HAND BOOK

— AND —

INSTRUCTIONS
FOR OPERATING
THE MOTIOGRAPH
MOVING PICTURE MACHINE

THIS BOOK SUPPLIED FREE WITH EACH MACHINE
EXTRA COPIES WILL BE SENT UPON RECEIPT OF
TEN CENTS EACH. . . . . .

INSTRUCTIONS

FOR OPERATING

The Improved Motiograph No. 1A

MODEL 1912

Motion Picture Machine

IN WHICH IS COMBINED

Price List of Repair Parts

FOR THE

MOTIOGRAPH

Manufactured by E. O. Mfg. Co., Chicago

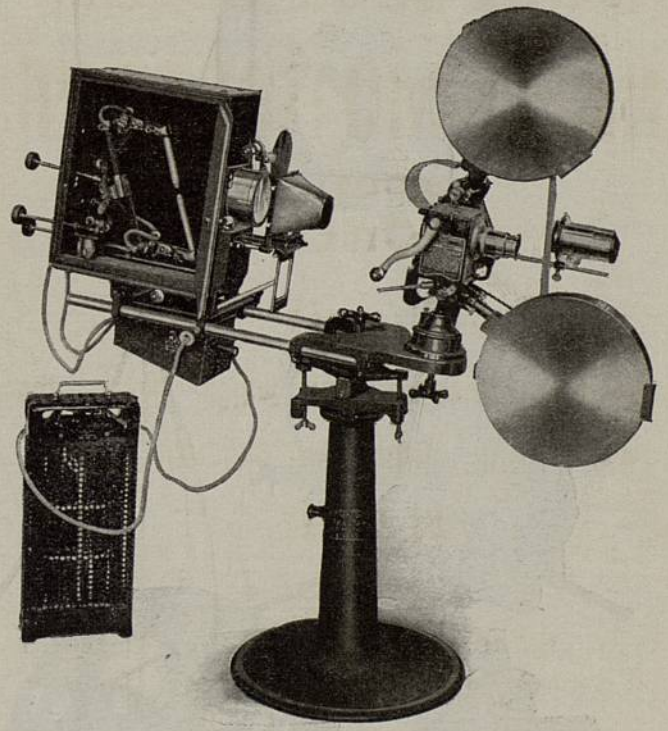
THE INSTRUCTIONS IN THIS BOOK COVER

No. 1A MOTIOGRAPH

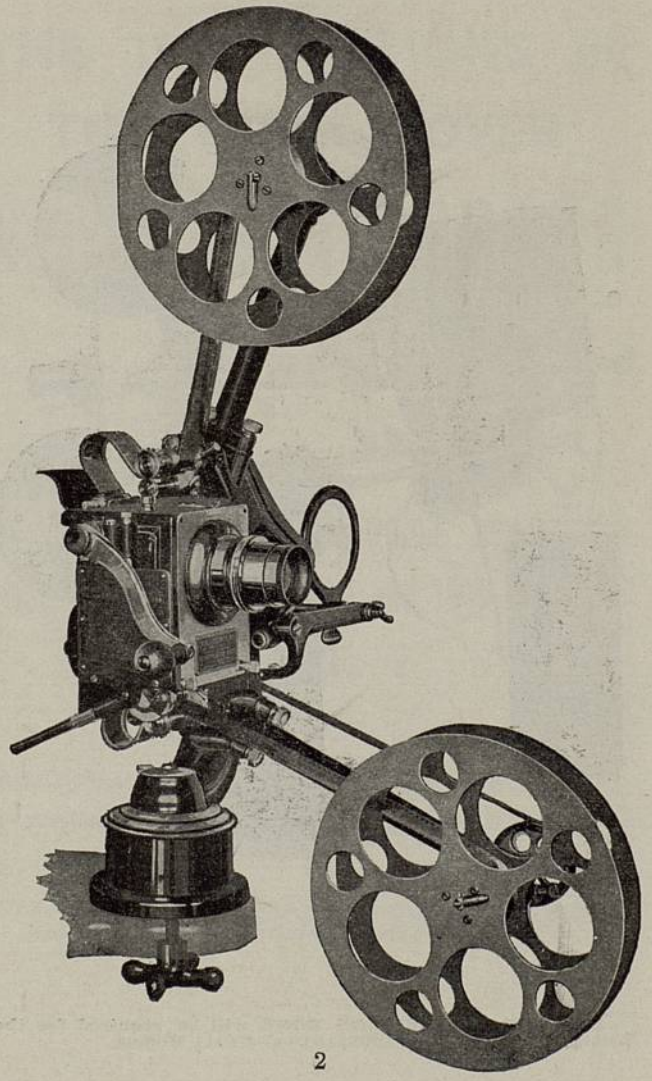
MODEL 1912 ONLY.

We have another book which covers the No. 1, 1908, 1909, 1910 and 1911 Models and the No. 2.

Instruction Books may be had free of charge by writing your dealer or the manufacturer.



THE 1911 INSTRUCTION BOOK will be required for the Motiograph of the 1908, 1909, 1910 and 1911 Models.



INSTRUCTIONS

FOR INSTALLING AND OPERATING THE IMPROVED MOTIOGRAPH No. 1A MODEL 1912 MOTION PICTURE MACHINE

THE INSTRUCTIONS SHOULD BE READ AND STUDIED CAREFULLY several times before undertaking to operate the machine, and then, when beginning to operate the machine, have it set up and at hand ready for reference. **When beginning to operate the instructions should be constantly referred to** at each successive step. Many operators make the mistake of hurrying through the directions, thinking that they understand them before they really do, as a result of which they are unable to get the results they should and would do if the instructions were more carefully studied. Another **great mistake** is to depend on the advice of some **one who claims to know**, but in reality does not. There are many such who pose as experts. These instructions were written for this particular type of machine by the inventor, who does know how to operate it, and **they should in all cases be carefully followed.**

The Motiograph complete motion picture machine equipment comes packed in a single case. The Motiograph mechanism, crank, framing handle and objective lens are packed in small boxes for safety, which, in turn, are packed in the large case. These parts should all be removed with care, carefully wiped to remove dust, etc., and **see that no part is overlooked** and left in the packing material.

(For illustration covering the numbers used in the following instructions see Fig. 1 and 2.)

If wood base is used the mechanism base, lamp house, sliding frame, backward and forward slide rods and brackets are screwed to the baseboard. The arc lamp, saddle, post, etc., will be found inside the lamp house.

When the pedestal base is used to support the Motiograph it should be placed in position in the operating booth or where the machine is to be operated and fastened very firmly to the floor with ⅜-inch lag screws, or large square headed wood screws, and care should be taken to see that as nearly as possible contact with the floor is had on all sides. In order to do this, as a rule, it is advisable to use wedges of hard wood. It will be well to screw the base tightly to the floor and then drive the wedges just tight enough at different points so the base will rest with equal pressure on all sides. Place the metal base board on swivel at top of pedestal, and insert No. **344** hand wheel bolt through top of metal base board and screw firmly to the pedestal.

Remove the small screw on rear end of left side tube and slip on No. **318-M** intermediate carriage with the flat track rod No. **377-M** to the rear and replace the small screw in tube.

Place No. **319-M**, top carriage, in position on bottom of lamp house, engaging the ends of the two rods at lower end of lamp house front **306-A**, into the ears of top carriage, No. **319-M** and fasten with the thumb screw at the rear of casting to bottom of lamp house.

Place lamp house on top of intermediate carriage, No. **318-M**, tilt lamp house back in order to allow flat track rod **377-M**, to enter between the rollers and dowel pins of top carriage, so that the rollers will rest on top of flat track rod when lamp house is tilted forward into position. The pins being underneath flat track rod.

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Remove screw from round track rod No. **338-M** and insert same through ears on front part of carriages, No. **318-M** and No. **319-M**, then insert screw through intermediate carriage No. **318-M** and screw into track rod firmly to hold same in position.

Then place No. **310-A**, slide carrier swing, into the short rod on left side of No. **307** cone support, and place No. **307** cone support in position by inserting the two short rods on cone support into front casting of

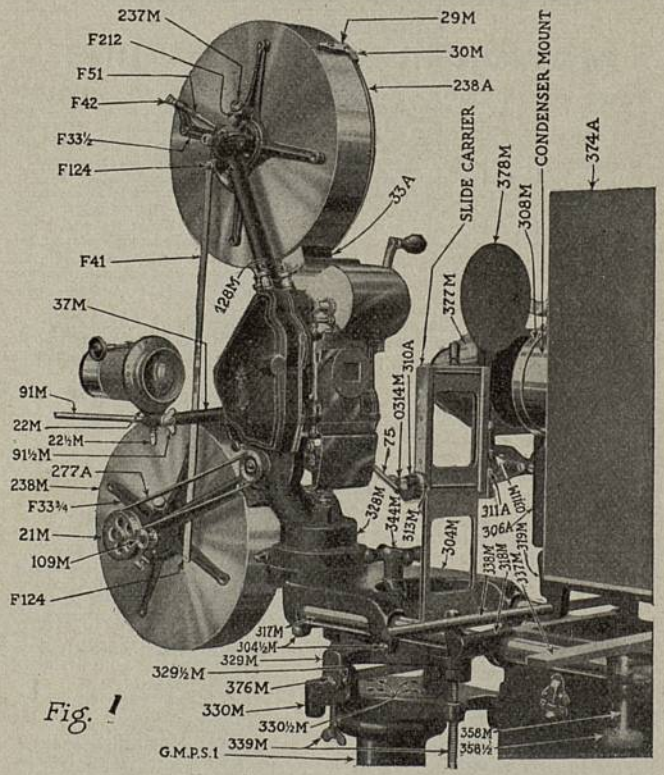

Fig. 1

lamp house, and tighten the four screws, two on each side, then place No. **377** lamp house cone, in position with seam underneath, allowing the dowel pins on left side of cone support to enter the small holes in cone, then bring cone around into position and fasten with the two small thumb screws on right side of cone support.

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Attach the stereopticon slide carrier to the lamp house slide carrier swing No. **310-A** and clamp in position with the thumb screws No. **0314-M** on top of carrier swing.

The condensing lenses are mounted in a nickel plated mount, and by the use of two inside telescopic bands, are held in position as shown in figure **17** at **"B"**. The condenser mount is held in position on the front of the lamp house by two clamps and two screws.

The mount may be removed from the lamp house front for changing or cleaning the lenses by turning the two clamps until the flat sides of the clamps come next to the flange of the condenser mount. The mount is usually left attached to the lamp house for shipment. The flat side of the condenser should always be outward and the convex or round sides toward each other. The surfaces of the condensing lenses should be free from dust, perspiration or other accumulations, to insure the unobstructed passage of the light.

Insert No. **12-A** hand wheel bolt into the No. **328-M** sub base from underneath the front of base board. Set the Motiograph mechanism on the circular swivel base No. **328-M** and screw down tight with the No. **12-A** hand wheel.

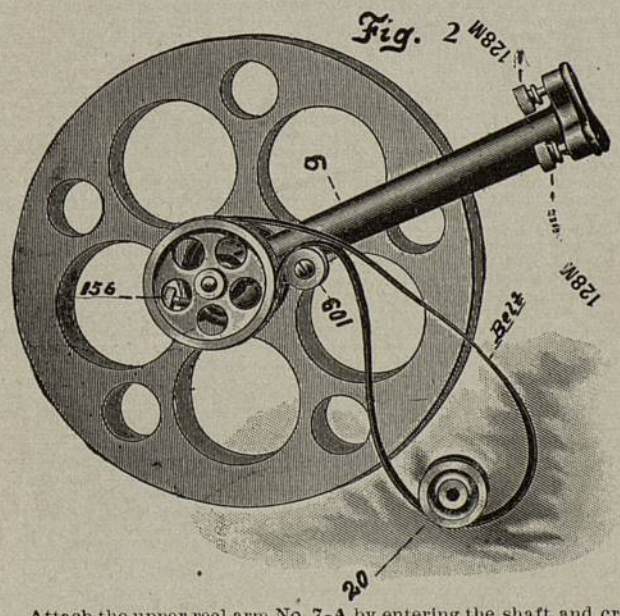

Fig. 2

Attach the upper reel arm No. **7-A** by entering the shaft and cross pin into the rewind vertical arbor socket and screw into place with the three reel arm thumb screws No. **128-M**.

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Attach the take-up or lower reel arm No. **9-A** with the three reel arm thumb screws No. **128-M**. Place the take-up belt in position on the take-up pulleys with the tension pulley under the belt No. **277-A**, first having loosened the tension screw of the belt tension pully No. **109-M**, until the belt is quite loose. The belt should always be kept just tight enough to turn a full reel of film, that is, so the reel will keep turning until all of the film has passed through the machine and taken up on the lower reel. If the belt is too tight it will cause unnecessary wear on the teeth of the intermittent sprocket and on the gears throughout the machine, and will also damage the film by checking the sprocket holes, and will cause more or less trouble by running the film off lower sprocket.

When the fire proof magazines are to be used, they should be attached before the reels are put in place. To attach the fire proof magazines, unscrew the thumb screws No. **237-M** in the magazine spider **33½** and **33¾** so as to let their points pass the flange on the reel arm. Put the magazine in place on the reel arm by inserting the boss on the reel arm into the opening of the spider. Have the fire trap or valve No. **33-A** toward the upper or lower feeding sprocket, depending upon which one of the reel arms you are assembling. If the upper magazine, be sure and raise the stop bolt No. **F-42** in order to allow the lower end of same to pass the flange on the reel arm, then tighten the thumb screws No. **237-M** to engage the flange on the reel arm. Have these just tight enough so that the magazine may be easily shifted from the operating to the rewinding position, then screw down the lock nuts on the screws No. **237-M** in order to keep them in this position. On both the upper and lower magazine will be found a machine screw No. **F-124** to which attach the shift rod No. **F-41** which is for the purpose of shifting the magazines simultaneously to the rewinding position. Now open the magazine and attach the reel, turning around until the key pin on the arbor enters the seat hole or key way in the reel and close the jointed reel shaft latch.

Great care should be taken at all times to have the reel all the way on so that the latch will be entirely closed, as otherwise in closing the magazine door the latch will come in contact and bind on the inside of door causing much damage to the film, if not breaking it entirely. Place the framing lever handle No. **75-M** in the framing lever socket No. **11-A** and screw it into place. Loosen the little thumb screw on the crank handle No. **013-A**, place the crank handle in position on the crank arbor and tighten the little thumb screw on the crank so it engages with one of the small notches on the end of the crank arbor to hold the crank in place. Remove the stereopticon lens bracket screw and attach the stereopticon lens bracket No. **37-M.** Attach the stereopticon lens bracket rod No. **91-M** by removing the wing nut No. **91½-M** and washer and insert same into either the front or rear of the bracket depending on the focal length of the lens. then replace washer and wing nut and screw wing nut on firmly. Remove the stereopticon lens from its box, carefully wipe from surface of the lens any dust that may have accumulated. Remove the flange ring from the lens, insert it back of the lens mount ring No. **22-M** with the bead or rim to the front. Insert the lens from the other side and screw it in place. It is not necessary to have the flange ring attached to the lens mount ring or to have the lens mount ring threaded. Attach the stereopticon lens mount ring No. **22-M** to the slide rod No. **91-M** on stereopticon lens bracket, No. **37-M** tighten into place with the thumb screw No. **22½-M.**

Remove the objective lens from the little pastboard box and screw it into position on the front plate of the mechanism, first having removed with a soft cotton cloth any dust that may have accumulated on either the front or rear surface of the lens. The lens consists of a slip tube and jacket. Turn the focusing ring on jacket so that the sliding part of jacket is about half way between the front and rear extreme.

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Then the slip tube or lens part may be pushed in and out until the image on the screen comes to a focus. A sharp focus may be obtained by manipulating the focusing ring on lens jacket. If the lens is of long enough focus that it requires one, an extension collar will be furnished with it, which must first be screwed into the front plate and the lens jacket in turn, screwed into the extension collar.

LIGHT FOR MOTION PICTURES

There are two kinds of light that may be considered practical for motion picture work, viz: electric light and calcium light. The Electric arc light is preferable owing to its strength, convenience and low price. If electric connections cannot be had, the only practical substitute is calcium light. Calcium light is obtained by burning a combination of oxygen and hydrogen gases against a cylinder of prepared unslacked lime. The gases for calcium light may be had compressed in tanks from calcium light companies located in the principal cities throughout the United States. The tanks hold fifty cubic feet, the cost of which is usually $6,50, besides freight charges, and the average consumption is from six to nine cubic feet per hour.

When using compressed gasses from cylinders, connect one end of one of the rubber tubes which accompanies the outfit, to the nipples of the black tank (containing hydrogen gas) and the other end of the rubber tube to one of the nipples on the calcium jet, then connect one end of the other rubber tube to the nipple of the red tank (containing hydrogen gas) and connect the other end of the rubber tube to the other nipple of the calcium jet.

Another and usually more convenient means of obtaining calcium, light is by using the Enterprtse Portable Calcium Gas Making Outfit, which produces calcium gas by the use of a chemical called Oxone, which generates gas when brought into contact with water at a cost of about $1.00 per hour.

AN EXCELLENT SAFEGUARD where electric light is used for projection work is to have on hand one of these Portable Calcium Gas Making Outfits, which may be used in case the electric light should be temporarily shut off, as sometimes happens from accidents at the power house or from other causes.

When using calcium light instead of electricity a calcium or oxygen-hydrogen jet must be used instead of the arc lamp, which must also be provided with a special lamp post.

Place the calcium lamp post in position on the lamp sliding base inside of lamp house and tighten screws provided to hold same in position, then place calcium jet in position on lamp post and lower the jet or the post to a point where the point of the nozzle will be about 3-16 inch below the center of the condensing lens and tighten the thumb screw to clamp it in position.

When using the No. 1-A Motiograph lamp house it will be necessary to remove the two porcelain bushings through which the wires are passed when using the electric arc lamp and pass the rubber tubing through these openings and connect the tubings to their respective nipples on the gas jet. (See instructions which are furnished with the gas making outfit). When using the 1909 lamp house, which is furnished with the No. 2 Motiograph outfit, all that will be required will be to remove the sheet metal slides in back of lamp house and insert the tubing through the circular opening.

Take a lime cylinder from the lime box, place it in the fork of the calcium jet, revolve the lime and see that it is in an upright position and adjust the location of the lime screw slide so the surface of the lime wou'd be from ⅛ to ¼ inch distance from the point of the nozzle of the calcium jet.

Particulars regarding the Enterprise Portable Gas Making Outfit will be found in our catalog or will be furnished on application.

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The Electric Arc Lamp.

(For Illustration see Page 54).

The arc lamp, saddle, post, etc. will be found inside the lamp house and should be carefully unwrapped and wiped free from all packing material, dust, etc.

Beginning with April 1st, 1910, we began to make deliveries of the new type No. 1-A Motiograph arc lamp, as shown in cut Fig. 3, including a rack body designed to give the operator the choice of setting his lamp in a vertical position or with the top inclined backward at an angle of 18, 23 or 28 degrees from the vertical position, a satisfactery arrangement which is not found in any other arc lamp. To accomplish these adjustments we use two pieces called the rack body No. MG-85 and a rack body support No. MG-86, held in position by two screws No. MG-87. When delivered the rack body sets on the rack body support at an angle of 23 degrees from vertical, with the carbon clamps adjusted so that the carbons will be parallel with the rack bars No. MG-18 and MG-19, the lower carbon being about 1-16 inch in advance of the upper to force the crater or small cup shape which forms on the end of the upper carbon on D. C. (direct current) and on the end of both carbons on A. C. (alternating current), as near to the front as possible so as to face the condensing lens. From these craters the greatest source of light is obtained. To change the angle remove the two screws No. MG-87 that attach the rack body to the rack body support and shift to the position desired. To incline the lamp at a greater angle locate the rack body lower on the support. To incline at a lesser angle move the rack body up on the support. For a vertical position attach the rack body to the extreme top of the support.

The vertical position with carbons also set in vertical position, as shown in Fig. 3, for alternating current is desired by some. Others prefer the vertical position with the carbons set at an angle as shown in figure 4, while still others, ourselves included, prefer the same position of lamp and carbons for alternating current as for direct current, which is the position in which the lamp is received, as shown in figure 13.

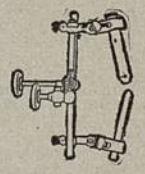

Fig 4

The No. 1-A lamp house as delivered after April 1st 1910, has several ⅜-in. openings in the rear through which to pass the stems of the arc lamp adjustment handles, the stems being secured in the sockets by headless screws No. MG 25¼ and MG 40½ which must be removed and the stems of the adjustment handles removed from their respective sockets. Place the arc lamp in position into the burner slide No. MG-1 inside of lamp house after first having loosened screws No. MG-1¼ and 1½ sufficiently so as to allow the lower end of the main body No. MG-3 to slip all the way down (being careful to engage MG-3½ main body stud, between the flanges of No. 32 swivel collar for side adjustment), then tighten screw No. MG-1¼ so that it will enter the small grooves on lower end of main body and tighten screws No. MG-1½ just enough so that it will freely allow side adjustment of arc lamp. Now insert the handle stems No. MG-25 and MG-41 through their respective openings in rear of lamp house from the outside and insert them into their respective sockets No. MG-25¼ and MG-40; replace the headless screws and screw them into place.

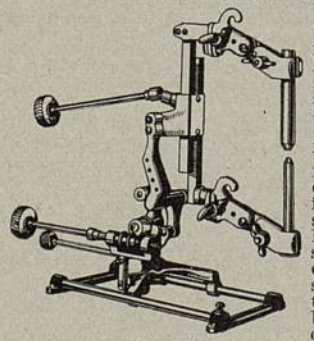

Fig. 3

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Where the 1909 Togo Universal arc lamp is used as furnished with the No. 2 mechanism, the lamp house is provided with a circular opening in the rear, through which the hand wheels of the arc lamp should be passed and the arc lamp burner slide post placed in position on the burner slide; the sheet metal slides in the back of the lamp house should close on the stems of the hand wheels to hold them in their respective positions.

The Electric Arc Light.

Is the result of the electric current jumping, so to speak, from one conductor to another, in order to complete a circuit. The light is produced by the excessive friction or resistance of the air to the passage of the electric current. For example, if you bring together two wires, the ends of which are connected with a primary battery, such as is used with an electric door bell or telephone outfit, and then separate them, the result will be a tiny electric spark. If you bring together two wires connected with an electric light circuit of 110 volts and then separate them, the result will be a blinding flash and the melting of the two wires at the point of contact. The reason for the difference in intensity between the two sparks is due to the greater intensity of the electric light circuit over that of the electric door bell circuit. The conditions that produce the electric arc light are the same as those which produced the spark in the door bell circuit and the flash in the electric light circuit, only that two carbon pencils are substituted at the point of contact, which, instead of melting, are slowly consumed, with the result that they produce a light of the most intense brilliancy.

For the production and use of electric arc light for optical projection work, the following accessories for each lantern or motion picture machine will be required:

1st—Hand-fed Arc Lamp, which consist of a frame and machanism necessary for the support and adjustment of the carbons.

2nd—One or more Rheostats, the office of which is the reduction of the electric current to make it suitable for the requirements. The rheostat consists of a considerable quantity of wire of high resistance, and the necessary adjustments for controlling it.

3rd—Carbons of a size that is suitable to the kind of current that is to be used (direct or alternating) and the quantity of current that is to be consumed.

4th—A knife switch, for convenience in connecting or breaking the circuit, for the safety of the operator when making connections, changing carbons, etc.

The Knife Switch should be of ample capacity to fill all requirements, whether for the traveling exhibitor or one that is permanently located, and generally speaking, we would advise the combination of the knife switch and fuse block when using a single lantern, or motion picture machine alone.

When using a double lantern, two knife switches are required, and it will be found more convenient to have the switches and the fuse block separate. The type of fuse block that uses enclosed fuses is most desirable, because in most cities and towns the Board of Underwriters will no longer permit the use of the open link fuses.

Our No. 7 Electric Knife Switch and Fuse Block is recommended as thoroughly efficient and one that will fill all requirements up to 250 volts and fifty amperes.

5th—A Fuse Block, for the purpose of protecting the wiring, etc., in case of accidental short circuit.

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6th—Fuse wire or Plugs, of strength depending upon the amount of current to be consumed, the number of lamps in operation, etc.

