Film-Tech

The information contained in this Adobe Acrobat pdf file is provided at your own risk and good judgment.

These manuals are designed to facilitate the exchange of information related to cinema projection and film handling, with no warranties nor obligations from the authors, for qualified field service engineers.

If you are not a qualified technician, please make no adjustments to anything you may read about in these Adobe manual downloads.

www.film-tech.com

From Magic Lantern

to

Stereophonic Sound

The Story of Motiograph, Inc.

by

I. L. Thatcher

Reprinted From The Modern Theatre Section of BOXOFFICE, *Issue of May 8, 1954*

In sixty years of theatre equipment manufacture, Motiograph, Inc. has pioneered in developing a continuously improved line of projection products. Creative and efficient engineering, experienced workmanship and well-made parts and the forward looking policies of the men who manage the company have made Motiograph an important factor in the development of the motion picture industry. In these pages is chronicled the history of that contribution, from the days of the magic lantern to stereophonic sound.

FROM MAGIC LANTERN TO STEREOPHONIC SOUND

by I. L. THATCHER

As Motiograph, Inc., nears the eve of its 60th anniversary, the pioneer motion picture equipment manufacturer can proudly and generously share that occasion with the entire industry, having made its start in the mid-'90s, shortly before the first commercial film showing in America. It was in that period, too, that the Optigraph, the first of a long series of projectors, was introduced by this company.

In the years since the introduction of that first projector, Motiograph has developed a complete line of sight-and-sound projection equipment. Each new model produced down through the years was evolved through efficient engineering, experienced workmanship with well-made parts, and the company's continuing efforts to improve design and operation.

With the revolution of techniques for presenting screen fare now in full swing, it is fitting that we review the preceding 60 years to better appreciate how truly far the motion picture industry has come.

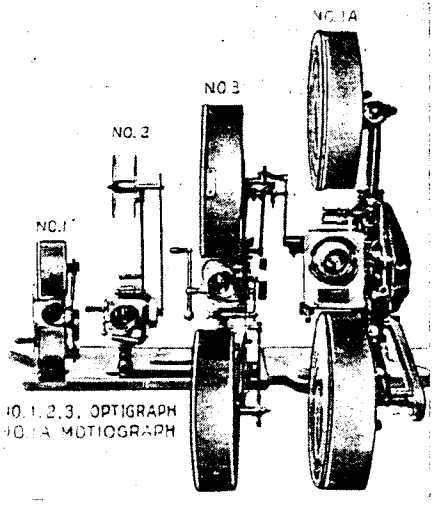
Looking back, one cannot help being impressed with the stature of the industry, its constant growth and its improvement in the physical properties, equipment and techniques. While we no longer hear the chant "the movies are only in their infancy," recent developments prove that motion pictures are still in the growing stage and far from full development.

It was in 1896—58 years ago—that motion pictures were first shown in a regular theatre. The "Gay 90's" were in full bloom. Life was easy-going and exciting. People, carefree and eager to enjoy themselves to the fullest, considered entertainment a "must."

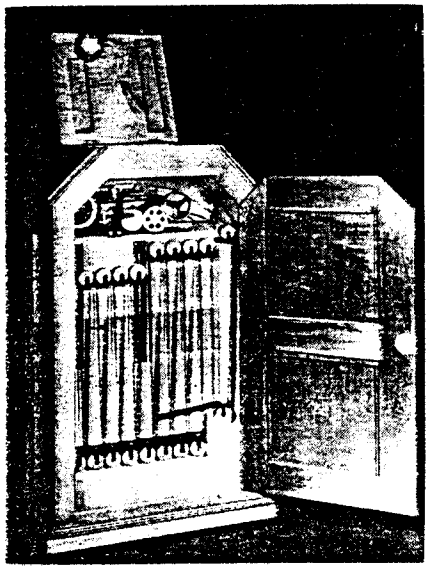
The picture was perfect for the curtain to rise on the glamorous early nickelodeon. Nearly a hundred years of genius and diligent endeavor had made this nickelodeon possible.

Sir Humphry Davy, one of the first great names in electricity, produced the first arc light in 1800. Photography, essence of the entire motion picture industry, came into existence when de Niepce developed a process for making pictures in 1824. Dr. Coleman Sellers, in 1861, invented his Kinematoscope, a device for viewing *stereoscopic pictures* of moving objects. Henry Heyl, in 1870, projected moving pictures with his Phasmatrope, a stereopticon, fitted with a revolving slide carrier and a shutter with an intermittent movement which interrupted the light at the moment the slide was changed. George Eastman, in 1889, developed for Edison's Kinetoscope a suitably flexible celluloid film, in sufficiently long, straight strips and of a width which has remained standard.

