the tricks of this business would be to tell it all. It may be said, however, that a great many pins and invisible threads and wires are used. Then, of course, special scenery is required. This director employs a corps of carpenters who do nothing but build miniature stage settings and properties, many of which are quite as elaborate in detail as those employed in

LEADING MAN AND LEADING LADY IN ONE OF THE ANIMATED DOLL PHOTOPLAYS, SHOWING THE CARE AND THOUGHT EXERCISED IN DRESSING THE DOLLS TO SUIT THEIR RESPECTIVE RÔLES

productions featuring real people. The question of costumes is also an important one and so, like almost everything else, they are designed and manufactured under this director's personal supervision. It may be stated that they cost quite a bit of money, too. The latest achievement of this director is to give expression to his dolls. He has worked out a scheme whereby they are made to smile, frown, pout, wink and exhibit various other emotions. But just how this is done is a secret which rests with the director alone.

This business of directing dolls is one which tends to try one's patience. Yet when the pictures are projected on the screen, and the work of hours flits by in as many seconds, the startling results more than make up for the labor and skill involved in the production.

CHAPTER XVII.

MOTION PICTURES IN STRANGE FIELDS

SLOWLY but surely the motion picture is coming to be looked upon as something aside from a means of entertainment. Engineers have already discovered the scientific value of the motion picture in making a report. In the medical profession the motion picture is being employed to demonstrate certain operations and treatments. In schools and colleges the motion picture is slowly making its way as an instructor. At the army training camp, the motion picture has proved an ideal drill sergeant and lecturer; our boys of the National Army were taught the operation of the Lewis and Browning machine guns and the Stokes mortar and the hand grenade, long before they became personally acquainted with these death-dealing devices. As a lecturer and instructor, the motion picture is rapidly gaining ground.

HISTORY is repeating itself in the motion-picture world. The principle of motion-picture photography was first resorted to in the scientific study of motion. In order to decide an argument regarding the locomotion of race horses, Edward Muybridge, an Englishman, arranged to take a series of photographs of a moving horse. For this purpose he set up twenty-four cameras, using wet collodian plates, at the Sacramento, Calif., race track. Each camera was actuated by a fine thread attached to its shutter and extending across the race track, so that the horse would break it and release the shutter when well within the range of the camera. The result, after due experimentation, was a series of plates showing the progressive actions in the locomotion of a horse. Thus Muybridge solved a much mooted question—and incidentally laid the foundation for the motion picture.

And to-day, almost a half century later, the motion picture is again entering the field of science, while still retaining its enviable position in the world of entertainment. There are scientists in many countries who are now following in the footsteps of Dr. E. J. Marey of France, who took up the work of Muybridge and established the Marey Institute at Paris, which has come to be known as the cradle of cinematography. Marey did away with the battery of cameras employed by Muybridge, and introduced the present system of a single camera and a movable negative. His first camera was called the Marey Photographic Gun, and made its debut in 1882. Marey foresaw the endless scientific possibilities of cinematography; and from the Marey Institute in France there have issued wonderful films without end. That institution has been equipped with every form of apparatus and facility for carrying on the work; and the foremost scientists of the world have become members of the Institute.

X-RAY MOTION PICTURES

Among the many interesting researches of the Marey Institute have been the X-ray motion pictures produced by M. J. Carvallo, making it possible to record the functioning of the human organs. That the problem was not an easy one is evinced by the fact that many investigators had attempted it before without success. A

A PEEP INTO THE WORKINGS OF A CALIFORNIA FILM STUDIO WHILE A COMEDY SCENE IS BEING "SHOT," WITH THE USUAL CROWD OF ONLOOKERS STANDING ABOUT BEHIND THE CAMERA

special camera had to be constructed, in order that exposures might be varied from every 20 seconds to one per hour, according to the character and the subject under investigation. His camera was driven by an electric motor, and operated automatically after it was once set.

Finding the standard film unsuited to the requirements, M. Carvallo made use of a special film with a more sensitive emulsion than was available at that time, about eight years ago. In this manner he obtained the most interesting films, such as those depicting the digestive process in a frog, a mouse, a chicken, a dog, and so on. The subjects were fed with either a peculiar paste, or the usual food combined with basic bismuth nitrate, thus rendering the digestive organs opaque and delineating them clearly on the film. These films were copied on to standard film for the entertainment of motion-picture audiences throughout the world.

TAKING PICTURES BY MEANS OF ELECTRIC SPARKS

Another investigator at the Marey Institute, M. Lucien Bull, has conducted a most interesting series of experiments on the movements of insects, particularly while in flight. By taking a vast number of exposures in a very short space of time, and then projecting these exposures at the usual speed, M. Bull has made it possible to analyze in detail the flight of any insect, such as the dragon fly, for instance.

For his purpose this investigator required a camera that would make more than 100 exposures per second. At the time no mechanical device could actuate a shutter and the film at that speed without injuring the film; and so M. Bull set to work on a new principle of cinematography, namely, electric spark cinematography. By means of an induction coil and a regular oscillating circuit, comprising a condenser and a spark gap, he obtained intensely luminous sparks at uniform intervals and as rapidly as desired. In order to have the sparks keep in step with the exposures, since no shutter was employed, he made use of a commutator arrangement on the same shaft as the film. Thus as the commutator bars came into line with a pair of brushes, the induction coil primary circuit was closed and a spark resulted an instant later. The film, on the other hand, was mounted on

THIS X-RAY PICTURE SHOWS WHAT HAPPENS TO THE BONES OF MILADY'S FOOT WHEN SHE INSISTS ON WEARING HIGH HEELS

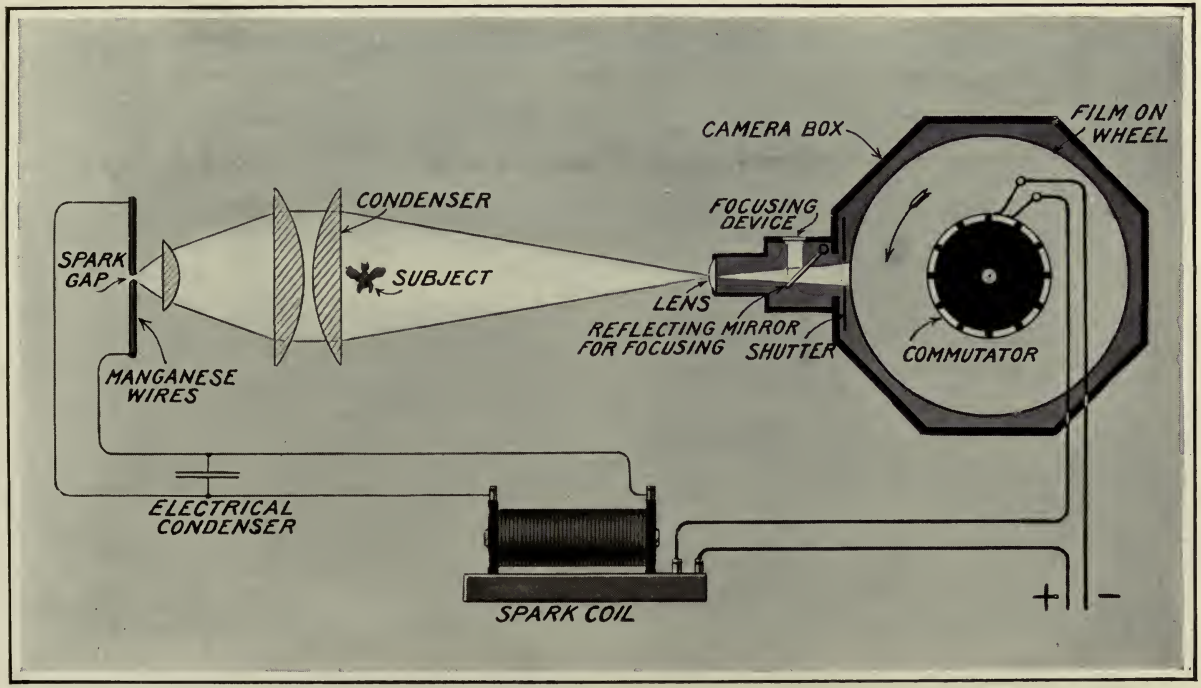
the rim of a wheel which turned in a light-proof box. The illumination emitted by the spark passed through the specimen and through the lens and on to the film being turned on the rim of the wheel.

The band of film employed by M. Bull was sufficiently long to accommodate 54 pictures during one revolution of the wheel. Because of the total absence of intermittent movements and complicated mechanisms, this arrangement permitted exposures to be made at a remarkably high rate of speed.

The spark gap is composed of two pointed magnesium electrodes, less than 1/12-inch in thickness, while the spark is 1/25-inch long. The spark is very rich in the ultra-violet rays, which possess the proper actinic or photographic qualities. Naturally, the images on the film are in the form of silhouettes.

If the problem of making the exposures has been a difficult one, that of handling the insect has been at least equally difficult. With a system of photography such as this one, where the images are all made within a fraction of a second, it has been found necessary to start filming just as the insect starts on his winged journey. It has also been necessary to have the insect fly across the field of the lens, which is generally done by placing the apparatus near a window, because insects instinctively fly towards a light.

M. Bull set to work devising a mechanism which would open the simple shutter of his camera the moment the fly came into the field of the lens. The first mechanism comprised a pair of pincers for holding a house-fly or dragon-fly captive until the desired moment, when it could be released by actuating an electro-magnet. Another mechanism consisted of a glass tube sealed at one end and open at the other. The open end was cut on the slant, so as to provide a sloping exit. The exit was half blocked by a light piece of mica, attached to a light spring on top of the tube. As the insect is emerging from the tube, with the mica flap on his back, the camera operator closes the switch and has everything in readiness. Then, as the insect is free of the flap, the latter drops down and closes the circuit which causes the camera shutter to open and the images to be recorded. A third device consisted of a tiny spring board, so to speak, pivoted at the center and carrying at one end a contact point. Normally, the aluminum board



FOR THE FILMING OF INSECTS IN FLIGHT, THIS SYSTEM OF MOTION-PICTURE PHOTOGRAPHY HAS BEEN DEVELOPED AT THE MAREY INSTITUTE IN PARIS AND USED WITH EXCELLENT RESULTS

rests its inner end on an adjustable contact screw, so that the contacts are together. But as the insect in the glass tube walks out along the aluminum board, the weight is shifted to the other half of the board which then presses down on that side. At this point the camera operator closes the switch and has everything in readiness for the exposure. Then, just as the insect clears the tube and starts off on his flight, the aluminum board, being heavier on the contact side, goes down on that side and closes the circuit which actuates the shutter.

THE FLIGHT OF A BULLET

The work of M. Bull extends as far back as 1904. Since then there have been numerous investigators at work on similar films. Dr. C. Cranz, an eminent German scientist, some years ago worked out a system whereby 500 consecutive pictures can be taken in 1/10 second, the exposures varying from 1/1,000,000 to 1/10,000,000 part of a second. Dr. Cranz has followed the same general method as M. Bull, employing an electric spark for his illumination. In this instance the sensitized band runs over two steel cylinders. Over 280 feet of film must pass by the exposure aperture in the short space of one second. Special provision is made so that the film will not receive more than one series of pictures.

Dr. Cranz has produced divers films showing the flight of bullets. One of these shows the firing of an automatic pistol, from the time the bullet emerges from the muzzle until the smoke of the powder charge pours out. Similarly, he has made films depicting the passage of a bullet through a steel plate. By means of certain facilities to measure the vertical and horizontal speed of the missile, it becomes possible to employ such films for ordnance investigations. In fact, the British government set up such an installation many years ago for the study of bullets in flight. No doubt, numerous governments and ordnance factories are now provided with similar apparatus for studying what happens when one attempts to stop a modern bullet.

ANALYZING THE GAME OF BASEBALL AND OTHER THINGS

There is no limit to the application of speed motion pictures. Not long ago a well-known American film producer made use of

THESE FILM IMAGES OF BASEBALL PLAYERS HAVE BEEN MADE AT THE RATE OF 128 "FRAMES" PER SECOND

its new type of camera for a pictorial analysis of baseball. The new motion-study camera takes 128 pictures a second, and the films are projected at the standard rate of 16 per second. At this rate it requires eight seconds to project 128 pictures used for the analysis. Consequently, the action is slowed down eight times the normal speed.

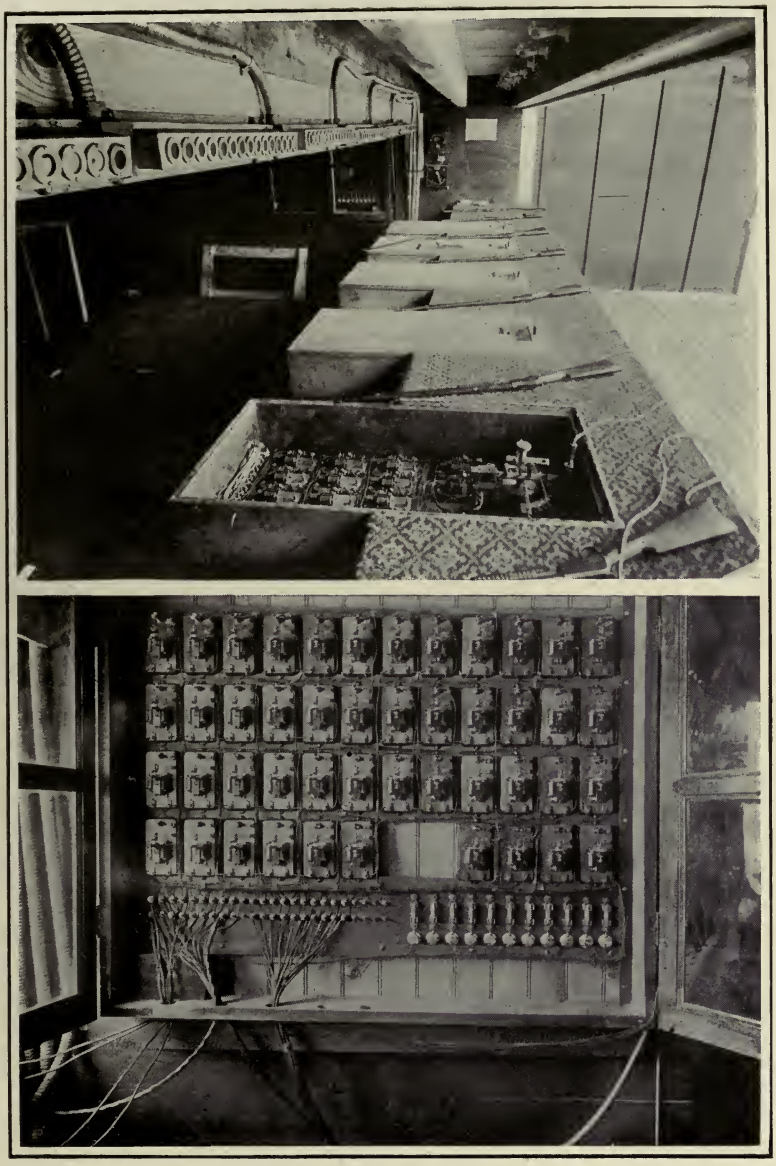
Applied to baseball, these motion pictures depict the art of any well-known pitcher or batter. A swing of the arm, the hold, the release of the ball, and the passage of the ball through the air can be plainly discerned and studied. As the ball leaves the pitcher's hand it travels, or, to use a more appropriate term, floats through the air. When the ball comes in contact with the bat, the rebound action is clearly shown.

The same general principle has been applied in efficiency engineering with telling results. Efficiency engineers have been able to study all kinds of action, and it is the study of such pictorial records that has made possible the simplifying and improving of many methods and processes. Such pictorial records have often been coupled with chronometers, appearing in each image so as to indicate the lapse of time. As a means of studying motion, nothing can equal the cinematograph; and the same bit of action can be reviewed over and over again, at any speed.

SHOOTING AT MOTION PICTURES

At amusement resorts and in the army camps motion pictures are employed for training as well as for entertaining the men. Suitable motion-picture films have enabled the armies to train soldiers for sentry duty, so that the experience of coming face to face with an enemy soldier is pretty closely duplicated for the benefit of the "rookie." On the screen in front of him, the new soldier is suddenly confronted by a suspicious form emerging from a natural cover. He has to go through the regular procedure of calling upon the stranger to halt, ask for the pass word, give the order to advance so many paces, and so on, while an officer stands by and comments on the alacrity of the "rookie."

But the most valuable service of the motion picture in the military camp has been in training future marksmen. The British army was the first to appreciate the value of motion pictures for training its new army at the beginning of the great war.



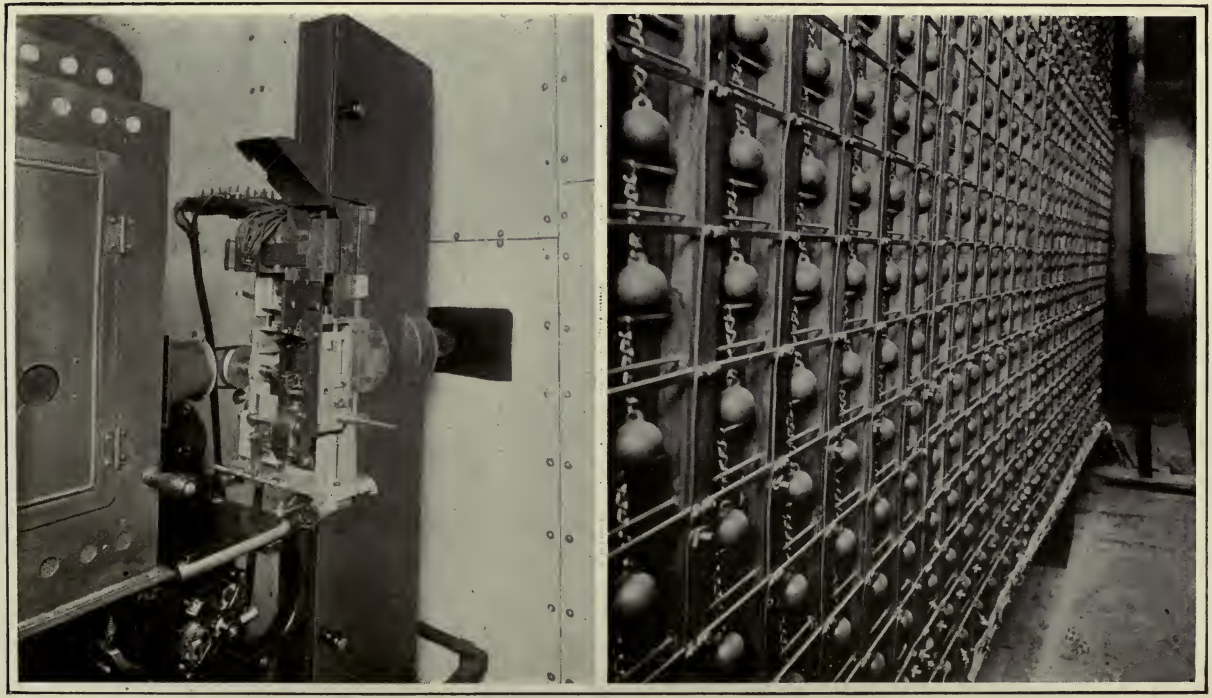
ABOVE: COUNTER OF THE ANIMATED SHOOTING GALLERY. BELOW: SOME OF THE ELECTRICAL APPARATUS WHICH HELPS RECORD HITS

One system of target motion pictures recently invented by an American, makes use of a steel plate about eight feet square and painted white, for the screen. At the back of this plate a wooden gridiron supports small iron balls hung on short pieces of chain arranged so that the impact of the bullet on any point on the steel screen will drive a ball away from the plate, causing the chain to cross two rods, thus closing a break in an electric circuit. Only the rods immediately behind the target are energized, so that a hit will be electrically recorded if the bullet strikes the target. Otherwise the apparatus shows a miss.