7th—Insulated Wire or cable for connecting the lantern or motion picture machine with the main supply wires of the building. The size of the wire or cable will depend upon the quantity of current to be consumed.

The rules of the "National Board of Fire Underwriters" require the following:

For 15 amperes a No. 12 wire. For 20 amperes a No. 10 wire and for 50 amperes a No. 6 wire is required.

The electric lamp in most common use for motion picture work is known as the Vertical **Hand-fed Lamp.** Some operators prefer the right angle lamp, which possesses some advantage in the matter of better illumination, but is not quite so easy to keep in adjustment as the vertical lamp.

The automatic lamp is now very seldom used for optical projection work owing to the great cost and the difficulty in keeping it in focus.

The use of alternating current is accompanied by a humming noise which is indispensable when using a rheostat. The intensity of the noise when using alternating current will depend on the number of alterations per minute and the number of amperes used. Some alternating currents make more noise than others, depending upon the number of alternations per minute. The greater the number of alternations the less the noise. Alternating current of low frequency is undesirable for optical projection work.

To get a brilliant picture it is necessary to use plenty of current. The action of a transformer is to convert pressure (voltage) into volume (amperes) without destroying a portion of the current as when using a rheostat. Transformers are known under various names as **Current Saving Devices.** The added quantity of current helps to hold the arc in the center of the carbons and makes the light much easier to manage and keep in focus, besides giving greater illumination and a brighter picture.

When using alternating current an unsteady light is usually the result of the arc traveling around the points of the carbons. When the arc is on the side next to the condensing lenses the light is brightest, but when it is on the side away from the lenses, the light is dull.

When using either direct or alternating current, flaming is usually caused by the carbons being too far apart, and if they are too close together it will cause hissing. If the current is too strong for the size of the carbons, it will cause both flaming and hissing. Carbons that have impure spots, or that are coarse-grained will cause sputtering.

The adjustment of the hand feed arc lamp is exceedingly simple. The habit is soon acquired. The carbons require to be fed together every few moments as they are consumed. The peculiar noise produced by the arc as it becomes lengthened suggests to the operator the necessity of readjustment. In case from neglect of adjustment, the light becomes extinguished, it is necessary to bring the carbons together until the points touch, and then separate them sufficiently to give the best illumination.

There are two ways of making an electric arc light brighter—first, by reducing resistance, which is limited by the heating of the rheostat, and, if carried too far, the wires in the rheostat will burn out; and, second, and best way, is to use greater carrying capacity, by wiring the rheostats in multiple, as shown in preceding diagrams, also by the use of larger carbons.

The cost of using electric arc light, when using twenty-five amperes of current is about 35c per hour, and fifty amperes would cost about twice that amount. The cost will vary somewhat in different cities. Where motion pictures are to be used for Motion Picture Theatre or Nicolodeon, electric connections can usually be had, but the traveling

exhibitor will find that there are many places where he wishes to give an entertainment where electric connections are not available, in which case it will be necessary to use calcium light.

Care should be taken to always open the switch before undertaking to handle the arc lamp, replace the carbons, etc. That is what the switch is for.

Care should be used in handling current above 110 volts. We advise against the use of 500 volts, as it is dangerous. It is a current, however, that is seldom met with for lighting purposes.

Great care should be exercised to avoid allowing the wires to touch each other, to touch metal of any kind, or to touch any metal that would connect the two wires, as it may cause a short circuit and injure the apparatus, the hands of the operator, or both. The use of a fuse block and fuses is a good thing to protect the apparatus. Care should be taken to protect the eyes when using electric light. There is not only danger of injury to the eyes, but the light will tempororily blind you, which will be a great hindrance to the satisfactory conducting of your work.

RESISTANCE DEVICES.

A certain amount of resistance is required when operating an electric arc lamp, in order to reduce both the force (pressure) and the volume of the current, and it is the office of the rheostat to supply the needed resistance.

Resistance is perhaps one of the most important things to the operator. Generally speaking resistence devices may be divided into four classes, viz:. rheostats, transformers, choke coils and arc rectifiers.

The rheostat is the oldest form of projection resistance and for direct current is the only one available. Resistance is necessary from the fact that the carbons of a projection arc lamp form a dead short circuit when brought together. Means must therefore be provided to allow of but a certain limited quantity of current passing through the short thus made or the wires would burn up instantly were it not for the fuses, since the lamp would take far more current than the fuses and wires would carry. In fact could such a condition be maintained the only limit to current flow would be the capacity of the dynamo feeding the system. To prevent this, resistance is inserted in the circuit and we will first consider that form known as the rheostat. Different metals possess different degrees of conductivity (current carrying power), copper wire being the best of any metal commercially available. That is to say, a copper wire of given size will carry a larger amount of current without heating than a wire made from any other metal combining the toughness and ductility necessary and at the same time not too costly. On the other hand, an alloy of certain other metals possesses high resistance to current, and wire made from this alloy is used in rheostats. The resistance device is to the electric circuit exactly what the valve is to the water pipe. If you wish to get a certain quantity of water from a water pipe you don't take the cap off its end—you install a valve and open it just enough to let through the desired quantity. If you wish a certain quantity of current, say, 40 amperes, from a wire charged at 110 volts, you cut the wire and connect in a certain length of resistance wire calculated to allow 40 amperes to pass at a pressure 110 volts. If the pressure were suddenly raised to 220 instead of 110 volts, you would have to insert more resistance wire or you would get more current and your resistance would heat unduly. The more resistance wire of a given size you insert in a circuit at a given pressure the less current you will get and the less resistance the more current will go through. The higher the voltage, the more resistance you must have to get a given number of amperes. The rheostat is nothing more or less than a case carrying a certain number of feet of resistance wire wound into coils to save space and mounted on insulators. Some are so arranged that a part of the coils can be cut out or

cut in by moving a lever or changing a connction; these are called adjustable rheostats. In the non-adjustable rheostats there are two binding posts, one being attached to the end of the first coil and the other to the end of the last coil, the current thus being obliged to pass through the entire length of all the coils in the device. Now if a binding post be attached to the end of the fourth coil of a rheostat containing 6 coils and one of the wires be attached to that post instead of the one at the end of the sixth coil, two of the coils would be "cut out" thus decreasing the resistance by one-third and corresepondingly increasing the resultant current. When you see a rheostat with more than two binding posts, it is that kind of an arrangement exactly. One post is always a "permanent" and one wire must always be attached to it, but you vary the amount of current according to which post you attach the other wire. The adjustable rheostats, which have a sliding lever, amount to the same thing, each contact being in effect the same as a separate binding post, as above described.

Some rheostats are composed of a number of separate "cells", each being in itself a complete rheostat, they are really two or more complete rheostats isclosed in one case. One of the well known of this type is the ACR. Universal rheostat, as illustrated and described in Figs. 9 to 12, inclusively. This type of machine is quite flexible, as the cells may, by means of "jumpers", be connected in any desired manner, both series and multiple, or each cell may be used separately.

Right here let us explain the terms "series" and "multiple". This is something which confuses many but which is in reality very simple. Series, as applied to rheostats, means that all current which reaches the lamp must first pass through all the resistance coils in two or more rheostats, one after the other. We think this is simple and plain enough to require no further explanation, except to say that adding rheostats in series reduces the current.

Multiple puzzles many however, and we will endeavor to explain it fully.

Now, supposing we have a large water main, for example; we connect or tap in two water pipes together, with two valves, the effect is precisely the same as connecting rheostats in multiple. By opening both valves you get just double the quantity of water through both pipes than you would through one pipe by opening one valve. Thus it will be understood that two or more rheostats connected in multiple to the supply wire will allow additional current to pass through just as two or more water pipes with valves connected to the water main will allow additional water to pass through.

The selection of rheostats for resistance will depend upon the voltage of the electric line on which the electric arc lamp is to be used, whether direct or alternating, and the amount of amperage or current that is to be consumed.

In computing resistance it will be well to remember that the number of volts consumed in making the arc of the lamp is usually about fifty and the rheostat must have sufficient capacity to take care of the balance. For example, on the 110 volt circuit, the arc consumes fifty volts of the electric current and the rheostat takes care of the balance of sixty volts. For the 220 volt circuit the rheostat must take care of about 170 volts.

In case the outfit is not to be used in a permanent location such as a Motion Picture Theaire, public hall or church and is to be used by a traveling exhibitor, it will then be necessary for him to equip himself with rheostats of such capacity and in such number that he will be able to meet any ordinary conditions with which he may come in contact.

In the matter of rheostats their design is almost legion, but the really good ones are limited. All rheosats put out with the Motiograph

machine comply fully with the Underwriters' rules. The A. C. R. Dandy is similar to the Universal but non-adjustable and but 25 amperes capacity on 110 volts pressure, either direct or alternating. It has but two binding posts, attach a wire to each. The A. C. R. Universal has a capacity of 45 amperes. It is in effect two separate rheostas in one case. The two cells may be used singly, in series or in multiple. See Figs 9 to 12, inclusively. The A. C. R. Adjustable Underwriters model has two binding posts, one of which connects of course directly with adjustment lever. Connect a wire to each post. Move lever clear over to "in", turn on turrent and adjust to suit. The contacts are excellent. Keep them clean. In case the contact spring should ever get loose, remove the lever and bend the spring down a little. The adjustment is on a slate base, located under a heavy metal cap. The machine is quite light and the contact arrangement being so well protected it is an excellent rheostat for road work. Capacity 45 amperes on 110 volts or 25 amperes on 220 volts, All these devices are protected by perforated sheet metal casing. The coils are independent of each other and are very easily removed and replaced. The coil connection is through machine-turned lugs, the coils being held in place by two set screws.

When using alternating current, with a rheostat for resistance, there is always a singing noise, which is caused by the vibration due to the rapid and constant reversing of the current.

Current Saving Devices

The use of the rheostat form of resistance on alternating current is out of date. Too much power is wasted in heat, besides which they do not furnish nearly so satisfactory projection current as does a rightly constructed current saving devices.

The Bell Inductor Compensator has an extremely high efficiency because it does not depend upon magnetic leakage for amperage regulation, but has a practical device for current control. Four points of adjustment are provided, allowing instantaneons regulation of amperage with a delivery at the lamp of 35, 45, 50 or 60 amperes.

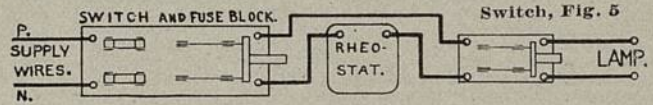
The Fort Wayne Compensarc, the Hallberg Economizer and Edlson Economy Transformer are three other highly efficient transformers which are handled by us. For further information see Motiograph catalog. These are low voltage transformers.

A good transformer used on the current cycle it is designed for is absolutely noiseless and you should be able to lay your hand on it anywhere at any time without feeling undue heat. Usually they are adjustable, giving about from three to four different amperages ranging from 35 to 60 amperes. It is quite possible to get practically as good projection light from 60 cycle alternating current, by the use of one of these devices as from direct current, but very close attention must be paid to setting the carbons, as will be explained further on under the heading of "Carbons", however, their weight renders them somewhat undesirable for road work. Transformers cannot be used on direct current under any condition. In making connections you will find on most machines two binding posts marked "Lamp". Connect a wire to each post and run one (either one) to one lamp binding post and the other to the other lamp binding post. Some devices have two other binding posts, they being marked "Line". Run wires from operating room switch to these posts. That is all there is to it. Other devices have four line binding posts, connections being made to different posts for different voltages. Instructions will come with these devices for connecting.

A well built transformer, used on the current it is designed for, will last indefinitely.

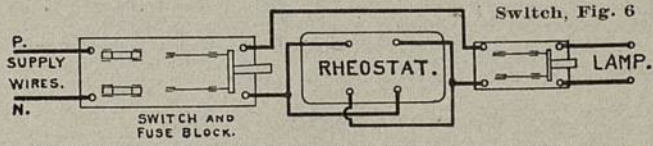
Connecting Lamp and Rheostat With the Supply Wires

The four following diagrams will illustrate some of the more desirable methods of making electric connections:



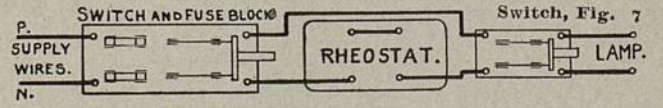
Switch, Fig. 5

Figure 5 illustrates a single arc lamp, either for single lantern or motion picture machine with one A. C. R. Dandy rheostat and connected by knife switch and fuse block.



Switch, Fig. 6

Figure 7 illustrates a single arc lamp, for either a single lantern or motion picture machine, with the A. C. R. Universal Rheostat which consists of two rheostats wired in multiple and connected by knife switch and fuse block.



Switch, Fig. 7

Figure 7 illustrates one arc lamp, for either single lantern or motion picture machine with A. C. R. Universal Rheostat which consists of two rheostats wired in series and connected by knife switch.

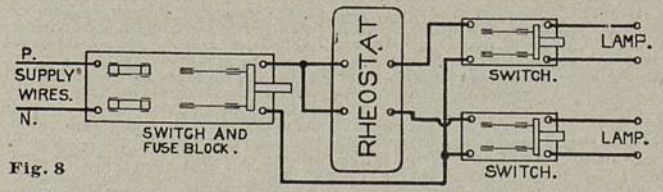


Fig. 8

Figure 8 illustrates the A. C. R. Universal Rheostat which consists of two rheostats and is connected with two Arc Lamps by two knife switches and one combined fuse block and knife switch.

Where the wires come together in the form of a "ball," the insulation has been removed, the bare wires spliced together and the unions covered with electrician's rubber tape. Where the wires cross each other, it is simply a cross without any connection.

THE 1911 INSTRUCTION BOOK will be required for the Motiograph of the 1908, 1909, 1910 and 1911 Models.

The following four figures show the different methods of connecting the "A. C. R. Universal" Rheostat. It is called the "Universal" because of its universal adaptation. The Adjustable Rheostats are intended for use only on lines of same voltage as that for which the rheostat is marked.

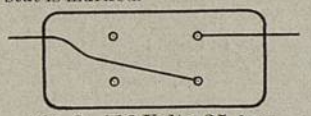


Fig. 9—110 Volts, 25 Amperes

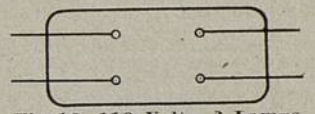


Fig. 10—110 Volts, 2 Lamps, 25 Amperes each.

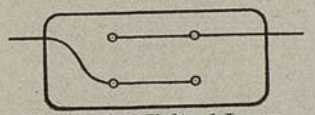


Fig. 11—110 Volts, 1 Lamp, 45 Amperes.

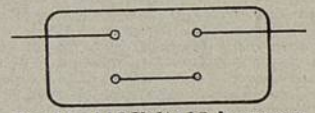


Fig. 12—110 Volts 12 Amperes; 220 Volts, 25 Amperes.

In connecting up one or more electric arc lamps, care should be taken that the fuses used in the fuse blocks are not of greater capacity than those used in the plug that connects the house system; otherwise, in case of accident, the house lights would be liable to be put out of commission.

The Asbestos Covered Cables furnished with Motiograph Equipments are provided with copper tips or terminals to be attached to the Arc Lamp. It has been learned by experience that these terminals after becoming crystalized and oxidized from the intense heat through long continued use are liable to break. To prevent this breakage we have provided

An Auxiliary Hook Clamp on the arc lamp bracket which holds the wire in place and distributes the flexibility throughout the entire length. The terminals, however, are not a necessity and in case they should break, the wire may be cut off where it enters the terminals, about an inch of the asbestos stripped off, and the wire may be formed into a hook, placed around the binding screw and between the two washers. This method is used by some in preference to using the terminals, except where prevented by city ordinances.

ELECTRIC CURRENT—DIRECT AND ALTERNATING.

For electric lighting purposes two types of current are in general use, viz: the direct and the alternating.

The first thing to know is the voltage of the line to which connections may be made, and whether direct or alternating current, and this information should be obtained from the local electric light company or a local electrician.

The direct current is best suited to optical projection purposes, and usually has a pressure for lighting purposes of 110 volts. It is sometimes, however, used with 220 and 500 volts pressure, usually where the principal object is for power purposes, and its use for electric lighting is only of secondary consideration. The 110 volt circuit is pleasant and safe to handle, but care should be exercised in handling 220 and especially the 500 volt current. The 500 volt circuit is used usually for street railway power purposes, but is sometimes also used for illuminating purposes.

Between 30 and 35 amperes of current is considered sufficient on direct current.

THE 1911 INSTRUCTION BOOK will be required for the Motiograph of the 1908, 1909, 1910 and 1911 Models.

The difference between direct and alternating current is simple once it is understood. Direct current is constant and flows constantly in one direction, so that one carbon of the lamp is always positive and the other negative. Direct current is generated and forced from generator over positive wire, returning over negative; therefore it will be understood that the current flows from the positive wire to the negative.

The positive wire should always be connected to the upper binding post of the arc lamp and the negative wire to the lower binding post of the arc lamp. This is most important, for the crater from which all light is obtained forms on the positive carbon.

There are several methods of ascertaining which is the negative and which is the positive wire on direct current, but the following is the simplest: Connect one wire from one binding post of the operating room switch to the lower binding post of arc lamp, connect other wire from remaining switch binding post through the rheostat to upper lamp binding post. Now, being first sure that the resistance is in, if using an Adjustable rheostat, close the switch and light the lamp by turning the hand wheel of the carbon feed lever until the points of the carbons touch, after which separate them about 1-16 inch or to a point where the light is brightest and allow them to burn a few moments, then separate then sufficiently or pull out the switce to break the current and extinguish the light. Examine the carbon tips; if the lower is burnt to a round point and the upper has a saucer-like depression called a "Crater", you have it right, but if just the opposite condition exists change the wires at the lamp and connect the rheostat in on the other wire. It is sometimes difficult for a beginner to determine the direction of the current in this manner, in which case the water test, which is always reliable, should be used. To make the water test, take a glass of water, close the switch, take the ends of both wires that are intended to be attached to the lamp and hold them near each other in the glass of water. Care must be exercised not to let the two ends of the wire touch each other, or to touch a piece of metal that would connect them, as the result might be very unpleasant. As the ends of the wire are brought near each other, small bubbles will form on the negative wire while few, if any, will form on the positive wire. In making this test, remember the negative bubbles.

With A. C. it does not matter at all which wire is connected to upper or lower binding post of lamp, both wires are alternately positive and negative.

N. B.—Direct current is always preferable because it is easier to handle. Although equally as good results may be obtained with alternating current providing it is handled properly.

Alternating current flows first in one direction and then in the other this being caused by the peculiar construction of the Generator (Dynamo). The current flows one way for a time, varying from 1-25 to 1-275 of a second. It then is reversed flowing in the opposite direction for the same period of time. These two periods of flow are termed a "cycle." To make this term more clear suppose you walk across a room, then turn and walk back again. When you got back where you started from you would have completed what would correspond to a "cycle" in alternating current. Therefore when you hear 60 cycle current spoken of, it means that the current reverses in its direction 120 times per second. If it be 132 cycle, it reverses at the rate of 264 times per second, etc. In the two-pole dynamo the current flows in one direction during the time the armature makes one half a revolution, and in the opposite during the other half, so that one complete turn of the armature completes one cycle. Modern dynamos, however, have more than two poles, (some of them a great many more), thus reducing the necessary armature speed required to produce a given current frequency. ("Frequency" means the number of cycles per

second). All dynamos, direct or alternating, are constructed to produce a certain voltage, and the machine designed to produce for instance, 110 volts could not and would not produce 220 volts or any other pressure than that named.

Alternating current usually has a pressure of 110 or 220 volts and sometimes in the higher multiples or in other voltages slightly different from the above.

In order to obtain satisfactory results, greater amperage must be used with alternating current, than with direct. From 35 to 60 amperes is considered sufficient in practically all cases.

With alternating current, each carbon of the lamp is alternately positive and negative. This has a very decided effect on projection light. Many operators claim that as good results cannot be obtained from alternating current as with direct currrent but this is not true, though it is somewhat more difficult to handle and requires more current (amperes) to produce results equal to those possible with direct current.

Alternating current is preferred by power, and many lighting companies, mainly for the reason that it can be generated at high tension (voltage) transmitted to the place where it is to be used and there transformed (reduced to lower voltage) by means of a very simple arrangement known as a transformer, the latter requiring very little care or attention; also is just as readily transformed from a low to a high voltage.

This cannot be so readily done with direct current. For several reasons high tension direct current is neither so desirable or commercially practical as is alternating.

(**NOTE**: Those who wish to learn more about this matter may do so by consulting works on electricity at their public library.)

Now the saving lies just here, (high voltage) current capable of performing an immense amount of work, can be transmitted over a much smaller wire than can the same amount of electrical energy at low voltage. It is **Quantity** (amperes) of current flowing not pressure which determines the size of wire necessary. One ampere at 2,000 volts becomes about 10 amperes after it has been transformed down to 110 volts pressure. While a very small wire will carry three amperes it takes a much larger one to carry 30 amperes. Now suppose the current must be conducted one mile from the power station, if the tension is 2,000 volts, the current may be brought right up to the transformer (usually located on the pole nearest to where the current is to be used) on a small wire, whereas if it was generated at 110 volts, it might be carried all that distance at that voltage, thus requiring about ten times the amperage, which is an immense saving in wiring cost—the main reason why power and lighting companies prefer to furnish alternating current instead of direct current.

Many operators wonder how it is that if the current reverses in its direction so often, there is flow sufficient to maintain an arc. This is very simple when one stops to consider the enormous speed of the electric current.

Three Wire System.—In cities where the current is largely used for power as well as for light, what is called a "Three Wire System" will frequently be found. As a rule, in the three wire systems, the two outside wires carry 220 volts, while the combination of either outside wire with the middle wire will give a pressure of 110 volts. As 110 volts is most desirable for optical projection work, the connections should be made accordingly.

In handling steam we use the term "pound" to denote preasure. In handling water, its volume or quantity is expressed in "gallons".

Electricity has pressure just exactly as has steam in a boiler, but this pressure is expressed in volts instead of as in steam, in pounds.

Electric current has volume or quantity just as has flowing water and this quantity is measured or expressed in "amperes" instead of gallons as is the case with water. Fix it firmly in your mind that the term **"VOLT" means pressure**, and nothing else but pressure just exactly as pounds means pressure in a water pipe or steam boiler, and that **"AMPERES" means volume or quantity**, of current flowing, exactly as gallons would mean the quantity of water flowing in a water pipe.

Electric current has both pressure and volume, exactly the same as has water in a water main and the term "volt" and ampere means in electrical practice precisely the same thing as do pounds and gallons when applied to a water main carrying water under pressure.

Definitions of Terms.

These definitions are the clearest, simplest the writer has been able to discover after a search of many standard works on electricity. He believes that a close inspection of them will enable the average man to arrive at a pretty close understanding of what the terms really mean. At any rate they cannot be put in simpler language.

VOLT:—The practical unit of electric pressure, or electro-motive force. The pressure required to move one ampere against a resistance of one ohm. The electro-motive force induced in a conductor usually an armature coil, which is cutting 100,000,000 magnetic lines (of force) per second.

AMPERE:—The unit of electric current (quantity of volume). That amount of current which can be driven by a pressure of one volt, the unit of electric pressure or electro-motive force, through one ohm, the unit of electric resistance. Such a rate of flow of electricity as would transmit one coulomb per second (a coulomb is defined as the unit of electrical quantity, that quantity of current which would pass in one second through a resistance of one ohm, under a pressure of one volt), a current of such strength as would deposit .005084 grains of copper per second. The unit rate of flow per second.

OHM:—(There are several standards, viz.: The Board of Trade Ohm, English Ohm, British Association Ohm, Legal Ohm and the Standard Ohm): The "Legal" ohm is the standard used in the United States, and it is defined as follows: The resistance of a column of mercury (the resistance such a body of mercury would offer to current) 106 centimeters in length, having an area of cross-section of one square millimeter at 0 degrees Centigrade or 32 degrees Fahrenheit. This is now the international value of the ohm.

WATT:—The unit of electrical activity or power. The number of watts is numerically equal to the amperes times the voltage. One volt times one ampere equals one watt or 1-746 horse power, sometimes called "Volt-Ampere".