Edison, first motion picture producer,



The three projectors at the left are early Optigraphs. Right is No. 1A Motiograph, the machine with which the company made its first big bid in the market in 1908, even today considered a fine projector.



The Edison Kinetoscope, 1895-1896, the early motion picture device for which George Eastman developed a suitably flexible celluloid film and of a width which has remained standard.

in 1893 erected the first motion picture studio in West Orange, New Jersey, and in 1894 invented *the first* SOUND-MOTION-PICTURE device, his Kinetophone, employing a record synchronized with 50 feet of film running in his Kinetoscope. The Kinetoscope was a small cabinet, operating on the coin-in-the-slot principle. One at a time, through a peephole, spectators could see magnified pictures in action.

Louis and Auguste Lumiere in 1895 introduced their Cinematograph, combination camera, printer and projector. (Three years later, in Paris, using a 100-ampere arc and a water-filled glass flask as a condenser, they projected motion pictures a distance of 600 feet to a screen 80 by 100 feet, obtaining the *FIRST* WIDE or at least BIG SCREEN PICTURES.)

The first public showing of Thomas Armat's Vitascope projector was in 1895. It employed an intermittent motion of the film and introduced the Geneva Cross into the projector mechanism.

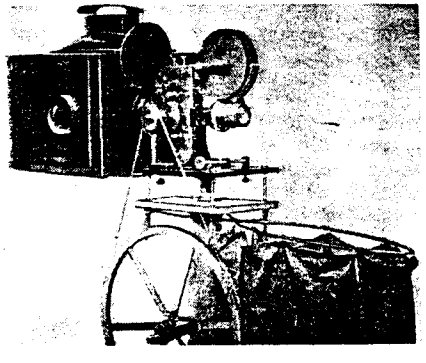
The same year, the Lambda Co. publicly demonstrated in New York a projector later called the Eidoloscope, and Paul and Harris of London devised their Theatograph projector and arc lamp.

An improved model of the Vitascope, made by Edison and introduced as an added attraction at Koster & Bial's vaudeville theatre, New York, in 1896, marked the real beginning of exhibition in America of motion pictures on a screen. The several one-minute film subjects were poorly photographed and projected with much flicker. Nevertheless, the realism startled and amazed the audience.

In this setting Motiograph made its bow to the industry by introducing the Optigraph, first of a long series of projectors which ultimately led to a full line of sight-and-sound projection equipment.

Alvah C. Roebuck, native of Lafayette, Ind., and the Roebuck of the famed mail order house, conceived the idea of offering an "entertainment outfit" by which the purchaser might liven up church social activities and at the same time earn some extra money for himself and the church.

In 1896 this offer included a magic lantern, several sets of slides, a supply of advertising posters, admission tickets, and a book of instructions. The idea was a great success: orders poured into Roebuck's Chicago office from all parts of the country. He operated the business under the name of Enterprise Optical Manufacturing Co., the parent company of Motiograph.



The English were developing projectors in the 1890s, also. One was the Theatograph, a projector and arc lamp, invented by Paul and Harris of London.

Roebuck, too, was well aware of other happenings of about this same period. He heard that Edwin Amet, of Waukegan, Ill., in partnership with George K. Spoor (later the "S" of Essanay) had just developed a motion picture projector known as the Magniscope. The Polyscope, a projector made by Selig in Chicago, was announced and the Biograph, together with its wide film and the operator, had been booked into Hammerstein's Music Hall as a "act."

William Rock, later one of the partners of the Vitagraph Co., with Walter Wainright rented a small storeroom at 623 Canal street in New Orleans, rigged up a cloth screen, installed a projector and some wooden kitchen chairs, and called the spot Vitascope Hall.

It also came to the attention of Roebuck that plans were being made to "shoot" the Corbett-Fitzsimmons fight at Carson City, Nev., and a reenactment of the Oberammergau Passion Play in New York.

In the face of all this activity, Roebuck envisaged a tremendous future for this new entertainment medium. Consequently in 1898 he set upon the production of what has since come to be recognized as the first practical motion picture projector—the Optigraph.

December 14, 1935, The Modern Theatre section of BOXOFFICE, reviewing the progress of equipment manufacture, said:

> "Who built and marketed the first commercially practical moving picture machine? . . . The result, to our mind, is somewhat conclusively in favor of Motiograph as the daddy of the machines that turned magic lantern shows into movies."