One of the accompanying illustrations shows the back of the steel screen with the balls attached to it and the rods running across it. The balls are three inches apart. The rods run horizontally, but every other one is connected with a vertical wire. We may liken the horizontal rods to parallels of latitude and the vertical wires to meridians or lines of longitude, by which any spot on the screen may be fixed, just as on a map. Having determined the latitude and longitude of the different points that will be occupied by the target, it only remains to provide means for energizing the vertical and horizontal lines crossing at these points at the particular moment when they will be traversed by the moving target. This is done by using sets of contact fingers on each side of the film in the projection mechanism and cutting perforations in the film through which various combinations of fingers may make contact to close the circuit of the corresponding parallels and meridians of the screen.

There are nine fingers on one side to control the parallels and nine fingers on the other to control the meridians. These fingers operate in pairs of various combinations to close the circuit of relays which in turn operate to energize the corresponding rods. By using intermediate relays, nine fingers are enough to control three or four times as many rods.

In preparing a film, it is thrown up by means of a weak light upon a chart which shows the location of the wires and the balls of the large target board. The operator looking at the projected image of the first picture of the film sees by the chart what wires must be connected to the current to sensitize the animal or other moving target in the picture. Having determined its latitude and longitude, so to speak, the edge of the film is correspondingly

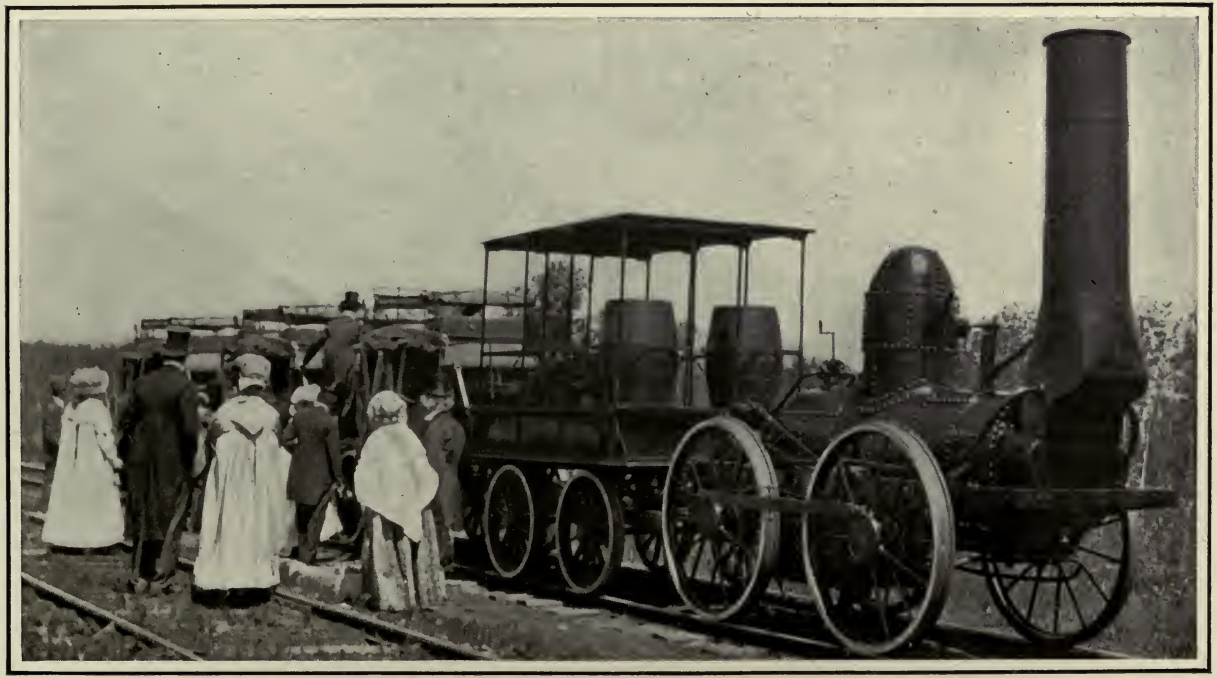


AT THE LEFT: MODIFIED PROJECTOR EMPLOYED IN PROJECTING THE ANIMATED TARGET PICTURES. AT THE RIGHT: REAR OF THE STEEL SCREEN, SHOWING THE IRON BALLS AND CONDUCTOR BARS

perforated with two holes on each side, then the next picture is similarly treated, and so on until the entire tape has been perforated. Only a momentary impulse may pass through the fingers because the film comes to rest for but an instant, and then moves on, breaking the electrical contact through the perforations. Accordingly, a device is provided which automatically keeps the rods energized until the next impulse is passed through the fingers as they drop through the perforations of the succeeding picture on the film.

The "vital" spot on the animal never passes out of the sensitive area on the screen. It is not to be supposed that a bullet must actually strike the steel curtain at the very point behind which the ball is resting. There is no spot on the screen that is dead. If a bullet should strike midway between two balls, both of them would be thrown outward, making contact with their respective rods. Thus between two successive positions of the animal or subject and through which by the illusion of the cinematograph the subject appears to move, the screen is sensitive, and should a bullet strike any intermediate spot, a hit would be recorded. In other words, there is never a time when the illusion makes it impossible to score a hit.

The hits and misses of each marksman are recorded by a series of lamps located before and above him. The circuit to these lamps is closed through his own gun. Electrical connections to the different guns are made through a light flexible cord which does not interfere in the least with the shooting. The contact is made at the hammer when the gun is cocked, and broken when the gun is fired. An electrically operated ratchet device steps a brush from the terminal of one lamp to the terminal of the next lamp circuit. A timing device is used to operate a circuit breaker. Every rifle is connected to its own "stepper" and scoring lamp. When the gun is fired, the timing device closes the circuit connecting the particular gun with the steel target contacts for a fraction of a second. If the shot is a hit during this interval, an impulse lights the lamp by throwing a switch. If the shot is a miss, the timer cuts the connection after the proper interval and the lamp stays dark. The gun cocked for the next shot steps the brush to the next lamp, and so on. Any number of rifles can be



AS AN INSTRUCTOR, THE SCREEN HAS NO EQUAL. WRITTEN AND SPOKEN WORDS ARE BY CONTRAST BUT CRUDE MEDIUMS. COULD THE WORKING OF AN EARLY LOCOMOTIVE BE BETTER TOLD THAN BY THE SCREEN?

used, for the interval required for an impulse to reach the lamp of each gun is hardly appreciable.

THE SCREEN AS THE DRILL SERGEANT

Not only in the matter of training sharpshooters has the motion picture served armies in time of war. Our own Army, which had to be raised in short order, has made good use of motion pictures for the purpose of teaching military subjects in quick order. Indeed, the authorities made use of the fact that we are a nation of "movie" fans; and the text-book was replaced in many training camps by the more interesting and more effective motion-picture studies.

For instance, in the matter of the two types of Browning machine guns with which our Army has been equipped, the doughboys were taught their action by means of elaborate animated drawings as well as photographs of the weapons in action. Better still, they were introduced—that is to say, pictorially, of course—to the inventor, John M. Browning, and then to his remarkable weapons. Expert machine gunners were shown using the Browning weapons, and such pictures served just as effectively as if these experts had come to every camp where the films were shown. Best of all, a film subject can appear in one hundred, two hundred, or any number of places at one time, providing a sufficient number of positive prints are made. So that in the case of our newly created Army, where speed was a paramount essential, the pictorial demonstrations of certain experts were available for many camps at the same time; and from a standpoint of economy the film method of training more than made good.

Three classes of motion-picture studies were employed by our General Staff in training the draft Army. First of all were the films employed for teaching squad movements, artillery in action, cavalry maneuvers, and so on. In such films the experts used for the various scenes wore cardboard signs bearing letters or names so that their movements and duties could be plainly followed. The second class comprised the motion-study or motion-analysis films, in which the photographs are taken at a high rate of speed, say 96 or more per second, and projected at the standard rate so that any process, movement or action can be

ANOTHER VIEW OF THE REPLICA OF THE "DE WITT CLINTON" LOCOMOTIVE AND ITS TRAIN, RECENTLY BUILT TO DEPICT HOW OUR FOREFATHERS TRAVELED IN THE DAYS OF PIONEER STEAM RAILROADING

brought down to a slow speed which permits of careful study, as already referred to in this chapter. The third class of films dealt with the detailed explanation of any mechanism and its functioning, such as rifle grenades, machine guns, recoil members of guns, and so on.

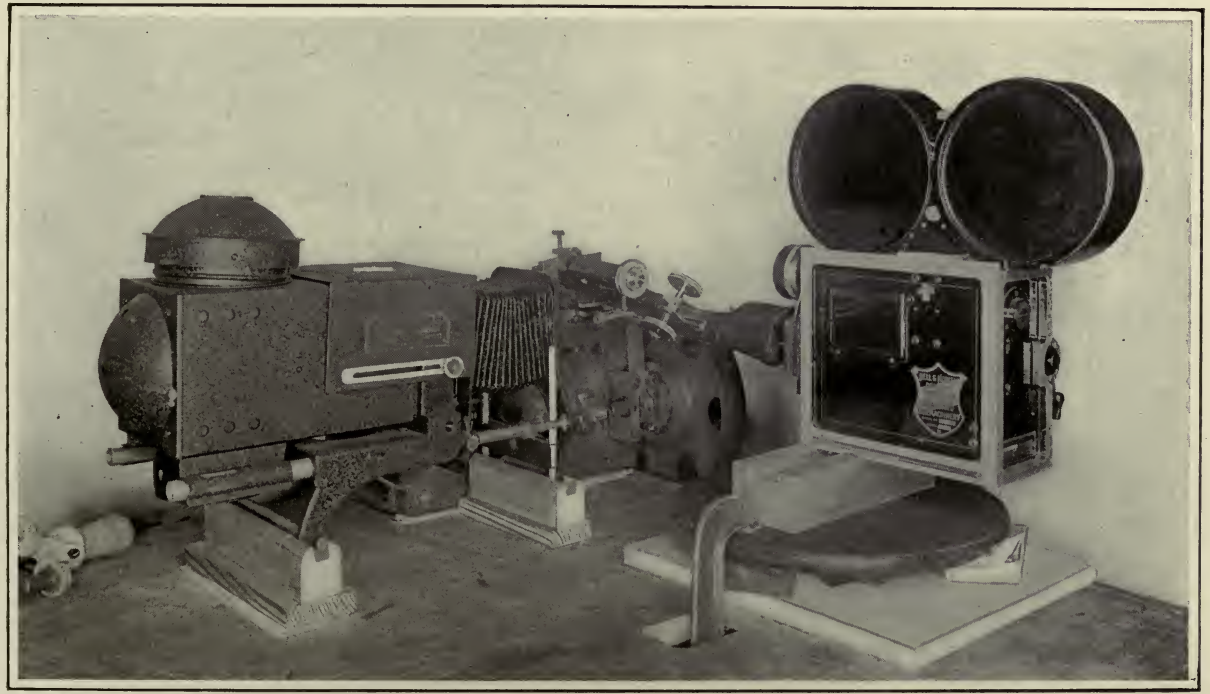
MOTION PICTURES OF METAL STRESSES

The moving picture has entered a new field. When it was first introduced, few, if any, would have imagined that it would be applied microscopically—that is, that moving microscopic images would be taken and the revelation appear on the screen of what takes place under a microscope. What is probably the first instance of this class of film applied to engineering, was exhibited at a recent convention of testing engineers at Atlantic City, N. J.

Wrought iron was used to try out the idea. It is known that when a metal like wrought iron or steel is subjected to alternate stresses or shocks, brought about by repeated bendings or blows, the metal gradually deteriorates or weakens, and finally breaks, sometimes with serious consequences. It is also known that all such metal is made up of close-lying crystals and that such bending or blows distort those crystals, causing the ultimate weakness.

A moving reproduction has been taken and vividly projected on the screen of the successive changes which take place in the structure of crystals of such iron when subjected to alternate bends or blows. The piece of iron was placed in a bending machine. The microscope was attached to cover the place or joint where the iron was most affected, and a motion-picture camera was attached to the microscope. As the piece of iron was bent back and forth the effect in the breaking point was recorded through the microscope and in the camera. About one three-hundredths of a square inch of area of this iron was thus reproduced. The effect was remarkable, each minute change in the structure and crystals being accurately reproduced until the piece broke. The gradual progression or formation of the cracks or weakening lines was distinctly visible.

Credit for this really wonderful accomplishment is due to a professor in the University of Illinois. He has probably rendered a distinct service and may have opened a broader field than he now realizes. He has probably introduced a method of investiga-



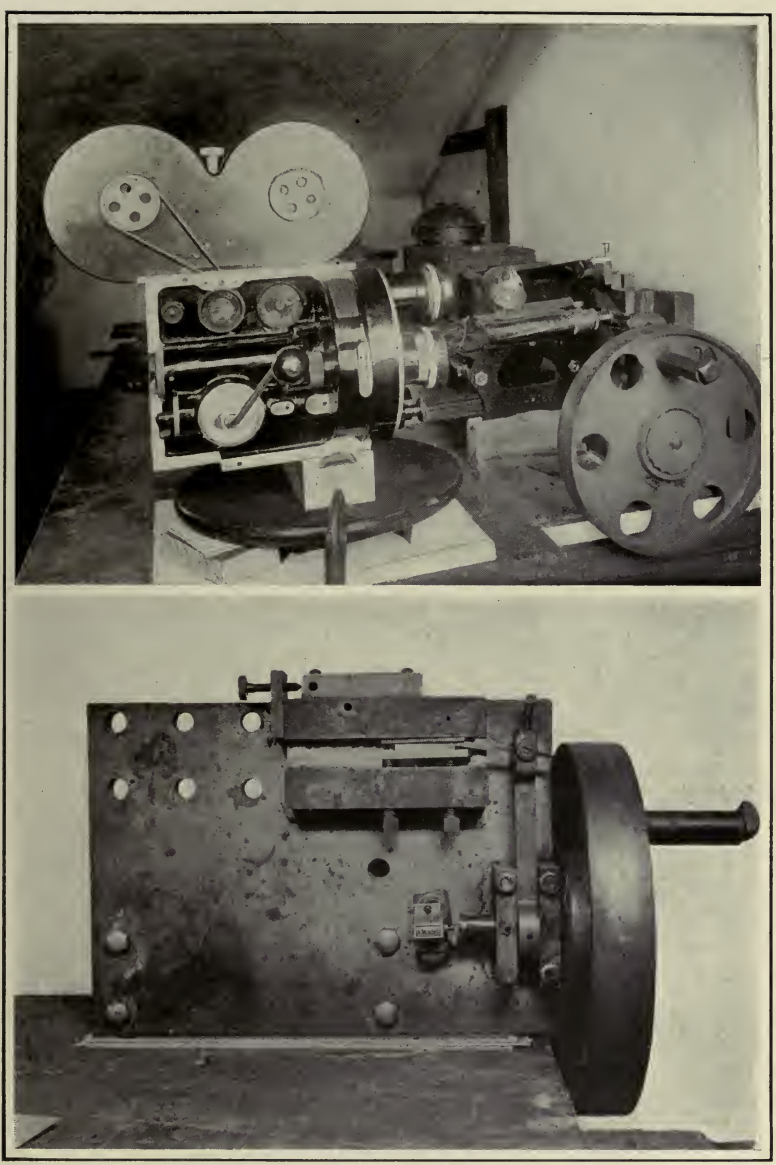
BY MEANS OF A BENDING MACHINE, STEREOPTICAN, MICROSCOPE, AND A MOTION-PICTURE CAMERA, EXCELLENT FILMS HAVE BEEN PRODUCED DEPICTING THE PROGRESSIVE BREAKDOWN OF STRAINED METALS

tion of far-reaching importance, both technically and practically. It is believed that the new idea will be successfully applied to steel, non-ferrous or copper metals and other alloys in the near future. Besides explaining many interesting phenomena not now fully understood, it may settle some controversies which otherwise would remain open much longer. It may determine just how steel as well as iron really deteriorates or weakens under stress, whether through the crystal or in some other way. Such an investigation might lead to a heat treatment prolonging the life of certain steels and making them less liable to fatigue, as it is called, or to gradual or sudden deterioration. The conclusion is evident that such an accomplishment might assist in prolonging the life of important members, cables and ropes for elevators, etc., conserving life as well as material thereby.

By its application it may ultimately be possible to tell, for example, by the appearance of the surface under a microscope, whether a material has passed 30 per cent of its effective life or 90 per cent thereof. If the characteristics are sufficiently pronounced, which experience alone can tell, then it will be possible to polish a section of a cable in use and examine it with a microscope from time to time and thus determine whether that section at least is nearly ready to fail or whether it shows no indication of failure. These observations would be based on previous motion pictures of the same material. The keynote of the idea is that failure takes place gradually, beginning the moment a piece of metal is first put into use, and ending only when that piece gives way entirely.

MOTION-PICTURE PORTRAIT PHOTOGRAPHY

Often a snapshot made with a one-dollar camera in the hands of the amateur is superior to the handsome portrait of the leading studio. It is superior because it is natural; for as perfect as the photographic qualities of the studio product may be, it is generally artificial, so to speak. Especially is this true of children, whose best portraits are none other than the snapshots made of them while at play. And after all, the main purpose of a portrait is to present the subject as we know him, and not as he distorts himself before the studio camera to the tune of "Look pleasant, please!" or "Watch the birdie!"