How to Make Calculations

Electricity is computed by what is known as Ohm's law, which is as follows: A pressure of one volt will carry a current of one ampere through one ohm of resistance. According to Ohm's law, the three units of electricity are dependent upon each other; that is, the current increases when the voltage increases, and decreases when the resistance increases.

Computations of electricity are made after the formula: "Current equals electro-motive force divided by resistance." Thus, if any two factors are known, the other may be readily ascertained.

Knowing the voltage and the number of ohms resistance the number of amperes flowing may be determined by dividing the volts by the ohms; as, for instance, having 110 volts pressure and a rheostat offering

3 ohms resistance how many amperes will we get? 110 divided by 3 equals 36⅔, the number of amperes. Knowing the voltage and number of amperes flowing, the ohms resistance offered may be determined by dividing the volts by the amperes, as, for instance, with 220 volts pressure and 40 amperes flowing how many ohms resistance have we? 220 divided by 40 equals 5½, the ohms resistance offered to current passage. Knowing the number of amperes flowing and the ohms resistance we can find the voltage by multiplying the amperes by the ohms, as, for instance, if we had 3 ohms resistance and were getting 30 amperes of current, we would find the pressure by multiplyitg 30 by 3, which would tell us the voltage was 90.

Rule of Thumb.

The following formulas, known as the "Rule of Thumb", is correct and is very convenient in aid of memory. In this formula V equals volts, A amperes and O ohms. Remembering that it is expressed as a fraction and that the line means "divided by" and that with the upper quantity eliminated the two lower should be multiplied together, just cover up the quantity desired and what remains will equal the quantity covered up. For instance: I wish to ascertain the resistance, knowing the amperage and voltage. I place my thumb over the "O" and see that V divided by A will give it.

$$\frac{V}{O \quad A}$$

To find the watts being consumed you simply multiply the voltage by the number of amperes flowing; as for instance, we have 30 amperes at 110 volts. How many watts? 110 multiplied by 30 equals 3,300 watts. How many kilowatts is that? 3,300 divided 1,000 equals 3 3-10 kilowatts. How many horse power is it? One watt is 1-746 of a horse power, therefore 3,300 watts would equal 3,300 divided by 746, or 4 and 158-373 horse power.

CARBONS.

Size, Kind and How to Set.

For optical projection work carbons of special quality are required, viz: Those that are of the highest grade, are of uniform composition and are free from hard and soft spots. The ordinary carbons used for street and store illumination are not satisfactory for this purpose as they will not give an even and steady illumination. For this work two varieties of carbons are used, viz: what are known as solid and soft cored. The solid carbons are made of the same composition throughout, while the soft cored carbons have a core of very soft carbon in the center, which is used for the purpose of making them burn more readily in the center than on the outside, thus holding what is called a "crater" in the center of the carbon.

As to the size and kind of carbon to be used, that will depend on several things and will vary with individual cases; for alternatiug current, it may be said that ⅝-cored above and ⅝ or 9-16 cored below, will prove satisfactory in practically all cases. For direct current ⅝-cored above and either ⅝, 9-16 or ½ inch cored or preferably 9-16 or ½ inch solid may be the best below, according to the individual preference or the current strength used.

If solid is used below, do not get too hard a carbon or your light will have a tendency to be yellow. Try the different carbons until you get one which gives best results but don't decide by burning one car-

bon, give each at least one day's trial. In putting your carbons into the clamp it is necessary to use considerable pressure on the clamp, since, if there is not good contact much heat will be generated through electrical resistance due to poor contact. If the contact is very poor there may be arcing between the carbon and clamps, and this will consume carbon, still further loosening the connection and unduly heating the carbon arm and clamp. Don't overdue the matter of pressure however, as the carbon arm and clamps become somewhat weaker when heated and are liable to break.

Whether you are using A. C. or D. C. (alternating or direct current) as has been said before, practically all the illumination comes from the "crater", a saucer shaped depression which forms on the upper (positive) carbon tip with D. C. and on both tips with A. C. (though with the latter the craters are usually flat, rather than depressed in the center, as with D. C.)

The whole endeavor in setting the carbons should be to get the crater to form of good size and face the condensing lens as squarely as possible. Setting the carbons with D. C. is comparatively easy and simple. The arc lamps are so made that the top may be set farther back from the bottom (angling the lamp, this is called) so as to aid in getting the crater square with the condenser. With D. C. the lamp should be angled back just as much as possible and not get the lower carbon tip or any part of it between the crater and condenser.

Whether or not the tip is interfering, may be determined by closely examining the tips through the peep glass in the lamp house door, draw a line with the eye, when the arc is burning normally, from the lower edge of the crater to the lower edge of the condensing lens and if such a line strikes the lower tip, there is interference and loss of illumination, though if slight it may not amount to much.

The reason for using a large carbon above and a smaller carbon below is that the direction of the flame is upward, for which reason the upper carbon, called the "positive," is consumed more rapidly than the lower, when they are of the same size, but by having the upper one larger than the lower, the consumption is nearly equal, and thus the point of consumption is held in focus with the lenses while feeding both carbons at the same rate of speed. The point of the lower carbon is slightly forward of the point of the upper carbon, as indicated in the cut shown at Figure 13. The object of having the point of the lower carbon a little in front of the point of the upper carbon is for the purpose of holding the arc as nearly to the front of the carbon as possible, so as to get the benefit of the greatest possible amount of illumination. When a greater range of adjustment is desired the upper carbon adjustment fixture should be used.

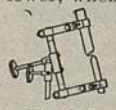


Fig. 13

Where alternating current is used, it is customary to use two soft cored carbons of nearly the same diameter. While theoretically, when using alternating current, both carbons burn with the same rate of speed, in practice it is found that, owing to the upward direction, of the flame, the upper carbon burns slightly faster; thus it will be found preferable to have the upper carbon of a slightly larger diameter. For example, when using about twenty-five or more amperes a $\frac{5}{8}$ top carbon and $\frac{9}{16}$ bottom, both soft cored, will be found preferable. The reason for using two carbons of more nearly the same size on alternating current is that the direction of the current alternates with high frequency, thus causing both carbons to be consumed at approximately the same rate of speed.

The reason for using soft cored carbons on alternating current is that the arc has a tendency to travel around the edges of the carbons, while they are being consumed, but when using carbons with soft cores it has a tendency to hold the arc toward the center of the carbons, and thus keep the arc in focus with the condensing lenses.

Care should always be exercised to have the carbons in perfect alignment sidewise, whether using A. C. or D. C.

The main thing in the projection of motion pictures is good projection light, and the most important thing to secure good projection light is to have the carbons set just exactly right, since this will, in a great measure, determine the position of your crater. If, when using direct current, you set the lower carbon too far back, your crater will be too low down, as shown in **A**, figure 14, instead of straight ahead as it should be. If, on the other hand, you get it too far ahead, a long "skirt" will form on the back edge of the upper carbon tip, as shown in **B**, figure 14. This is not a good condition as the crater is not in the best position and moreover there is a tendency of this "skirt" to break off, often fully half way up the crater, causing a poor light until a new crater can be formed.

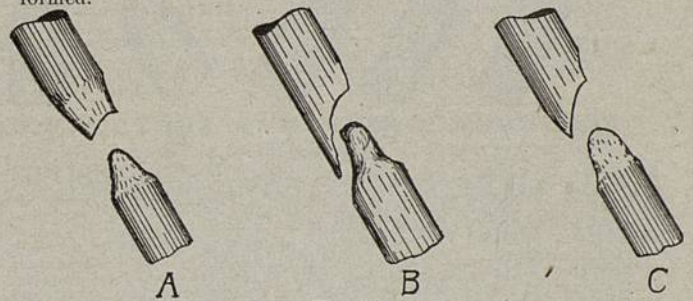


Fig. 14

"C" figure 14 shows an ideal condition which may be maintained at all times by close attention, barring imperfections in carbons. Bear in mind that it is, more than anything else, the exact amount of advancement of the lower carbon ahead of the upper, which produces this condition. There is little or no difference of opinion among operators as to the best set for D. C. carbons but there is a vast difference in the matter of care to get the set exactly right so that the best possible results will be obtained.

With Alternating current, it is quite another story. Figure 13 shows one method of setting A. C. carbons, D. and E. figure 15 two more, each of which have their advocates. It will be found, however, that whereas three years ago you could hardly find an operator setting his carbons as per figure 13, (the D. C. set) you will find that at present nearly all high class men set their carbons the same for either D. C. or A. C. They have d scovered, as we ourselves have, that while a slightly higher candle power is obtained from carbons set as per D. and E. figure 15, the crater cannot be controlled or maintained in one position, therefore steady light with these sets is an impossibility, especially with set D, figure 15.

(With set D figure 15 the lamp itself should be straight up and down) we shall therefore confine our remarks largely to the set shown in figure 13, which we strongly advise all operators to use. It is precisely the same set as is used for D. C. In using this set we cannot caution you too strongly to be exceedingly careful to get your carbons set exactly right. "Pretty near" will not do at all.

Using the round points of the carbons as your guide, set the tip of the lower carbon about 1-16 in. in advance of the upper and keep it that way. When you have it right the craters will appear about as shown in **C** figure 15, which is perfect. With such a crater you will

have quite steady strong light at all times. If the upper crater burns too flat advance the tip of lower carbon just a very little. If the lower tip shows a tendency to form, as in **B**, figure 15, move it back just a trifle but remember that a little movement of the tips backward or

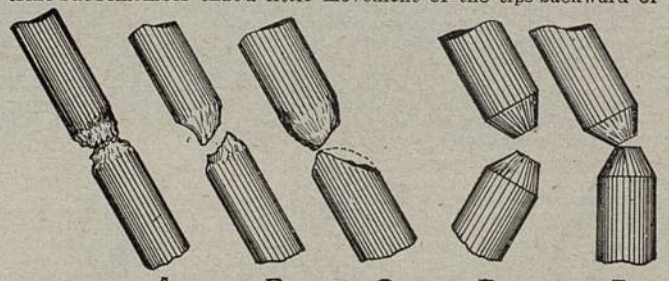


Fig. 15

forward may make a big difference in the form of the craters. The craters are small and a 1-16 in. move of either tip makes a big change in their forms. With alternating current, the carbons must be fed a little at a time and often and the arc must be compartively short, but if too short a condition such as shown in **A**, figure 15 will arise. Such a condition means the carbons kept too close together. The remedy is, if you get them in that shape, burn a slightly longer arc for a time. In fact, whenever your crater is going wrong and you change your carbon tips, lengthen the arc for a couple of minutes until the crater form changes. With A. C. the colored glasses which are found in the door of the lamphouse, are very necessary, since to get good results, one simply must watch the arc itself as it is impossible to get a good steady light with alternating current without looking at the arc itself when anything is wrong with the light.

It is very important to have a backward and forward movement of the carbon tips especially with alternating current.

The Universal No. 1-A arc lamp for the Motiograph No. 1-A has a universal arm and carbon clamp and top carbon adjustment fixture, is provided with all adjustments and is the most complete arc lamp on the market. This lamp is the same as the No. 1-A except for the addition of the Universal arm and clamp and the top carbon adjustment feature. The Universal arm and carbon clamp has been designed for use with the Motiograph No. 1-A Arc lamp. It is new, novel and a great improvement over any other form of carbon clamp; is a marked convenience on direct current and is of great advantage in the use of alternating current, especially when the preference is to use the carbons set at an angle.

The carbon clamp is arranged for Universal adjustment; is strong, unique in design and highly efficient. It will hold carbons from ⅝ in. to ⅝ inch in diameter with a vise-like grip. Holders can also be furnished when necessary for ¾ inch carbons. The clamp socket may be turned to set the carbon at any angle, after which the socket is firmly clamped in that position by three heavy machine screws. The clamp and socket are made of steel and the arm is of gray iron. It has a milled seat for the carbon so as to insure perfect contact without breakage. Both arm and socket are very heavy and strong; are well finished and nickel plated. It is made to interchange with other parts of the arc lamp and may be added to the model No. 1-A lamp at any

time. We can furnish either short or long carbon arm. The short arm is the best when using the lamp in a vertical position and with carbons at an angle.

A top carbon adjustment fixture has been designed as an attachment for the Motiograph No. 1-A arc lamp. The object is to provide a forward and backward movement for the top carbon in order to keep it in proper relationship with the lower carbon. This adjustment feature is not only desirable for use with direct current, but is of special advantage when used in connection with the Universal arm and carbon clamp when using alternating current with the carbons set at an angle. It is made to interchange with and can be attached to the regular Motiograph model No. 1-A arc lamp in but a few moments with the aid of a screw driver. It may be purchased with the arc lamp or may be added at a later date. The adjustment is accomplished by a screw which is turned by a four-winged thumb nut. The thumb nut can be turned by hand or by tapping the wings with a screw driver or other instrument. The range of movement is ¼ inch each way, making a total of ½ inch. It is made of gray iron and steel, is very rigid, well finished and is nickel plated. For further particulurs refere to the 1912 Motiograph catalog.

CONDUCTORS AND NON-CONDUCTORS

Electrically speaking, all substances are divided into two classes—they are either conductors or non-conductors, the latter called insulators. Both conductors and insulators are of varying value, so far as their respective properties are concerned. Pure annealed silver is considered the best conductor, with copper, gold, platinum, iron, tin, lead and bismuth decreasing in conducting properties in the order named, bismuth being almost a non-conductor.

The best known non-conductors or insulators are dry air, rubber, paraffine, slate, glass, porcelain, mica, fibre, wood and shellac, named in the order of their value as non-conductors. All of the above are more or less affected by moisture, losing their insulating qualities when wet. To conduct a current of electricity with the least possible amount of waste and the least resistance, it is necessary to have the best practical conductor, which from a commercial standpoint is copper, and it should be separated from contact with metal or other conductors by some good insulator. The insulators most generally in use are slate, glass. porcelain, mica and fibre.

The fuse block is necessary as a protection to the main line and to the lights in the house in case of accident. Fuse wire is made of soft composition metal of a low melting point. If from carelessness or through oversight the two wires that supply the current should come in contact wiih each other, either directly or indirectly, through the lamp. lamp house, or other parts of the apparatus, it passes more current through the fuse than it was made to carry, and instead of putting the line out of commission, it simply burns out one or both of the wires enclosed in the fuse plugs of the fuse block, and by replacing the fuse plugs, which can be done in a few moments, the line is again ready for use. While the fuses should be of ample carrying capacity to furnish sufficient current for the requirements, they should not be stronger than the fuses that connect the house wires with the supply wires, otherwise. in case of accident. the entire lighting system might be put out of commission. Usually 35 to 60 amperes capacity is sufficient.

Fuse blocks are quoted without fuses, hence it is necessary to order them of sufficient capacity to serve the requirements. Two fuses are required for the fuse block and a few additional should be ordered to provide for accident.

Flexible Wire or Cable of sufficient capacity and sufficient length should be provided to make connections between the instrument and

the supply wires of the main building. For a permanently located outfit such as in a Motion Picture Theatre, Church or Hall, it is customary to have the local electrician run the wires when practicable to a point very near the instrument, hence but a comparatively short length of insulated wire is necessary to make connections to the instrument. Some prefer the asbestos covered cable, others the regular jute stage cable. Where not over fifteen amperes of current is used, the flexible insulated electric light wire will generally fill the requirements, except in cities where prohibited by the regulations of the Board of Underwriters or the City Council.

The traveling exhibitor should be equipped with a length of anywhere from 30 to 100 feet of flexible wire or stage cable, as he will often find that the source of supply is some distance from the most convenient point where the instrument could be located. The capacity of the stage cable will be found in the regular price list.

FOCUSING THE LIGHT

Test the slide on the lamp house and see that it slides freely on the backward and forward and the sidewise movements.

The proper ajustment for the lamp house on the backward and forward slide should be a point where a clear field on the screen is obtained.

To obtain this adjustment after the equipment is assembled, complete, and connected to the light service, turn on your arc light and open the film gate on mechanism allowing the light to project through the aperture opening and objective lens, bring your lens to a clear focus. If the lamp house is too close to machine, you will notice a blue ghost or large dark spot in center of screen. To eliminate this, draw lamp house back slowly until the ghost has entirely disappeared and you obtain a perfectly clear, white image on the screen.

Set the Arc Lamp to the proper angle required to suit the current to be used (direct or alternating) as previously described, get the carbons clamped in their proper positions and adjust the arc lamp to a position that when the points of the carbons are brought together the meeting point will be on a line with the center of the condensing and objective lenses and about **3½ to 4 inches distant from the rear condensing lens.**

Separate the points of the carbons about an inch, turn on the current by closing the knife switch and open the dowser shutter on the front end of the lamp house funnel, bringing the carbons together, then separate slightly and adjust until the arc burns steady and quiet.

The lamp should now be adjusted upward and downward, backward and forward and sidewise to a point that will give a clear round disc of light about two inches in diameter to cover the square opening in the heat shield on the film gate. If the circle of light should be too large, a part of the illumination would be lost and the brilliancy of the picture impaired; if too small, the illumination on the screen would be clouded in some parts about the margin. When the light is properly adjusted, the illumination on the screen will be free from either orange or blue color, and will be even and bright all over.

A Clear Field.—When focusing the light upon the screen, before the film is placed in the machine, we advise having a clear field on the screen, but the advice in this matter should not be misunderstood. It is not practicable to have what might be called an absolutely clear field without great loss of light. To obtain a perfectly clear field, it would be necessary to make the disc of light over the aperture plate so large that probably not more than one-half or one-third of the illumination that passes through the condensing lenses would be available. This method is practiced abroad, but they use two or three times the amount of current to overcome the loss in illumination. In this country it is customary to reduce the disc of light on the aper-

ture plate to a point where it will just nicely cover the corners, thus utilizing all of the available illumination. This method will leave a very light purplish or violet cloud in the center of the illumination, but when the picture is projected on the screen it is not possible to detect it. This is the method that we recommend as being most practical.

The following diagrams illustrate the results of defective centering, showing the shadows and stating the cause. These can be speedily remedied and a little practice will soon make one adept in centering the light accurately.

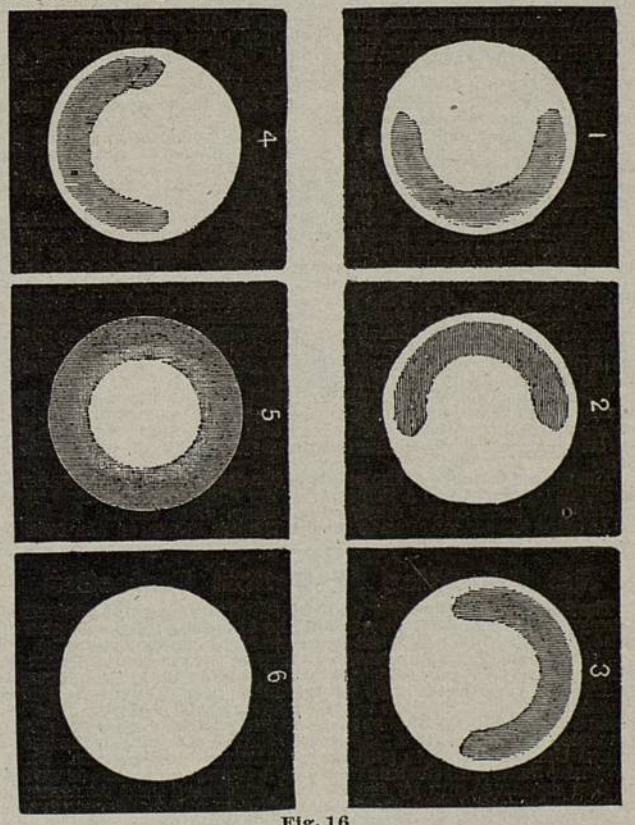


Fig. 16

In Figs. 1 and 2, the radiant, i. e. the crater, needs to be properly ad-

justed laterally, it is too far to the right or left.

In Figs. 3 and 4, it is too high or too low.

In Fig. 5 it is too far from condenser lenses and if too near a dark spot will be noticed in center of screen.

Fig. 6 shows it to be in correct position, the field being entirely clear.

Remember that the illumination is not in the lens. If your illumination is not sufficient your light is at fault. The lens should give you a sharp focus on the picture, giving sharp detail, but the strength of the illumination must come from your arc lamp or calcium jet. If your lens does not give you a sharp focus after you have turned the focusing ring to both of the extremes of adjustment, it will be an indication that the slip tube is either too near or too far from the film, in which case it will be necessary to slide it in and out until a clear picture is projected upon the screen.

Open the film gate, swing it to the left, turn the crank of the motion picture machine so the leaves of the shutter do not cover the opening in the aperture plate, so as to allow a free passage for the light through the aperture plate and the objective lens. This should be done before the film is placed in the machine.

The objective lens on the front of the motion picture machine should now be focused by turning the focusing ring until the square of light on the screen is sharply defined; that is the margin of the light opening should be clean and sharp and not fuzzy. When this is done only a slight adjustment is required to focus the picture sharply when the film is in place. All of the above adjustments should be accomplished before the film is placed on the machine. We recommend the use of a piece of mica on which some sharp scratches have been made with a knife, for the purpose of getting a sharp focus before the film is put in place, and we consider this a very good plan. A piece of ruled mica is furnished with each Motiograph.

When using the Motiograph equipped with the Automatic Fire Shutter it will be necessary to open the film gate when doing the preliminary focusing of the objective lens, and to see that the illumination on the screen shows a clear outline of the margin of the aperture plate.

The proper distance of the points of the carbons from the condensing lenses is about 3½ to 4 inches, varying slightly, depending upon the length of focus of the condensing lenses. Care should be taken not to bring the arc too close to the condensing lenses, as the intense heat is liable to break them.

The Principles of Optical Projection

The following brief review of the leading principles of projection is designed for the reader who, having no knowledge of the science of optics, wishes to understand the operation of projection apparatus.

With the aid of the apparatus we throw or project upon a screen an enlarged image of a transparent object (a slide or film). The process is almost the reverse of ordinary photography. For example, in photographing a scene by means of the photographic objective lens we obtain a reduced image of that scene on the ground glass. This glass is replaced by the sensitized plate and by the use of chemicals the image is fixed thereon. Now, in projection we reverse this process. From the picture made with the lens we make a transparent slide, or we use the film negatives, and by means of a condensed light we strongly illuminate these and with an objective lens an enlarged image is projected upon the screen, and this screen image corresponds with the real objects first photographed.

From this illustration it will be seen that the first essential in

projection work is the lense or objective. Just as in photography, the quality and tone of the picture depend to a very great extent upon the quality and character of the lens, so in projection the objective is the factor which determines the excellence of the screen image.

The condensing lenses must be of a diameter slightly greater than the diagonal of the slide or film in use. The size most commonly used is 4½ inches in diameter.

As the condensing lenses are in close proximity to the arc or other source of light, they are, of course, subject to considerable heat and will expand and contract accordingly as they are heated or cooled. Some arrangement should therefore be made for this expansion and contraction so that it will be as even as possible. We have done this in our patent ventilated mount, which provides for the circulation of air and ensures the even expansion and contraction of the condensers.

The optical principle of projection for both lantern slide and moving picture apparatus will, perhaps, be more readily understood from the diagram following:

At A is an electric light or other suitable illuminant, the light from which is caught up by the condensing lenses or condenser B; this condenser is an arrangement of lenses so constructed as firstly, to gather up as great a volume of light as possible, and secondly, to concentrate the light which it gathers at the center or diaphragm plane of the objective when the objective is located at the proper distance from the slide or film, which distance is determined by the focal length of the objective.

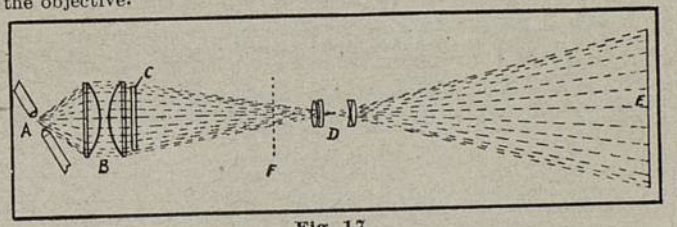


Fig. 17

Diagram Showing the Principle of Optical Projection

The slide or film should be placed at such a point that the entire area of the opening is fully illuminated, and it should also be placed so that the greatest number of light rays possible should pass through it. Taking into consideration the fact that the opening in the mat in the lantern slide is 2¾ x 3 inches and in the moving picture film 1 1/16 x 1 3/8 inches, it will at once be evident that the slide must be placed at the point C in the diagram in order that its entire area be covered, and the moving picture film must be located at the point F in order that it may take in the greatest number of light rays.

