

BELL & HOWELL  
Standard Continuous  
FILM PRINTERS

Standardized  
Cine-Instruments and Machines

# Standard Continuous Film Printers



**BELL & HOWELL COMPANY**

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NEW YORK  
11 W. 42ND ST.

HOLLYWOOD  
6324 SANTA MONICA BLVD.

LONDON [B. & H. CO., LTD.]  
320 REGENT ST.

*Established 1907*

*Pioneer Manufacturers of Professional Cinematograph Cameras and  
Equipment used almost exclusively by World's Foremost Producers*



REG. U. S. PAT. OFFICE

## PREFACE

THE "continuous" principle in film printer construction has— from the first—been recognized as a valuable aid to increased production. The application of this principle to the earlier types of film printing machines resulted in pictures of inferior quality. This outcome was due rather to failure to perfect other features of the construction than to defects inherent in the continuous feed principle. The difficulties met with in the operation of these printers had to do, primarily, with the slippage or creepage of the film. They arose from defects in design and construction due to failure (a) to take into account the difference in length between the positive and negative films, commonly known as negative shrinkage, or (b) to provide for the control of the film at the printing aperture instead of some distance away from it, or (c) to bring the positive and negative films into perfect contact at the moment of exposure to the printing light.

BELL & HOWELL Continuous Film Printers are so designed, constructed and equipped as to avoid the difficulties experienced with other types of continuous printers, and to render efficient aid in the production of pictures of brilliant screen quality. The difficulties referred to and the methods employed to overcome them are discussed at length under "Distinctive Features," where attention is invited to many features of design and construction found only in these printers.

BELL & HOWELL Continuous Film Printers are now made in two models, viz.: the original model for printing standard width (35 mm.) film and a similar machine adapted to print the amateur sub-standard (16 mm.) film.

Sound Recording: Great interest is now being shown in Talking Movies. Particular attention is directed to the fact that any BELL & HOWELL Continuous Printer can be readily adapted on special order for this kind of work. A Special Triple Adjustment Sound Attachment can be installed on any BELL & HOWELL Continuous Printer. This device permits printing sound or regular negatives interchangeably. Experience has proven that this continuous printer is the most satisfactory for the printing of sound negatives. Further particulars furnished on request.

BELL & HOWELL COMPANY.

BELL & HOWELL COMPANY

The BELL & HOWELL Standard Semi-Auto-  
matic Continuous Film Printer  
Model "D"



*Used by the Leading Motion Picture  
Laboratories all over the world.*

# Specifications for BELL & HOWELL Standard Continuous Film Printer Model "D"

This printer has for many years now fulfilled every requirement incident to the quantity production of positive prints and is unparalleled in its high efficiency as a factor in modern motion picture production. In operation this machine is semi-automatic with respect to the printing light control, i.e., while the actual change of the volume of light at the point of film contact is effected by an electrically operated device, the extent of these changes are predetermined by the attendant. This affords an instantaneous change of light at the proper time to compensate for unequal densities of consecutive scenes in the negative film and also eliminates a stop at each change of scene as was required in earlier models of continuous printing machines.

## *Distinctive Features*

To be found only in Bell & Howell Standard Continuous Film Printers

- I. Standardization.
- II. Creepage or Slippage of Film Overcome.
- III. Control at Printing Aperture.
- IV. Film Movement Mechanism.
- V. Film Contact.
- VI. Triple Adjustment Sound Attachment.
- VII. The Printing Mechanism.
- VIII. Light Control.
- IX. Safety Features.
- X. Production—Quantity—Quality.
- XI. Framing Unnecessary.