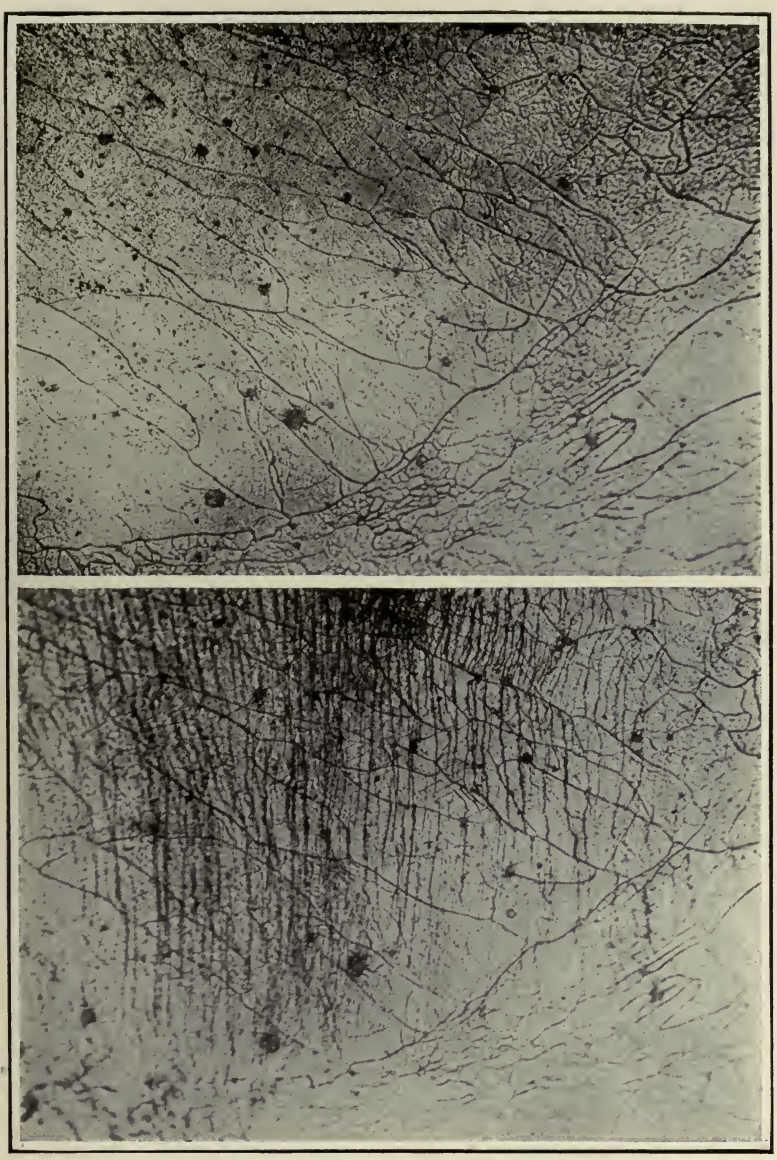
ABOVE: ANOTHER VIEW OF CAMERA, MICROSCOPE AND BENDING MACHINE. BELOW: BENDING MACHINE, SHOWING COUNTER

To remove the artificial atmosphere, to eliminate "posing," and, in a word, to make portrait sittings a pleasure rather than an ordeal, has been the object of quite a number of inventors, both here and abroad. They have succeeded in evolving suitable cameras which make it possible to take motion pictures on glass plates. Any one of the images on the glass plates can be selected for enlargement, or, if desired, the glass plates can be inserted in a modified form of camera and projected as motion pictures.

In one form of motion-picture portrait photography, invented by an American, the standard sized glass plates are held in plate holders. By means of an intermittent movement the glass plate is moved in steps from right to left past the lens to register the first row of images, and then dropped down and moved from left to right for the second, followed by another drop and a right to left movement for the third row, and so on until the plate is entirely exposed. The movement, which consists of an ingenious arrangement of gears, chains, ratchets and dogs, is actuated by a hand crank at the side of the camera. Numerous adjustments of marked simplicity permit the photographer to arrange the movement for any number of images from two to more than one thousand on a 5 by 7 inch plate, or from a 3½ by 5 inch image to a pin-head image, with the same lens equipment, by means of the adjustable framing slides of the aperture. Again, the images may be made at any speed desired, ranging from eight to sixteen per second. Or, if the photographer desires, the images may be made one at a time by a single-picture movement.

Just behind the lens board of the new type of camera is a compartment containing part of the plate-shifting mechanism, as well as the revolving shutter. The latter is similar to those employed in standard motion-picture cameras, being provided with a single slot or opening of variable size so as to permit of wide latitude of exposures which may be necessary in changing from large images to microscopic ones. A lever, connecting with the shutter, is arranged to be fastened at variable distances from the center of the latter, so as to alter the rate at which the pictures are made.

In the compartment at the rear of the camera is the frame which carries the plate-holder. To load the camera, the plate holder is inserted in the frame at the bottom of the compartment,

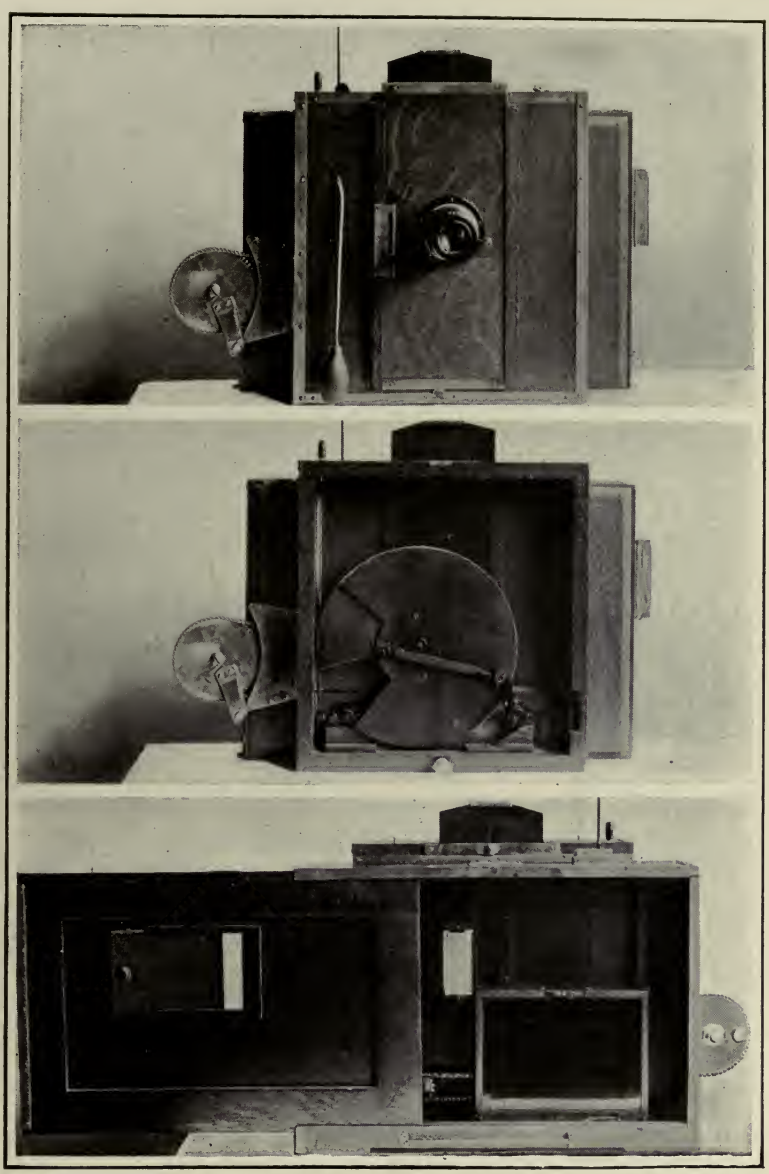


ABOVE: WROUGHT IRON BEFORE BEING STRESSED. BELOW: SAME WROUGHT IRON SHEET AFTER 424 FLEXURES

as shown in one of the accompanying views, after which the sliding door is closed and the plate-holder is raised to the upper right-hand corner by means of the hooked rod protruding through the top of the case. In being raised in this fashion, the plate-holder leaves its front slide below it, so as to expose the negative, but as the plate is shifted from one side to the other past the lens and dropped down at the end of a row, the holder-slide again regains its position so as to mask the plate completely by the time the last image has been recorded. This feature, it will be noted, makes the apparatus daylight-loading, and the operator can employ one plate-holder after another during the rush of business without undue loss of time for reloading.

A fast anastigmat lens of short focal length admits of its use for practically the entire range of images, and focusing is facilitated by the employment of a small piece of ground glass that can be shifted behind the lens aperture while the photographer observes the focus through the opening at the rear of the camera. When everything is in readiness, the focusing slot is closed and the crank is turned. The subject can practically do as he pleases, since the camera is recording every movement; and among the dozens upon dozens of images recorded on the plate there are bound to be several quite typical of the subject.

Now the negatives obtained in this manner offer many possibilities to the photographer. First of all, of course, is the possibility of making elaborate portraits of any standard size by the enlarging process. By using a relatively slow plate with a minimum of grain, the tiny images can be enlarged to perfect portraits of fair size. The enlargements can be made singly or in groups, and one photographer employing this camera has achieved no little fame by making his enlargements on a long strip of cloth-backed paper, containing many portraits of the same subject, and called by him a "Yard of Smiles." Still another possibility is the use of small contact prints for "stamps," which may be pasted on letters or calendars or used in any other manner that the purchaser may see fit. Contact prints of the entire plate offer pleasing studies of the subject, and can be cut up into separate pictures when desired. Again, the cut pictures can be assembled into pads or books, which, when flipped before the eyes, present a motion picture of the subject to the never-ending interest of



THREE VIEWS OF A PLATE CAMERA WHICH PERMITS OF MAKING MOTION PICTURES FOR PORTRAIT PURPOSES

parents and friends. Indeed, an animated portrait is by far the best kind of a portrait, and becomes a priceless souvenir in later years. Glass-plate positives printed from negatives obviously can be projected in the camera or in a similar machine as motion pictures.

An Italian inventor, after years of experimentation, has evolved a similar form of apparatus for making motion-picture portraits. In his camera, however, the dimensions of each image are limited to one size, in the neighborhood of one-quarter inch square. Thus several hundred images are recorded on the standard sized plate employed.

The tiny images can be enlarged into beautiful portraits by means of a simple enlarging lantern. In order to avoid grain marks due to the great degree of enlargement, this inventor makes use of silk bolting cloth in front of the paper receiving the enlarged image. The silk cloth serves to eliminate the coarse grain marks while leaving its fine and almost indiscernible weave on the enlargement.

So the motion picture can serve as a means of obtaining beautiful and life-like portraits, by means of the enlarging process which has already been perfected to a high degree. In fact, many amateur motion-picture cameramen make small enlargements from their choicest strips of negatives, realizing the value of the tiny ¾ by 1 inch negatives for this purpose. And there are to-day on the market cameras which take "still" pictures on standard motion-picture film. On 50 feet of such film, it is possible to take 800 images, any one of which can be enlarged to a clear 3¼ by 4¼ print.

THE MAP MAKER AND THE MOTION PICTURE

Ever since the great war proved the value of photographs taken from airplanes, map makers have been interested in applying this form of winged photography to their work. For military purposes, cameras have been developed in which motion pictures are made at a slow rate of speed while the airplane is flying over hostile territory. It may be that in the no distant future these same cameras will be applied to the task of map making. Already it is reported that airplanes have made flights over "Darkest Africa," filming hundreds of miles of territory

AGAIN WE SAY, NOTHING IS IMPOSSIBLE IN MOTION PICTURES. TORNADOES, EARTHQUAKES, FIRES—ANYTHING CAN BE DUPLICATED BY MEANS OF INGENIOUS MODELS SUCH AS THIS ONE

which still appears rather blank in our geographies and atlases. Obviously, the motion picture has a fertile field to exploit in that direction, along with its present application in presenting to us the peoples of the farthest corners of the globe, which, after all, is the most fascinating and therefore effective way of teaching geography.

FILMING SCIENCE OR DRAMA AT THE OCEAN BOTTOM

It is not so many years ago that two young American brothers, aided by their father, designed and constructed a submarine tube which enabled them to make films at the bottom of the ocean. At first they contented themselves with films of fish life and the remarkable sea gardens in southern waters, but finally, they turned to producing remarkable dramas of a brand new variety, using the ocean floor for their theme and background.

The submarine tube employed by these brothers consists of a large number of flexible sections, reinforced by steel bands, hanging from a well in a barge and terminating at the lower end in a steel chamber. The tube is flexible, of course, permitting it to sway with the movement of the barge and the tides, so that it is not subjected to great strains. The steel chamber below is round with the exception of a horizontal funnel-shaped extension which contains the huge glass window through which the subaqueous scenery can be seen and photographed. Air is supplied through the flexible tube. As many sections may be added as are necessary to bring the steel chamber down to the desired depth.

The two brothers made their first essays at submarine photography in Hampton Roads; but it was not very long before they appreciated the difficulties of making good photographs in those muddy and poorly illuminated waters. So they hied off to the West Indies, where clear water and powerful sunlight awaited them. Furthermore, they secured far more beautiful settings and sea life for their submarine pictures in those tropical waters than would ever be possible farther north.

The first submarine motion pictures were made by these two brothers, and showed native boys diving for pennies tossed into the water by tourists. By means of the submarine tube, it became possible to show the dusky lads plunging below the surface, searching about for the pennies on the crystal white sands below,

THERE IS NO TRICK TO THIS PICTURE. IT WAS MADE AT THE BOTTOM OF THE OCEAN BY MEANS OF A SPECIAL SUBMARINE TUBE

and then coming up to the surface with the pennies in their mouth. A short while later motion pictures were made of the ocean bottom in the region of Watling's Island, where Columbus touched on his journey to the New World. These motion pictures were a revelation; for they brought to motion-picture audiences strange sights from the bottom of the ocean, where until that time it was practically impossible for us to penetrate. Thanks to these films a submarine journey was depicted on the screen, with the audience taken over range and valley, through plains of sea weed and through forests of beautiful coral growths, with hundreds and thousands of beautiful and strange denizens of the deep coming into view as the scenes unrolled. One of the most thrilling features of these submarine films was a fight between a stalwart Bermudian native and a shark, the latter being attracted into the field of the camera by the carcass of a horse suitably arranged near the tube.

At depths not exceeding thirty feet and with a reflective white bottom, it is unnecessary to employ artificial illumination. At greater depths it is necessary to resort to artificial light in the form of water-proof and heavily protected quartz-burner Cooper-Hewitt lamps of great candle-power, which are lowered over the desired scenery. With such powerful lamps it becomes possible to photograph objects 75 feet or more away from the camera.

The possibilities of submarine photography appear to be without limit. The Williamson tube, employed by these brothers, as well as other effective devices, are now available for filming deep-sea stuff. It has been predicted that in the near future we shall have views of the great ships sunk during the world war, such as the *Lusitania*. By means of electrically operated cameras and powerful lamps, which can be operated from the surface, it should be possible to take motion pictures at practically any depth, since it is the human element that places a very definite limit on deep diving.

FILMING MARINE LIFE ON TERRA FIRMA

It should not be taken for granted that all sea life is filmed at the bottom of the ocean. In fact, some of the most remarkable photographs of this kind had their inception in a number of huge tanks built back of the home of a natural scientist and curator of the New York Zoölogical Gardens.

SCENE FROM A THRILLING UNDERSEA PHOTOPLAY, PHOTOGRAPHED AT A DEPTH OF THIRTY FEET

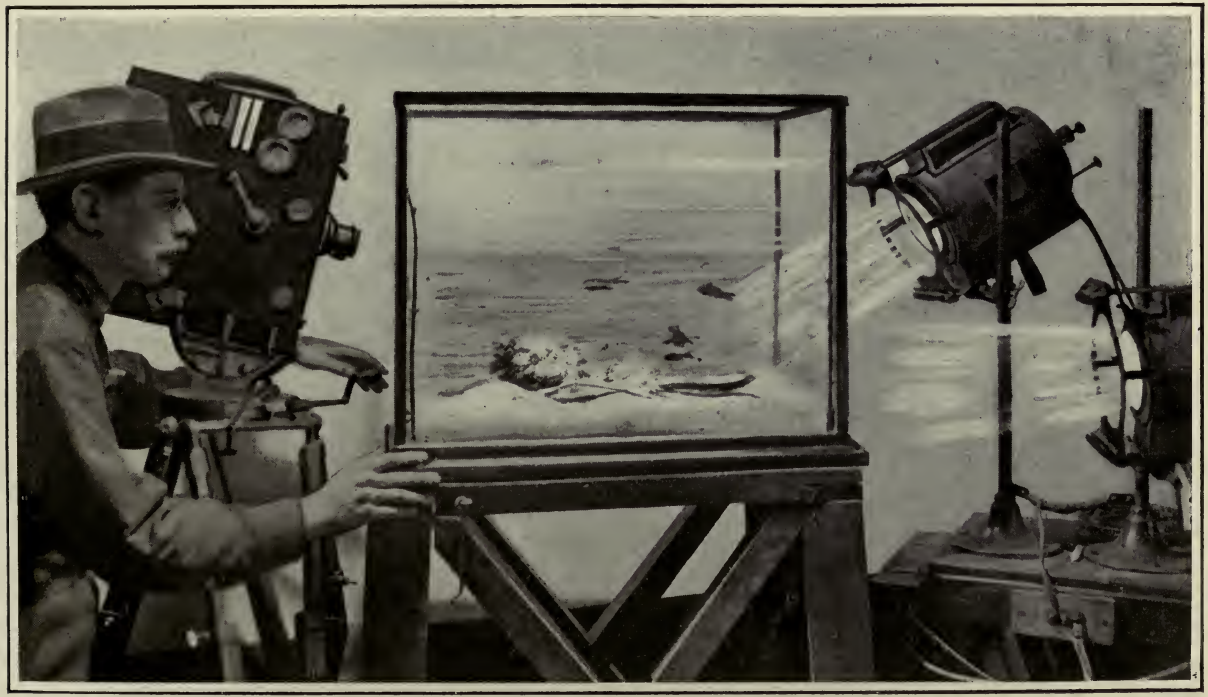
When the curator determined to make some marine motion-picture studies which would thrillingly picture deep sea life, he first made a series of experiments by the sea. Along the shore, it was found possible, during the time of the brightest sunlight, to photograph the sandy bottom at a moderate depth. This was done with something like a huge megaphone. The end of the contrivance was covered with glass. All sorts of strange life were portrayed, but many and even more curious and interesting forms were observed at a depth too great to be filmed by the means at the disposal of this natural scientist. So he decided to set up a marine jungle in his own laboratory.

To do this a number of enormous plate-glass tanks were built and so constructed that the water could be heated to the temperature exactly necessary to some forms of marine life and chilled to the point required by others. Sea water of a clarity found some distance out at sea was brought to shore and carried in big cans to the studio. In this water rare and curious specimens of marine life were also transported.

Next a great quantity of rocks and marine plants was brought to the laboratory. The idea of this was to arrange many kinds of settings. To produce the pictures the curator had in mind, the interiors of the big tanks were arranged with the same care as a stage. In one scene the effect was produced of the sea jungles, of waving growth in which roams the devil fish, and the caves wherein these monsters lurk. Then there was material for rocky labyrinths where the shy fish find shelter, sea prairies where the crab legions congregate, and the walls of the reefs on which live the beautiful corals, star fish, and sea urchins.

Special settings were also arranged for what the curator declares to be one of the most remarkable creatures he ever captured. This is the smoking caterpillar, an animal that walks about on the sea bottom, in upright positions, and appears to throw out its chest with an air of pride while it smokes a cigarette. To unbelievers it is explained that the "smoke" comes from a white tube and is a lime secretion used to drive enemies away.

When the tanks were finally completed, inhabited and their settings satisfactorily arranged, the curator "shot" in them



BY MEANS OF POWERFUL ARC LAMPS, THE CURATOR OF THE NEW YORK ZOÖLOGICAL GARDENS HAS MADE EXCELLENT FILMS OF MARINE LIFE CONTAINED IN AN ORDINARY AQUARIUM

some very extraordinary dramas and comedies, as can well be imagined.