Proceeding from the slide the light passes through the objective lens at D, where the rays cross, and the object is hence reversed, which accounts for the necessity of placing the stereopticon slides or picture film in the machine up side down and by means of the objective the object is imaged or delineated upon the screen E. The degree of sharpness and flatness of the image depends upon the optical corrections of the lens.

The relative positions of the arc, condenser and objective must be such that an image of the light source will be formed at the diaphragm of the objective. All the light coming from the condenser is then utilized and the image on the screen is at its brightest.

Oftentimes lantern slides and films are to be used interchangeably and approximately the same sized image is desired with both. As the opening in the slide mat is approximately four times that of the moving picture film, it is, therefore, necessary to have a lens for lantern slides approximately four times the focal length of that of the lens used in films. It is possible to match the size of the images in one dimension only (either width or height) as the two openings are not proportionate in size.

It is necessary therefore in ordering to specify whether the images are to be the same height or width.

The Selection of a Lens

The most important consideration in projection work is the lens, for on its selection depends the quality and size of the image on the screen. Not the lens mounting nor the diameter of the lens itself, but its equivalent focus and distance from the screen, determine the size of the image.

At a given distance the greater the focal length the smaller will be the image. Shorter focus lenses, therefore, will give larger images. Do not make the mistake of selecting lenses of such short focus that the magnification will be so great that when the observer is near the screen much of the definition and perspective will be sacrificed.

Brilliant pictures of medium size are far more satisfactory. The projection distance must be measured from the film or slide to the screen.

Size of Image:—This can be determined by multiplying the difference between the distance from lens to screen and the focal length of the objective by the size of the slide and dividing the product by the focal length. For example:

Let L be the projection distance, 40 feet (480 inches); S, the slide mat, 3 inches; F, the focus of the lens, 12 inches; then we have the formula (in which D is the size of the image).

$$D = \frac{S\,(L - F)}{F}$$

Substituting for the letters their known values we have

$$D = \frac{3\,(480 - 12)}{12} = 117 \text{ in. or } 9\tfrac{3}{4} \text{ ft.}$$

Focal Length:To determine this factor multiply the size of the slide or film opening by the distance from the lens to screen and divide the product by the sum of the size of the image and the size of the slide.

Thus we have the formula $F = \frac{S \times L}{D + S}$ and substituting their values as before

$$F = \frac{3 \times 480}{117 + 3} = \frac{1440}{120} = 12 \text{ inches.}$$

Distance from Slide to Screen;—With the other factors given we can get this by multiplying the sum of the size of the image and size of slide mat by the focal length and divide this product by the size of slide mat, thus:

$$L = \frac{F\,(D + S)}{S} \text{ substituting values}$$

$$L = \frac{12\,(117 + 3)}{3} = 480 \text{ incehs} = 40 \text{ feet.}$$

THE 1911 INSTRUCTION BOOK will be required for the Motiograph of the 1908, 1909, 1910 and 1911 Models.

Motion Picture Lenses

Table showing size of screen image when moving picture films are projected.

Size of Mat opening 11-16 x 15-16 inch.

E. F. In.	15 ft.	20 ft.	25 ft.	30 ft.	35 ft.	40 ft.	45 ft.	50 ft.	60 ft.	70 ft.	80 ft.	90 ft.	100 ft.
2½	....	5.4	6.8	8.2	9.6	10.9	12.3	13.7	16.4	....	....	....	....
	....	7.4	9.3	11.2	13.1	14.9	16.8	18.7	22.4	....	....	....	....
3	....	4.5	5.7	6.8	8.0	9.1	10.3	11.4	13.7	16.0	....	....	.. .
	....	6.2	7.7	9.3	10.9	12.4	14.0	15.6	18.7	21.8	....	....	.
3½	....	....	4.9	5.8	6.8	7.8	8.8	9.8	11.7	13.7	15.7	....	....
	....	....	6.6	8.0	9.3	10.6	12.0	13.3	16.0	18.7	21.4	....	..
4	....	....	4.2	5.1	6.0	6.8	7.7	8.5	10.3	12.0	13.7	15.4	...
	....	....	5.8	7.0	8.1	9.3	10.5	11.6	14.0	16.3	18.7	21.0	....
4½	....	....	....	4.5	5.3	6.2	6.8	7.7	9.1	10.6	12.2	13.7	15.4
	....	....	....	6.2	7.2	8.4	9.3	10.5	12.4	14.5	16.6	18.7	21.0
5	...	....	....	....	4.8	5.4	6.1	6.8	8.2	9.6	10.9	12.3	13.7
	....	....	....	....	6.5	7.4	8.4	9.3	11.2	13.0	14.9	16.8	18.7
5½	....	....	....	....	4.3	4.9	5.6	6.2	7.4	8.7	9.9	11.2	12.4
	....	....	....	....	5.9	6.7	7.6	8.4	10.2	11.9	13.6	15.3	17.0
6	....	....	....	....	....	4.5	5.1	5.7	6.8	8.0	9.1	10.3	11.4
	....	....	....	....	....	6.2	7.0	7.7	9.3	10.9	12.4	14.0	15.6
6½	....	....	....	....	....	....	4.7	5.2	6.3	7.3	8.4	9.6	10.6
		....	....	....	....	....	6.4	7.1	8.6	10.0	11.4	13.0	14.5
7	....	....	....	....	....	....	4.4	4.9	5.8	6.8	7.8	8.8	9.8
	....	....	....	....	....	....	6.0	6.6	8.0	9.3	10.6	12.0	13.3
7½	....	....	....	....	....	....	....	4.5	5.4	6.4	7.3	8.2	9.1
	....	....	....	....	....	....	....	6.2	7.4	8.7	10.0	11.2	12.3
8	....	....	....	....	....	....	....	....	5.1	6.0	6.8	7.7	8.5
	....	....	....	....	....	....	....	....	7.0	8.1	9.3	10.5	11.6

Example: With a lens of 5½ inch focus at a distance of 35 feet the screen image will be 4.3 x 5.9; at 40 ft., 4.9 x 6.7; at 45 ft., 5.6 x 7.6, etc.

Note: When ordering lenses, give size of picture wanted, and distance from machine to screen.

Stereopticon Lenses

Table showing size of screen image when lantern slides are projected.

Size of Mat opening 2¾ x 3 inches

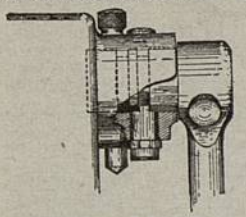
E.F. In.	15 ft.	20 ft.	25 ft.	30 ft.	35 ft.	40 ft.	45 ft.	50 ft.	60 ft.	70 ft.	80 ft.	90 ft.	100 ft.
6	6.6	8.9	11.2	13.5	15.8	18.1	20.4	....	....	....	....	....	....
	7.3	9.8	12.3	14.8	17.3	19.8	22.3	....	....	....	....	....	....
8	....	6.6	8.4	10.1	11.8	13.5	15.2	17.0	20.4	....	....	....	....
	....	7.3	9.1	11.0	12.9	14.8	16.6	18.5	22.3	....	....	....	....
9	....	5.9	7.4	8.9	10.5	12.0	13.5	15.1	18.1	21.1	....	....	....
	....	6.4	8.1	9.8	11.4	13.1	14.8	16.4	19.8	23.1	....	....	....
10	....	5.3	6.6	8.0	9.4	10.8	12.2	13.5	16.3	19.0	21.8	....	....
	....	5.8	7.3	8.8	10.3	11.8	13.3	14.8	17.8	20.8	23.8	....	....
12	....	....	5.5	6.6	7.8	8.9	10.1	11.2	13.5	15.8	18.1	20.4	....
	....	....	6.0	7.3	8.5	9.8	11.0	12.3	14.8	17.3	19.8	22.3	....
14	....	....	....	5.6	6.6	7.6	8.6	9.6	11.6	13.5	15.5	17.5	19.4
	....	....	....	6.2	7.3	8.3	9.4	10.5	12.6	14.8	16.9	19.0	21.2
16	....	....	....	....	5.8	6.6	7.5	8.4	10.1	11.8	13.5	15.2	17.0
	....	....	....	....	6.3	7.3	8.2	9.1	11.0	12.9	14.8	16.6	18.5
18	....	....	....	....	5.1	5.9	6.6	7.4	8.9	10.5	12.0	13.5	15.1
	....	....	....	....	5.6	6.4	7.3	8.1	9.8	11.4	13.1	14.8	16.4
20	....	....	....	....	....	....	5.3	6.0	6.6	8.0	9.4	10.8	12.2	13.5
	....	....	....	....	....	....	5.8	6.5	7.3	8.8	10.3	11.8	13.3	14.8
22	....	....	....	....	....	....	....	5.4	6.0	7.3	8.5	9.8	11.0	12.3
	....	....	....	....	....	....	....	5.9	6.6	7.9	9.3	10.7	12.0	13.4
24	....	....	....	....	....	....	....	....	5.5	6.6	7.8	8.9	10.1	11.2
	....	....	....	....	....	....	....	....	6.0	7.3	8.5	9.8	11.0	12.3

Example—With a lens of 10 inch focus at a distance of 20 feet the screen image will be 5.3x 5.8; at 25 ft., 6.6 x 7.3; at 30 ft., 8.0 x 8.8; at 50 ft., 13.5 x 14.8, etc.

Note—When ordering lenses, give size of picture wanted and distance from machine to screen.

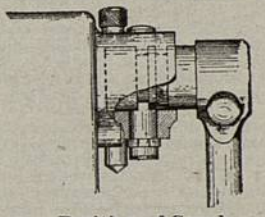
THEADING THE FILM

Film is received from the manufacturers wound in a roll, the center of which is too small to admit the core block of the reel, which



Position of Crank when Showing Pictures

Fig. 18

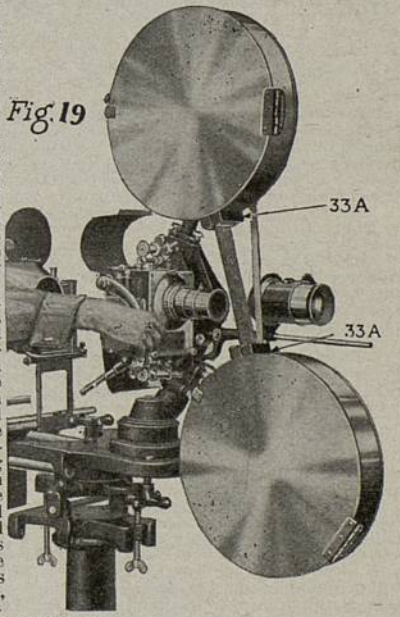


Position of Crank when Rewinding Films

makes it necessary to rewind it. This may be done by removing the lower reel from the arbor, place the roll of film on the bare arbor, insert the outer end of the film under the spring clip on the core block of the upper reel and wind the film on the upper reel.

To shift the connection between the crank and the reel arbor, all that is necessary is to press a spring plunger at the right of the crank boss of the main frame, turn the crank slightly, pull it towards you about $\frac{1}{16}$ of an inch, and the spring bolt will automatically drop into the other groove and hold the crank in place for rewinding the film. See Figs. 18 and 19.

Fig. 19



After the film has been wound on the upper reel, remove the upper reel and place it on the take-up below. Place another reel on the upper reel arm, take the outer end of the film (which was on the inside of the roll when received) pass it to the rear of the upper reel, inserting the end under the spring clip. and again wind the film on the top reel, making sure that the emulsion or dull side of the film is wound toward the outside, as it is very important that the emulsion or dull side is toward the light at all times, otherwise, all reading matter will be reversed, when running film.

When the film has been wound back on the upper reel, press the

THE 1911 INSTRUCTION BOOK will be required for the Motiograph of the 1908, 1909, 1910 and 1911 Models.

spring plunger and return the crank to its normal position. When using this form of reeling mechanism in combination with fire proof film magazines, it is unnecessary to remove either the magazines or the reels for rewinding; in fact, all that is necessary is to remove the film from the sprockets and shift the magazines so that the fire traps No. 33A will be directly toward each other as per figure 19.

With reasonable care and by the use of a few feet of white undeveloped film on each end of the picture film as leaders, the operator will see that the film is nearing the end and it can be run and rewound time after time and it will not be necessary to disconnect the film from either reel until the film is to be changed for a different subject.

When film is rented from a rental exchange it will be received wound on a reel as explained above, then all that is necessary is to see that the end containing the title is on the outside, otherwise it will be necessary to rewind the film as above

Draw from the reel a length of about two feet of film, press the handle of the upper sprocket roller bracket No. 24 to the left as far as it will go, pass the film under the sprocket wheel so that the teeth of the wheel engage in the perforations of the film, and press the top of the roller bracket to the right until the roller comes into place against the sprocket wheel and holds the film in place. The rollers should not press tightly against the film, and there should be just room enough between the roller and the sprocket wheel for the film to pass without being pressed. The adjustment of these rollers is accomplished with the screw No. 203 and check nut. This adjustment is always properly set before the machines leave the factory, and should not require any further attention until the rollers have become somewhat worn, unless someone tampers with the machine. However, it is well to keep this adjustment in mind.

Press the film gate latch No. 154 to open the gate, swing the gate back, raise the intermittent sprocket roller bracket No. 23 until it stands in a horizontal position, lay the film on the aperture plate in such a position as to leave a loop at the top, and return the intermittent roller bracket to its original position, to hold the film in place on the sprocket teeth of the intermittent sprocket.

The intermittent roller bracket has a screw adjustment the same as those of the upper and lower roller brackets, except that it has a check screw instead of a check nut to hold the adjustment.

Press downward on the handle of the lower roller bracket, pass the film over the lower feeding sprocket wheel, leaving a loop between the intermittent and the feeding sprocket. See that the teeth engage the sprocket holes in the film and turn the roller bracket to place. Pass the loose end of the film over the core block of the lower take up reel and under the end of the spring clip.

When threading the film, it would be well to place the framing lever about the middle of the two extremes of its up and down movement, for by so doing the upper and lower loops may be properly proportioned so as not to require rearrangement.

Turn the handle of the machine over to the right toward the front of the machine at the rate of about one revolution per second. The exact speed at which the handle should be turned will readily be determined by the movements of the figures in the pictures, which should be normal and natural.

While the machine is in motion test both bottom and top loop to see that they are sufficiently long. Take hold of the framing lever handle No. 75, swing it up and down while machine is in motion as far as it will go, and when at the two extreme positions there should still be a small loop remaining. If the loop is entirely taken up, the roller bracket should be opened and the loop extended sufficiently. If this is not done the film may be torn. You are now ready to start. The loops should not be too long as they have a tendency to vibrate considerably, which may make the pictures unsteady.

It is Important when running new film to scrape off the spots of film emulsion that collect on the film tension springs and the ribs of the aperture plate. These accumulations, if allowed to remain, have a tendency to not only scratch the film, but make it run unsteady, and are liable to be the cause of slightly tearing the corners of the sprocket holes in the film, besides making the machine run heavy, with increased wear to the parts. A silver dime is a good instrument to use for scraping them. On the first run the tension springs should be scraped about three times while making a run of one thousand feet. Do not scrape the springs with a knife or other steel instrument, as it would be liable to leave a rough surface on the tension parts that would injure the film.

Very often through carelessness or accident the film is broken or torn, consequently anyone attempting to operate a motion picture machine will find that mending a film, or making a patch, as it is more commonly called, a matter of greater importance, as a poor or improperly made patch will cause more trouble than the beginner can imagine. In the first place, if the film is cut off in the wrong place it will cause a misframe every time the patch passes through the machine. Second, if the perforations or sprocket holes are improperly matched the mend will be crooked or two holes will be too small, causing the film to jump and very often throws it off the sprocket entirely and many other troubles too numerous to mention. To make a patch properly proceed as follows: Cut the film as per figure 20, making a stub end as indicated by the letter **A**, not to exceed 3-16 in. long, and cut **B** exactly on the dividing line between the first two perfect pictures, cutting away all the damaged film. Now lay a small metal straight-edge in position as shown by dotted line E in figure 20. With a sharp knife scrape the emulsion from the stub, indicated by letter **A**, right up to the edge of the straight-edge, scraping down the celluloid until a rough whitish-gray surface is produced. Be sure to scrape well around the sprocket holes since this is where the patch usually begins to loosen. Now turn end **B** over with emulsion side down and

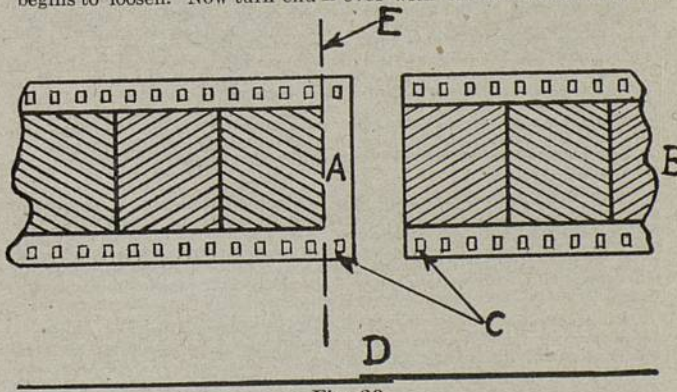


Fig. 20

again using straight-edge scrape back of film for a space equal to the width of stub end **A**. This latter proceeding is very important since there is likely to be oil on the celluloid, but even if there is not, the

patch will not adhere nearly so well if the back of film is not well scraped. It takes a very sharp knife to do the scraping properly. (A bit of emery paper fastened to a block of wood makes a good substitute).

Be sure emulsion sides of both ends are either up or down, apply your cement liberally on the stub end **A** and working fast since cement evaporates rapidly, join the two ends so that end **B** just covers stub **A**, being very careful to have the sprocket holes **C** perfectly matched and press the patch together firmly, applying all the pressure you can for a few seconds, when the cement will have set and the patch is finished, and if properly made will appear as shown in D figure 20 when looking at the film edgewise.

A film mender as shown in figure 21 will be found very convenient to mend or splice films with ease, accuracy and speed. It has metal projections for properly locating the films between the clamps and a glass plate to prevent the cement from sticking the film to the mender and are made of hard wood with nickel plated trimmings. A specially prepared (film) cement is required for mending or splicing moving picture films and may be obtained from any film exchange or dealer in motion picture supplies, or from us direct.

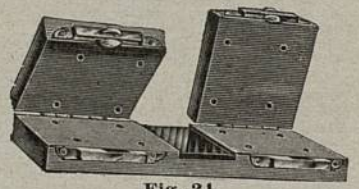


Fig. 21

STEREOPTICON VIEWS

To show stereopticon views, it is necessary to push the lamp house to the extreme left and adjust the stereopticon lens so it is central with the round disc of light which has previously been adjusted for the motion pictures. The light rays should center properly through the stereopticon and give a clear field of illumination on the screen. The lamp house should be slid to one side and the other testing the illumination through both the motion pictures and the stereopticon lens to average up the differences and get a good illumination on both. When using lenses as short as 10 inch for the stereopticon views and 3 inch for the motion pictures, a very close adjustment is required. The adjustment need not be so close if the distance between the arc lamp and the condensers is increased about a half inch for the stereopticon views.

Such a close adjustment is not required for lenses of longer focus than above.

The Side Adjustment of the Steoropticon Lens, to make the Stereopticon picture register with the Motion Picture **when using the Stereo-Motiograph** is accomplished by loosening the screws that hold the metal sub-base of the Motiograph mechanism on the baseboard, turn the mechanism to the left until the Motion Picture registers on the same spot on the screen as the Stereopticon view projected from the upper stereopticon; then tighten the screws in the sub-base.

Stereopticon Views Brighter than Motion Picture Views.—Beginners are apt to be puzzled by the difference in brilliancy between stereopticon and motion picture views, but this must be expected, and is due to the motion picture having to be magnified about four times greater than the stereopticon view. The standard size of view (inside the mat) from which a stereopticon picture is projected is 2¾ x 3", while the size of the view from which the motion picture is projected measures about ⅛x⅛ of an inch.

Focal Length of Condensing Lenses Important

When a motion picture objective lense of from 3" to 4½" focus is used, a 6½" focus condensing lens in the rear nearest the light and a 7½" focus front condenser will be required, and for from 5" to 7" equivalent focus objective lenses, use a 7½" focus condensing lens for both front and rear.

Two 7½" focus condensers will answer the purpose in most all cases although at times when using objective lenses over 7" equivalent focus, a 7½" focus condensing lens in the rear and 8½" or 9" focus condensing lens in front will prove more satisfactory. The longer the focus of condensing lenses used the further the arc light will be from the rear condensing lens, which greatly reduces the heat and breakage, although at a slight loss of illumination.

Breakage of condensing lenses is usually caused by drafts of air striking the condensers when the lamp house door is open or from excessive heat caused by allowing the arc to become too long, causing the carbons to flame and flame striking the rear condensing lens. Any precaution taken to prevent the above will tend to reduce breakage.

SETTING THE SHUTTER

Setting the No. 1 Intermittent Double Cone Shutters on the No. 1A Motiograph, Model 1912.

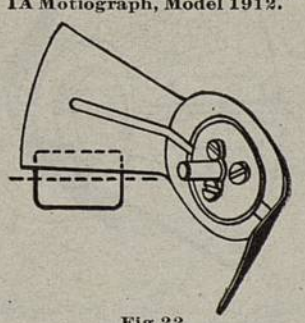


Fig 22.

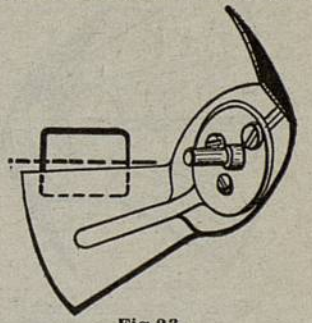


Fig 23.

The principle of setting the shutters for the Motiograph is the same as for any other Motion Picture machine, that is, the larger wings of the shutters should cover the light opening or aperture as nearly as possible during the time that the intermittent sprocket and film are in motion, and the smaller wings should pass during the exposure while the film is at rest. It is not necessary to pay any attention to the small wings when setting the shutters, as they take care of themselves and are only intended as interrupters of the light, which reduces the flicker in the picture to a minimum.

To set the shutters, remove the front plate which carries the lens after which remove the outer shutter wing (the one nearest you) loosen the screws on the inner shutter, leaving the shutter just loose enough on the shaft to be turned easily by hand, and tight enough so they will not move of their own accord. Remove the gear cover, after which take hold of the balance wheel and turn the the mechanism in the same direction as during the operation of the machine; **turn very slowly until the intermittent sprocket wheel starts to move, after which set the lower edge of the large wing of the inner shutter** about ⅛ inch above the center of the aperture opening (indicated by a dotted line in illustration Figure No. 22) when looking on a line parallel through the

center of the light aperture. Now revolve the mechanism slowly in the same direction, observing when the intermittent sprocket wheel stops, that **the top edge of the large wing of the inner shutter is about 1-8 inch below the center of the aperture opening** (indicated by a dotted line in illustration Figure No. 23.)

Tighten the screws firmly, after which revolve the mechanism until the inner shutter is at the original position, that is, the lower edge of the large wing should be about ⅛ inch above the center of the aperture opening. Replace the outer shutter on the shaft, tighten the screws partially in the same manner as was done with the inner shutter, **set the top edge of the large wing about 1-8 inch below the center of the aperture opening** (indicated in Figure No. 24) after which tighten the screws firmly.

The space between the two large wings of the shutters should be exactly the same width when the intermittent sprocket is just ready to start (but not started), as it is just as the intermittent sprocket has come to rest after turning, and said space should be exactly in the center of the aperture opening when looking on a line parallel through aperture opening.

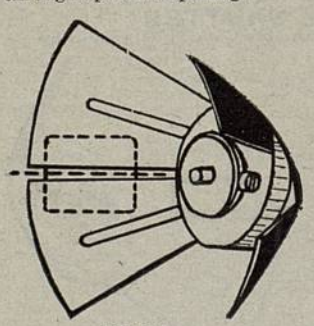


Fig 24.