### I. Standardization

BELL & HOWELL Continuous Film Printers are built to the standard established by the BELL & HOWELL gauge of film perforation. That is to say, the film movement mechanism of the printer is made to coincide exactly with perforations made to BELL & HOWELL gauge. Absolute accuracy of register of the film at the printing aperture is thus assured. The element of standardization contributes largely to the general efficiency of the printer and aids in overcoming the specific difficulties mentioned elsewhere. Note: While the film movement mechanism of our Continuous Film Printers is constructed with especial reference to the BELL & HOWELL Gauge of Film Perforation, the use of the printers is by no means limited to film perforated to that gauge. The BELL & HOWELL Standard Printer will print satisfactorily, film perforated to the new BELL & HOWELL rectangular perforation. (See also paragraph X).

We are now prepared to supply a special model of this printer for 16 mm. operation, as well as the original model using the standard size film. The two models embody exactly the same essential principles. The only difference is in the dimensions of the sprockets, rollers, flange hubs, etc.

Any BELL & HOWELL Continuous Printer can be adapted at the factory so that it can be used to print the 16 mm. sub-standard film. When this change-over is effected, the machine becomes a 16 mm. continuous printer and cannot be used for the regular standard (35 mm.) film.

## II. Creepage or Slippage of Film Overcome

The creepage or slippage of the film in its travel past the printing aperture presented itself to pioneer builders of continuous film printers as an insurmountable difficulty. This difficulty and the means employed by us to overcome it, may best be described as follows:

A strip of negative film shrinks after exposure, development and proper drying, and is, therefore, shorter than the positive film. When the two strips are carried through the printer together it is impossible to make them register perfectly before the printing aperture unless some provision is made to offset the difference in length. In the construction of the BELL & HOWELL Continuous Film Printers the difference in length between the two films is equalized by providing a convex surface over which the films must travel on their way past the printing aperture. The radius of this surface is such that when the positive and negative films are in position upon it with the positive film on the outside, the greater length of the positive film is counterbalanced by the increase in length of its arc over that of the arc of the negative film. The perforations in the two strips of film are thus made to register perfectly and all creepage or slippage of the film because of shrinkage, is eliminated.

## III. Control at Printing Aperture

A common fault of printers of either the step feed or continuous feed type is that the point of film control is at some distance from the printing aperture. When the point of control is so located there is sure to be creepage of the film on its way from the film supply reels past the printing aperture to the film drive sprocket because the negative film travels a shorter distance than does the positive film. The extent of the creepage will depend upon the diameter of the driving sprocket and its position in relation to the printing aperture. Control at the printing aperture assures steady pictures as this is the proper place to register the film.

Provision is made for the control of the film at the printing aperture, thus making creepage impossible at that point. A sprocket having the same radius as the aperture plate and a contacting surface approximately one-third greater than the height of the aperture, engages with the film and advances it to the printing aperture. The film is brought to accurate register just before it reaches the printing aperture and remains in register until printing is accomplished. A loop in the film interposed between the printing aperture and the take-up sprocket prevents the strain upon the films at the printing aperture, and they pass over the take-up sprocket to the take-up reels without interruption. (See paragraph on Film Movement Mechanism IV.)

## IV. Film Movement Mechanism

In all BELL & HOWELL Standard machines and instruments, care has been taken to avoid frictional contact between the film and the mechanism employed to move it. The film supply sprocket located below the feed reels receives the films from the reels and coacts with the aperture sprocket in maintaining a loop between the supply sprocket and the aperture. The films pass from the sprocket to the tension rollers. These rollers—mounted on weighted levers—are self-adjusted to exert sufficient stress on the films to keep them taut at all times. They maintain a proper degree of tension against the teeth of the printing aperture sprocket, thereby providing the means for the correct registration, and eliminating a further possibility of creepage or slippage between the negative and positive films. The tension is in direct proportion to the pressure exerted upon the films. It is sufficient to take all curl from the films and to keep them in perfect alignment. The rollers coact with the aperture sprocket, the teeth of which engage with the films as they come from the tension rollers and bring them into perfect register before the printing aperture. This method assures steady pictures.