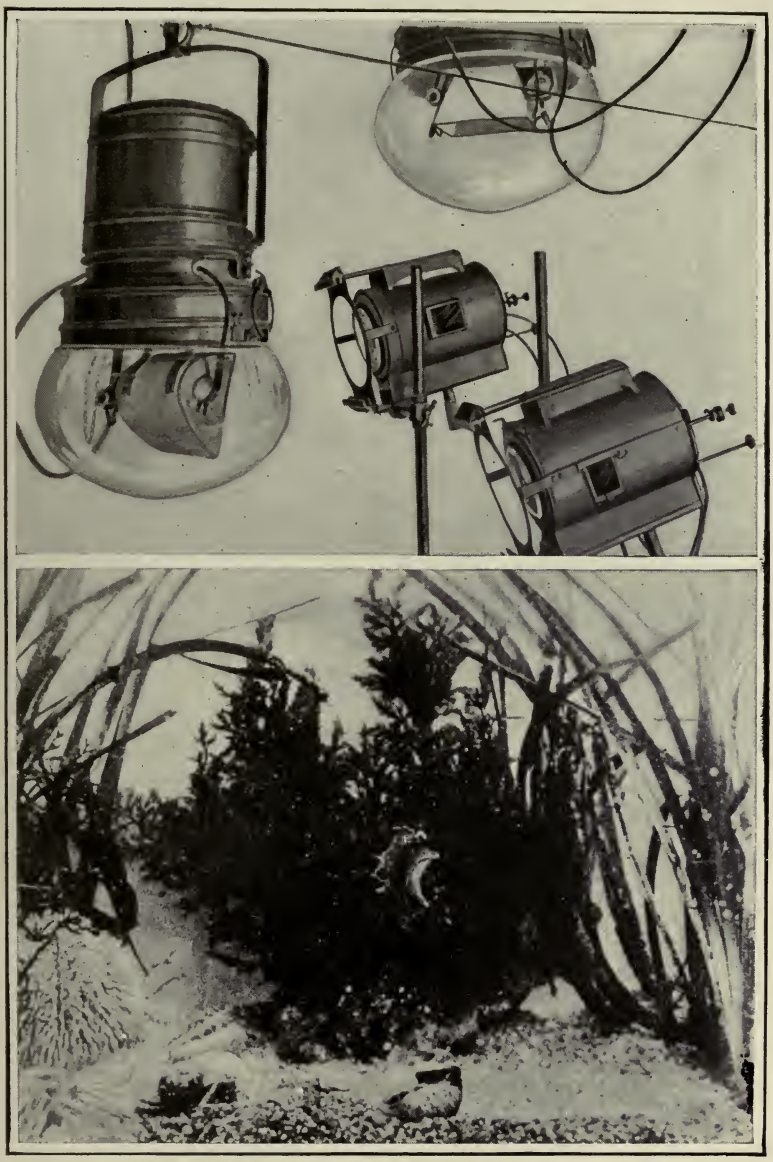
In order to use the camera successfully in deep tanks of sea water and follow the movements of the actors among rocks and tangles of ocean growth, there is much to be done in the matter of lighting. Then again, most of the particularly interesting forms of deep-sea life prowl only at night. These nocturnal forms were illuminated by huge arc lamps, giving a total of 40,000 candlepower. It was necessary to make the bottoms of some tanks of glass so that beams of light could be projected among the rocks from beneath. The water of the tanks is slowly filtered, being constantly in moderate circulation and passing through screens which catch accumulating particles that might cause it to be hazy.

It was not long after filming his first marine subjects that the curator discovered the delicate health of certain kinds of specimens, which could not survive the short trip from the seashore to his laboratory.

To get these last-mentioned specimens before his camera, this scientist found it necessary to rig up a tank at the sea beach and film the specimens immediately after removal from the water. There were many troubles in doing this. The water in the tanks rapidly heated from the glaring sun, but this difficulty was met by having a supply of ice and a thermometer at hand. On some days the wind made it impossible to keep the light shielding screens in place, and sand particles in the air, together with salt spray, caused trouble with the particularly delicate mechanism of the close-up motion-picture camera. But by keeping everlastingly at it the curator has succeeded in producing a large number of excellent films, depicting many varieties of marine life.

A POET OF THE SCREEN

It seems a wide step from cold science to passionate poetry, yet motion pictures to-day combine the two on the same program of almost any theater of the better class. There is at least one film producer who is using the motion picture for scenic purposes, coupled with wonderful poetical sentiments. This producer depicts a wanderer with his dog as sole companion, going out into



ABOVE: SOME OF THE LAMPS EMPLOYED FOR FILMING MARINE LIFE.
BELOW: TYPICAL SCENE MADE IN AN AQUARIUM

the wilderness far from the haunts of civilization in order to get in touch with Nature and with our Maker.

Such poetical films are quite inspiring, although it is a question whether they are thoroughly appreciated. That the idea can be extended is perfectly obvious; and we may yet see a new field for the poet who stands ready to co-operate with the producer-artist who can obtain suitable pictures which lend themselves to such treatment.

And for all that has been said regarding the many odd applications of the motion picture in this chapter and elsewhere, the story is by no means complete—and never will be complete. As an entertainer, the motion picture has come to stay. As an educator, it is just beginning to come into its own. As an aid to the doctor, the surgeon, the engineer, the business man, and others of a serious turn of mind, it is the greatest discovery of the ages. For the time being, however, cinematography is still in its infancy.

CHAPTER XVIII.

MOTION PICTURES IN THE HOME AND BUSINESS

THE HOME and the office are being invaded by the motion picture, just as the musical comedy and opera and the orchestra and the military band have already done through the agency of the modern phonograph. Truly, the phonograph has a wider appeal than the motion picture as a home entertainer; but where the former already exists there is a field for the latter. Inexpensive and thoroughly practical, motion-picture apparatus is at last finding its way into homes; and the day is almost here when every home will have its collection of family and general films and a compact projector alongside the phonograph. In business the motion picture is a potent means of publicity; there is no better way of placing one's sales argument before a prospective buyer than through the medium of the screen.

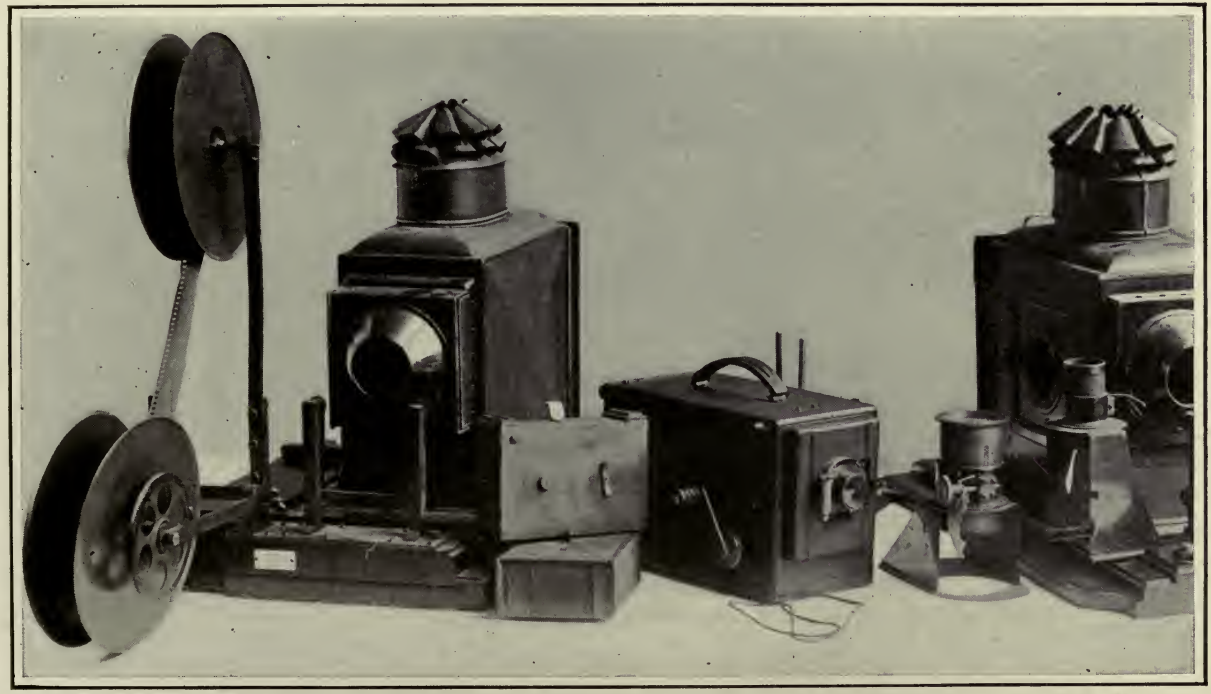
COMPARED with the motion picture, the conventional snapshot is lamentably incomplete. It offers but a very small impression of any given subject; indeed, it represents that subject during a brief instant only, let alone that it does not show the action of the subject. In the case of individuals, the snapshot impression may be entirely erroneous, for the reason that a person is too often apt to "pose" for a photograph, assuming an expression that is far removed from those generally associated with that person.

But to make motion pictures of any given subject is to make that subject literally live forever. The fidelity of the screen reproduction is remarkably complete. Which means that the interesting moments of childhood, the disports of a dog or other domestic pet, the more important incidents of a journey, and other phases of our lives can be recorded for the years to come. Ten, twenty or thirty or more years later these incidents can be recreated, as it were, not only for the amusement of the family but friends, as well.

Aside from enabling the recording of interesting phases of our lives, the motion picture has still another attraction. Deep down in the heart of practically every film devotee there lurks a desire to see himself in the films. For to be filmed is to be accorded that rare privilege of seeing one's-self as others see one. In other words, one can then "look himself over"! And concordant with this clandestine interest in motion pictures, there is generally the desire to produce photoplays like those in the theaters, perhaps not so elaborate, to be sure, but photoplays nevertheless with friends and relatives playing various rôles.

What fun there is in amateur photoplay production! Sister Blanche, who has written hundreds of scenarios and holds a record for receiving every one of them back, can now write a short scenario for Brother Tom who is to direct the amateur photoplay; Aunt Clara, who has always longed to "get into the 'movies,'" can now realize her heart's desire; handsome chum Fredie can now appear at his best before the camera; little Bill around the corner can now show that he really is as comical as Charlie Chaplin, and so on.

That the foregoing is by no means a fantastic suggestion is obvious from the interest taken in amateur photoplays by our



CRUDE, HIGHLY INFLAMMABLE, AND PHOTOGRAPHICALLY IMPERFECT WERE THE EARLY AMATEUR MOTION-PICTURE SYSTEMS OFFERED TO THE PUBLIC, SUCH AS THIS ONE OF ENGLISH MANUFACTURE

society folk. For several years past the summer's program has not been complete if it did not contemplate a photoplay with various members of the smart set taking part. Generally, the camera operator and the director have been professionals, although in some instances they have been society folk like the players, making the photoplay a pure amateur undertaking. As often as not such films have been produced for a benefit of some sort, and by comparison the amateur theatrical has faded into insignificance.

So it is evident that there is a field for simple motion-picture apparatus for the amateur. Just as the phonograph has brought the music of the entire world into our homes, so must the amateur cinematograph at no distant date bring motion pictures into our midst. The "library" of motion-picture subjects will include not only well-known stories, views of foreign lands, novel manufacturing processes, side-splitting comedies, and news weeklies or dailies, but also the photoplays of the family with an all-star cast including everyone from the one-year old baby to seventy-year old grandpa.

A MATTER OF DOLLARS AND CENTS

The home "movie" has been slow in coming, let us admit. But the reasons for its tardy appearance are many fold. Most important of all, however, has been the matter of cost. Motion pictures of the standard type are recorded on long strips of film, and film is an expensive material. The price of raw negative film may be anywhere from 2¼ cents to 3½ cents per foot, to begin with. After the film has been exposed, it must be developed, thus adding another cent to the price per foot. There still remains the print to be made from the negative. The positive print costs either 4 or 5 cents per foot. So from the raw negative to the finished positive the cost is anywhere from 7¼ to 9½ cents per foot.

If a single foot of film were sufficient to record considerable action, then the cost would be inconsiderable. But to record the average bit of action it requires 20 feet or more which immediately brings up the price to a prohibitive point for the great majority of interested persons.

It is this great cost of film that has held up the introduction

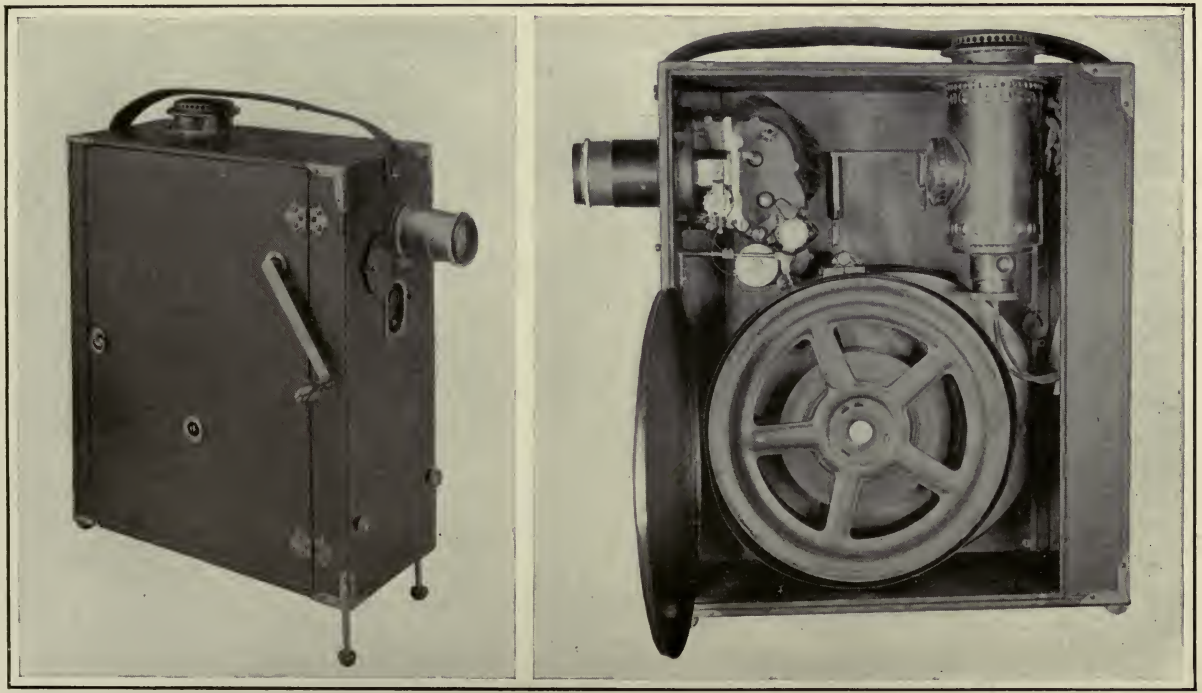
THESE SAMPLE STRIPS OF FILM HAVE BEEN TAKEN FROM THE COLLECTION OF AN AMATEUR MOTION-PICTURE PHOTOGRAPHER, IN ORDER TO SHOW THE WIDE RANGE OF SUBJECTS WHICH MAY BE RECORDED

of home "movies." Realizing this, many inventors have sought to get around the drawback of expensive film; and some of the schemes tried have included glass plates carrying hundreds of images, small sized film, and paper or opaque films. Much has been accomplished along this line; in fact, there are a number of practical motion-picture systems now available for the average home and it appears to be a matter of business handling rather than practicability upon which the immediate future of home cinematography depends.

Of course, there are certain advantages that go with the standard sized film. For one thing, the home motion-picture projector handling standard film can be used for whatever films are available on the market; and there are always great numbers of old films that can be picked up for next to nothing. Then again, standard film, being of a fairly large size as compared to other sizes, gives excellent screen results. And while it is true that standard film is not, as a rule, non-inflammable, there are numerous small projectors available in which the fire hazard is materially reduced. Still, fire underwriters object to the use of inflammable film in homes, which means that a fire insurance policy and such a projector do not go together.

The owner of a camera that takes standard motion-picture film for his own amusement finds plenty of places where he can leave his work to be developed and printed. Occasionally, when an interesting subject of wide appeal is made in his camera, he can offer it to any of the several motion-picture companies interested in such subjects and realize a nice sum of money; whereas with special film such a subject would have little if any market value.

But nevertheless, after all is taken into consideration, the standard sized film does not meet the requirements as well as the smaller films and plates and opaque films now being slowly introduced. Standard film remains expensive and far beyond the reach of the great majority, although there are numerous inexpensive cameras and projectors made for amateur work using such film. Some of the cameras sell for as low as $35.00, and can be operated with the ease of a Kodak. The projectors sell for as low as $60. In the more elaborate models there is a compact, highly efficient machine the construction of which is largely of aluminum. It is mounted on a metal-lined wooden cabinet



WEIGHING BUT TWENTY OR THIRTY POUNDS AND BEING ENTIRELY FIREPROOF, PROJECTORS OF THE "SUIT-CASE" TYPE HAVE PROVEN QUITE POPULAR FOR HOME AND BUSINESS USE

which contains the reels, and only a small section of film is exposed at any time to the fire hazard. The mechanism is motor driven. As far as operation is concerned, this projector is ideal in every way for home use. Its price, however, is somewhat over $200.00, which makes it prohibitive in most instances.

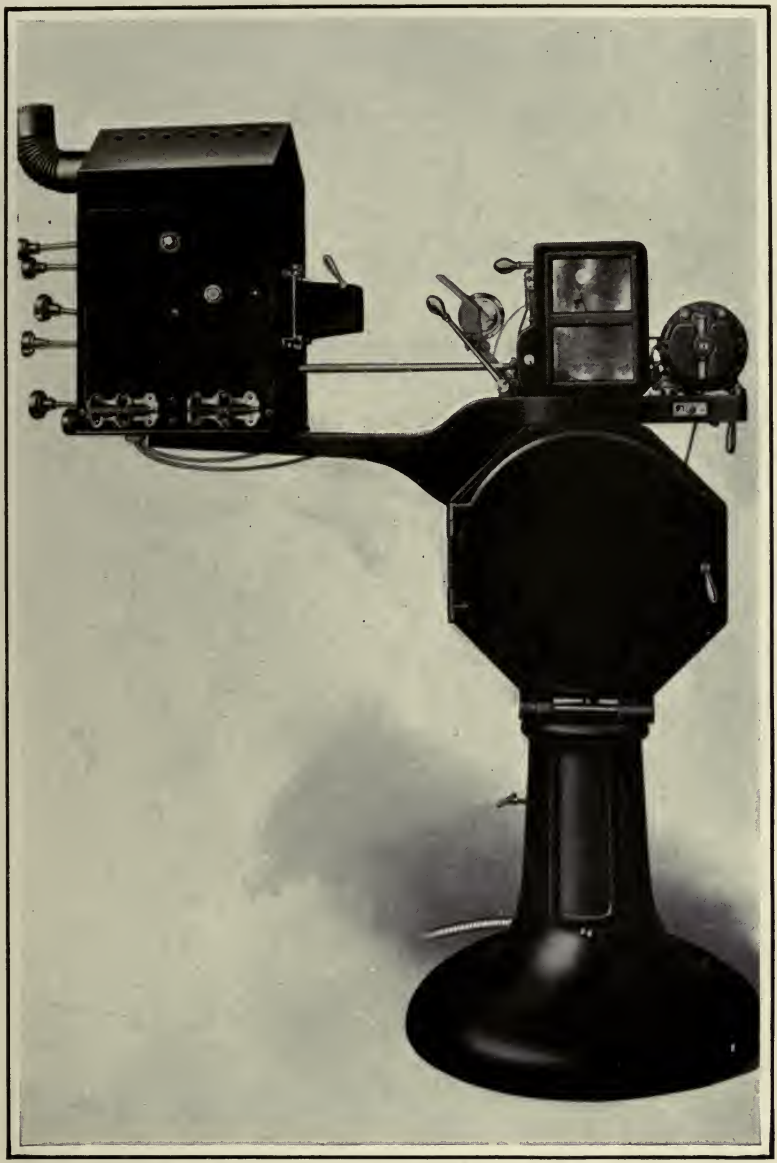
Then there are numerous "suit-case" projectors available for the home, schoolroom, church, or salesman on the road. These projectors are made up in the form of substantial carrying cases which contain the complete apparatus. When set up the case of such a projector acts as the fireproof or asbestos booth for the film and the mechanism, although the operator, of course, operates the machine from without. In the hand-driven models the crank comes through a hole in one side, while in the motor-driven models practically everything is enclosed except the motor switch and connecting cord.