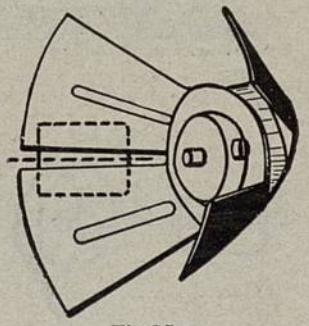


Fig 25.

Figure No. 25 represents both shutters in the position they should occupy when the intermittent sprocket wheel stops.

After the setting of the shutters has been once done it will be found very simple and easy to repeat.

The Auxiliary Front Intermittent Shutter No. 3 has been designed to fill two special requirements, but not an improvement on our No. 1-A double cone shutter, which is by far the best shutter on the market. The first of these requirements is to accommodate lenses of extremely short focus. Lenses of shorter focus than about 2¾ inches cannot be used to advantage with the regular Motiograph No. 1 double cone shutter, and when lenses of shorter focus than about 2½ inches are to be used we recommend the use of the auxiliary front intermittent shutter No. 3, which may be attached to and used with the No. 1-A mechanism. The first of which were placed on the market in April, 1910. With this form of shutter there is no limit and lenses of as short focus as may be desired can be used. We will say, however, that extreme short focus lenses should never be used where the machine could be set at a greater distance from the screen where longer focus lenses can be used, especially where the machine is to be located considerably to one side above or below a line that would be parallel with the center of the screen, because at best, an extreme short focus lens requires the greatest possible care in focusing and when located

at a considerable distance to one side, above or below a line that will be parallel with the center of the screen, it will be impossible to get a sharp focus on all parts of the picture. The other reason for which the Auxiliary front shutter was designed is to satisfy the demands of the few who believe that with its use the picture is more free from flicker. While it does project a picture quite free from flicker it is at a great sacrifice of illumination and brilliancy.

To Attach the Auxiliary Front Intermittent Shutter.—Remove the lens plate on front of mechanism by loosening the two thumb screws at the bottom, lift up the spring at the top, while puling the front plate forward sufficiently to disengage the spring and lift it up to disengage it from the thumb screws below. Remove the gear cover by loosening the three screws, one in front, one in back and one at the top of the mechanism which hold the gear cover in position; then loosen the two screws No. 206—Fig. 29, remove the shutter No. 170-A, remove the screws shown in Fig. 22 and remove the shutter No. 171-A. Next remove the shutter drive shaft screw No. 41-A, Fig. 29, which holds No. 46-A bevel gear on shutter shaft, then loosen the small set screw in gear bridge which holds No. 42-A bushing for governor drive in position and loosen the small set screw which holds No. 69-A bushing for shutter drive arbor in position. The whole shaft may now be pushed toward the gear bridge sufficiently to allow No. 46-A bevel gear to drop out. With the front shutter is furnished a bevel gear similar to No. 46-A, except that it is smaller and is to be attached to the shutter drive shaft on the inside of the mechanism by simply reversing the operation on which we have just explained to remove the gear No. 46-A. These bevel gears are held on the shutter drive shaft by the single screw in the center. There is a steel plate attached to the center of the gear on which there is a tongue which engages with the grooves of the same size in the shutter drive shaft. Care should be exercised that the tongue is properly engaged with the groove in the shaft, before tightening the screw No. 41-A, Fig. 29.

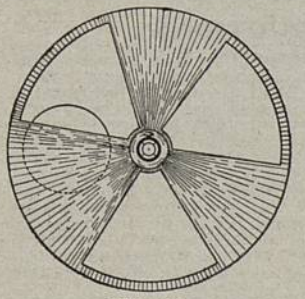


Fig. 26

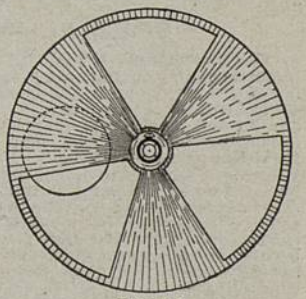


Fig. 27

The No. 3 front shutter is used in front of the lens and is mounted on a front plate which is to be used in place of the regular front plate that comes with the Motiograph machine. Insert the shutter shaft through the bushing in the front plate and place front plate on front of mechanism in the same position as the other was fouud, being careful to engage the teeth of the bevel gear on the shutter shaft, with the teeth on the bevel gear No. 46-A on the shutter drive shaft. All that now remains to be done is to set the shutter as per the following instructions:

To Set the No. 3 Shutter. Place the shutter on the shutter shaft, as shown in illustration. It is held in place on the shaft by a thumb nut on the end of the hub. The shutter consists of three wings, one of which is larger than the other two. The large wing is intended to cut off the light while the film is in motion and the other two serve as interrupters for the reduction of flicker. To set the shutter in time with intermittent film sprocket, loosen the thumb nut on the hub of the shutter, and small screw in center of hub, take hold of the balance wheel and turn the mechanism very slowly in the same direction as when in operation until the intermittent sprocket begins to move. Set the top edge of the large wing so it is about ¼ of an inch above the center of the lens. (See Fig 26). Now turn the balance wheel until the intermittent sprocket stops then see that the lower edge of the large wing of the shutter is about ¼ of an inch below the center of the lens. (See Fig. 27). The shutter should be set as far back on the shaft as is practicable, that is, not to exceed about ⅛ inch from the front of the lens mount. When properly located tighten the thumb nut on the shutter hub, and small screw in center of hub. When long focus lenses are to be used, the shutter may be reversed on the shaft, that is, the hub and thumb nut placed at the rear. This will make it possible to set the shutter well to the front, so as to pass in front of a long focus lens.

When using alternating current of 60 cycles, two interrupters may be objectionable, owing to the fact that at times the alternation of the current is liable to run synchronously with the interrupters in the shutter in such a way as to very largely cut down the illumination. Where this condition exists, the only remedy is to use a shutter having but one interrupter, in which case it would be necessary to use either our regular cone shutter on the inside of the shutter box or that we should furnish the shutter in front of the lens with but one interrupter instead of two, known as the No. 3½, but where the one interrupter is used only in front of the lens, it will not give quite as smooth a picture as with two.

SPECIAL INSTRUCTIONS.

GOOD SCREW DRIVERS A NECESSITY. It is of most vital importance in working on a piece of machinery that a sufficient number of screw drivers should be kept on hand to cover the full range of sizes of screws that are in use. The screw drivers should be of good quality and of such a temper that they will hold their shape. Next of importance to a sufficient range of sizes in screw drivers, is to **"Keep them in proper condition."** Never, under any circumstances, allow your screw drivers to be sharpened with a short taper. They should have a very long taper with the edge perfectly flat on the bottom and the corners where they come in contact with the screw slot, should be squared in the form of almost a right angle. Under no circumstances should screw drivers be used on which the corners have become rounded, because the screws on which it is used will very quickly become ruined, not only making it difficult or impossible to turn them, but at the same time will give the machine a very untidy appearance.

There are several important adjustments in the Motiograph machine that it will be necessary for the operator to concern himself with.

First:—The proper adjustment of the shutters as described in "Setting The Shutter" on another page. If, for any reason the shutters should be thrown out of time from coming in coutact with something inserted within the machine while in motion, the wings of the shutter would not cut off the light at the proper moment with relation to the movement of the film, the result would be a streaking of the picture known as a "travel ghost", which is especially noted on the reading matter or title of the picture, or where a white object is shown on a dark or black background, the white streak will be noticed either up

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or down from the white object extending into the black background instead of a sharp clear-cut picture as it should be. The above may easily be remedied by carefully following the instructions on "Setting The Shutters".

If the above condition exists it will also be impossible to get a clear focus with the lens.

Second:—The proper adjustment of the idler on the take-up belt is important as, if too tight, it will pull too hard on the film causing unnecessary wear on the gears of the machine throughout and especially shortening the life of the lower feed sprocket, as the teeth of same soon become "hook" shaped which in turn, causes unnecessary wear on the perforations or sprocket holes of the film. It also makes the machine run much harder.

The flexible, broad, flat belt in combination with the adjustable idler, shown in Fig. 2 furnishes a most senstiive yet positive means of taking up the film without doing injury to it. The proper adjustment is obtained by manipulating screw No. 156, Fig. 2 which raises or lowers the idler No. 109, Fig. 2 which tightens or loosens the belt as the case may be. It should be just tight enough to make sure that the film will be wound upon the take-up reel as fast as it comes through the machine, being careful not to get it too tight as the looser it is possible to run it, the better for everything concerned.

The belt idler adjustment screw No. 156, Fig. 2, is provided with two check nuts the purpose of which is, that when the desired adjustment of the belt has been secured, the screw may be locked in position so that it will not loosen of its own accord. When the film is being rewound on the mechanism the belt should be lifted off of the belt tension idler No. 109 Fig. 2, as otherwise it will be too tight and cause too much friction and unnecessary wear in the gears of the rewind attachment.

Third:—The adjustment of the sprocket rollers or idlers should be given careful attention. There should be just room enough for a double film to pass freely between the rollers and sprocket without pressure on the film when a patch passes through the machine, as in these places the film is double. The film rollers are adjusted to position by a set screw that passes through the roller bracket provided with a check nut on the upper and lower bracket and a check screw on the intermittent roller bracket which should be tightened so as to retain the adjustment after properly made.

Fourth:—The adjustment of the governor and fire proof shutter is accomplished by sliding endwise the pivot bushings No. 194 Fig. 29, which is located in the main frame and No. 193-A, which is located in the gear bridge on the end of gear No. 90, Fig. 29, by first loosening the screws which hold them in their respective positions.

To adjust the fire shutter loosen the screws as above stated and with the film door closed, holding the bushings between the thumb and finger, slide them slightly in and out together with the governor until the point is reached where the fire proof shutter No. 163, Fig. 29, will be just ready to raise when the machine is started in operation, and so that it will just barely rest on the pin upon which it drops when the machine is stopped. If properly adjusted the shutter will quickly raise all

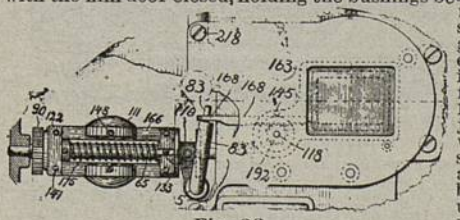

Fig. 28

Shows fire shutter, governor, crank arbor and rack bar.

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the way up as soon as the machine is started and will just as readily drop all the way down when machine is stopped. When the fire shutter governor is properly located as above directed, tighten the screw which holds bushing No. 193-A in gear bridge, then push the bushing No. 194, Fig. 29, toward the gear bridge so that it will rest lightly against the shoulder of No. 65 governor arbor Fig. 29 and tighten screw which holds bushing in position.

The governor that operates the fire-proof shutter may be removed from the Motiograph if necessary by removing the bushings at each end of the governor shaft or arbor as above directed, or by removing the gear bridge and inside bushing, No. 194, Fig. 29.

In adjusting or replacing the fire shutter governor do not adjust the bushing too tight against the shoulders of the arbor, as it will cause the machine to run hard and besides the wear will be excessive. The raising of the fire shutter is accomplished by the No. 111 governor balls spreading apart when the machine is in motion, pulling the No. 110 roller guide toward them which connects with the No. 83 governor crank arbor, which in turn connects with the No. 168 rack bar, the same being in turn connected with the smaller gear on No. 163 brass shutter, all of which work automatically. When the mechanism is stopped the No. 175 governor springs bring the two No. 111 governor balls together, whice again lowers the fire shutter No. 163.

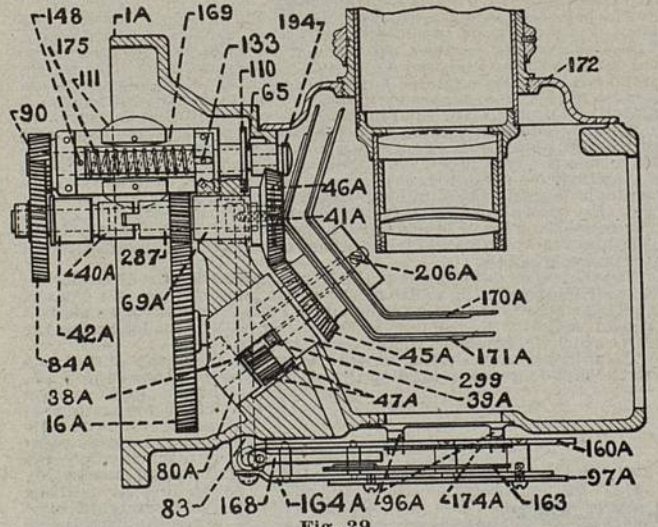


Fig. 29

Shows sectional view of intermittent shutter, fire shutter and governor, tension bars and springs.

Fifth:—The proper adjustment of the film tension bars and springs is very important as, if they are too tight, they are liable to cause great damage to the film and unnecessary wear to the intermittent sprocket, and if too loose they will not hold the film steady, causing the picture to jump on the screen. They should be just tight enough

to hold the film steady when machine is running but there should be no excessive pull felt at the crank handle each time the intermittent sprocket pulls down the film when the film door is closed and machine is in operation. To adjust the tension spring No. 174-A, Fig. 29, remove the film gate from the mechanism by loosening the hinge screw at the top of door while door is open sufficiently to allow the door to drop down slightly after which it may be lifted up off of the lower hinge screw, being careful to lift No. 168 rack bar off the governor crank arbor No. 83. Loosen the upper screw in the cooling plate of the door and swing cooling plate around out of the way. Then remove the two screws which hold the No. 174 tension spring in position. Now slip the tension spring down slightly in order to release it from the hooks of the No. 96-A tension bars. Note carefully just how all parts are placed before they are removed for adjustment or replacement, otherwise considerable trouble may be experienced when replacing same. If it is desired to tighten the film tension, bend the spring down slightly on the ends so that the center of spring will be higher than the ends, in fact a slight bow shape, then when the screws are replaced and the center of the spring is drawn down into position, the ends of the spring will bear on the tension bars, giving the desired tension on the film when the door is closed. If, in case there is too much tension and it is desired to loosen it, simply reverse the operation of bending the spring. Care should be exercised not to bend the spring up or down too far, as they are very highly tempered and are liable to break. In replacing the door be careful to get the No. 168 rack bar back in the proper position on the No. 83 crank arbor. All of the above numbers referred to will be found in Figs. 28 and 29.

Sixth:—Another and perhaps one of the most vital adjustments is that of the Geneva movement called the star and cam that operates the intermittent film sprocket, although easily accomplished once it is understood; however, it is unnecessary to make any adjustments on the above unless the star and cam becomes considerably worn after a

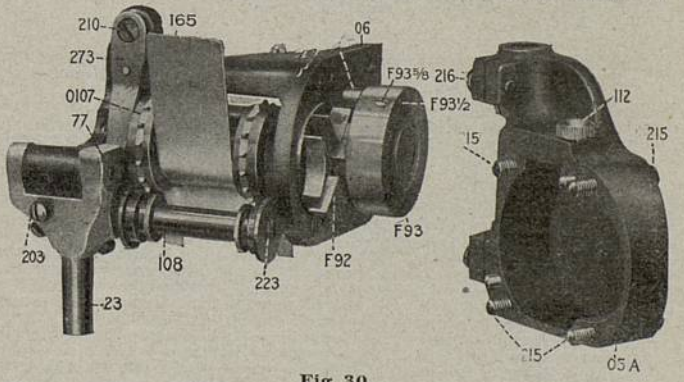


Fig. 30

The No. 1A Model 1912 Framing Device is shown above with vertical casting removed, exposing star and cam.

continual run for some time and a lost motion has developed which can readily be ascertained by taking hold of the teeth of the inter-

mittent sprocket and shaking same up and down when the star wheel and intermittent sprocket are at rest; that is when the pin No. F-93½, Fig. 30, in the Geneva driver or pin wheel No. F-93 is on the opposite side of the pin wheel from the star wheel No. F-92. To eliminate the above lost motion, proceed as follows: First, remove the side or license plate from the mechanism by raising up the little thumb nut on the front of the crank shaft boss, pull the top of the plate outward and remove it; now loosen the two smaller thumb screws at the bottom of the front plate which carries the lens and raise the spring at the top

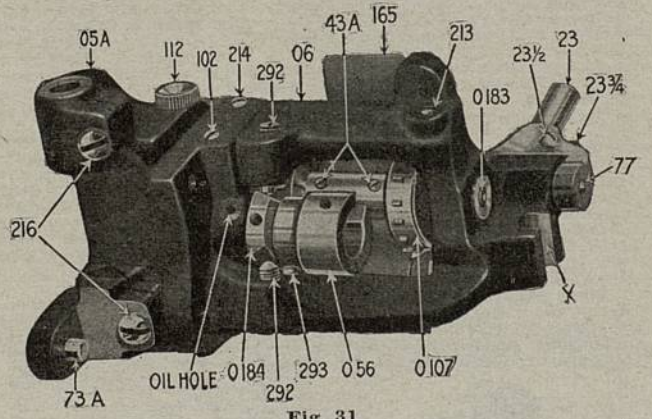


Fig. 31

The No. 1-A Model 1912 Framing Device is shown above with vertical casting attached, enclosing star and cam in an oil-tight chamber.

slightly, at the same time pull the top of front plate outward and raise it up to disengage it from the screws on the lower corners and remove it. Open the film gate by pressing the little button or projection shaft at the front of and a little below the crank shaft boss. On the front of framing device upright casting, No. 05-A, Fig 31, will be found two round head screws, No. 216, which serves to clamp the two split bosses through which the vertical slide rod No. 72 passes from the top to the bottom of the main frame of the mechanism, which screws into bottom of same. These screws are for increasing the tension of the framing device to prevent it from shifting out of position while the mechanism is in operation. Loosen these screws so as to relieve the tension on the vertical rod so it can be easily turned, then unscrew it and pull it out through the top of mechanism. Remove the entire framing device through the aperture in the side of mechanism.

After having removed the framing device as above directed it will appear as shown in Fig. 31, and may now be adjusted as follows:

First, Loosen the small, headless set screw, No. 102, Fig. 31, to set the Geneva parts closer together, loosen the lower set screw, No. 292, Figs, 31 and 32, slightly; then tighten the upper set screw No. 292, Figs. 31 and 32. This operation may be repeated loosening and tightening the screws respectively a little at a time until all of the lost motion is eliminated. Have the adjustment of the Geneva driver, cam or pin wheel, No. F-93, Fig. 30, just close enough to the star wheel,

THE 1911 INSTRUCTION BOOK will be required for the Motiograph of the 1908, 1909, 1910 and 1911 Models.

No. F-92, Fig. 30, that the movement of the pin wheel shaft will be free and easy, yet so there will be no circular movement to the intermittent sprocket wheel, No. 0107, Figs. 30 and 31, while it is at rest. Do not tighten so the cam or pin wheel will not work perfectly free. If too tight, simply reverse the above operation by loosening the top screw, No. 292, Figs 31 and 32, and tighten the lower screw No. 292. When the Geneva movement is in proper adjustment do not forget to retighten the headless set screw, in fact have all screws perfectly tight when through with adjustments. The Motiograph machine has only one eccentric bushing, No. 0184, Fig. 32 and 33, which is located on the cam shaft, making it much easier and more simple to adjust than other machines which have two eccentric bushings, one on each end of the intermittent sprocket shaft and requires very close attention when adjusting in order that the intermittent sprocket will be level.

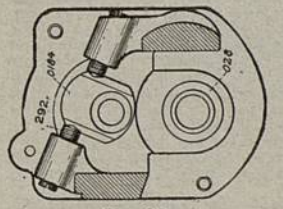


Fig. 32.
Eccentric Bushing Adjustment

If lost motion is developed endwise on the intermittent sprocket shaft it may be eliminated by loosening the headless set screw, No. 213, Fig. 31, which will be found on the small end of horizontal casting, No. 06, and directly over No. 0183 bushing, Fig, 33, and pushing said bushing in so that it will rest snugly against the shoulder of the star shaft, eliminating all play, but not so that it will bind when turning, then tighten set screw, No. 213, Fig. 31.

Instructions for Replacing Motiograph Parts That are Worn.

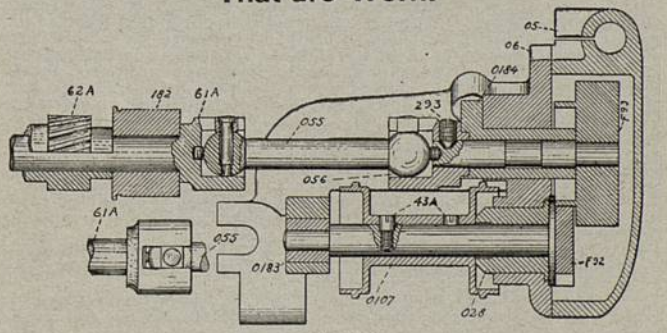


Fig. 33

Always note carefully just how parts are placed before removing them, you will then experience much less trouble in replacing them properly.

To Replace the No. 056 Ball Socket Fig. 33, on the cam shaft, remove the framing device as above directed, remove the No. 05 vertical casting which forms a cover over the star and cam, by removing the four screws No. 215, Fig 30. Next remove screw No. 293, Fig. 33, in the

THE 1911 INSTRUCTION BOOK will be required for the Motiograph of the 1908, 1909, 1910 and 1911 Models.

center of ball socket No. 056 will be seen the end of the cam shaft. The end of the cam shaft and the shaft opening in the ball socket are slightly tapered. Place on end of cam shaft a punch of brass or hard wood or a very soft piece of steel will do, tap lightly with a hammer, this will release the socket from the cam shaft. The end of the punch must never be rounded but should be perfectly flat and perferably should have a hole in the center so as not to flatten down the leather cushion. Never under any circumstances, use a hard steel punch and be careful that the punch sets square on the shaft. A special three-piece, vest pocket size punch or tool set for this purpose may be obtained from us for $1.00. Place the new socket on the end of cam shaft and through the hole for screw No. 293, Fig. 33; observe that the hole sets accurately over the hole in the shaft, then with framing device in an upright position, place the cam on a suitable solid support and with a piece of hard wood or brass placed on top of the ball socket or by use of the vest pocket punch, tap it lightly with a hammer in order to bring it firmly into place, then insert the screw No. 293 and screw it down very tight. If lightly driven on in this manner into proper position and the screw firmly tightened, there is no danger of its ever coming loose.

To Replace the Cam, No. F-93, Fig. 33. follow instructions precisely for replacing No. 056 socket, removing the old cam by pulling the shaft out of No. 0184 eccentric bushing after removing socket as above directed and inserting the new cam and replace the socket.

To Replace the Star and Shaft, No. F-92. Fig. 33, follow instructions for replacing No. 056 socket and cam, then remove the stripper plate, No. 165, Fig. 30, by removing the three screws underneath the framing device which hold it in position. Remove the two screws, No. 43-A, Fig. 33, then by taking hold of the star wheel pull it out and insert the new one, being careful to get the screw holes in the shaft right side up.

Keep in mind the fact that steady pictures depend more on the accuracy of the Intermittent Sprocket Wheel and the Geneva Star and Cam than on any other part of the machine; hence, it is of the most vital importance that the greatest care should be exercised in order to maintain the accuracy that is absolutely necessary to the production of good work. As the fitting of the cam to its shaft is an operation that cannot be well done without special facilities, we have combined these two parts as one, and they are so listed in the Parts Price List, and no operator or mechanic should, without the special facilities, undertake to separate the cam from its shaft and expect to fit another in a way that will do accurate work. The Geneva driver pin No. F93½ Fig. 30, may be removed for replacement by loosening screw No. F93¾ Fig. 30, which holds it in position. The star wheel and shaft is one solid piece and is very accurately ground by high grade automatic machinery.

To Replace the 0107 Intermittent Sprocket—Follow instructions to replace the 056 ball socket to replace the cam F93 and to replace the star and shaft F92.

To Replace Eccentric Bushing, No. 0184, Fig. 33, follow instructions to replace No. 056 ball socket, then loosen screws No. 102 and 292, Fig. 31, and push bushing out toward sprocket.

To Replace Large Bushing, No. 028, Fig. 33, follow instructions to replace star and shaft, F92 then loosen screw No. 214, Fig. 31, and push bushing out toward star side.

To Replace Small Bushing, No. 0183, Fig. 33, follow instructions to replace star and shaft, No. F-92, then loosen screw No. 213, Fig. 31, and push bushing out.