But the Optigraph was not to remain in the state of the first model. Improvements were many and rapid. The mechanism was redesigned, an efficient framing device was added and a take-up reel provided for

---

The Matthews Team That Manages Motiograph, Inc.—These three members of the Matthews family first acquired control of Motiograph in 1935. Thorwell, known to the trade as Thor, is president. Fred is vice-president. He has been active in TESMA and now heads that organization. Douglas is treasurer of the firm.

H. THORWELL MATTHEWS

FRED MATTHEWS

W. DOUGLAS MATTHEWS

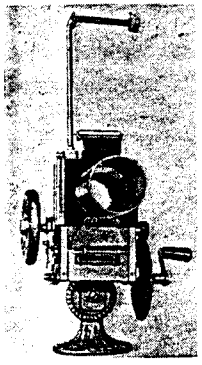
more safety and greater film protection.

Edison at that time started making his Exhibition Model, a projector which continued to be sold until 1914.

Roebuck's vision of an expanding industry was taking shape. National news events were now being filmed—among them the funeral procession for the victims of the U.S.S. Maine, and the embarkation of Teddy Roosevelt's famous Rough Riders for Cuba.

In 1899 a German patent was issued to a group of inventors who had synchronized a projector and phonograph. The following year another German patent described a device for recording sound on a steel ribbon. Ernst Ruhmer, in 1901, recorded a sound track photographically upon motion picture film. In rapid succession came other methods, but none won much acceptance. The short playing time of records, and the lack of suitable sound amplification discouraged the hundreds of inventors struggling to make pictures talk. They were destined to be frustrated until the day of the photo-electric tube.

The first true motion picture theatre, the Electric, opened in 1902 at 262 South Main street in Los Angeles. Admission was ten cents and the show lasted an hour. The first five-cent "store" theatres opened in Chicago the same year.



The Optograph, forerunner of Motiograph.

Until the middle of 1902, when the first film exchange was opened by Harry Miles in San Francisco, exhibitors had bought many films outright from the producers at about $100 a reel and they were theirs to run as long as they pleased. But now the renting of film effected a great savings for theatres.

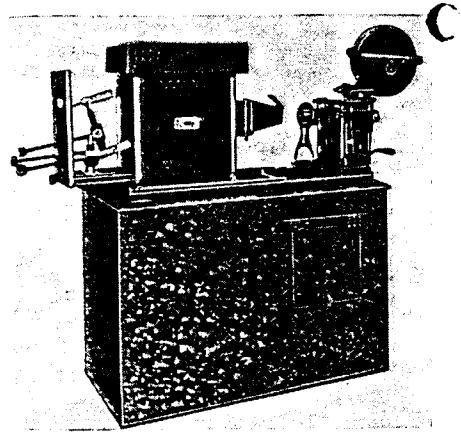
The first model of the celebrated Powers projector, the Peerlescope, was made in 1902. It was equipped with a gas light source. After the film passed through the projector it dropped into a cloth bag.

The first picture to really tell a story was released in 1903—an 800-foot dime-novel thriller in 14 scenes. This was the famous "The Great Train Robbery," produced by Edwin S. Porter in Patterson, N.J., at a cost of $400. A closeup of the robber, firing a revolver point-blank at the audience, came so close to 3-D effect that the audience ducked and women fainted.

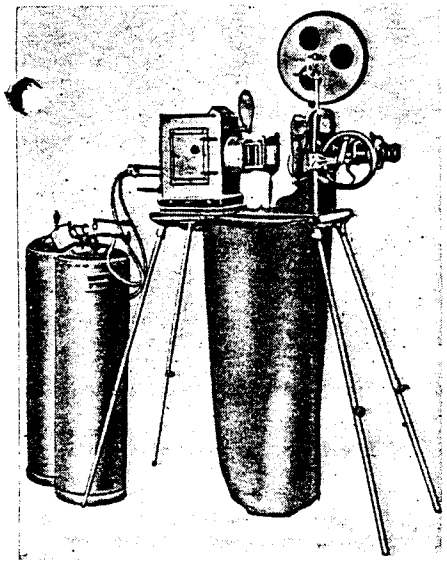
Alvah C. Roebuck of Sears-Roebuck fame (shown here as he looked in 1898 and 1943) founded Enterprise Optical Manufacturing Co., parent company of Motiograph, which offered an "entertainment" package consisting of a magic lantern, slides, posters and tickets in the 1890s.

Practically in Motiograph's backyard in Chicago, Broncho Billy Anderson searched for gold, fought Indians, and branded cattle week after week.