Aside from the suit-case type, there are several other light-weight projectors of the simplest design and lightest weight. These projectors consist of an arc lamp or filament lamp, a plain film shifting mechanism, a shutter which also acts as a flywheel, two plain film reels, and a substantial iron base. The weight of such a projector is in the neighborhood of 25 pounds. In order to economize space, projectors of this general design are sometimes arranged so that the projected image is at right angles to the beam of light from the lantern, a prism being employed to bend the beam.

FROM SMALL TO STILL SMALLER PICTURES

Among those who have devoted some attention to the home cinematograph problem is Thomas A. Edison, the famous inventor. Several years ago he spent considerable time developing a home projector with his characteristic thoroughness and skill. The projector which he finally evolved can best be described as a professional projector in miniature. Taking all that was best in standard projectors, Edison reduced these factors and assembled them into a diminutive but highly practical home projector.

To solve the high cost of film, Edison made use of a film of slightly less width than the standard. Instead of one image after another in a single row down the film, he arranged his images in three longitudinal rows, with the perforations between



THIS PROJECTOR, WHICH THROWS ITS PICTURES AT RIGHT ANGLES TO ITS AXIS, HAS BEEN DESIGNED FOR SCHOOL USE

the rows instead of near the edges, so that with 300 feet of film he obtained about 16 minutes of continuous action, or the equivalent of more than 900 feet of standard film. The operation with this film consists of first sending it through the projector with the first row in position, then sending it through backwards with the second row in position, and finally sending it through again as in the beginning, but with the third row in position.

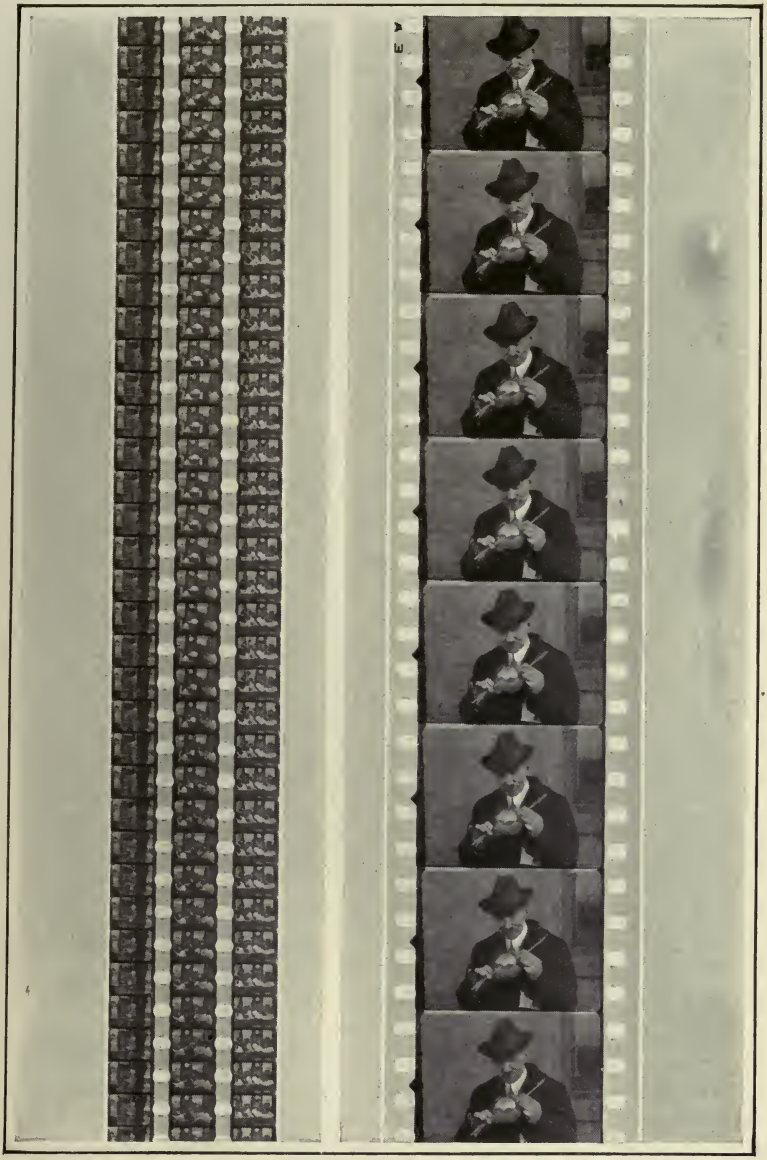
Although each image measured but 3/16 inch or less in height by ¼ inch in width, while the screen image measured up to eight by ten feet when desired, the pictures were fairly clear and well illuminated. A baby arc working on lighting circuits through a rheostat (for direct current) or transformer (for alternating current) supplied the illumination. And while no shutter was employed in the tiny projector, the screen results were reasonably free from flicker.

The films for Edison's home machine were printed from standard Edison films by means of a reduction printer. At the time the projector was first introduced, the films were quite up-to-date, representing the best work of the well-known players of the Edison film organization. Travel, scientific, and industrial films were also available in the rather complete Edison library.

Still, Edison did not provide a camera for use with the home projector, and in that way he only satisfied one-half the demands of home cinematography. And following a fire at the plant in which the film manufacturing equipment was destroyed, the enterprise was abandoned.

Edison has not been alone in his idea of reducing the size of the film as a means of bringing the cost of home "movies" within the reach of the multitude. One of the really successful home "movies" has come from France, in the form of a simple, efficient projector and a camera using film of lesser width than the standard. Like the Edison and most genuine home "movies," the film in this case is of non-inflammable stock, making it absolutely safe to handle and entirely within the requirements of the fire underwriters.

In the earlier models of the French home "movies" referred to, the cranking of the projector also operated a magneto which supplied current to the incandescent lamp. More recently this system has been Americanized to the extent of designing a ma-



SAMPLE STRIP OF EDISON HOME KINETOSCOPE FILM WITH THREE ROWS OF IMAGES COMPARED WITH STANDARD FILM

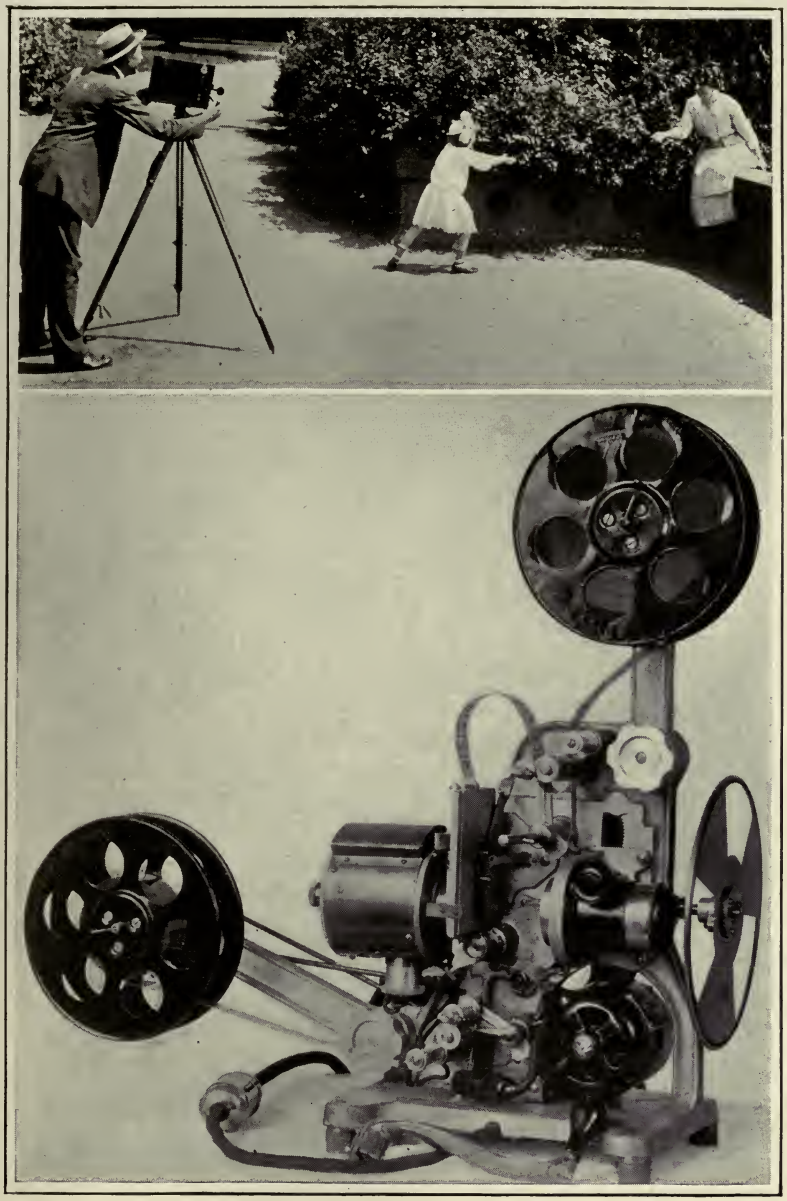
chine that is typically American in appearance. Instead of the elaborate, if not ornamental, appearance of the French model, the Americanized projector is extremely simple and compact and constructed entirely of aluminum except where steel and iron and brass are unavoidable. This new model is motor-driven, and operates on any lighting circuit. The illumination is supplied by a tiny incandescent lamp of the gas-filled, high-efficiency class. A shutter and a special intermittent movement are employed; indeed, so quick working is the intermittent movement of this machine that its percentage of brilliancy on the screen is greater than that of any other projector, professional or otherwise, so it is claimed. At any rate, the projected picture is absolutely steady and flickerless.

Where electric current is not available, this projector can be used together with a hand-driven generator on a suitable stand. Outfits of this type have been employed by troops during active service, far removed from electric supply and other conveniences.

A camera is also available in this French system of home cinematography. As in the case of the projector, the very best commercial practice is incorporated in the camera. In fact, this camera is of the enclosed magazine type, with a high-speed lens, rigid tripod, and excellent mechanism. Perfect pictures can be made with it even by the amateur because above all its operation is simple and readily grasped.

It cannot be denied that this French system, especially in Americanized form, is the ideal home "movie." The owner of a projector and camera can make his own films and project them for his little circle of friends and relatives. Amateur photoplays can be produced with this excellent equipment for club and church entertainments and benefits. Furthermore, the agents for this system maintain elaborate libraries of film throughout the world, enabling subscribers to the service to obtain the best dramas, comedies, scientific, travel, industrial, and other subjects.

Ideal that system is; to say otherwise would be to shun the truth. Yet, the great drawback is the familiar one—price. The projector sells in the neighborhood of $250.00, the camera for $175.00, and the films rent for several dollars a day for a fair entertainment. As far as the multitude is concerned, the system is beyond reach; but there can be no doubt that for persons of



SAFE HOME MOTION PICTURES: FILMING THE SUBJECT, AND THE PROJECTOR WHICH IS APPROVED BY FIRE UNDERWRITERS

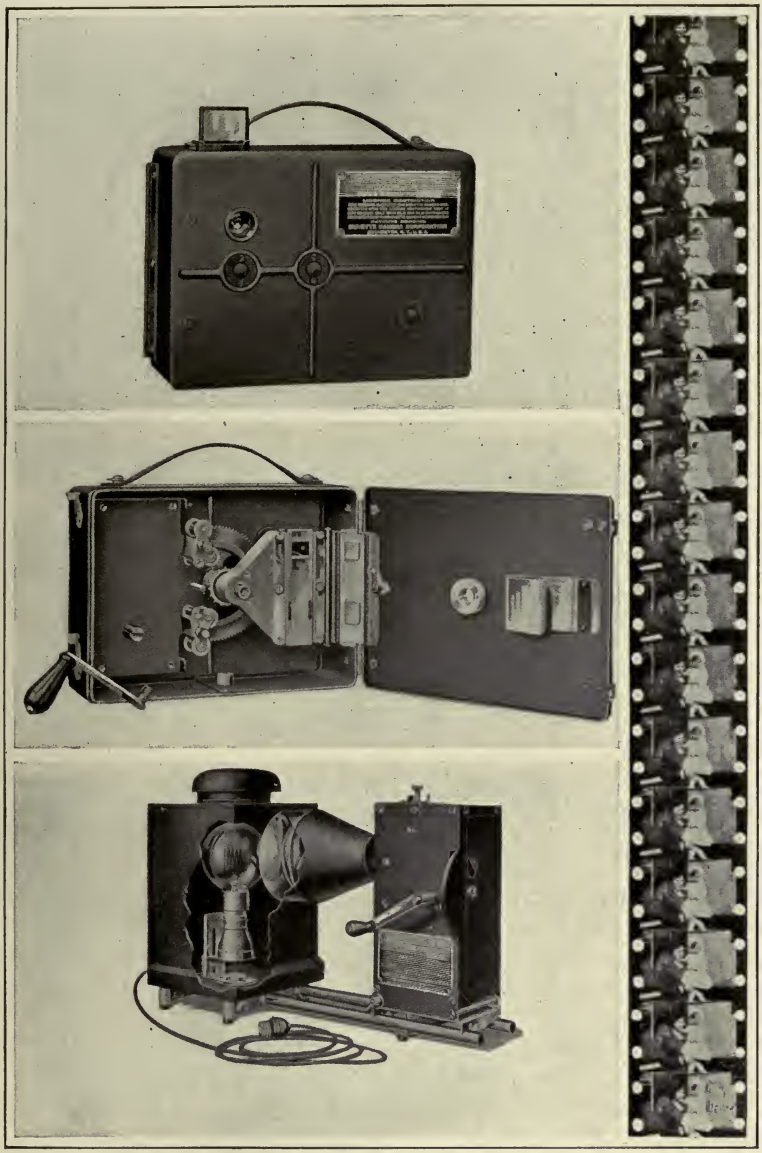
means it is absolutely ideal and the solution of the home cinematograph problem. That, in fact, is amply proved by the larger numbers of projectors and cameras of this type in daily use.

BRINGING HOME "MOVIES" WITHIN THE REACH OF ALL

For the present, at least, it remains to be seen what success is accorded a home cinematograph system that has been worked out with the price question always foremost in the mind of the inventor. Realizing that the public at large could not afford to pay several hundred dollars for a projector and several more hundred for a camera and then still face the high prices for the film, the inventor in question has evolved a projector which sells for $60.00, a camera for $40.00, a tripod for $5.00, and negative film for $1.50 for a package of 50 feet.

The system is still comparatively new on the market, and the attention of the public has not yet been attracted to the advantages of the equipment as it must be before this system becomes more universal. The practicability of projector and camera has been proved beyond doubt, and the price of films is certainly within the reach of the average phonograph owner who pays $1.00 or more for an occasional record. It is simply a matter of informing the public that a practical and inexpensive apparatus is now available.

The camera of this American system is of metal, finished in a durable black, and of the size of a small folding Kodak. The lens is a special formula of a well-known lens maker, designed to give great sharpness and detail on magnification. It is 32-mm. fixed focus, thereby limiting the necessary knowledge and experience of the operator to the ability to turn the crank while looking at his subject through the direct-view finder on top of the case. The film comes in handy containers or packages, that fit directly into the camera. No dark-room work is necessary. Each package, containing 50 feet of film, which is equivalent to 100 feet of standard film, or over two minutes of action, is ready for instant use. When ready to place the film package in the camera, a paper seal is broken, a small section of the film is pulled out until a six-inch loop is obtained, which is twisted so as to fit into the "throat" of the camera, the door is closed, and the filming can proceed.



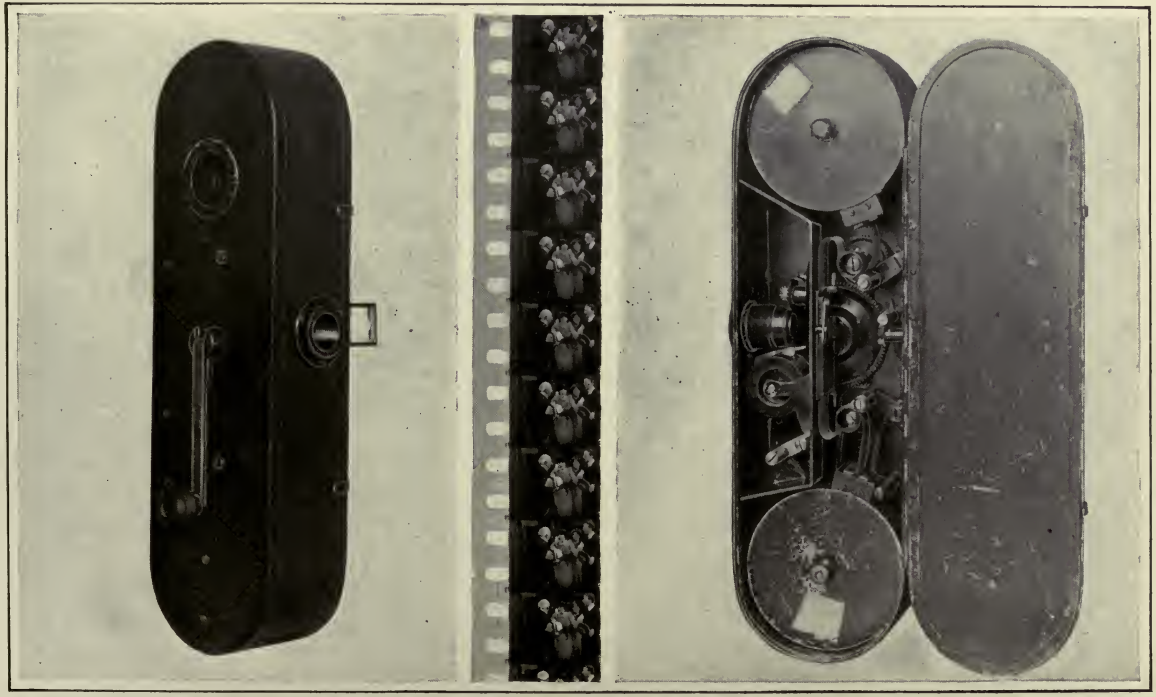
CAMERA, PROJECTOR, AND SAMPLE STRIP OF FILM OF A RECENTLY INTRODUCED INEXPENSIVE SYSTEM OF MOTION PICTURES

The projector is also of all-metal construction, attractively finished like the camera. The film magazine, with a capacity of 200 feet of film—some seven minutes of action—becomes a permanent container for the film. When the magazine is full it can be indexed and stored away just as one would index phonograph records. In this manner a "library" of films is readily started. The lamp of the projector is a specially designed Mazda, filled with nitrogen, and gives a powerful light when operated on ordinary house current. Passable moving pictures from 10 inches to 9 feet wide, depending upon the distance thrown, can be projected. The projector will operate any distance from 10 to 25 feet. At 12 or 15 feet it projects a picture four feet in width with fair clearness.