To Replace Ball Socket, No. 61-A, Fig. 33, it will be necessary to replace the shaft also, as they are made of one piece of metal. Remove the gear cover and the gear bridge, now remove screws No. 205 in the hub of the balance wheel No. 14. The gear for the balance shaft is mounted on a sleeve or collar, No. 62-A, and the balance wheel in turn is mounted on this gear sleeve. One of the set screws in the hub of the balance wheel engages only with the gear sleeve, while the other passes

through the gear sleeve and is seated in the balance shaft. Two screws, No. 285, pass, one through the extreme end and one through the center of sleeve and into the balance shaft. After removing the balance wheel remove the screws No. 285, remove the sleeve and gear, the balance shaft and ball socket No. 61-A can now be slipped out through the shutter box of the mechanism. Insert the new balance shaft and ball arbor No. 61-A in the bushing No. 182, Fig. 33, put the gear sleeve No' 62-A in place on the shaft, insert screws No. 285 and screw them down tight, now replace the balance wheel, see that the holes for set screws are in their respective places to engage with the holes in the sleeve, turn the screws to place tightly and replace the bridge.

To Replace Balance Shaft Bushing No. 182, follow instructions to replace ball socket No. 61-A, loosen the screw in the rear of the mechanism to the left of the joint or hinge of the film gate, which hold this bushing in place, back it out quite a ways as it is deeply sunk into the bushing, now by passing a small strip of hard wood through the shutter box from the right hand side of the mechanism (looking toward the front of the machine), push it out towards the direction of the gear cover. In replacing the bushing see that the hole for the set screw comes at the right point to receive the screw and turn the screw to place tightly.

To Replace the Framing Device into the mechanism first insert the ball-arbor, No. 055, figure 33, into the ball socket, No. 61-A, by taking the small, square block between the thumb and the finger of the right hand and guiding it into slot of the socket No. 61-A, then place the framing device into the opening of the mechanism from which it was removed and push it into position, at the same time placing the other end of ball arbor into the socket, No. 056, figure 33, in the same manner as was before directed in placing No. 055 ball arbor into No. 61-A socket, and also at the same time see that the vertical guide rod on the opposite side of the shutter box enters the slot X, Fig. 31, in the opposite end of the framing device and see that the short, flat link attached to the end of the framing lever is placed over the pin, No. 73-A, Fig 31, on the lower front boss of the framing device; insert the vertical slide rod, screw it into place and tighten the tension screws No. 216; replace the front plate, tighten the screws at the lower corners and replace the side plate.

Oiling Very Important.—It is absolutely necessary that a Motion Picture Machine be kept well oiled, in order to keep it in good condition, and that it may do good work. Remember that while in operation the balance wheel shaft and Geneva action, which operates the intermittent sprocket, is making nearly 1200 revolutions per minute, or 72,000 revolutions per hour, and that when giving seven shows per day, of forty-five minutes each, the balance wheel and Geneva action has made about 360,000 revolutions. No machine can be expected to endure such work without proper care. **Be sure that ALL** of the bearings are oiled and that **none** have been **overlooked.**

When running afternoon and evening all of the bearings should be oiled twice during the day, besides which the Geneva movement and governor shaft pivots should be oiled after every other show, or make sure that there is a sufficient amount of oil in the Geneva movement casing that the Geneva movement is kept constantly lubricated.

It is Important that the oiling should be carefully done, and that none of the bearings should be overlooked. It is advisable to establish a practice of always oiling the bearings in the same order, as in this way you will be less liable to overlook any of them. Care should be exercised not to have any oil on the sprocket wheels and on the film pressure rollers, as oil in these places would be transmitted to the film and badly damage it. All surplus oil remaining on the outside of the oil holes, or in other places where it might come in contact with the film, should be carefully removed with a soft cotton cloth.

The Quality of Oil used on a Motion Picture Machine **is of great importance.** Do not get the impression that anything sold under the name of oil is good enough. Never oil with kerosene or any oil that is highly adulterated with kerosene, as it has practically no lubricating

properties. Do not use ordinary lard oil that is adapted to use on heavy machinery; it is too coarse and will gum the bearings. There are oils on the market, some of which are extensively advertised and are recommended for lubricating, polishing furniture, and as rust preventatives, etc., that are not at all suitable for the lubrication of a motion picture machine. Sewing machine oil of fine grade is most desirable, and the best place to get it is at a sewing machine agency. A cheap grade of sewing machine oil should not be used owing to its poor quality as a lubricant.

The quality of oil used is of vital importance and should be given careful attention.

Use of Vaseline in the Framing Device Oil Chamber.—Remove that part of the framing device which forms the cover to the oil chamber, No. 05 vertical casting, Fig. 30, by removing the four screws, No. 215, Fig. 30, in the side, after first having removed the framing device from the mechanism as before directed. Take the remaining part of the framing device in one hand, and with the flexible metal tube of white vaseline in the other, force the vaseline into the opening of the flange of the pin wheel, No. F-93, Fig 30, where the pin, No. F-93½, is located until that opening is well filled, then force the vaseline all around the outside of the flange of the pin wheel. Then cover the entire surface of the star, No. F-92, Fig. 30, with a liberal coating. This is all that will be required. Care must be taken not to put in too much vaseline, as the rapid rotation of the star and cam wheel will have a tendency to force it out through the oil cup, which would be very undesirable.

After replacing the cover put eight or ten drops of fine lubricating oil in the oil cup, No. 112, Figs. 30 and 31, on top of the framing device, which will mix with the vaseline and soften it to the proper consistency. If care has been taken in applying the vaseline thoroughly the machine should run, even under the heaviest usage, for at least three weeks without further attention to this part, except to add occasionally a few drops of fresh oil. At the end of that period, if the vaseline has become blackened, it is time to remove it, clean the pin and star wheel, wash them off with benzine or gasoline and put in fresh vaseline as described above.

Vaseline as a lubricant for the star and pin wheel is, in our belief, without an equal. It is necessary, however, to avoid the cheap qualities put up in bulk, and **never**, under any circumstances, use carbolated vaseline. We recommend no grade other than the white vaseline put up in flexible metal tubes, which may be had at drug stores or it may be ordered of the manufacturers of the Motiograph.

One party writes us that **after using** one machine **continuously for sixteen months** under the above treatment there was **no noticeable wear** on either the pin or the points of the star wheel.

When Oil Only is Used without vaseline it is preferable to use a very heavy oil of fine quality, rather than a thin oil.

To keep a machine in good condition it should occasionally have the working parts cleaned with gasoline to remove dirt, gum and old oil, the parts wiped dry with a soft cotton cloth, and fresh oil applied.

The High Speed Spindles of the Motiograph all run in interchangeable phosphor-bronze bearings. These may be replaced with new ones when worn. Phosphor-bronze is one of the best anti-friction metals known, and with proper care none of the bearings should need replacing for a long time.

The Fire Trap Rollers Should be Kept Clean. In case the film should become ignited and the flame extend to the fire trap or valves, No. 33-A, Fig. 19, some of the melted celluloid is liable to stick to the rollers and when dry it becomes very hard and brittle, and would do much damage to the film if allowed to remain. In a case of this kind the rollers should be carefully cleaned. The rollers should also be cleaned from time to time to keep them free from accumulations of dust, oil, etc., which will do more or less injury to the film. Alcohol or refined benzine is good for the purpose.

A FEW SPECIAL POINTS TO BE OBSERVED

(1) Keep the machine clean and well oiled, but do not use an excessive amount of oil. Use only oil of good quality.

(2) Do not endeavor to make adjustments on the machine unless sure it is needed.

(3) Do not get the impression that you can improve the machine before you are familiar with it. After being familiar with its workings you will probably not get such impression.

(4) Do not attempt to remedy a fault until the point in the instruction book covering the trouble has been carefully studied.

(5) Keep the surfaces of the Carbon Clamps, which bear upon the Carbons, clean and bright, so as to secure good electrical contact at all times.

(6) Watch the terminals on the Asbestos Lamp Wires and as soon as they show signs of breaking from the heat of the Arc Lamp, renew them or omit them entirely, placing the wire in the form of a "U" around the screws between the two washers on the Binding Post. By this means burn-outs during the show may be entirely avoided and the consequent annoyance as well.

(7) Always project the light on the screen and secure a good clean field before starting the show. To do this after the picture starts is annoying to the audience and it is impossible to secure as good results as with a clear screen.

(8) When using alternating current feed the carbons more often than for the direct current. Keep the carbons close together (nearly touching each other) and the light will be much stronger and steadier and the carbons will burn much more even.

(9) When the carbon points are allowed to burn too far apart, the edges grow rough and the light will become unsteady, which will greatly reduce the illuminating power and cause the picture to become blurred and hazy and discolored.

(10) The best results are obtained by using hard, fine grained carbons. These give a brilliant white light which is essential to the clear definition of the picture on the screen. Soft, coarse grained carbons contain more gas and have a tendency to give the arc a yellowish hue, which greatly reduces the illuminating power. Never use ordinary carbons intended for street lighting.

(11) Keep the Lamp House clean and free from carbon dust. The bottom of a Lamp House covered with carbon dust is a source of trouble to the operator and when such conditions prevail, it shows the operator to be careless, if not incompetent.

(12) Always keep the lenses clean, as dirty glasses reduce the light very largely. It is well to wipe all lenses with a soft cloth wet with alcohol and then polish with a soft, dry linen cloth.

(13) Be sure to have the condensing lenses match the objective lenses properly. It is the custom with many operators, when a condensing lens breaks, to put in almost anything available to replace it, and in many cases this accounts for the poor results they obtain.

(14) The operator who looks after these minor details carefully will be most sure to get good results and save himself a lot of trouble. Carelessness and indifference are in a large measure responsible for all the troubles of the operator.

(15) There is always a demand for good operators and they can command good wages. The man who is willing to give ample time and attention to details is sure to succeed.

THE 1911 INSTRUCTION BOOK will be required for the Motiograph of the 1908, 1909, 1910 and 1911 Models.

DONT'S To Be Observed in the Operation of the Motiograph

While the Motiograph has proven itself the **strongest and by long odds the best wearing Machine** on the market, it has heavy, continuous and exacting work to perform, and, like any other piece of machinery, requires reasonable care and attention.

It should be oiled frequently and especially all of the parts that run at high speed should be oiled as often as **every four hours** while in use. Other parts once a day. Wipe off surplus oil with cotton or linen cloth.

The parts should be cleaned with gasoline as often as every two or three weeks.

DON'T fail to keep the Geneva Star and Cam well lubricated.

DON'T use kerosene as a lubricant, or any light oil containing a considerable amount of kerosene. Use **high grade** sewing machine oil.

DON'T overlook the oiling points for the intermittent sprocket shaft. The oil holes are on the side of the framing device toward the lamp house.

DON'T attempt to run at high speed with weak film tension springs. If on high speed the picture jumps, more tension is required.

DON'T adjust the governor too tight. If too tight, the machine will run hard and, besides, the wear will be excessive.

DON'T attempt to force the mechanism, if it runs hard or there is an indication of an obstruction in the working parts. It may need oil, or an obstruction removed. To force it under such conditions might result in serious breakage. Stop and immediately locate the difficulty.

DON'T attempt to operate with the intermittent sprocket not properly adjusted. It will cause an unsteady picture.

DON'T adjust the Geneva star so close to the cam or pin wheel as to cause unnecessary friction, It should be close, but not tight. If tight, will make the machine run hard and cause unnecessary wear.

DON'T rewind too rapidly, or stop with a jerk. The mechanism is geared up high and excessive speed with the crank handle might do damage.

DON'T frame the film too rapidly. Adjust framing device with an even, steady movement.

DON'T neglect replacing parts that have become badly worn. Delay may cause added expense at a later date.

DON'T expect good results with mechanism out of adjustment.

DON'T fail to observe every line of instruction in the book of directions. They are all there for a purpose and should be closely observed.

DON'T overlook instructions for resetting the shutter. Very simple if carefully followed.

DON'T lubricate the Arc Lamp racks, pinions and posts with **anything** but **powdered dry graphite**. Any oil, or oil and graphite mixture may cause the parts to bind and cause trouble.

The enclosure for the Geneva parts of the framing device is intended to hold a quantity of oil. We recommend a mixture of vaseline and good lubricating oil.

THE 1911 INSTRUCTION BOOK will be required for the Motiograph of the 1908, 1909, 1910 and 1911 Models.

Price List

OF

REPAIR PARTS

FOR THE

Motiograph No. 1A

MODEL 1912

MOTION PICTURE MACHINE

IMPORTANT

When ordering Repair Parts it will be necessary, on account of the changes and improvements that are made from time to time, to **give the Serial Number of the Mechanism.** The number is located near the lower left hand corner of the film gate on the main frame. If the number is given it will enable us to supply promptly the parts required.

DON'T FAIL TO

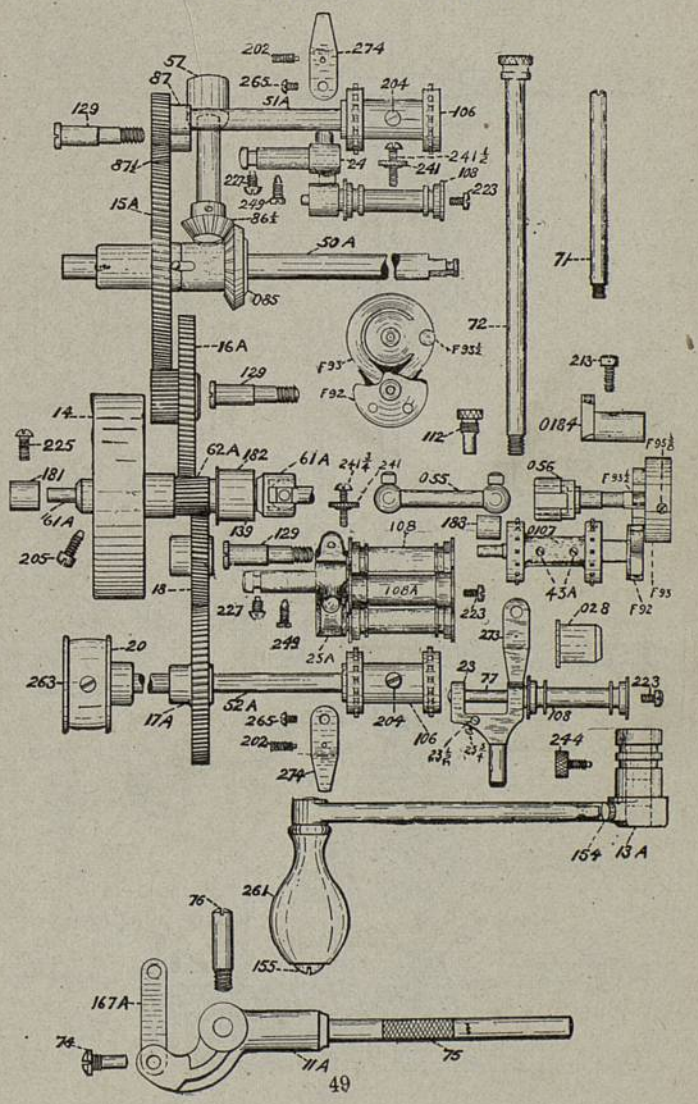
GIVE THE SERIAL NUMBER,

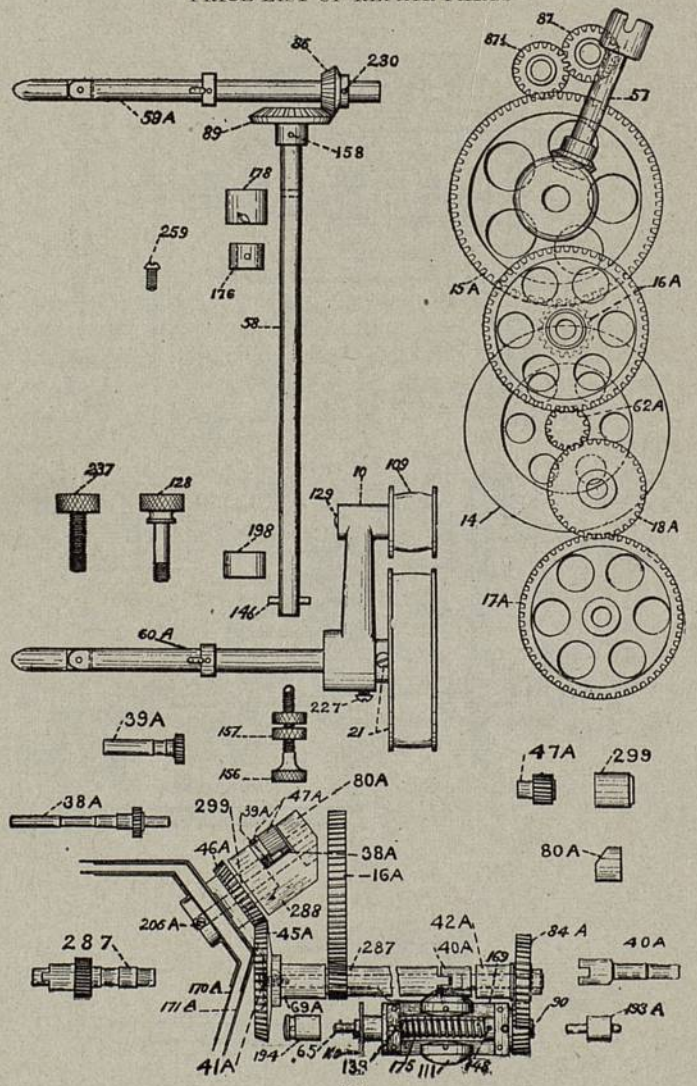
AND

Order by Code Word or Article Number. Either one explains fully the part required without any further explanation—except the Serial Number of your Mechanism.

The numbers with "A" following represent parts used exclusively in the No. 1A Models.

Careful attention to the above will avoid chances of errors or delay.

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14
18A
198
146
17A
60A
227
21
39A
157
156
47A
299
80A
38A
46A
16A
288
45A
206A
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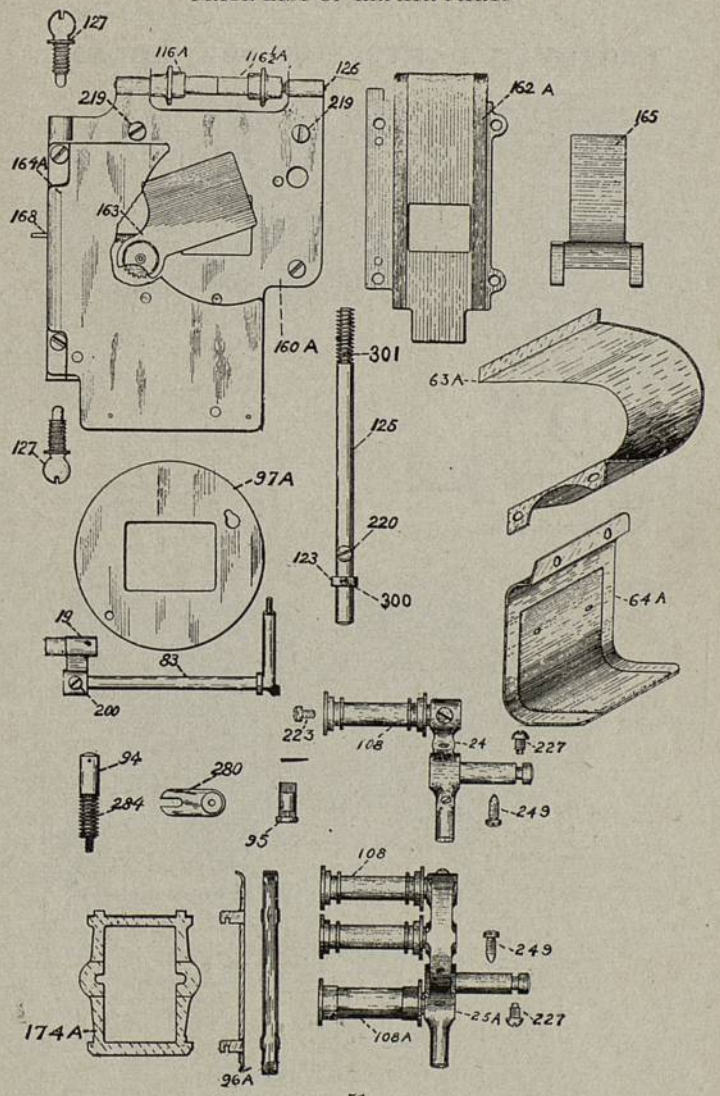
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152A
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301
63A
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300
64A
19
83
200
223
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25A
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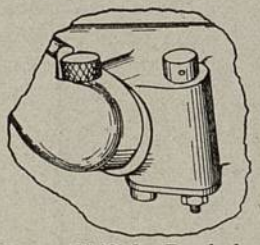
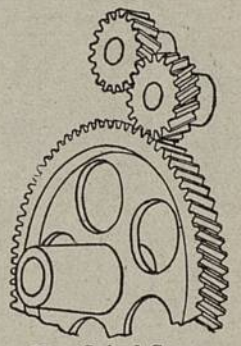
108A

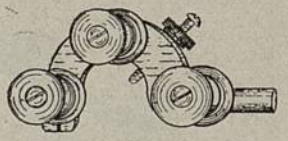
IMPROVED PARTS FOR 1912 MODEL



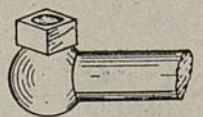
Sprang Shift for Rewind



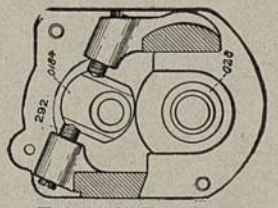
New Spiral Gear



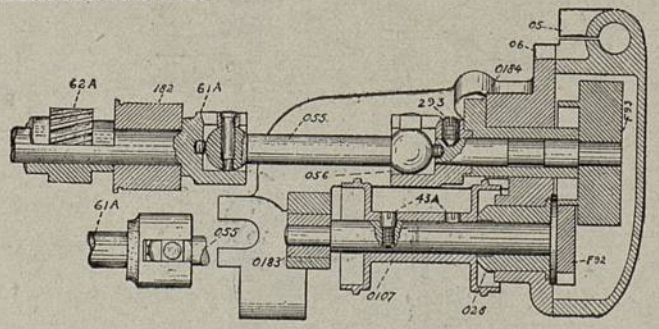
Double Roller Bracket



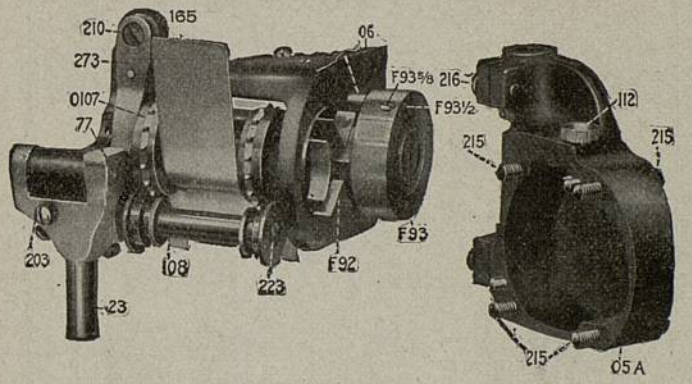
Hardened Square Blocks on Ball Arbor



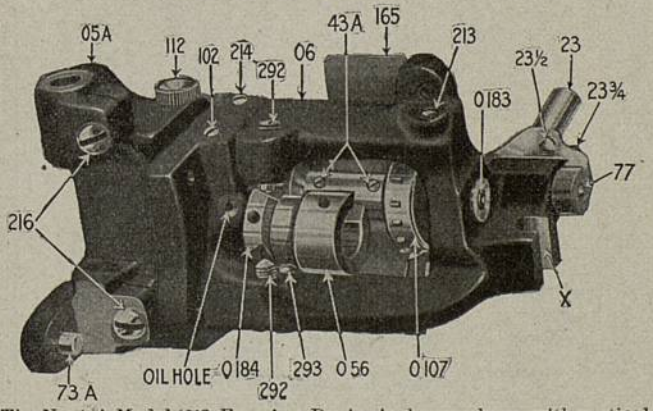
Eccentric Bushing Adjustment



Framing Device Parts Assembled



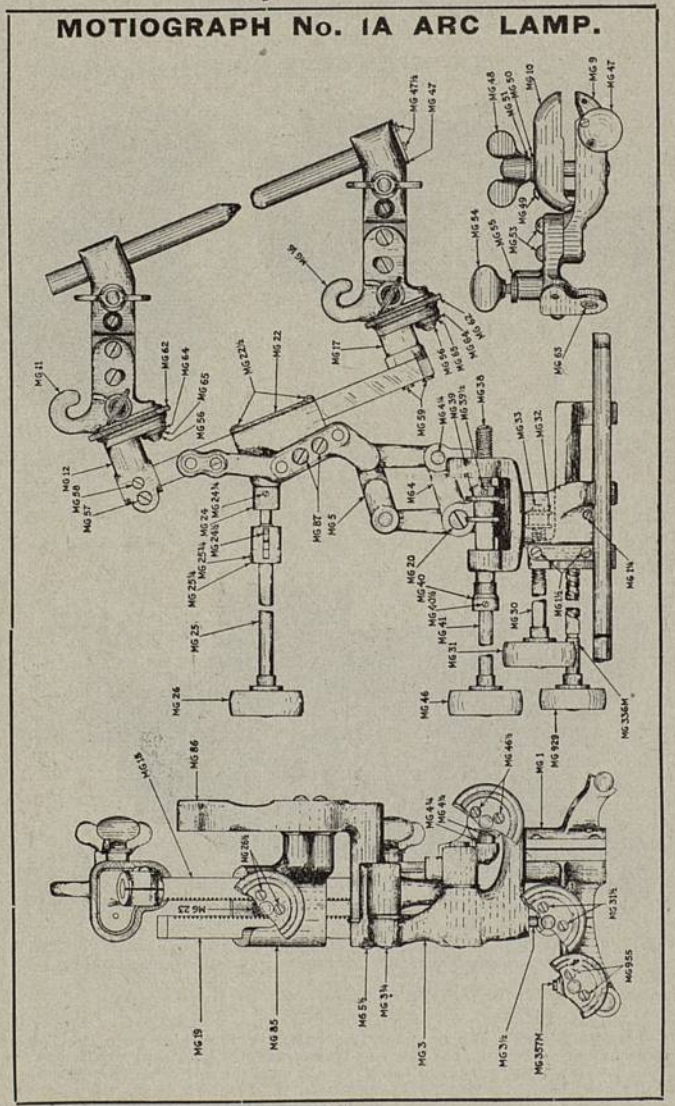
The No. 1A Model 1912 Framing Device is shown above with vertical casting removed, exposing star and cam.