Storeroom theatres opened everywhere.



One of the famous projectors in film history—the Selig Polyscope, manufactured in Chicago. Even today, it has a modern look.



Powers Peerlescope, 1902, equipped with a gas light source. Film dropped into a cloth bag after passing through the machine.

The novelty of this new form of entertainment and the low admission price packed them to overflowing. Exhibitors could net up to a thousand dollars a week with as few as 200 seats. Tunes from tinny pianos "playing the pictures" floated out from darkened rooms on every street. These "theatres" had but one projector, equipped with a vertical carbon arc lamp, and at the end of each reel a slide flashed on the screen to ask the indulgence of the audience "while the operator changed reels."

Carl Laemmle, in 1906, opened his first theatre in Chicago. It was the White Front on Milwaukee avenue, and as it prospered Laemmle opened more theatres and the Laemmle Film Service.

The first issue of the first film trade publication, VIEWS AND FILMS INDEX, a weekly which was sent to 1,700 picture exhibitors, appeared April 25, 1906.

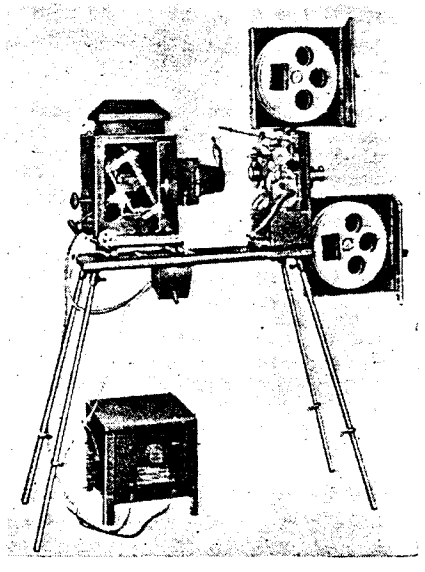
The development of Cooper-Hewitt mercury-vapor lamps made possible indoor shooting and, in 1906, the famous Biograph Co. opened a studio in New York.

The Kinemacolor Co., in 1907, produced the first natural color pictures. Previous color films were the work of artists who used a magnifying glass, brush and colors to tint the black and white positives.

Motiograph's real bid for a prominent position in the theatre equipment manufacturing field was made in 1908, when Roebuck produced his Motiograph Model "1A," well-engineered and even today considered a high grade projector.

The Model "1A" boasted an improved shutter, a very accurate Geneva movement, and a strong cast-iron, circular-base pedestal, instead of small, tubular legs. The crank and stereoptican arrangement of the earlier models was retained.

By this time, the "feature" picture had arrived. "The Life of Buffalo Bill" had been produced in three reels. Griffith was directing Mary Pickford and Marion Leonard. Tom Mix was one of the favorite stars, as were Florence Lawrence, Arthur Johnson, Mabel Normand, Wallace Reid, Maurice Costello, Anita Stewart, Earle Williams, Francis X. Bushman, Beverly Bayne, Lois Weber, Norma and Constance Talmadge, Ethel Clayton and Alice Joyce. Ten thousand theatres were in operation, with new ones opening at the rate of a hundred a month.



An Edison exhibition model of the early days. One of many photos in Motiograph's historical file of early projectors.

Edison again tried his hand at popularizing talking pictures by synchronizing a phonograph with his projector. But it was "no soap." Why should film stars talk?

Roebuck's constant desire to maintain a margin of superiority by means of improvements and new inventions resulted in a new projector, the Model "D" Motiograph. In a short space of time, he received nearly one hundred successful patents. One of the many changes incorporated in the new models included the first double shutter, introduced in the Model "D."

In 1913, "Quo Vadis," the 8,000-foot spectacle, made in Italy by Cines, proved that even longer pictures were not only acceptable but demanded. Shows of this length required two projectors to avoid the necessity of many intermissions.

In 1913, the first "cliff-hanger" was produced by Selig—"The Adventures of Kathlyn" starring Kathlyn Williams. There were 13,000 motion picture theatres in operation in America, and for $100 exhibitors could "buy" enough film for running a house doing $4,000 a week, terms of less than 2½ per cent of the gross. Compared to today's film rentals, this figure seems unbelievable.

The first "deluxe" picture theatre, the Strand, New York, was opened in 1914.