At the time of writing, this system is intended for anyone who desires to produce his own films, be they of the baby, the latest trip, an interesting machine, a parade, a sporting event, or an amateur photoplay. Eventually it would seem that the organization behind this system will be producing comedy and drama and scientific and travel and other subjects, possibly copied from standard film by means of a reduction printer. But for the time being it is squarely up to the owner of a complete outfit to produce his own subjects.

In Europe the matter of home cinematography attracted considerable attention, especially on the part of large camera manufacturers, prior to the outbreak of the great war. Typical of many attempts to use small films was that of a German camera manufacturer, who developed a pocket camera which could be used also as a printing machine and as the projector. The film employed in this apparatus was scarcely one-half inch wide, making its cost comparatively small. The camera weighed but little, and made use of the conventional tripod for "still" photography. Because of the small size and short lengths of film, the owner of such a combination camera-printer-projector was able to do all his own work, thereby reducing the operating cost still further. It must be admitted that up till the outbreak of the war, this German equipment represented a very near approach to a universal home "movie."

One American inventor has hit upon a scheme for utilizing the standard film in this manner: He cuts standard film in half and



AN AMERICAN MOTION-PICTURE MAN HAS DEVELOPED THIS SYSTEM OF HOME MOTION PICTURES WHEREIN STANDARD FILM IS SPLIT IN HALF, MAKING FOR ECONOMY AND A COMPACT CAMERA AS SHOWN

uses but one row of perforations. His images are only half as high as the standard. Thus he uses only a quarter as much film as standard, thereby reducing the price greatly while avoiding the trouble of special film and perforations. This scheme is ingenious, to say the least.

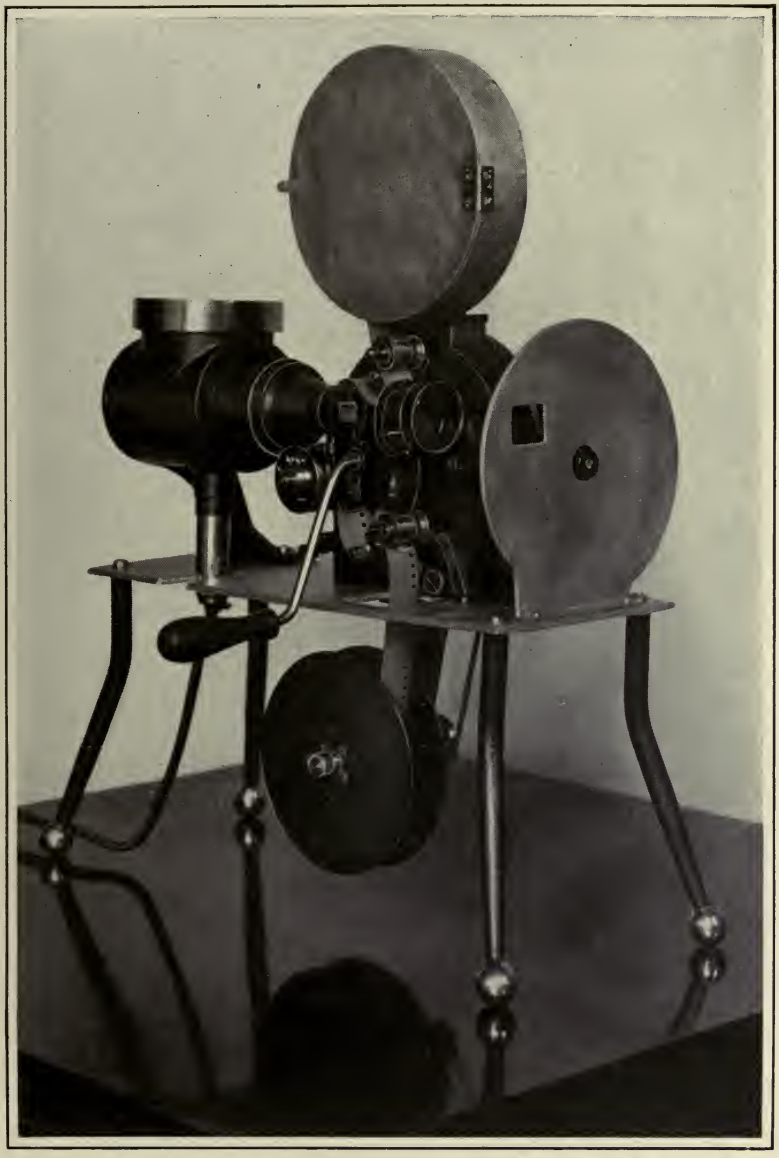
USING PAPER INSTEAD OF FILM

By some it is still held that the ultimate cinematograph for amateur use must be one in which film is replaced by some cheaper carrier of the images. To this end some inventors have worked out systems making use of paper instead of celluloid films. Lately, an American inventor has introduced paper films of the same size and perforation as standard film, which can be used in a special type of reflecting projector, working on the same general principle as the post-card projectors. To be sure, paper film is much less expensive than celluloid, and its printing can be done with standard motion-picture equipment. The projection of this opaque film is fair, and there is no difficulty in this direction. Mechanically, the paper is made sufficiently heavy to stand the wear and tear on the sprocket holes for some length of time.

In this system, however, one must go back to standard celluloid film in making the negatives from which the paper films are printed. So if the owner of such a machine desires to produce his own "movies," he must use a camera—inexpensive or expensive, amateur or professional, small or large—and standard film. Obviously, the negative costs the same in this case as would the negative for any standard projector; but the economy takes place in the positive print on paper.

So far we have only dealt with films. There are some authorities who persist that the home "movie" of the future will not use film; instead, it will employ plates or printed sheets, with the images running in horizontal and vertical rows. Long ago this system of motion pictures was attempted in France with fair success, and to-day one such system at least is available for use in the home.

By an ingenious mechanical movement, a European inventor now in America makes it possible for anyone to make motion pictures on glass plates. The first row of images on the plate are



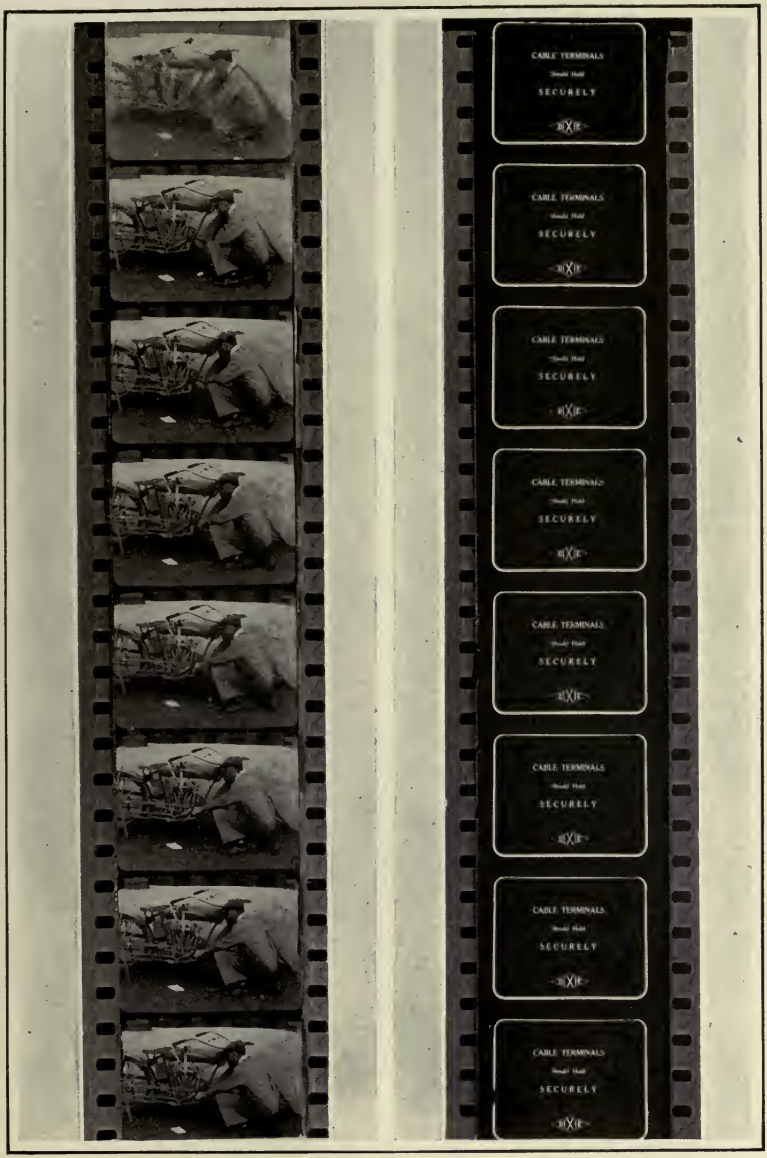
PROJECTOR EMPLOYED FOR PROJECTING THE SPLIT FILM SHOWN IN THE PRECEDING ILLUSTRATION

made from one side to the other, and upon registering the last image on the line the plate drops down a sufficient distance to accommodate the second row, which is made in the opposite direction. Reaching the last image of the row, the plate again drops down and the third row is made. So back and forth, dropping down one row each time, the images are registered on a single plate. In a representative system of this kind a single glass plate measuring approximately 5 by 7 inches, registers images at the rate of 12 or more per second to the number equivalent to 75 feet of standard film.

The camera of this system which now exists in the United States, having been brought by its inventor from France, has top and bottom magazines which handle a dozen plates at a time. The operator merely has to crank the camera in the usual manner, while the images are recorded on the first plate without loss of time in shifting from one row to the next. Most important of all, however, is the detachable metal piece on each glass plate, which not only serves to guide the plate through the camera but also causes it to engage the next plate which comes through the camera mechanism without a halt. Thus the operator can use his twelve plates at one time, registering images equivalent to over 900 feet of standard film. The projector of this system works on the same principle, and can show one plate after another without a break.

The low cost of such a system is at once obvious. Glass plates, 5 by 7 inches, can be obtained for a few cents each. The average amateur photographer can develop his own plates in the usual manner; and if he cannot, any photographic studio can do the work for a small fee. The negative once developed and finished, a positive is printed in a printing frame. This glass positive or "transparency" can be used in the projector. Thus home "movies," in this case, are reduced to a simple matter of plate photography.

In every way this plate system of motion pictures appears to solve the problem of home cinematography. One concern in New York which has developed such a system, sells a camera for $35.00 to $50.00, and the projector for about the same price. Indeed, it seems that ultimately the two functions will be combined in one machine, as is the case with several home "movie" systems. Again, this concern has constructed printing machines



STRIPS OF INSTRUCTIONAL FILM PREPARED BY A MAGNETO MANUFACTURER, DEPICTING THE CARE OF MOTORCYCLE IGNITION EQUIPMENT

for printing positive plates from standard motion-picture film; so that in time the owners of their projectors will be in a position to buy or rent plates on standard subjects, well-known comedies and dramas, and so on.

When it comes to cost, this system is undoubtedly the most promising; for the positive plates can be produced for less than 25 cents—and each plate represents as much action as 75 feet of film. Of course, it is true that glass plates are not as handy as unbreakable, compact film; but where cost is the paramount consideration, this handicap seems more than offset. Still further to reduce the cost of positives, the concern introducing this system in the United States has of late experimented with gelatine sheets carrying printed images, and the results appear to be quite promising. By running such sheets through a regular printing press, it may yet be possible to make weekly news films which can be mailed to subscribers by regular mail, just as a periodical is mailed to its readers every week or every month.

THE SCREEN REPLACES THE FAMILY ALBUM

Ultimately, the home "movie" must supplant the family and snapshot album. Already there are available a number of systems to fit various pocketbooks, and it is now possible to record any subject for future projection.

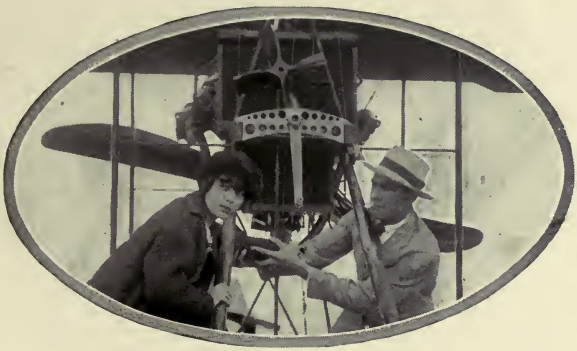
To say that the box camera and Kodak must eventually give way to the amateur motion-picture camera, would not be strictly true. There will always be a distinct field for the "still" picture: all subjects do not lend themselves to motion pictures. For instance, a landscape, a house, a sunset—all these and other subjects devoid of action do not require animated photography for faithful reproduction. But the child at play, the athletic event, a busy street scene, a public celebration—all these and others full of action require animated photography.

So at no distant date most homes will have their home "movie" equipment as well as their box camera or Kodak. Perhaps the former will in time become as common as the latter; but at any rate, it has a definite field which cannot long be denied it.

CHAPTER XIX.

THE PRESENT STATUS OF THE MOTION-PICTURE ART

WHERE does the motion picture stand today? Why has it made such deep inroads in the time-honored field of the legitimate stage? Why is it that the photoplay is so effective, despite the seeming handicap of muteness? How does it succeed in overcoming the absence of color? Why is it so artistic? Common questions, these; and the author has endeavored to answer one and all of them in the following chapter, with the aid of some of the leading minds in the motion-picture industry. The present status of the motion picture speaks volumes for the initiative of the men in the industry; for it must be remembered that it is barely a decade ago that motion pictures became a business. And more has been accomplished than appears on the screen; for there are numerous ideas which exist but which have not as yet been introduced to the public.



WHEN gallery business of regular theaters began dropping away several seasons ago, and the cause became attributable to the comparatively new art of motion pictures, experts were ready to explain their great attractiveness by their extremely low price. The same good excuse did for falling off of family patronage in the balcony. But it was difficult to make it serve when the occupant of the orchestra chair showed willingness to divide his interest between a spoken play and a motion-picture show.

In this last-named circumstance, there was more than the question of price; it meant that motion pictures were commencing to rank high as genuine entertainment in public estimation.

Since this became evident, pictures have made many strides. So has the drama, for that matter; and thereby better plays have reclaimed much of the gallery and balcony trade, and a greater proportion of that of the orchestra. An uncomfortable fact has come to light in this, however; and that is that, in so doing, the reclamation has not lessened attendance at picture palaces.

Here is a grave situation. Persons in the theater may reasonably show apprehension if pictures, which make substantially the same appeal as drama, are to command the same audiences. The question becomes, Will audiences continue to divide their allegiance, or will they eventually make it a matter of choice?

In order to gain a fair perspective on this momentous problem, it is imperative to examine quality as well as character of each entertainment.

INSPIRATION AND TECHNICAL HANDLING

After all, "The Play's the Thing," whether in a motion picture or on the stage; so *that* necessarily comes first. In either case, the play involves essentially the same matters of inspiration and technical handling. That is, speaking now of the play, apart from its mounting, which, of course, has marked points of difference.

As to inspiration, for a long time the motion-picture drama had been just a rehash of old stage plays, novels and short stories. To-day, however, it is finding the bulk of its inspiration in its own ranks. It has its own corps of dramatists, among whom at least several are qualified to rank with the foremost dramatists of the

VISITORS ARE A NECESSARY EVIL IN ANY STUDIO. DAY IN AND DAY OUT VISITORS COME IN FLOCKS AND DROVES TO SEE HOW THE "MOVIES" ARE MADE. AND THE POOR ACTORS MUST ACT DESPITE IT ALL!

speaking stage. The screen works of those dramatists have been remarkable for their highly dramatic quality, their depth of feeling and their psychological truth. Yet those dramatists, with all their admirable qualities, are but the forerunners of a coming school of photo-dramatists.

Actual construction of film plays—the continuity, as they call it—will probably always rest with the director, because details of treatment depend largely upon exigencies of the physical location that may not be anticipated by the author. The modern director is generally a person of taste and discernment, a truth that may be conveniently demonstrated by the achievement of a certain director the author has in mind. While giving infinite attention to detail in directing a recent photoplay, this director, knowing that the most imperative thing in drama as in life is the present moment, made every bit of it contribute to progress of an action that remains conspicuously an example or rare cinematographic intelligence.

In the world of the so-called regular theater, they will tell you as an enduring truth that the skeleton of every great play is told in pantomime. Pantomime is the staple of the pictures. The axiom is amplified by the trained dramatist and the seasoned actor, who declare that dialogue should be employed to advance the actual plot only when it is impossible or impracticable to do it with dumb show. The modern photoplay bridges such gaps in precisely the same way, with its subtitle, a device that has come to be quite as effective as the most polished dialogue, while it has the supplemental merit of being "heard" in the remotest part of the house.

When the complete appreciation of motion pictures comes to be written, there will be an intensely interesting chapter about the subtitle. It has grown, even in its logical and consistent place, from a simple explanatory note, to a cleverly fitting link in the given chain of events, presented with a decorative background that conveys the force of the immediate situation in unmistakable symbols as well as in preceding pantomime.

In pantomime, the screen has a tremendous advantage over the stage in a device known as the "close-up." This, as its name implies, is a method of enlarging a detail, such as a hand writing a letter, so that it fills the screen and may be seen by everyone.

A SKILLED DIRECTOR IS HE WHO CAN TAKE A LARGE NUMBER OF "EXTRAS" AND GET THEM TO REGISTER THEIR INDIVIDUAL PARTS IN A THRILLING AND CONVINCING MANNER ON THE SCREEN

There has been much discussion of the close-up, and some attempts to abolish it, notably on the part of one director who aimed to keep his figures of uniform size, diminishing them with his perspectives but never permitting them to approach the camera beyond a certain point. Nevertheless, the close-up remains a remarkably effective peculiarity of screen photography. The close-up has the power of compelling the spectator to act with the picture, so to speak, bringing the object of his attention so near that it fills his complete comprehension, spiritual as well as mental, as it completely fills the zone of action on the screen.

THE PART OF MECHANICAL DEVELOPMENT

In his attempt to solve the problem of pictures and stage in their relation to audiences, the dramatic expert states it this way: "The public will never prefer an art that appeals to but one sense, to one that appeals to both sight and hearing." To this, the photoplay expert responds, "Appeal to the sense of sight in pictures, is so infinitely superior to that of the regular drama, that it amply compensates for lack of the spoken word, giving potentialities to the photoplay that will, in total effect, make it the equal of the drama."

Pass in review some of these potentialities. The great advantage of pictures over the speaking stage is their facility of changing scene, whereby they may have a moving steamship, and a panorama of any given country, or view of any other subject, the scenes being separated by an interval too short to be comprehended.

The stage, we are told, is a three-dimensioned space; the figures are rounded; the scene is plastic. The screen, on the other hand, is a plane surface, without real perspectives. This objection to the screen production has been triumphantly met of late by the motion-picture engineers.

In the first place, the reason stage figures look rounded and screen objects flat, is that the former are seen with two eyes, and the latter with but the single viewpoint of the camera. The basis of the new process, patents for which have been taken out by a leading producing organization, was the old parlor stereoscope, through which one could look at two apparently identical flat

INTERIORS OF TWO TYPICAL EASTERN STUDIOS, SHOWING THE ARRANGEMENT OF SCENERY AND LIGHTS

pictures and see them merged into one in which everything stood out and rounded. After much experimentation, the stereoscopic motion picture is an actuality; screen perspectives are no longer flat. Indeed, they are more correct to the eye than those of the stage. The stage has a back drop with a single perspective painted upon it, this standing in violent contrast to the double perspective of the foreground. The new picture is a single film and may be run in any standard machine without special attachment.