The No. 1-A Model 1912 Framing Device is shown above with vertical casting attached, enclosing star and cam in an oil-tight chamber.

IMPORTANT. Where parts are listed complete, such as the Geneva Star and Shaft, the Geneva Cam or Pin Wheel and Shaft, etc., do not order them separate, as it is not practicable for one without special facilities to properly fit them.

MOTIOGRAPH No. 1A ARC LAMP.



REPAIR PARTS
FOR THE
MECHANISM OF THE No. 1A MOTIOGRAPH
Model 1912

Important Notice

We will not be responsible for errors in filling orders for repair parts unless the complete number is given at the time of order—for instance: If a star wheel is wanted it must be ordered as F-92, whereas, if part for the arc lamp is wanted it must be ordered as MG-9, if long casting for the carbon clamp is meant.

M No.		Code	Price
1-A	Main frame casting of mechanism	Kransjes	$15.00
2-A	Sub base for wood base board	Kransprop	1.60
3-A	Gear cover	Kranswerk	3.50
4-A	Gear bridge	Kranz	3.00
05-A	Framing device, vertical casting	Kransband	3.00
06-A	Framing device, horizontal casting	Kramhandle	4.00
7-A	Upper reel arm, casting only	Kranzbeere	3.50
8-A	Upper reel arm cap	Koperpool	1.00
9-A	Lower reel arm, casting only	Kranzdraht	3.50
10-A	Take-up belt tension idler bracket	Koperslaan	1.50
11-A	Framing lever casting	Kranzgeld	.90
12-A	Hand bolt to clamp Mechanism to base	Kranzholz	1.00
13-A	Crank handle casting, only	Kranzlampe	1.10
013-A	Crank handle complete	Kranzleist	1.25
14	Balance wheel	Koperzout	1.50
15-A	Main gear	Kranznaht	1.50
16-A	Double gear between main gear and balance shaft gear	Kranzpolyp	1.50
17-A	Gear on lower sprocket shaft	Kranzreif	1.40
18-A	Gear between balance shaft gear and lower sprocket shaft gear	Kranzritt	1.20
19	Governor crank, complete	Kopfgeld	.90
20	Small belt pulley and screw	Kopfgelder	1.20
21	Large belt pulley and screw	Kopfgicht	1.50
22	Stereo lens mount ring	Kopfhaar	.75
22½	Thumb screw for Stereo lens mount ring	Resumpta	.06
23	Intermittent roller bracket and shaft	Kopfhaaren	1.20
23¼	Screw to bind roller shaft in intermittent bracket	Resumptif	.01
23½	Adjusting screw intermittent roller bracket	Resumptivo	.01
23¾	Screw to bind 23½ screw	Resupieras	.01
24	Roller bracket, upper, with shaft	Kopfhalter	1.50
24½	Screw to bind roller shaft in upper bracket	Retouchais	.01
25-A	Roller bracket, lower, with shafts	Kopfhaut	1.75
25¼	Screw to bind rear roller shaft in lower bracket	Retouchant	.01
25½	Screw to bind front eccentric roller shaft in lower bracket	Retoucheur	.01
028	Bushing, large for Intermittent shaft	Kopfkohl	.60
29	Magazine latch, large piece	Kopflaenge	.40
26½	Spring for magazine latch	Retosto	.04
30	Magazine latch, small piece	Kopflanch	.25

Note:—When Ordering State for 1912 Model and give the serial number of your machine.

No. 1-A Mechanism—Continued

M No.		Code Word	Price
31 and 32	Magazine hinge	Koperfiche	$ 1.50
33-A	Fire trap, casting only	Kopflinie	1.25
33-CT	Fire trap complete, with rollers	Kopflos	3.00
F-33½	Spider casting only, for upper magazine	Resupieron	1.25
F-33¾	" " " " lower "	Resupiesen	.85
37	Stereo lens arm bracket	Kopfmuskel	1.00
38-A	Shutter shaft and gear, solid	Kranzrolle	.45
39-A	Shutter shaft and gear, main, hollow	Kranzsins	.90
40-A	Governor drive shaft	Krapjes	.75
41-A	Shutter drive shaft screw	Krappartig	.06
F-41	Shift bar between magazines	Resupinado	.15
42-A	Bushing for governor drive shaft	Krappbad	.24
F-42	Plunger pin, upper spider	Resupinate	.10
43-A	Screws for intermittent sprocket each	Krappeln	.18
44-A	Screw for gear on upper sprocket shaft	Krappelst	.06
45-A	Bevel gear on shutter drive shaft	Krappkohe	1.00
46-A	Bevel gear on shutter shaft	Krapplandl	1.00
47-A	Intermediate gears in shutter gear case	Krapproth	.60
48-A	Screws for clamping inner shutter wing on gear hub	Krappthurm	.06
50-A	Crank staft with pin	Krasgap	1.00
51-A	Upper sprocket shaft	Krasheid	.90
F-51-	Spring for plunger pin, upper spider	Resupiste	.06
52-A	Lower sprocket shaft	Krassende	.90
055	Ball shaft, hardened	Kormsoon	2.10
055½	Trunion for new style, hardened 055, each	Trunball	.50
056	Socket on Geneva cam shaft, hardened	Krampfst	1.10
57	Reel arm socket shaft	Kopfstimme	1.50
58	Vertical shaft inside upper reel arm	Kopfstoss	1.75
59-A	Upper reel shaft	Krateros	.90
60-A	Lower reel shaft	Kraterrand	.90
61-A	Balance shaft and hardened socket, one piece, including spring plunger	Kratwagen	2.40
61½-A	Spring plunger for new 61A	Springbal	.05
62-A	Gear and sleeve on balance wheel shaft	Kratylos	1.50
63-A	Upper fire shield	Kopftuch	1.00
64-A	Lower " "	Kopftuches	1.00
65-	Governor shaft	Kopfueber	.90
65-G.C.	Governor complete	Kopfueabung	4.50
69-A	Bushing for shutter drive shaft	Kratzhaken	.24
71	Framing device, guide rod	Kopglas	.45
72	Framing device slide rod, long, with head	Kopfzeng	.75
73-A	Pin for connecting link, framing device	Resupply	.01
74	Framing lever connecting screw	Kopierbuch	.09
75	Framing lever handle	Kopialien	.75
76	Screw to hold framing lever in frame	Kopmessen	.06
77	Intermittent roller bracket joint pin	Koppelaars	.06
80-A	Bushing for shutter gear case (rear)	Kratzmilbe	.18
81	Shaft for roller brackets	Resurgebat	.12
83	Governor crank shaft	Koppelhout	1.20
84-A	Gear on governor drive shaft	Krausbart	.90
085	Bevel gear on crank shaft	Koppelg	1.80
86	Bevel gear on upper reel shaft	Koppeln	.90
86½	Bevel gear on rewind socket shaft	Koppelriem	.60
87	Gear on upper sprocket shaft	Koppelseil	.60
87½	Intermediate gear, small	Koppelst	.60

IMPORTANT. Where parts are listed complete, such as the Geneva Star and Shaft, the Geneva Cam or Pin Wheel and Shaft, etc., do not order them separate, as it is not practicable for one without special facilities to properly fit them.

No. 1-A Mechanism—Continued

M No.		Code Word	Price
89	Bevel gear on vertical shaft in upper reel arm	Koppelzug	$ 1.30
90	Gear on governor shaft and hub	Koppiger	.75
91	Stereopticon slide rod to hold lens ring	Kepplung	.36
91½-M	Wing nut and washer for No. 91	Kramplach	.24
92-A	Screw to locate shutter gear case	Kraushaar	.06
F-92	Geneva star and shaft in one piece 1912	Resurgence	3.50
93-A	Screw to retain shutter gear case in frame	Krausholz	.06
F-93	Geneva cam and shaft complete for 1912	Resurgidas	3.25
F-93¼	Geneva cam pin, hardened	Resurgido	.24
F-93⅝	Screw to hold pin in cam	Resurgiera	.08
94	Push rod for rewind shift of crank	Kopstempel	.60
95	Locking pin for rewind shift	Kopsters	.45
96-A	Film tension shoes, each	Kraushuhn	.50
97-A	Round aperture heat arrester on film gate	Krausismo	.48
99-A	Thumb screw for front plate (two) each	Krauskohl	.09
102	Screw to clamp eccentric bushing in frame	Krautacker	.06
103-A	Screw to clamp shutter drive bushing	Krautartig	.06
105-A	Cap for hole, when changing over '09 screw for clamping mechanism to base	Krauthacke	.09
106	Sprocket, upper or lower	Koraalrood	3.00
0107	Sprocket, intermittent on framing device	Krampnsch	3.50
108	Idler rolls, hardened steel (each)	Koraalzaad	.75
108A	Idler film roll, hardened, lower roller bracket	Resurgimos	.60
109	Tension pulley for take-up belt	Koraalzout	.60
110	Roller guide on governor shaft	Korahite	.75
111	Governor balls, brass (two), each	Koralle	.36
112	Oil cup on framing device	Korallholz	.09
114-A	Shutter gear casing complete with gears	Krauthahn	4.75
116	Roller, complete for top of gate, with shaft and spring	Gaterol	.75
116-A	Roller, top of gate, solid end, hardened	Resurgir	.30
116½-A	Roller, top of gate, spring end hardened	Reticent	.15
118-A	Spring for plunger, to locate mechanism on base	Krauthorn	.12
119	Center pin in hinge of magazine	Korbholz	.01
120-A	Side plate to hold license plate	Krautland	.18
121	Nut, upper reel shaft	Resurgiran	.12
123	Collar on gate latch rod	Korbmoebel	.10
F-124	Screws to connect shift bar to magazine spiders, each	Resurgiria	.12
125	Gate latch rod	Korbsessel	.30
126	Shaft for No. 116	Korbstang	.01
127	Ball screw for gate hinge	Korbstich	.09
128	Screws to fasten upper or lower reel arm to frame each	Korbstuhl	.18
129	Shaft screw, hardened, for gear or for belt tension pulley or stereo. lens bracket	Korbwelle	.18
133	Pin in governor shaft	Korenbaard	.06
135	Pin for governor drive gear	Korengarf	.06
146	Pin in vertical shaft in upper reel arm	Korentang	.06
148	Pin in gear on governor shaft	Korenvink	.06
154	Screw to fasten crank to shaft	Korenzeef	.09
155	Screw to hold wood handle on stud	Reticino	.01
156	Adjusting screw for take-up belt tension pulley	Korfdrager	.15
157	Lock nut for screw No. 156	Korfjes	.10

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No. 1-A Mechanism—Continued

M No.		Code Word	Price
158	Pin in gear on shaft inside upper reel arm	Korfmakers	$ .06
160-A	Main frame of film gate	Krautwerk	1.80
162-A	Aperture plate	Krawall	1.05
163	Automatic fire shutter and gear	Korkbaum	1.20
164-A	Heat shield on gate	Krawar	1.00
165	Apron or stripper plate on framing device	Korken	.45
167-A	Link to connect framing device with No. 11-A	Kreatine	.20
168	Rack bar for fire shutter	Korkmesser	.06
169	Governor strips, each	Korkpresse	.06
170-A	Shutter wing (inner)	Kreatinine	.75
171-A	Shutter wing(outer) with collet and screws	Kreaturen	.90
172	Front plate	Korkspund	2.00
F-173	Stud in crank for wood handle	Resurja	.06
174-A	Film tension spring to hold No. 96-A	Krebsartig	.50
175	Governor spring	Korkud	.06
176	Collar on vertical shaft inside upper reel arm	Korkulme	.06
178	Large bushing, bronze, on vertical shaft in upper reel arm	Korkzieher	.24
181	Small bushing in gear bridge for balance wheel shaft	Kornart	.18
182-A	Large bushing in main frame for balance wheel shaft	Kornarten	.36
183	Small bushing for intermittent sprocket shaft	Kornban	.18
0184	Eccentric bushing for framing device	Kramsweis	.90
193-A	Bushing in bridge for governor shaft	Krebsauge	.18
194	Bushing in frame for governor shaft	Kornetton	.18
198	Small bushings in reel arm	Krananker	.18
200	Screw in governor crank	Korngesetz	.06
202	Locating screw for idler bracket spring	Kornhoefen	.06
204	Screw for sprockets, upper or lower	Kornhuegel	.09
205	Screw for balance wheel	Kornis	.06
206-A	Screw for shutter wing collet	Krebsbach	.06
207	Screw for upper reel arm cap	Kornjahr	.01
208	Locating screw for front plate	Kornjabres	.06
209	Screw to fasten magazines to spiders	Kornkrebs	.01
210	Screw for springs on framing device	Kornland	.01
211	Screw for fastening apron or stripper plate on framer	Kornlandes	.01
212	Screw to fasten heat shield to gate	Resurjais	.01
213	Screw to clamp small bushing, in framing device	Kornmangel	.09
214	Screw to clamp large bushing, in framing device	Kornmarkt	.09
215	Screw to hold No. 05 vertical casting to No. 06 horizontal casting of framing device	Kornmass	.09
216	Screw to hold framing device in position on slide rod	Kornmasses	.01
217	Screw for aperture plate	Kornminze	.01
218	Screw for lower fire shield	Kornmohn	.01
219	Screw for studs on gate	Kornmotte	.01
220	Screw for gate latch	Kornmuehle	.09
221	Screw for film tension spring	Resurprise	.01
222	Screw to hold round aperture heat arrester to No. 164-A	Screwheat	.01
223	Screw to hold idler roller on shafts	Kornnelke	.06
224-A	Screw to hold bridge on main frame	Krebsblume	.09
225	Screw to hold bushings in bridge	Kornpflege	.01
227	Locating screw, for roller brackets	Resurrect	.06

No. 1-A Mechanism—Continued

M No.		Code Word	Price
230	Screw in reel shaft bevel gear	Kornreich	$ .06
231	Screw for gear cover, upper	Kornrolle	.30
232	Screw for gear cover, rear	Kornroson	.30
233	Screw for gear cover, front	Kornsaat	.30
235	Screw to clamp governor bushing in frame	Resurtiese	.02
237-M	Screw for attaching magazine to reel arm	Kornschan	.25
238-A	Magazine body and cover	Kornsichel	6.00
241	Lock nut on roller bracket adjusting screw	Kornsperre	.06
241½	Adjusting screw, upper roller bracket	Resurveyed	.01
241¾	Adjusting screw, lower roller bracket	Resuscito	.01
244	Screw for locating crank handle	Kornuiten	.06
245	Set screw in gear on rewind socket shaft in frame	Resvaladio	.06
248	Safety cap for crank shaft, wood	Kornwedel	.15
249	Screw to hold roller bracket in place	Korwicke	.06
251-A	Roller for magazine fire trap	Kornwolfes	.45
253-A	Shaft for roll in magazine fire trap	Resvalar	.03
255	Screw to hold traps to magazines	Kornzinses	.01
257	Screw for nut on reel shaft	Kornzolles	.01
258½	Spring for gate latch rod	Kornesp	.06
259	Set screw to bind bushing in reel arm	Koroniden	.01
261	Wood handle for crank	Korpsen	.18
262	Screw in framing device casting guide rod slot	Korpsgeist	02
263	Screw for small belt pulley	Korrel	.09
265	Screw for roller bracket springs	Korrupt	.01
268	Screw in magazine latch	Korstgebak	.06
273	Springs for intermittent roller bracket (2 pieces)	Kortarmig	.24
274	Spring for upper and lower roller bracket (3 pieces)	Kortbeen	.24
275	Spring to hold front plate (2 pieces)	Kranenvoet	.24
276	Set screw to fasten large balance shaft bushing in main frame	Kortbekken	.09
277-A	Take-up belt	Kortbondig	.24
278	Screw for No. 275 springs, front plate	Retabamus	.01
283	Plunger to locate machanism on base	Retablir	.15
283½	Locating plunger head	Retabolo	.08
284	Spring for push rod, rewind shift	Kranich	.06
285	Balance shaft screws, each	Kratsbank	.09
286	Motor drive arbor	Kratzeisen	.75
287-A	Shutter drive shaft and gear	Kratsfuss	.90
288	Shutter gear case	Kratzkamm	1.90
289	Screws to clamp bushing in shutter gear case	Kratzwolle	.06
290	Shaft for intermediate gears in shutter gear case	Kratzwunde	.24
291	Screw in gear on lower sprocket shaft	Krausista	.06
292	Adjusting screw for eccentric bushing in framing device	Krauskopf	.09
293	Screw for socket on Geneva drive shaft	Krautbiene	.09
294	Screw for upper fire shield	Krauthaupt	.01
294½	Screw for heat arrester gate	Retabunt	.01
295	Latch pin for side plate	Krautlese	.15
296	Nut for latch pin	Krautnude	.12
297	Spring for latch pin	Krautsalat	.06
298	Screw for side plate	Krautvogel	.06
299	Bushing for shutter gear case (front)	Kratzkeile	.18

Note:—When Ordering State for 1912 Model and the serial number of your machine.

THE MODEL "W"

Latest Improved 1912 Framing Device.

Art. No.		Code Word	Price
W 1	Horizontal main casting	Volutabro	$4.00
W 2	Vertical casting, cap for W-1	Volutamus	3.00
W 3	Large bushing for geneva star shaft	Volutelle	.60
W 4	Small " " " " "	Volutide	.18
W 5	Eccentric bushing for geneva cam shaft	Volutions	.90
W 6	Geneva cam and shaft	Volutta	3.25
W 7	Geneva driver pin, (Hardened)	Volvaardig	.24
W 8	Screw to clamp W-7 in W-6	Volvaceas	.08
W 9	Geneva star and shaft, (one piece)	Volvaires	3.50
W10	Intermittent sprocket, (Hardened)	Volvaria	3.50
W11	Screws for sprocket, (Hardened) (Two) each	Volvebaris	.18
W12	Ball socket on geneva cam shaft, (Hardened)	Volvedor	1.10
W13	Screw to fasten W-12 to geneva cam shaft. (Hardened)	Volvemos	.09
W14	Intermittent idler roller bracket and shaft	Volvendos	1.20
W15	Idler roller, (Hardened)	Volverelle	.75
W16	Pin to hold W-14 to W-1	Volviera	.06
W17	Springs to hold W-14 in position, (Hardened)	Volvieron	.24
W18	Screw to hold W-17 to W-1	Volvoce	.01
W19	Adjusting screw for W-14	Volveoren	.01
W20	Screw to clamp W-19	Volvoering	.01
W21	Screw to clamp roller shaft in intermittent bracket	Volvoetig	.01
W22	Screw to hold W-15 on shaft	Volvox	.06
W23	Screw to clamp W-3 in W-1	Volvoxis	.09
W24	Screw to clamp W-4 in W-1	Volvulo	.09
W25	Screw to clamp W-5 in W-1	Volwassen	.06
W26	Adjusting screw for W-5 (Two) each	Volwerpen	.09
W27	Screw to fasten W-2 to W-1	Volzalig	.09
W28	Take-up screw to adjust framer on guide rod	Volzin	.06
W29	Screws in W-2 to adjust friction on slide rod (Two) each	Volzinnen	.01
W30	Oil cup on W-2	Vomer	.09
W31	Pin in W-2 for connecting link	Vomeraio	.01

Motor Pulley Attachment.

Art. No.		Code Word	Price
MA 1	Gear cover	Retraheris	$3.75
MA 2	Support casting for idler pulley arm	Retrahido	1.10
MA 3	Idler pulley arm	Retraidas	1.70
MA 4	Large belt pulley and screw	Retraigan	2.40
MA 5	Socket shaft for large belt pulley	Retraitan	.85
MA 6	Bushing for large belt pulley shaft	Retraite	.90
MA 7	Small belt pulley and screw for motor shaft	Retrajeras	1.20
MA 8	Idler pulley	Ratrajese	.60
MA 9	Screws to fasten support casting to gear cover (3) each	Retranca	.01
MA10	Retaining screw for idler pulley arm	Retrancher	.06
MA11	Adjusting " " " " "	Retranqueo	.09
MA12	Locking nuts for adjusting screw MA-11 (2) each	Retranseo	.06
MA13	Screw for idler pulley, hardened	Retransire	.18

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Motor Pulley Attachment—Continued.