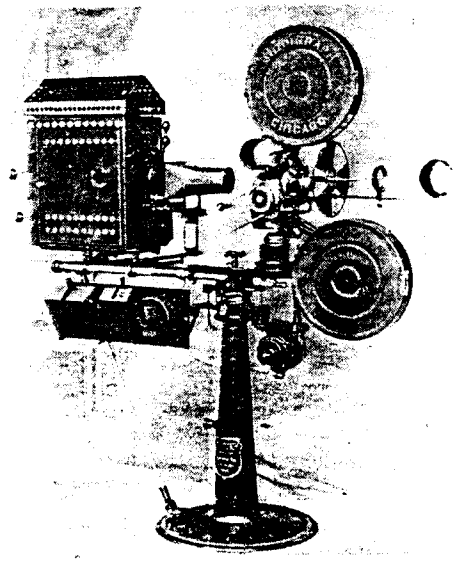
About this time motion picture audiences began expecting a large and capable orchestra to "play the pictures." In 1915, D. W. Griffith produced "The Birth of a Nation," to this day a masterpiece of cinematographic art. The first picture to play at $2 top, it was presented with orchestral accompaniment by 12 road companies.

The next epoch in Motiograph history was the Model "E," produced in 1916. Among the principal new developments of this projector were the positioning of the motor beneath the lower magazine. This operated the mechanism by belts and was provided with a speed control that made speed variation absolutely mechanical and positive. A newly designed condenser mount enabled the operator to remove the lenses without touching them. Both the stand and the magazines embodied revolutionary improvements in design.

One of the reasons for Motiograph's remarkable progress in the theatre equipment field at that time probably was their guiding policy which still continues. It was Roebuck's belief that a combination of well-made parts, efficient engineering, experienced workmanship and improved design could result only in a projector of the highest quality.

It is in this huge, one-story plant, spreading over many acres in Chicago that Motiograph manufactures its line of projectors, stereophonic sound systems and other equipment for the motion picture business. The plant is located at 4431 West Lake St., Chicago. It was greatly expanded during the war.

While Motiograph had thus attained an unquestioned reputation for high quality, it was inevitable that it would also become known as a "high-priced projector." This was true only in a relative sense, for as Roebuck said, "When judged by the standards of performance and length of service, it has always represented true economy."



Model 1A, Motiograph, the machine that really put the company in business. Its strong cast iron base, instead of small tubular legs, was an early mark of distinction. It had an improved shutter.

In any event, the Model "E" appeared at a time when theatremen were becoming more projection-conscious. They were paying better prices for better pictures like Griffith's "Intolerance" and Charles Chaplin's "The Floor Walker."

By 1917 there were 17,000 theatres in America devoted to the presentation of motion pictures, and the end of World War I further accelerated the building of larger and better theatres.

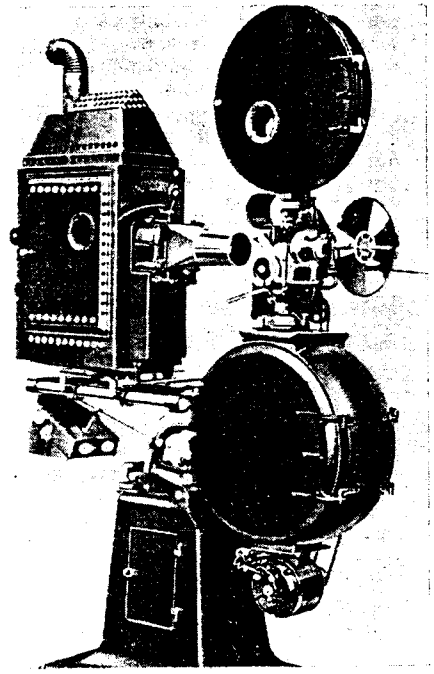
Heinrich Beck, in 1911, invented the high-intensity arc, but its first adaptation to motion picture projection didn't come until it was embodied in a projection lamp produced in 1918 by the Sunlight Arc Corp.

The year 1921 marked two great achievements: Rudolph Valentino's "The Four Horsemen of the Apocalypse," which did a steady and phenomenal business for years, and the introduction of Motiograph's Model "F," which set new standards for steady projection.

This projector is actually still giving service in a number of theatres today.

Much favorable commendation marked the introduction of the Model "F."