The stage has color; the commercially successful pictures have not. From time to time color-picture films have appeared on the market, but owing to inherent faults and heavy expenses these films never became a commercial success. Of late, however, newer and simpler color-picture processes have begun to appear, in which beautiful and accurate results are obtained at a cost well within reach of the average exhibitor. Correct color at every moment is something that the stage may approximate only in a broad way; on the other hand, if the film has this accuracy, it becomes still another point of superiority.

When the stage wishes to present a highly poetic scene, it can do little more in the way of psychological mounting than to bathe it in diffused light and play it behind gauzes. A post-director of the art staff of a large producing organization accomplishes this with a diffusing lens for his camera. It softens hard outlines, but yet paints a landscape, for instance, with full orthochromatic value. This beautiful photographic effect made its début unostentatiously in a recent photoplay.

The screen has become a three-dimensioned space in another sense. A spectator does not merely view the scene at a given distance—he enters it. He goes through doors; he ascends staircases; he travels with the characters in their private cars, their limousines, their railroad compartments or whatever their means of locomotion may be.

Picture settings are built to-day so that they actually have adjoining rooms. In a recent photoplay an entire first floor of a New York mansion was duplicated on one of the great glass stages in southern California, with everything complete, even to the billiard room. In another recent photoplay one strolls with the leading man through a long suite of magnificent compart-

ABOVE: SCENE WITH SHALLOW TANK, DEPICTING SINKING SHIP ON THE FILM. BELOW: WOOD AND PLASTER "ROCKS"

ments in a royal palace. Surely this wonder, though of minor importance, is denied the speaking stage.

ARTISTIC IMPROVEMENT

One may not speak of the manner in which pictures have been overcoming their mechanical limitations without remarking the way in which they are improving their advantages.

On the speaking stage the setting has served for too long a time and for too great a variety of physical action, to be designed as a fixed pictorial composition, which means balanced masses of light and shade, and converging lines; characters have to move about without making the effect displeasing. But in pictures, there are brief flashes of connective scenes, in which no one moves out of the fixed scheme. These may be built up for sheer pictorial beauty.

Will H. Bradley, art director of the *Century Magazine,* the artist who has done so much for the poster in America, is devoting much of his time to this phase of the pictures, accomplishing his work in such a way that it harmonizes absolutely with the practical obligations of the director. He designates to those companies that seek his expert advice, correct lighting of interiors, artistic variations of chiaroscuro, and dramatic effect to be produced by psychological handling of color notes.

Scenery is no longer painted for the pictures in prevailing tones of blue and brown, but in full, real-life values. Costumes are quite as colorful. As a result, orthochromatic registry is correct.

One rarely sees anachronisms in the pictures to-day. There is a technical expert in each large studio who commands all important archæological references. It was an expert who provided the accurate settings for the recent American film production of "Macbeth." This was said to have been the truest production of the famous play, from that standpoint, that has ever been made.

Lighting, largely due to some of the leading directors, who introduced night motion-picture photography by means of powerful flood-lights, has made great strides. Focusing overhead lamps has made it possible to photograph a scene with correct shadows from a table-lamp, for instance, the lamp itself not too bright and the rest of the scene sufficiently illuminated. Large shadows, instead of being abolished as formerly, are now en-

ABOVE: CAMERA USED FOR MAKING LARGE HORIZONTAL "FRAMES."
BELOW: RELATIVE SIZES OF STANDARD AND NEW IMAGES

couraged for their artistic effect. The effect of the baby spotlight, in picking one particular character out of the scene, has been secured by the use of a transparent iris, before the camera lens, making one figure bright and the rest in the shadow.

The author has purposely avoided detailing the numerous experiments being carried on to supplement the pictures with a mechanical speaking voice, because these, while interesting, have so far fallen short of satisfactory results from a commercial point of view. The difficulty of absolute synchronization of phonograph and the running film, which breaks and is clipped from time to time and in the mending cannot well be matched up with the accompanying vocal record, is negligible when compared with the difficulty of securing the human quality of voice. No mechanical instrument yet made for the purpose has succeeded in reproducing the overtones which lend quality to speech, and the lack of which gives us, for example, that curious anomaly known as the "telephone voice" as opposed to that of intimate conversation away from the transmitter.

The really important observation to be made about voice is that pictures seem to be developing to a point where voice, however natural, would be but a doubtful accessory. Unless all the living sounds of a landscape tenanted by Nature alone, might be incorporated in the "counterfeit presentment," there would be gaps in a running action where the power of suggestion that now makes itself hear the slamming gate when there is no sound but the click of the projector, would be rudely interrupted by jarring realism.

One might continue at great length to detail various innovations—flickerless devices, which do away with the brief region of darkness between individual pictures in the reel; the discovery of cold light, and the resultant success of paper "film" which is already available for special projectors of the reflecting variety; frames of various colors and widths which may be placed about a projected picture by means of an additional projector, and which, by varying the colors, can carry a certain meaning to the scene being presented in black-and-white for the sake of photographic clearness; and so on. But the few named here may suffice as concrete instances of motion-picture advance on the technical side. There can be no doubt that the screen has received the

NATURALISTS, WORKING WITH MICROSCOPE AND CAMERA, ARE BRINGING ALL THE WONDERS OF THE INVISIBLE WORLD TO THE SCREEN

best efforts of numerous inventors, and there seems no limit to what may be achieved in mechanical improvement.

It is difficult to introduce startling or revolutionizing innovations in motion-picture work. For instance, some time ago a well-known film man attempted to introduce a larger sized image in order to secure more pleasing proportions for the screen picture and to have a larger field to work in with large groups of players. By using standard film horizontally instead of vertically, and combining the space of two "frames" to make a single "frame," he obtained images measuring 1 inch high by 1½ inches wide, as compared with the standard image of ¾ by 1 inch. His horizontally operated camera and a comparison between his "frame" and the standard appear on page 391. At this writing his scheme has not been considered very favorably for the reason that the advantages claimed do not begin to compensate for the expenses involved in using special film and projectors. In other words, it is difficult indeed to upset the standardized state of the motion-picture industry.

But the real advance is along lines where the instances are intangible—the things academically called inspiration and photoplay writing. These almost defy analysis at the same time that they stir emotion to unexpected depths, and they share here no more limitations than in drama.

When Charles Lamb long ago enunciated the everlasting doctrine that the power of drama lies in suggestion as opposed to representation, he was anticipating the power of the cinematograph as well. This is the guiding principle of the new motion picture, freed of those mechanical limitations that once kept it from being what it is soon to become—a sister art of drama.

CHAPTER XX.

THE FUTURE OF THE MOTION PICTURE

OUR FIFTH industry is the motion picture! One by one it has overtaken and passed older industries—industries which have a more vital bearing on our daily lives than the amusement which the motion picture affords. Yet the screen art is in its infancy. It has exploited only the field of amusement to any considerable extent, and there still remain many other fields where it has even greater chances of success. To predict what developments may take place in this art is to fathom something which seems to surpass understanding. But, judging by what has gone by and by what is being done today, the author has endeavored to prophesy some of the developments which will no doubt mark the future of the motion picture, as a fitting conclusion to this work.

CONSIDERING that the motion-picture art is only a trifle over twenty years old, and that its career has been one of the wonders of modern enterprise, one hesitates to predict what lies before it in years to come. Yet the progress in the past has established a definite trend, and it seems only necessary to project that trend in order to predict what may reasonably be expected of the future.

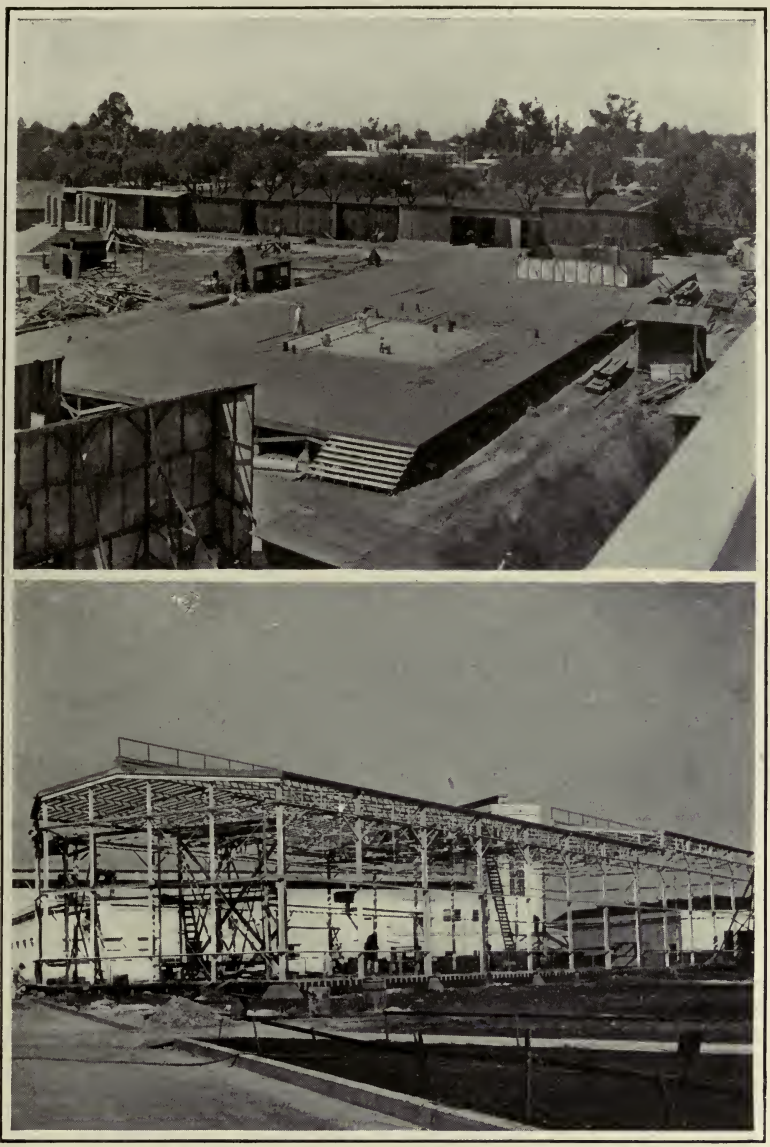
COLOR PHOTOGRAPHY AND TALKING PICTURES

There can be no doubt that successful color photography will soon become universal. Already there are several systems which are entirely practical, and their wide exploitation appears rather a matter of business organization than of inventive genius.

New problems are bound to arise with the introduction of natural-color photoplays. The comparative simplicity of the usual black-and-white scenery and makeup and photography have long caused the greatest directors of the screen art to look with disfavor on color photography. For with the introduction of natural-color films the director's troubles will be increased not a little, to be sure. He will have to utilize realistic scenery; color schemes will have to be studied, and garments will have to harmonize with backgrounds; and photographically numerous difficulties will arise where to-day, with black-and-white film, a subject is only considered in terms of high-lights and blacks.

Yet the public is the final judge. When once the public is presented with entire photoplays produced in every color of Nature, it will decide whether the additional expense and trouble involved in producing such photoplays are really worth while. If it decides in the affirmative, which it probably will, then sooner or later the black-and-white photoplay will have become a thing of the past.

The natural-color "movie" appears to be nearer realization than the talking "movie." It may be a long time before the latter is introduced on a large and permanent scale. Years ago certain French producers erected an elaborate theater in Paris in which a practical system of cine-phono, or talking picture, was exhibited. Entire operas were produced on the screen, with the players acting and singing at the same time in the most realistic fashion. It is said of this attempt that the cost proved too great;



WESTERN AND EASTERN STUDIOS: ABOVE—STAGE PLATFORM IN THE OPEN. BELOW—GLASS-ENCLOSED STUDIO UNDER CONSTRUCTION

and the public—that final authority—voted the results not worth the price.

Still, that was years ago; it may be that in the very near future a similar attempt will prove successful, financially and otherwise, and that it will mark a new era in photoplay production. Certain photoplays will be of the talking picture variety, while others will continue to be as they are now; for there are many who claim that the greatest appeal of the screen drama is the fact that it is silent: it gives the audience a great opportunity to think and sympathize and understand. Just as the stage art of pantomime has always had its following, so must the silent photoplay always hold its own. Such subjects as musical comedies and operas will no doubt be produced in talking picture form; and the leading "hits" of Broadway will some day be available in the smallest town, with the entire cast coming to the picture theater in small tin boxes—voices, music, and all!

But talking pictures call for special and elaborate equipment which every theater owner is none to anxious to install unless compelled to do so by public demand. The color films, in some of the present systems, can be exhibited either with standard projectors or with projectors slightly modified by means of special attachments. Any theater can show such films. But in the instance of the cine-phono every system, so far, has proved to be an expensive investment by way of exhibiting equipment, and that alone has prevented its universal exploitation more than the fact that much remains to be done by way of perfecting the results. Again the public is the final judge; if the public demands Broadway musical comedies on the screen of little towns hundreds and thousands of miles away from the Gay White Way, then the commercial success of talking pictures is assured.

Some authorities on motion pictures hold that all future films will incorporate the feature of great depth or relief; that is to say, the images will be stereoscopic as with the double-view cards and holder which used to be on the parlor table of almost every home a score or more years ago. When photographs are made in the usual manner with a single lens they are considered flat. That is to say, there is no idea of depth: figures in the foreground do not stand out from the background as they would if viewed with the naked eyes. The same effect can readily be studied by view-

DRESSING-ROOM BALCONIES OF AN EASTERN STUDIO, SO ARRANGED AS TO MAKE SUITABLE PRISON BACKGROUND WHEN DESIRED

ing a pail with both eyes slightly above the level of the rim, a short distance away, and then with one eye only. When both eyes are used the farther side of the pail plainly shows as such, whereas when one eye only is used the farther side appears to be merely an upward extension of the front. That demonstrates the stereoscopic effect.

Various schemes have been worked up in the past for producing stereoscopic effects in motion pictures. Some of these have been quite simple, while others have been too complicated and expensive really to warrant their employment now or in the future. But when it is borne in mind that some photoplays are to-day being exhibited in the best of metropolitan theaters, with seats selling anywhere from 25 cents to $2.00, there seems to be no reason why any effect, no matter what it may cost, should not be introduced sooner or later if the public asks for it. And the same applies to other improvements in film photography.

THE REAL MOTION-PICTURE THEATER

We have seen the motion picture from the time it was shown in the museums and side shows at amusement resorts, to the so-called nickelets and nickelodeons, and finally to the palatial picture theaters of New York and other large cities. We have seen the musical accompaniment to the screen drama start with the piano handled by a $12-a-week musician, with the music for all the world sounding like the ensemble of a poultry show or the operatic efforts of a feline quartet on a backyard fence, to the large and complete orchestras of the leading theaters and the orchestra-like organs of the smaller houses.

The future certainly must mean more rather than less for the motion-picture theater. More and more picture theaters of the type of the Strand and Rivoli and Rialto of New York city will appear in every city of reasonable size. Pictures will continue to appeal to the best class of audience, as they do now. It is not so long ago that pictures were avoided or ignored by the better class of society; but by steady improvement of the pictures and the method of exhibiting them, the art has finally won over every class of society from the poorest to the élite. To-day the picture theater vies with the legitimate theater in the number of motor cars strung out before it during a performance.

WHERE PHOTOPLAYS ARE PRODUCED INDOORS, A VAST COLLECTION OF LIGHTING EQUIPMENT IS NECESSARY, WITH A CORRESPONDING ELECTRIC BILL RUNNING INTO THOUSANDS OF DOLLARS MONTHLY

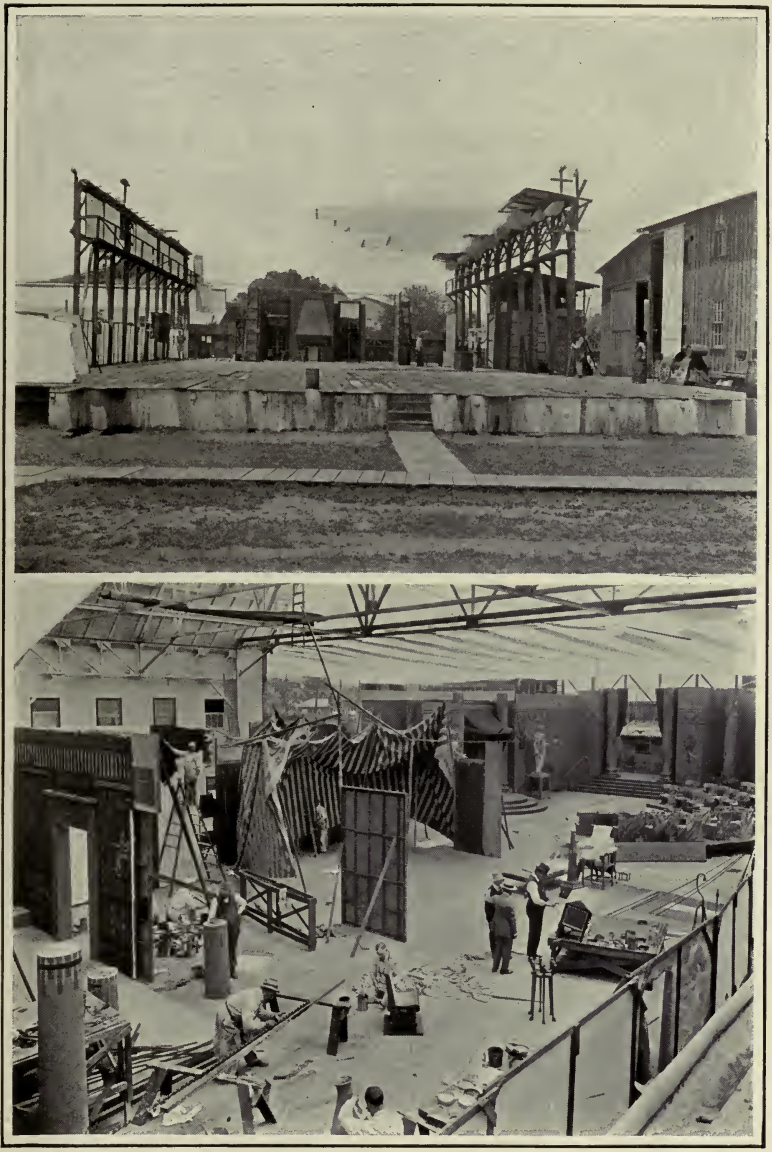
The interior of the high-class picture theater is elaborate in the extreme. The setting for the screen picture has been carefully studied, so as to harmonize with the subjects. Instead of the blinding contrast between the bright screen and the inky blackness of the theater, which formerly caused serious eye-strain, the modern theater exhibits its pictures in semi-darkness and even in pleasing colored lights.

Every feature film worthy of the name is generally accompanied by a special musical score. Indeed, leading producers employ the services of a skilled composer to prepare special musical scores which will aid, not hinder, the full understanding of the action by the audience. Motion-picture trade papers generally offer suggestions to exhibitors regarding the musical accompaniment for current photoplays. All in all, the matter of musical accompaniment has at last received its just share of attention; and the presentation of any photoplay, in turn, has been that much improved.

The ventilation of the picture theater is a matter that is more and more coming to the front. For above all else, the audience must be comfortable. There are numerous theaters to-day in which the ventilation is poor. Signs of this condition are not lacking: headaches, drowsiness, weakness—all these and other symptoms indicate the absence of fresh pure air. Such theaters are injurious to one's health and are the very breeding places of all sorts of contagion. Fortunately, these theaters are being replaced one by one by modern structures in which the matter of ventilation has been a foremost consideration.