Art. No.		Code Word	Price
MA14	Belt for A. C. motor 49½" long	Retrasaba	$ .48
MA15	Belt " D. C. " 48" "	Retrasas	.48
MA16	Motor pulley attachment complete	Retratador	10.00
MA17	Plate casting to attach D. C. motor to swivel casting on pedestal	Retrataran	1.50
MA18	Plate casting to attach A. C. motor to swivel casting on pedestal	Retratista	1.50
MA19	Screws to fasten MA17 and MA18 to swivel casting on pedestal, each	Retraverse	.06

Motiograph No. 1A Arc Lamp

Art. No.		Code Word	Price
MG-1	Burner slide, casting only	Krebsnase	$ 1.50
MG-1¼	Screw to hold main body in burner slide	Retacabas	.01
MG-1⅛	Screw to clamp main body	Retacado	.01
MG-3	Main Body	Krebsreuse	1.50
MG-3⅛	Main body swivel stud	Retacais	.06
MG-3¾	Main Body Stud to hold upper castings	Krebsroth	.15
MG-4	Lower horizontal casting	Krebsstein	.75
MG-4¼	Stud to connect MG-4 to MG-86	Krebssuppe	.08
MG-4⅛	Lower horizontal casting swivel stud	Krebssucht	.15
MG-4¾	Roller on MG-4⅛	Kredenzen	.15
MG-5	Upper horizontal casting	Kredenzest	.75
MG-5⅛	Stud to connect MG-5 to MG-86	Kreditbank	.15
MG-6	Bracket for use with calcium light only	Retendamus	1.00
MG-7	Post for MG-6	Retendreis	.12
MG-9	Long casting of carbon clamp, with stud	Kreditiv	.75
MG-9¼	Stud for long casting of carbon clamp	Klamstud	.09
MG-9X	Upper carbon clamp, complete	Comclampu	1.50
MG-10	Short casting of carbon clamp	Kreditlos	.50
MG-10X	Lower carbon clamp, complete	Comclampo	1.50
MG-11	Upper carbon clamp bracket	Kreeftslak	1.20
MG-12	Upper rack bracket	Kreeftspin	1.20
MG-16	Lower carbon clamp bracket	Kreekje	1.20
MG-17	Lower rack bracket	Kregelkop	1.20
MG-18	Upper rack	Kreideberg	.90
MG-19	Lower rack	Kreidefels	.90
MG-20	Screw to connect MG-3 to MG-4	Kreidewand	.35
MG-22	Rack Plate	Kreisamtes	.25
MG-22⅛	Screw for rack plate	Kreisbahn	.01
MG-23	Rack adjustment gear and shaft (one piece)	Kreisblatt	.36
MG-24	Rack adjustment gear ball	Kreischen	.25
MG-24⅛	Rack adjustment gear ball pin	Retenez	.01
MG-24¾	Rack adjustment gear ball screw	Kreischest	.09
MG-25	Shaft to operate racks, for carbon adjustment	Kreiselrad	.50
MG-25¼	Shaft socket for MG-25	Retengais	.35
MG-25¾	Screw, to hold shaft in socket	Retenidas	.03
MG-26	Wood handle for MG-25	Kreisfahrt	.15
MG-26⅛	Screw to hold wood handle on MG-25	Kreisform	.01
MG-30	Shaft for side adjustment, complete	Kreisfuge	.50
MG-31	Wood handle, for side adjustment shaft	Kreiskegel	.15
MG-31⅛	Screw to hold wood handle on MG-30	Kreislauf	.01
MG-32	Swivel collar for side adjustment	Kreislinie	.12
MG-33	Screw to hold swivel collar	Kreisrund	.01
MG-34	Washer on side adjustment shaft	Kreisstadt	.03
MG-38	Screw for up and down adjustment	Kreisstuhl	.58
MG-39	Swivel collar for up and down adjustment	Kreistagen	.18

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Motiograph No. 1A Arc Lamp—Continued.

Art. No.		Code Word	Price
MG-39½	Screw to fasten swivel collar on MG-39	Kreistanz	$ .08
MG-40	Socket on MG-38	Kreistrupp	.24
MG-40½	Screw to fasten MG-41 in MG-40	Retenons	.03
MG-40¾	Pin to hold MG-40 on MG-38	Krenksters	.02
MG-41	Shaft for up and down adjustment, complete	Krenkten	.50
MG-46	Wood handle for MG-41	Krensauer	.15
MG-46½	Screw to hold wood handle on MG-41	Krenterig	.01
MG-47	Plate on lower carbon clamp	Kreppende	.08
MG-47½	Screw to fasten plate, MG-47	Kreppflor	.01
MG-48	Wing nut for carbon clamp	Kresshuhn	.18
MG-49	Screw to hold short clamp casting (10x24)	Kressalat	.01
MG-50	Flat washer for carbon clamps	Kretscham	.02
MG-51	Convex washer, for carbon clamps	Retentabar	.04
MG-53	Machine screw to hold long clamp to bracket. (¼x24)	Kreubeere	.01
MG-54	Thumb screw to hold wire	Kreukelde	.18
MG-55	Washers for No. MG54 (2) each	Kreusmes	.02
MG-56	Clamp screw to clamp brackets together	Kreuzaltar	.01
MG-57	Clamp screw for upper rack bracket(10x24)	Kreuzarche	.01
MG-58	Machine screw to hold upper rack on bracket (8 x 32)	Kreuzarm	.01
MG-59	Machine screw to hold lower rack on bracket (2) (8 x 32)	Kreuzbaum	.01
MG-62	Mica insulators—flat—set	Krouzbild	.30
MG-63	Mica insulators round bushing	Kretzbinde	.18
MG-64	Mica insulators round washers	Kreuzblume	.18
MG-65	Iron washers for M. G. 56	Kreuzbogen	.02
MG-85	Rack body (new style)	Kreuzdorn	1.50
MG-86	Rack body support (new style)	Kreuzeumm	1.50
MG-87	Screw to hold rack body to support	Retentaras	.01
MG203A	Rear truss support for burner slide rods	Kortoor	.75
MG322	Burner slide track rod	Korvetbrik	.45
MG336M	Burner slide adjusting screw	Kosmas	.75
MG352	Screw, for burner slide friction	Kostfrauen	.01
MG357	Screw to retain MG336M	Kosthauses	.01
MG929	Wood handle for MG336M	Krachten	.15
MG955	Screw to hold MG929 to MG336M	Kransader	.01

Upper Carbon Adjustment Fixture for No. 1A Motiograph Arc Lamp

Art. No.		Code Word	Price
MG-91	Rack bracket for adjustment fixture	Kreuzestod	$3.25
MG-92	Adjustment bracket for carbon clamp	Kreuzfahne	2.75
MG-93	Support bolt	Kreuzfeuer	.24
MG-94	Adjustment screw	Kreuzfrage	.18
MG-95	Adjustment handle	Kreuzfuchs	.18
MG-96	Clamp bolt	Kreuzgang	.18
MG-97	Collar for Adjusting Screw	Kreuzgasse	.06
MG-98	Stock washer ⅜" x ⅝"	Kreuzgurt	.01
MG-99	Stock screw—round head, 8-32 x ¼"	Kreuzhafer	.01
MG-100	Pin for collar for adjustment screw ⅜"x½".	Kreuzhieb	.01
MG-101	Headless screw for adjustment thumb nut.	Kreuzholz	.01
MG-102	Universal adjustment fixture complete, for upper carbon clamp	Retouchons	7.00

IMPORTANT. Where parts are listed complete, such as the Geneva Star and Shaft, the Geneva Cam or Pin Wheel and Shaft, etc., do not order them separate, as it is not practicable for one without special facilities to properly fit them.

Upper Universal Carbon Clamp for No. 1A Motiograph Arc Lamp

Art. No.		Code Word	Price
MG-110	Bracket (long)	Kreuzigen	$2.25
MG-111	Clamp screw for bracket	Kreuzigest	.18
MG-112	Locating screw for bracket	Kreuzigung	.06
MG-113	Swivel for bracket	Kreuzkelch	1.25
MG-114	Clamp screws for swivel	Kreuzkluft	.24
MG-115	Washers for clamp screws for swivel	Kreuzknopf	.06
MG-116	Carbon holder	Kreuzlahm	.75
MG-117	Wing nut for carbon holder	Kreuzlinie	.18
MG-128	Bracket (short)	Kreuzstein	2.25

Lower Universal Carbon Clamp

Art. No.		Code Word	Price
MG-118	Bracket (long)	Kreuzmars	$2.25
MG-119	Clamp screw for bracket	Kreuznagel	.18
MG-120	Locating screw for bracket	Kreuznaht	.06
MG-121	Swivel for bracket	Kreuzotter	1.25
MG-122	Clamp screw for swivel	Kreuzpunkt	.24
MG-123	Washers for clamp screws for swivel	Kreuzraute	.06
MG-124	Carbon holder	Kreuzreim	.75
MG-125	Wing nut for carbon holder	Kreuzriss	.18
MG-126	Stop plate on carbon holder	Kreuzsalve	.06
MG-127	Screws for stop plate	Kreuzsegel	.01
MG-129	Bracket (short)	Kreuzstich	2.25

Motiograph 1-A Lamp House

Carriages and Pedestal Stand

Art. No.		Code Word	Price
300A	Track bracket for wood board	Kortmes	$ .45
301	Intermediate carriage, wood board	Kortmassen	1.50
302	Top carriage wood board	Kortom	1.50
304A	Iron base board casting only	Retentaste	7.25
304½A	Screws to clamp tubes in iron board	Retentemos	.01
306A	Casting on front of lower lamp house	Kortstaart	1.50
307	Cone support for lower lamp house	Kortvoer	.75
308	Band for dowser shutter, with screw	Retentemur	.90
308¼	Swivel screw to hold 309A to 308	Retracadas	.18
308½	Wood handle for Dowser shutter	Retracames	.18
309A	Dowser shutter complete, with ball piece and handle	Retentif	2.50
309¼	Screw to hold 308½ to 309½	Retractif	.01
309½	Stud for wood handle on No. 309	Reticolato	.06
310A	Slide carrier swing arm complete	Kortvoetig	1.90
310½A	Slide carrier swing arm, casting only	Retostado	.75
311A	Slide carrier level	Kranichzug	.45
0311	Pin for slide carrier level	Kranigheid	.01
313M	Slide carrier swing screw button	Retentiva	.20
0314	Slide carrier swing screw	Retentoris	.50
315	Condenser mount complete, without glasses	Krebsicht	1.90
315½	Tin rings inside condenser case	Krebskrank	.30
316	Condenser case only	Krebskreis	.95
316½	Steel spacer between condensing glasses	Krebsmatte	.65
317M	Tubes, iron base board	Retentriz	1.50
318	Intermediate carriage casting for metal board	Retentum	2.65

Note:—When Ordering State for 1912 Model and give the serial number of your machine.

Motiograph 1-A Lamp House

Carriages and Pedestal Stand (Continued)

Art. No.		Code Word	Price
319	Top carriage casting, for metal board	Reteporite	$2.25
319¼	Screw to fasten 319 to bottom of lamp house	Retractons	.09
319½M	Stop pins in No. 319	Returamur	.01
320	Lower track rod wood base board	Kortwieken	.45
321	Intermediate cross track rod for wood base board	Korund	.60
323M	Cone support rod, lower lamp house	Reterendas	.12
325	Sleeve to hold slide carrier swing in position on 323-M swing rod	Korybanten	.24
328	Mechanism sub base casting for metal board	Retcrendo	1.40
329	Upper swivel, for pedestal	Retergebo	2.80
329½	Screw to bind swivel rod	Retersant	.01
330	Lower swivel, for pedestal	Retersimus	2.80
330½	Screw to fasten No. 330 to pedestal	Retesasen	.06
331	Clamps to fasten condenser mount	Kosaken	.20
332	Screw to hold clamp for condenser mount	Kosen	.06
333	Support screw for condenser mount	Kosest	.06
334	Cone shutter stud	Kofewort	.01
337	Flat track rod, iron base board	Retexerunt	.65
338	Round " " " " "	Retexisset	.50
339	Adjusting screw, for pedestal swivel	Rethra	.60
340	Cone support dowel screw	Kosmetisch	.06
341	Roller on top carriage No. 319	Retiaculum	.12
342	Roller pin for No. 341	Retiary	.02
343	Slide carrier catch spring (two leaves)	Kossaeer	.15
344	Hand bolt to clamp metal base to pedestal	Retiatorum	.90
346	Thumb screw for intermediate carriage	Kostbar	.09
348	Thumb screw for cone support	Kosteloos	.09
349	Wood handle, on top carriage	Kostenlos	.18
0350	Felt cushion under mechanism base	Kostmud	.15
351A	Underwriters' safety hood support	Kostfrau	.30
353	Screw for attaching top carriage No. 302 to lamp house	Kostganger	.01
354	Oblong washer for Underwriters' safety hood	Kostgeber	.01
355	Screw to attach front casting to lamp house	Kostgeld	.01
356	Screw, for attaching rear truss to bottom of lower lamp house, ¾"	Kosthaus	.01
358	Adjusting screw for lamp house, complete	Retiatos	.70
358½	Wood handle for No. 358 only	Reticas	.15
359	Screw, to bind cone support rod	Kostherren	.01
360	Screw for lower track rod	Kosthuizen	.01
361	Wood screw for track brackets	Kostguffer	.01
362	Screw, special for cone shutter	Kostkind	.06
364	Screw to clamp lamp house rods	Kostkinder	.01
365	Screw, Underwriters' safety hood support	Kostschip	.01
366	Screw, filister head to attach soup plate to wood base board	Kostschool	.06
369	Screw, to hold 358½ wood handle, on 358 screw	Kotboddin	.01
370	Screw for 349 handle	Koteka	.09
373A	Base board for lamp house, wood	Koterde	3.00
374A	Lamp house body	Koterende	15.00
374½A	Lamp house top, Underwriters'	Reticebunt	1.40
375A	Lamp house door, Underwriters or plain, no hinge	Kothabzug	1.10
376M	Swivel rod, on pedestal	Reticelle	.12

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Motiograph 1-A Lamp House

Carriages and Pedestal Stand (Continued)

Art. No.		Code Word	Price
377	Lamp house cone, only	Kothbad	$1.50
377½	Lamp house cone and dowser (small) shutter	Krankarren	3.00
385A	Porcelain bushing	Kothaufe	.15
386	Door knob, wood	Kothhof	.15
387	Door catch	Kothhofes	.12
388A	Peep frame (metal parts) two pieces	Kothig	.38
389A	Peep frame glass (two colors, red and green) set	Kothiger	.25
390	Spring hinge for Underwriters' door, with screws and nuts	Kothkarren	.50
391A	Transite board inside top of lamp house 14" x 6½" x 3/16"	Kothknecht	1.80
391½A	Transite insulation, 6½" x 4½"	Krankasten	.24
392A	Transite Insulation, 3" x 4"	Krankbed	.21
393A	Transite board, outside bottom of lamp house, 14½" x 7" x 3/16"	Kothlawine	1.80

Stereo Dissolving Attachment.

Parts that are the same as those in lower lamp house and arc lamp will be found listed under Motiograph No. 1-A Arc Lamp and Motiograph No. 1-A Lamp House.

Art. No.		Code Word	Price
S408	Upper lamp house carrier casting, front	Kothurn	$ .75
S409	Upper lamp house carrier, rear	Kothvulkan	.60
S409½	Screw for attaching S409 and MG303A to bottom of upper lamp house, 1¼"	Retradebat	.01
S410	Base casting for upper lamp house support tube	Kothwetter	1.25
S412	Upper lamp house support arm and rod	Kottyphos	3.75
S413	Upper lamp house support cradle casting	Koubeitel	1.50
S414A	Base casting for lower lens front	Koudslide	2.40
S416A	Adjuster casting for upper lens front	Koudbier	1.80
S417	Eye screw for S422	Koudjas	.20
S418	Lower Stereo lens front	Koudestof	1.80
S419	Upper Stereo lens front	Koudjes	1.80
S421	Adjusting nut for S424A	Koudslager	.60
S422	Locking nut for S425	Koudsmeden	.45
S423	Screw to hold S424 in S416A	Kraftlohre	.06
S424A	Vertical adjustment rod for S419	Koudzweet	.30
S425	Horizontal adjustment rod for S419	Koukarien	.55
S426A	Vertical tube for upper lantern support	Kourilien	2.00
S427A	23" long brace for No. 426 vertical tube	Koulcab	.75
S428A	20½" short brace for No. 426 vertical tube	Korrok	.75
S428½	Thumb screw for S414A	Kouler	.09
S429	Thumb screw to clamp, upper lens front casting on S416A	Koulougli	.09
S430	Thumb end screw in S431A and S434	Kouarkin	.09
S431A	Rear support fulcrum rod and head	Koupara	.30
S432	Upper lamp house front casting	Retoured	1.50
S433	" " " cone support casting	Retournage	.75
S434	Rear support telescope tube with eccentric and eye ends	Retractor	.70
S435	Thumb screw for eccentric end of S434	Koseband	.09
S436	Telescope tube with eccentric head for upper lamp house front	Kraftmilch	.50

Note:—When Ordering State for 1912 Model and give the serial number of your machine.

Stereo Dissolving Attachment-Continued.

Art. No.		Code Word	Price
S437	Screw to retain S425	Kraandud	$ .06
S438	Thumb screw for eccentric head on S436	Koseband	.09
S439	Rod to connect upper lens front to cone support S433	Retostar	.30
S440	Screw for front end of S439 rods	Retractura	.02
S442A	Rear brace complete, consisting of S430 S431, S434 and S435	Kraftsaft	1.25
S443	Cone support rod, upper lamp house	Retradimus	.15
S444	Screw for ends of S443	Retrahamur	.02
S449	Long track rod for Stereo-Motio	Retostaria	.65

Stereo-Motiograph Dissolving Shutter

Art. No.		Code Word	Price
S450	Lens band and slide rod	Kousvormig	$1.65
S451	Link lever	Kouterhout	.60
S452	Lens yoke complete	Koutsters	1.20
S453	Slide head	Kozel	.90
S456	Link lever support	Kraag	.75
S457	Handle head	Kraaghop	.45
S458	Bushing	Kraagjas	.45
S460	Link	Kraagmerel	.24
S461	Washer for slide head	Kraagsteen	.15
S462	Connecting rod	Kraaidoorn	.45
S463	Wing bar and wing, upper	Kraakbeen	.60
S464A	Wing bar and wing, lower	Kraakwater	.60
S465	Handle	Kraaalboom	.30
S467	Collar on connecting rod	Kraalrand	.18
S468	Screw in link lever	Krankhoofel	.01
S469	Washer for connecting rod	Kraambed	.06
S470	Thumb screw for slide head	Kraambier	.09
S471	Shoulder screw for slide head	Kraangved	.09
S472	Machine screw for connecting rod	Kraamheer	.01
S473	Machine screw for handle head	Kraamkamer	.01
S474	Machine screw for lens band	Kraamkind	.01
S475	Screw in link lever	Kraamtuch	.06
S478	Machine screw for brake	Kraamsters	.01
S480	Pin in connecting rod collar	Kraamstoel	.01
S481	Brake cushion, leather	Kraamwaren	.06
S482	Dissolving shutter, complete	Disshutter	7.50

Stereopticon Parts—Miscellaneous

Art. No.		Code Word	Price
S486A	Flat brace for lower lens front	Kraftboll	$ .36
S487	Screw for flat brace (No. 8) small	Kraftwort	.01
S488	Screw for flat brace (No. 10) large	Kragen	.01
S489	Screw to attach lower lens front on S414A	Kragenente	.01
S490	Main clamp screw, hexagon, for wood base board (Stereo-Motiograph)	Kragentuch	1.00
S491	Screw for brace rods in rear support collar (R. H. N. P. No. 12, 24x⅜)	Krakeelers	.01
S493	Screws for support base casting	Krakeling	.01
S495	Roller on support base (auxiliary for lower lantern)	Krakers	.10
S496	Center screw in roller S495	Krallst	.09
S498	Washers on rear support cross rod	Krambude	.01
S499	Thumb screw rear support cross rod	Kramerato	.06

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Special Parts for Enterprise Double Dissolving Stereopticon.

Art. No.		Code Word	Price
ES 1	Lower lamp house carrier castings "front and rear" each	Retrusorum	$ .75
ES 2	Upper rocker support casting for top lamp house	Retrusos	.75
ES 3	Lower rocker support casting for top lamp house	Retschen	.75
ES 4	Flat support bar for lower rocker support ES 3	Rettangolo	.60
ES 5	Swivel rod to connect ES 2 and ES 3	Retterin	.15
ES 6	Screw to fasten ES 1 to bottom of lower lamp house each	Rettetest	.01
ES 7	Screw to fasten ES 2 to bottom of upper lamp house each	Retudier	.01
ES 8	Screw to fasten ES 4 to top of lower lamp house each	Retuerto	.01
ES 9	Screw and washer so fasten ES 3 to ES 4	Retuesta	.03
ES10	Center screw for ES 3	Retulero	.03

ALL OTHER PARTS ARE LISTED UNDER MOTIOGRAPH No. 1-A LAMP HOUSE.

Repair Parts For No. 3 Front Shutter.

Art. No.		Code Word	Price
FS-1	Front plate, brass casting	Fronplate	$3.50
FS-2	Disc shutter	Shutdisc	2.50
FS-3	Disc shutter shaft	Shutshaft	.50
FS-4	Bushing for disc shutter shaft	Shutbush	.50
FS-5	Bevel gear on disc shutter shaft	Shutgear	.50
FS-6	Bevel gear on shutter drive shaft	Shutdrive	.50
FS-7	Nut on clamping device	Shutnut	.40
FS-8	Collar on disc shutter shaft	Shutcoll	.15
FS-9	Screw for collar on disc shutter shaft	Shutscrew	.01
FS-10	Screw for bevel gear on shutter drive shaft	Screwgear	.01
FS-11	Screw for clamping device	Discscrew	.01
FS-12	Pin in bevel gear No. 6	Shutpins	.01
FS-13	Screws to clamp bushing for disc shutter shaft (two)	Shutclamp	.01
FS-14	No. 3 front shutter, complete	Shutkom	7.50

Repair Parts For Metal Operator's Seat.

Art. No.		Code Word	Price
GMPS-15	Operator's seat (only)	Ogival	$ 2.25
GMPS-16	Spider for operator's seat	Ogivettes	.85
GMPS-17	Seat support arm	Oglasa	1.80
GMPS-18	Long brace	Oglia	.90
GMPS-19	Medium brace	Ogliaro	.85
GMPS-20	Swivel rod, seat support arm	Ogling	.25
GMPS-21	Swivel rod for brace	Ogmios	.20
GMPS-22	Bolt for seat	Ognora	.20
GMPS-24	Bushing for bolt	Ognorache	.20
GMPS-25	Hand wheel to clamp seat	Ognuno	.50
GMPS-26	Screw to clamp seat on spider	Ogreish	.02
GMPS-27	Screw to clamp swivel rod in seat support arm	Ogress	09
GMPS-28	Screw to clamp swivel rod in brace	Ogrillon	.09
GMP-S29	Operator's seat (complete)	Ogrism	75.0

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WHAT USERS SAY OF THE MOTIOGRAPH

Feb. 17, 1910

W. H. Johnson, Mgr., Colonial Theatre, Kalamazoo, Mich., says:

"I purchased in 1907 the first Motiograph you turned out. Like it better than any machine made. Have used them all. You surely have a wonderful machine."

Oct. 5, 1909

F. W. Swett, with Southern Pacific R. R. Co., Transportation Dept. exhibiting in Manchester, Eng., says:

'People here who are well posted, say, 'they never saw such pictures before'."

Feb. 4, 1910

O. R. McGibbons, Prop., Orpheum Theatre, St. Louis, Mo., says:

"After careful investigation he bought two Motiographs. Patrons all speak of excellence of pictures."

J. V. Lopaze, Trinidad, Colo., says: Sept. 16, '09

"Best results and best pictures in town."

G. Robinson, Oxnard, Cal., says: Sept. 3, 1909

"The Motiograph Machine is fine as silk."

F. A. Turner, New Vineyard, Me., says: Nov. 12, '09

"The Motiograph is the best machine he has ever seen."

Calvin Huss, Business Manager, Spring Mills, Pa., says: Sept. 10, '09

"The Motiograph makes the steadiest pictures he has ever seen."

Bent Huntley, Prescott, Wis., says; Nov. 5, '09

"The Motiograph makes them sit up and take notice."

F. W. Spencer, Fulton, N. Y., says: Dec. 3, 1909

"The Motiograph is the best machine made."

O. F. Gould, Manager, The Bijou Theatre, Attica, N. Y, Sept. 15, '08

"Says Motiograph is as perfect as can be."

Virginia Theatre, Chicago, Ill., says: Sept. 14, '09

"The Motiograph is as near flickerless as possible."

Hagan & Comer, Grand Rapids, Minn., say: Dec. 14, '09

"The Motiograph gets all the business."

July 27, '09

Assistant Chief of the London Fire Brigade, London, Eng., says:

"The Motiograph is superb, perfection in every way,"

Mr. F. W. Swett, New York City, N. Y., says: Feb. 1, '09

"The best outfit in New York,"

Orpheum Theatre, Great Falls, Mont., say: June 7, '09

"Is old operator and can't say enough for the Stereo-Motiograph."

Frank M. May, Howard City, Mich., says: Jan. 30, '09

"Motiograph has the world beaten."

F. B. Johnson, Goldfield, Nev., says: Mar. 25, '09

"Motiograph superior to anything he ever saw."

Floyd B. Spencer, The Lyceum, Fulton, N. Y., says: Sept. 1, '09

"Is old operator and likes Motiograph best of all."

SEND FOR BOOKLET "WHAT USERS SAY" OF THE MOTIOGRAPH

Manufactured by

The Enterprise Optical Manufacturing Co.

564 W. Randolph Street

CHICAGO, ILL.