For the first time, the mechanism was



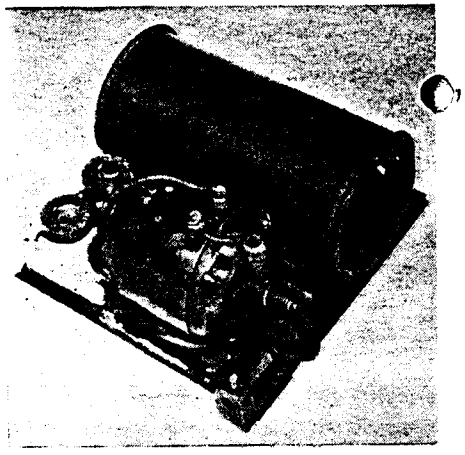
The Model "E" Motiograph projector was introduced in 1916. In this improved model the motor was positioned beneath the lower magazine, operating the mechanism by belts. Provided with a speed control, speed variation was absolutely mechanical and positive. It had a new type condenser mount.

enclosed, giving the projector a decidedly improved appearance. There was a better lens arrangement, removable bearings, and a variable-speed gripping disk. While it was still the front type, the shutter now had two blades, as well as a timing device which was adjustable while the machine was in operation. The base had been improved for tilting, and the magazines were provided with peepholes.

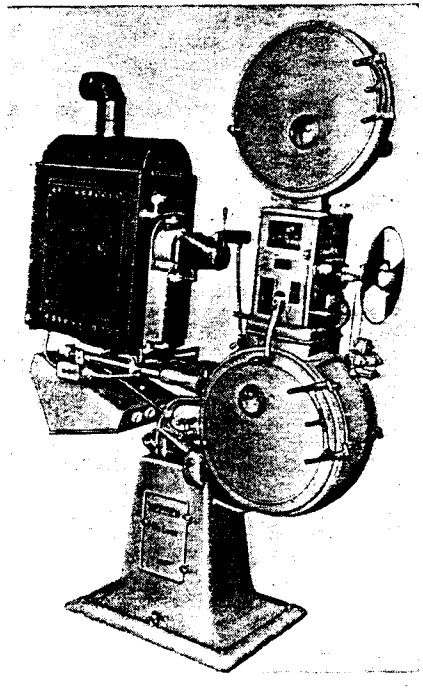
In 1922 Carl Laemmle produced the first million-dollar picture, "Foolish Wives."

The next year Harry H. Strong, inventor and developer of projection arc lamps, brought out the first fully automatic arc control, thereby liberating the projectionist from being chained to the projector.

April 15 of the same year saw the true beginning of the present talking picture era, when Lee de Forest introduced Phonofilm, sound pictures on film first installed at the Rivoli Theatre, New York.



The first Strong arc control mechanism was introduced in 1923. It was fully automatic, freeing the boothman from the projector.



For the first time the mechanism was enclosed when Motiograph brought out the Model "F" in 1921. There was a better lens arrangement and the shutter now had two blades as well as a timing device.

When sound came in, Motiograph was ready with its new Model "H." This projector introduced the first rear shutter and the first double shutter, providing a far more brilliant picture and resulting in less heat at the aperture. It also introduced Motiograph's Mirrophonic sound system, which reproduced sound on film and Vitaphone records. The projector included a pinion framer, operated by means of a wheel located behind the lower magazine, and a base which had been redesigned to meet the requirements of sound equipment.

New reflector arc lamps which, burning 15 amperes and projecting more light than had heretofore been possible with vertical condenser-type arcs burning 50 amperes, were introduced by a number of projection-arc-lamp manufacturers. This better light source, together with Motiograph's improved projectors, worked wonders to improve the pictures at the screen.

Picture production also was improving with bigger films coming from the studios. One of those released in 1928 was Warner Brothers' "The Jazz Singer," the first film with dialog.

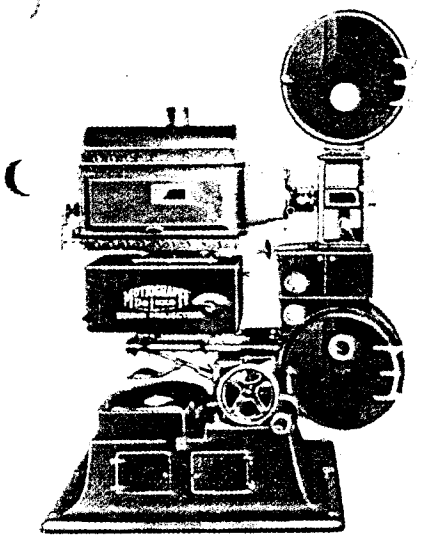
The building of larger theatres, with their larger screens, made stability of the projected image an important factor. In this, Motiograph was outstanding. These larger screens, porous for the transmission of sound from the rear, proved a great stimulus to the sale of the newly introduced, high intensity, reflector-type arc lamps. These lamps projected as much light at 60 amperes as had been possible with the 120-ampere, high intensity, condenser-type lamp.