It may be that the leading picture theaters of the future will operate on definite schedules or have so many performances a day, just as those theaters now showing super-feature films have two or three performances a day with all the seats reserved. But, on the other hand, it may be that the continuous performance feature which has been identified with motion pictures since their inception, may in most cases remain as it exists to-day. If so, and if seats are not reserved, then some system is bound to be introduced sooner or later so that a definite check is kept on the seats at the ticket office.

Some time ago a suggestion was made for keeping count of the seats in a continuous-performance theater. An inventor sug-



TWO MORE EXAMPLES OF WESTERN OPEN-AIR STAGES WITH OVERHEAD LIGHT DIFFUSERS FOR MODIFYING THE SUNLIGHT

gested the use of a sort of tell-tale board carrying one electric light for every seat in the house, with the corresponding number alongside. With the tell-tale board conspicuously displayed, it would then be possible for the theater-goer to see at a glance the empty seats in the house, the empty seats being indicated by lighted bulbs, or vice versa, as the case might be. Although the installation of such a system is bound to be very costly because of the extensive wiring, let alone the equipment, it seems reasonable to regard it as a feature of the elaborate theaters of the future.

If the comfort of the audience is to be served, then it is also reasonable to expect that the seating arrangement of the future theater will be ideal in every respect. The screen will be in plain view of everyone, and the distortion which is noticeable when one views the pictures from one side will be eliminated by avoiding side seats and boxes. And if these seats do exist, then certain optical systems will be devised, either in the form of special binoculars or certain changes in the projecting mechanism, in order to eliminate the annoying distortion.

While dealing with the matter of seats, it is well to consider the matter of persons coming in while a picture is under way. One of the most distracting features of present picture houses is to be disturbed by persons who wish to reach seats somewhere in the middle of a row, causing a dozen or more other persons to stand or shift to let them pass. The future exhibitor will see to it that his audience is not disturbed in this manner. It has been suggested that future inventive genius may provide some form of "pilot picture"—an actual reproduction of the screen picture—at the box-office. In this manner the theater-goer may know at a glance just what is being shown; and if the feature film of the evening is half through, he may walk about and return in half an hour or so in order to start his enjoyment properly.

It may be pointed out that a pilot picture is unnecessary. There are well-managed theaters to-day which run their performances on a definite schedule, even exhibiting a "time-table" in the lobby, so that the theater-goer can tell at a glance what he will see if he enters at a certain time. Still, this does not solve the problem of being disturbed by late-comers; most likely, this problem will eventually be solved by a seating arrangement whereby the

ARCS AND COOPER-HEWITTS IN EASTERN STUDIOS WHERE SUNLIGHT IS NOT AVAILABLE FOR INTERIOR SCENES

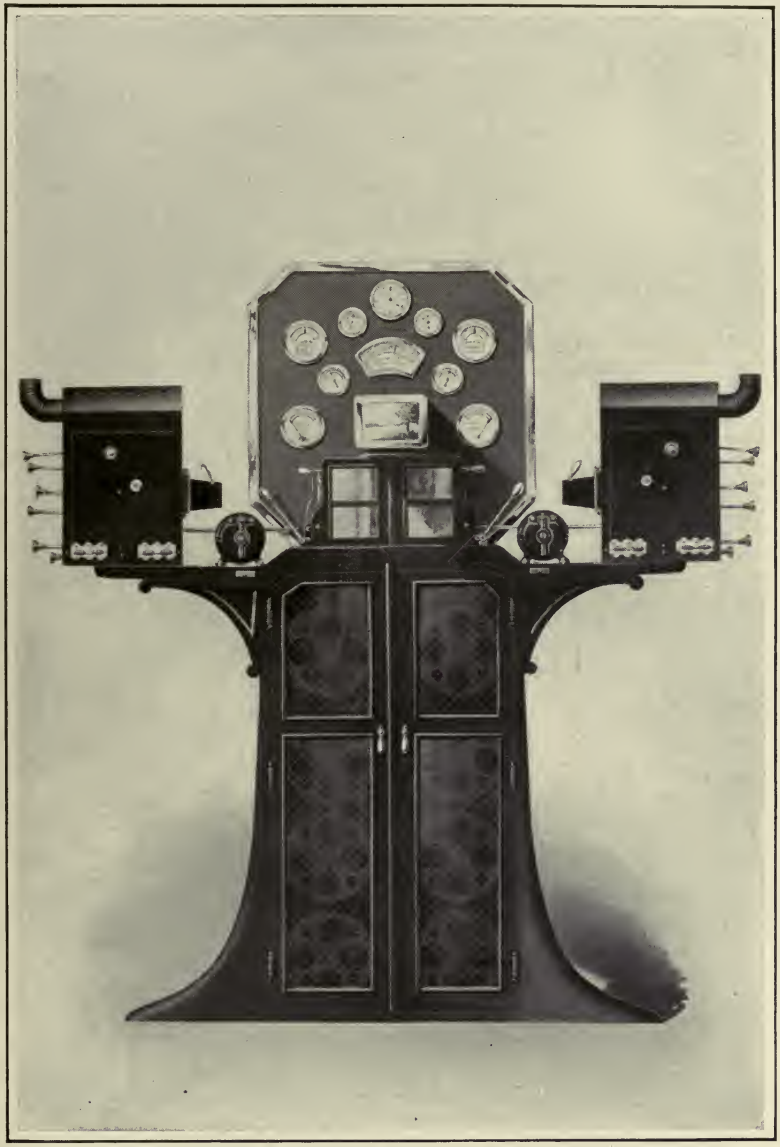
middle seats are filled first, leaving the outer ones free for the late-comers, or by shutting the doors while a photoplay is being shown. Of course, the feature photoplay, running for over an hour, has brought about this problem; for with the single-reelers of a half-dozen years ago each subject lasted only fifteen to twenty minutes, and there was no great objection to holding the late-comers at the rear of the theater until the intermission. The motion-picture art has never been held back by any obstacles, and sooner or later an end must and will be found to the problem of the late-comer at the continuous performance.

One of the pioneers of the motion-picture industry has developed an ingenious projector which is shown on page 407. This projector is no doubt bound to figure in the future theater. It consists of two projectors in one, projecting the images at right angles to the lamp houses by means of prisms. The film reels are placed in a fireproof cabinet below the projectors proper. Eight reels or more, comprising the entire program, may be projected automatically without a hitch, one film following the other without attention on the part of the operator. In fact, the designer claims that the day is not distant when the asbestos or fireproof booth will be done away with, and the operator will go about his work in evening clothes in a simple enclosure of brass railing. The audience will be able to "see the works," so to speak.

CAN THE PHOTOPLAY BE IMPROVED?

There is a vast difference between the pnotoplays of the present and those of a decade ago. But during the past two or three years progress along this line has been somewhat limited and not so obvious. The photoplay of to-day leaves little to be desired; motion-picture acting and story-telling technique and photography appear pretty nearly perfect.

To prophesy how photoplay acting will be improved in the productions of to-morrow is well-nigh impossible at present; for the attainments of to-day fulfill all that could be wished for—and more. We have the greatest actors and actresses appearing in photoplays—even those talented and renowned artists who but a few years ago would never have condescended to "act in the movies." The direction of photoplays is now in the hands of



THIS PROJECTOR SHOWS AN ENTIRE PROGRAM WITHOUT INTERRUPTION OR ATTENTION ON THE PART OF THE OPERATOR

veritable masters and it seems very unlikely that any striking improvement can be realized in this direction. All in all, the work of the motion-picture artists appears to have about reached the ideal—or dare we actually call it perfection?

As for photographic effects, it would seem that those now at the disposal of directors are quite complete. Close-ups, vignettes, "fade-ins" and "fade-outs," double-exposure, special printing, and beautiful tinting and toning enable the telling of a picture story in an effective and pleasing manner. Still, there are great possibilities in cinematography proper just the same as there are in any other art where mechanics play a large part.

Eyestrain has been given considerable attention during the past few years. One does not have to strain one's memory to recall those days when a headache or strained eyes marked a visit to a picture theater. Indeed, in order to reduce this eyestrain it used to be quite the thing to look at the screen through the fingers, or through a slot cut in a piece of cardboard. And later on, while this eyestrain still existed, one inventor got up a pair of spectacles consisting of fibre disks with a horizontal slot in each. The narrow slot, whether between fingers, in a piece of cardboard, or special spectacles served to shut off the distracting sidelights or reflections arising from the excessive flicker of the pictures.

The flicker of the screen was soon reduced to the irreducible minimum, practically speaking. There have been machines designed which are absolutely flickerless—machines in which one image dissolves right into the next without a period of darkness on the screen, hence without flicker of any kind. But such projectors, being more or less elaborate and expensive, have not as yet met with commercial success; the reason, apparently, is that the standard projectors are good enough, so to speak. It may be that in the future the audience will demand these improved projectors, in which event they will be forthcoming. They now exist, in practical form; but again the inventors await the final verdict of that judge of judges—the public.

Another source of eyestrain has been that caused by sudden changes on the screen, either in the composition of successive scenes or in the degree of illumination. For instance, if in one scene the eyes have been drawn to a figure on the extreme left,

COURT-YARD SET ERECTED IN THE YARD OF AN EASTERN STUDIO FOR A PERIOD PHOTOPLAY. AS FAR AS SCENERY IS CONCERNED, THERE SEEMS LITTLE ROOM FOR IMPROVEMENT IN THE FUTURE

and in the next the point of interest lies to the extreme right, the onlooker is immediately disconcerted and his eyes seek out the new point of interest only after suffering eyestrain and momentary confusion. Again, if one scene has been made in the open, in bright sunlight, and the next is uniformly dark, the quick change from a bright scene to a dark one and particularly vice versa is quite trying.

Already producers have given much attention to the matter of scene changes on the screen. The more advanced producers at this moment have more or less overcome all sudden changes in either light or points of interest. Where successive scenes do not match up sufficiently close to permit of going directly from one to the next, the various devices such as the "fade-in" and "fade-out," the various vignettes, and so on are employed. In this manner the eyes are gradually removed from one scene and introduced to the next.

Again in the matter of titles much attention has already been given to eyestrain. It used to be a regular thing to insert a title anywhere and everywhere, according to the story of the film. The eyes of the audience were taken off a bright scene, introduced to an inky black title, and no sooner were the eyes accustomed to the black oblong when they were suddenly confronted with a dazzling white scene again. Then came the decorative title, which, originally, was intended as something aesthetic rather than utilitarian. Some producers soon came to realize the practical value of the decorative title and ever since have used it with a double purpose in mind.

Because of the possibility of tinting the decorative title to any desired degree, this later-day innovation serves to relieve eyestrain. If the title is to be inserted between a dazzling white scene and a dark one, the design or motif of the title is made rather dark, so that the eyes of the audience are carried over from the bright scene to the dark one in progressive steps. Or if the title comes between two bright scenes, then the motif is worked up in light tones, so that the eyes are but slightly altered between scene and title, and back again to scene. One excellent practice now in vogue is to have the title always appear in a black oblong or square in the center of the gray motif or design. In this man-

AS FAITHFUL REPLICAS OF FRENCH BUILDINGS, EVEN DOWN TO THE MINUTE DETAILS, THESE SETS CANNOT BE SURPASSED

ner the lettering runs uniform on a uniform background, while the variable border takes care of the eyestrain.

Particularly in the matter of animated cartoons is eyestrain constantly being considered. Producers of such subjects are now shading their little characters and tinting their films, in order to take away from the otherwise dazzling highlights of the animated cartoons.

MOTION-PICTURE INSTRUCTION

It was Edison, if our memory serves us correctly, who once said that he could teach more history in fifteen minutes by means of motion pictures than could ever be learned from any book. That statement is precisely true. Long ago the educational value of cinematography was realized, but its application has been very slow indeed. Even to-day our schools could be much more efficient and interesting to the students if motion pictures were employed. In the study of the life of certain animals, for instance, a single reel would bring out the points in a manner never to be forgotten by the children. History could be made to live again and become firmly imbedded in the young minds by inspiring photoplays.

There is a vast field in front of the educational motion picture. What is being done to-day by way of teaching our soldiers the elements of military science by means of special motion pictures, is but a modest start. The same is true of special motion pictures used in medical colleges to instruct students in some delicate operation or treatment. Again the same is true of those motion pictures which are exhibited before engineering societies, showing the work in connection with a huge bridge or dam or aqueduct.

The action of a delicate mechanism can be explained in the simplest manner by means of the animated cartoon. A skilled mechanical draughtsman has established quite a name for himself by his animated drawings which explain the working of timely things, such as the submergence of a submarine, the manner of erecting a big bridge, or the action of a machine gun. And in each case the explanation is so obvious that even the women and children soon grasp the idea, whereas it would require hours of verbal explanation to accomplish the same end. In the latter

THE BEST OF ACTING IS EXPECTED NOT MERELY OF THE LEADING PLAYERS, BUT OF THE SUPPORTING PLAYERS AS WELL

case, however, the teaching would prove dull and uninteresting, whereas the screen always commands interest and attention.

It must come sooner or later, this idea of a motion-picture library, where a school will be able to secure reels on any subject. Motion pictures are certain to become recognized supplements to the textbooks.

THE SILENT BUT CONVINCING SALESMAN

Hand in hand with the motion-picture educator will come the motion-picture salesman. Both already exist, but only in a small way; and the future appears most promising.

Progressive machinery firms are already making use of motion pictures for interesting prospective purchasers in their products. Films are prepared showing machinery in actual operation, as well as the work in the factory and the various facilities of the firm. Instead of walking into a prospective purchaser's office and offering him a catalogue after the usual conversation, your progressive machinery salesman first says a few words mainly to secure permission to exhibit his set of pictures. His small projector, weighing 25 pounds or less, is soon set up on the nearest desk or table; a wire is run to the nearest receptacle; a light wall is chosen as a screen; the film is threaded through the machine; the room is darkened, and the improvised screen proceeds to unfold what amounts to an animated catalogue or advertisement. But this catalogue or advertisement, with its animated pictures and drawings, holds the undivided attention of the prospective purchaser. It is, in this respect, far different from the printed page which can be of some value only if it commands a few moments' attention.

Salesmen selling machinery, modern farm equipment, gasoline tractors, and other similar lines were formerly awkwardly placed when face to face with a skeptical and half-interested prospective purchaser. In answer to the question, "But where can I see one of your machines in operation," the prospective buyer would be told that there was one *only* three hundred miles away. In fact, the firm would pay all the traveling expenses! Would the prospect please come along and be convinced?

The bigger the business man the more valuable his time. So it generally proved that the really big man who was in a position to

THE DIRECTOR'S TASK IS BECOMING MORE AND MORE INTRICATE. HERE, FOR INSTANCE, THE DIRECTOR HAS ORDERED TWO ELECTRICIANS TO PLAY SPOT LIGHTS ON CERTAIN PLAYERS AS THEY MOVE ABOUT

sign the order "on the dotted line," could not and would not spare the time for such a trip. He remained unconvinced.

Commercial motion pictures have changed all this. Those progressive firms which back their salesmen with the best reels that genius can produce, have stolen a long march on their competitors. The most skeptical prospective customer can be convinced by showing him machines or equipment actually in use, either around the corner or around the globe from where he sits at that very moment. And it is a human failing to like pictures; a salesman with pleasing personality can always secure a few moments' audience with the busiest executive if he has motion pictures to show him.

The silent but convincing salesman, the motion picture, is coming in a big way within the next few years. Compared to other forms of publicity, the motion picture is inexpensive. Indeed, and as was explained in a preceding chapter, cameras can now be purchased at a slight cost, while numerous types of portable projectors are available for the use of traveling salesmen. So with an investment of a few hundred dollars and an outlay of $50 or $75 for each reel, any organization can avail itself of the very best form of publicity.

Motion picture publicity need not be limited to interesting prospective customers in their offices. Carefully prepared and without the earmarks of out-and-out advertising, special films can be made for use in theaters, before conventions, in clubs, and so on. Such films have been made and exhibited in numerous instances, and they have appeared on the same program as photoplays and news films without arousing anything but keen interest and appreciation on the part of the audience. Almost any business has much romance involved in its working, and it only remains for some master mind to dig out the interesting things and present them in a film.

And where does the publicity value come in if no name appears? one asks. The answer is simply this: That if a firm is turning out a certain product, it can secure added business by creating a general demand for that product. Once the demand is created, any business well conducted has ways and means of obtaining its share of the orders.

AS A MEANS OF CENTRALIZED LIGHTING, POWERFUL SEARCHLIGHTS SUCH AS THIS ONE ARE NOW BEING INTRODUCED

THE BROTHERHOOD OF NATIONS

Advertising is not limited to individuals and firms. Even nations have to advertise to-day.

When the great war broke out upon a peaceful world, Germany immediately started a vast advertising campaign, or, to give it the more refined name, propaganda. Newspapers were bought; hundreds of skilled writers were put to work in various countries, belligerent and neutral; periodicals were established with a lavish disregard for money; and, lastly, motion pictures were prepared of the German army and its accomplishments for presentation in neutral countries.

The United States, Spain, South America, Central America and the Scandinavian countries were flooded with German motion pictures. The object of these was two-fold: first, the Germans sought to create fear of the German power, which was shown at work in beautiful France and in expansive Russia; secondly, the Germans sought, if possible, to create an admiration for the German deeds. Of all the methods of propaganda employed by the Germans, it has been held by those in a position to know, that the screen method was the most effective.

Other belligerents soon followed Germany in the matter of film propaganda. Great Britain circulated marvelous films of the mobilization of her armed millions, of her great fleet, and of her historic battles. France circulated films showing the determination of the *poilus* when they carried out their resolve that the Germans would not pass at Verdun, as well as numerous other phases of her valiant fight against an almost overwhelming and brutal foe. Italy sent out her films, showing the brave Alpini struggling on mountain tops and the wonderful Italian engineers constructing cableways and roads where only the intrepid mountain climber had heretofore trod.

The Allies, having a good and just cause, finally won the approval of the world through their motion-picture propaganda. The Germans failed, because their part in this war was so obviously wrong and impossible, and because German U-boats and diplomats simply forced one nation after another to join the enemies of Germany.

And when the United States entered the great war, it followed

GETTING ALONG WITHOUT THE SUN: LIGHTING EQUIPMENT OF ONE OF THE CHICAGO STUDIOS, CONSISTING OF OVERHEAD ARC LAMPS, COOPER-HEWITT FLOOR STANDS, AND BABY SPOT LIGHTS

the example of other belligerents and set to work making films of its achievements on the battlefront and the home front. These films served a double purpose: first, they kept Americans informed as to the progress of the war and the war industries; secondly, they brought our ideals and hopes and realizations to the farthest corners of the earth. Our South American neighbors were kept in touch with our war efforts, and so were the Scandinavians and the Swiss and the Spaniards and all the peoples not actually at war. The Allies, too, were kept in touch with our gigantic efforts, just as they kept us in touch with theirs.

So out of the miles of celluloid depicting great battles, shipyard activities, the work of gun and shell makers, and the activities of men of the hour, has sprung a new brotherhood of nations lately engaged in a great and noble struggle. Peoples of various races, creeds, and modes of living have been brought into a closer understanding. Who knows but that the same medium, the motion picture, will continue to aid in the greatest of all things on earth in the future—the reunion of all nations into a real league of nations?

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