Wide film was an experiment of 1930, with Fox using 50mm for its Grandeur and Spoor-Berggren 70mm for quasi-stereoscopic effect.

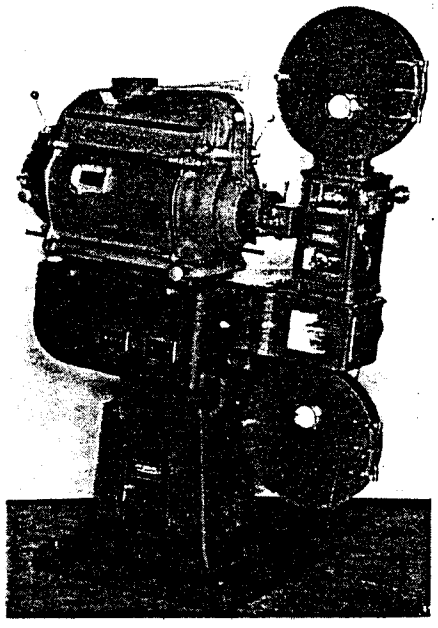
The introduction of the "Suprex" carbon, by the National Carbon Co., in 1933, spelled the doom of the low intensity arc and the AC arc lamp, which had been developed as an economy measure for the smaller theatre.

These high intensity DC lamps projected a tremendous volume of light at relatively low operating costs—a snow-white light which was perfect for the projection of the color films which were becoming so popular at that time.

In 1935, Fred, Thor and Doug Matthews took over the interests and active management of Motiograph and one of their first accomplishments was the development of the Model "HU" projector.



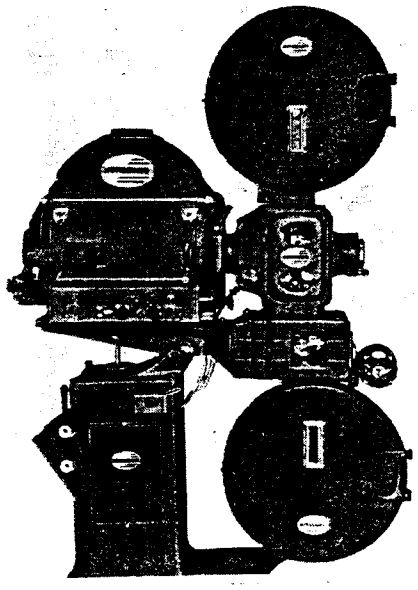
Motiograph was ready for sound with the Model "H" in 1926. This model had the first rear shutter and the first double shutter, and introduced Motiograph's Mirrophonic sound system which reproduced sound on film and Vitaphone records.



A one-piece shutter was a feature of the Model "K" projector introduced by Motiograph in 1936 after the Matthews family took over the company. A faster framing device was located in front of the mechanism. The base was improved.

In 1936, with such productions as "San Francisco" and "Mutiny on the Bounty" bringing in the shekels, Motiograph unveiled its now famous Model "K" projector. It soon became one of the best known projectors of the time. The one-piece shutter was a feature, as was the improved mechanism and base. There was a change from single to double bearings. A faster framing device was located in the front of the mechanism.

Motiograph's present type of sound system was adopted in 1938. Radical improvement became possible when the signing of an agreement with Electrical Research Products, Inc., a Western Electric subsidiary, permitted full use of Western Electric's many patents on sound-reproducing systems.



Motiograph's postwar projector, Model "AA," the latest and finest of the line, was brought out in 1946. It embodied radical improvements in performance and operation. It is shown here on an S base with 25-inch magazines.

Pearl Harbor interrupted Motiograph's plans to introduce their subsequently improved model projector.

Fortunately, the outbreak of the war found Motiograph in the midst of its greatest expansion program, and it required little effort to convert the enlarged facilities to the war effort. Because most of the equipment was modern and capable of producing highly-precisioned parts, it fitted in unusually well with the requirements for turning out essential war materials.

Throughout the war, the major portion of Motiograph's production, with three plants on a three-shift basis, was for Uncle Sam, although some projectors continued to be turned out for civilian use as late as August 1942. Subsequently, Motiograph continued the production of projection and sound-reproducing equipment for training purposes by the armed forces, and took on the production of secret war work.

One of the most important of Motiograph's war contracts was for a fire-control device known as a range and altitude converter, an electrically controlled director system for accurately determining the exact moment a gun must be fired and the precise spot at which it must be aimed, even though that spot was miles away.

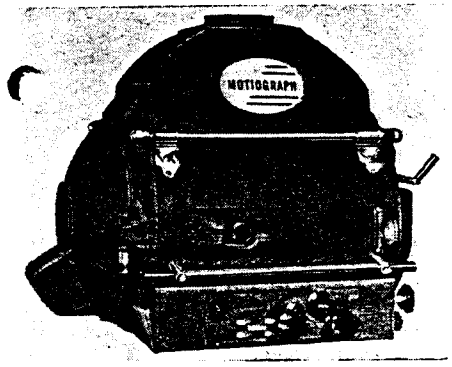
Another wartime product, which takes on even added significance today, was a scientific training device produced in conjunction with the Polaroid Corp. This device consisted of a projector and sound amplifier which reproduced on a giant screen three-dimensional pictures with stereophonic sound, to simulate a condition confronting pilots engaged in actual dive-bombing and aerial attack.

The trainee sat behind a "machine gun" which shot electrical tracers instead of bullets at planes on the screen. An ingenious automatic computer recorded the hits and misses. Each piece of equipment made it possible for trainees to fire the equivalent of 100,000 20mm shells, representing the approximate cost of the machine, each day.

Motiograph's present type of sound system was adopted in 1938.

The production of this equipment naturally gave Motiograph a head start in the development and production of the equipment required by the 3-D and wide-screen processes of today.

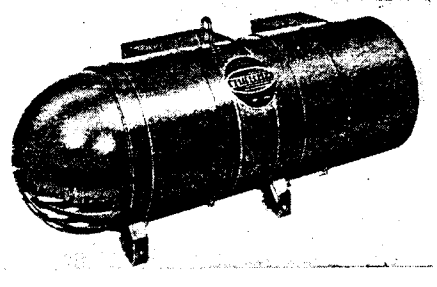
Motiograph plant expansion continued apace during the war, with the installation of more than $100,000 worth of new equipment. On the payroll were more than five times as many employes as in May, 1940. These workers were unusually skilled.



Early in 1949 Motiograph introduced its Hi-Power lamp, a 75/115-ampere, high intensity, reflector-type arc lamp for drive-ins and large indoor houses.

To an extent, the breathing spell which World War II gave the engineering staff was an advantage, for the many startling technical advances brought forth by the war were incorporated in a new postwar projector destined to be the finest of Motiograph's long line. It represented such an advance in design, construction and operation that it constituted a virtual necessity to the modern theatre.

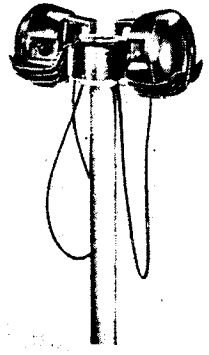
The new postwar projector, known as Model "AA," was formally announced in November, 1946. It embodied radical developments and improvements in performance and operation which resulted not only from the work done by an experienced staff of projection engineers, outside consulting engineers and industrial designers, but also suggestions made by projectionists from coast to coast and the entire organization of Motiograph dealers, the men on the installation and service firing line.



The Hi-Power 115/230-ampere motor generator sets were added to the Motiograph line in 1948.

It featured simplicity of operation and exceptional screen values. It also afforded ease of repair and adjustment in the field.

A complete line of drive-in theatre sound systems and in-car-speaker equipment for drive-ins of all sizes was announced by Motiograph early in 1948. Hi-Power 115/230-ampere generator sets were an addition to the Motiograph line that same year.



In-Car speakers, 1948.

The Motiograph 75/115-ampere, high intensity, reflector-type arc lamp was developed in February 1949.

In June 1951, Motiograph announced that it would thereafter manufacture and assemble the famous Victor Animatograph line of 16mm sound motion picture apparatus, bringing to Victor dealers and their customers 16mm projectors produced by the same craftsmen who were precision-building the Motiograph theatre line.

With the advent of 3-D and wide-screen presentation early in 1953, Motiograph was ready with 3-D interlock equipment for any make or model sound-reproducing system; 25-inch diameter magazines for 3-D projection to fit any make or model of projector and sound reproducer; 85-ampere and 115-ampere model, continuous-duty, 3-D generators designed particularly for interlock projection systems; and a full line of stereophonic sound systems to handle all the existing recording techniques.

Today, the Motiograph dealer organization is comprised of independent theatre supply men who have been chosen in accordance with rigid standards.

Today, the industry has come to another important milestone of development in screen entertainment, and Motiograph approaching its 60th anniversary, can look back on every step in this development with a great deal of interest and pride of accomplishment, for Motiograph was there when the whole thing started.