It is to be noted as a distinctive feature of this construction that the film movement mechanism presents no sliding surfaces to the films. On the contrary friction is reduced to the minimum by the employment of rolling instead of sliding motion, thus preventing scratches, static and abrasion marks.

In this connection it should be said that all the sprockets used in the printer are necessarily of the same peripheral speed. The film supply sprocket receives the positive and negative films from the feed reels and regulates the delivery of them to the tension rolls and thence to the printing aperture sprocket. While the sprocket below the printing aperture serves as a driving sprocket in the film take-up mechanism, its chief purpose—like that of the film supply sprocket—is to maintain a loop between it and the printing aperture sprocket, thus preventing strain upon the film between the take-up reels and the printing aperture sprocket and making impossible any interference with the perfect register of the two films at the printing aperture.

## V. Film Contact

A proper degree of contact between the positive and negative films at the printing aperture is necessary to the making of positive prints of fine screen quality. This result is now accomplished as follows:

The printing gate, in addition to being concaved to properly match the surface of the aperture plate and printing sprocket, is machined with a slightly raised portion immediately opposite the aperture opening and at right angles to the direction of travel of the film. The length of this raised portion is slightly greater than the width of the aperture opening, and while it allows the negative and positive film a free movement in approaching and leaving the exposing aperture, it serves to keep them in perfect contact at instant of exposure.



## VII. Triple Adjustment Sound Printing Attachment

The most important feature of this new development is its versatility; the three masks can be set at any combination desired as shown in figures 8, 9, 10, 11 and 12. Note particularly, that by retracting all the mattes as shown in Figure 8, regular negatives can be printed at an instant's notice.

The attachment consists of two main assemblies clearly shown in Figure 7, and is installed very accurately in position as illustrated in Figures 5 and 6. Note how the jaws of the sound attachment interlock with the lower aperture jaw to prevent light leakage.

Three masks are employed and are made so that the aperture has a fixed standard opening of  $\frac{5}{16}$ ". This means that the aperture opening cannot be altered for special work. However, this contingency can be easily taken care of by the use of an external rheostat (see page 16), or possibly by altering the adjustment of the back shutter (see page 14). Each mask operates in accurately milled slots in the casting and their travel is limited by two slots cut on their under sides in which the pawls "P" (Fig. 7) engage. The stroke of the masks is  $\frac{1}{2}$ ", which is the distance between these slots. This withdraws the mask far enough to avoid interference with the light.

Due to the three masks being held in place by the triple tongued spring "S" (Fig. 7), a little care must be exercised to avoid slamming the gate (see operation No. 7, page 24). This, of course, should not be done at any time, but it is a point to be watched when the sound attachment is installed in position at the gate.

The middle mask "B" is recessed so as to avoid any possible fringing due to reflections from the side of the masks. The two side mattes "A" and "C" are milled with a slight rib on the sides adjacent to the middle mask. When the middle mask is pulled back, it engages this rib on the side mask and moves it over sideways a distance of .017". This causes a strip .017" wide to be double exposed and thereby causes a black line, .017" wide, to be printed between the sound and picture areas (as now standardized by the Society of Motion Picture Engineers).

The sound negative can be printed from either end of the roll, and either the sound or picture area can be printed as desired, without rewinding. Figures 8, 9, 10, 11 and 12 show how this is done.

### Adapting Previous Model Printers for Sound Work

The triple adjustment sound attachment can be installed in old model printers. It is only necessary to ship front "butterfly" casting to the factory.

It is imperative that the back shutter be installed if not already existing in the printer, as the opening of the front aperture jaws cannot be varied to control the intensity of the printing light.

For sound work, it is also advisable to have helical cut gears and flat belt installations, in order to insure the utmost evenness in operation.

The triple adjustment sound attachment has met with exceptional favor for sound printing, and is offered with the confidence backed by its genuine success in operation under the most exacting conditions.

BELL & HOWELL  
Continuous Printer with Triple Adjustment  
Sound Attachment

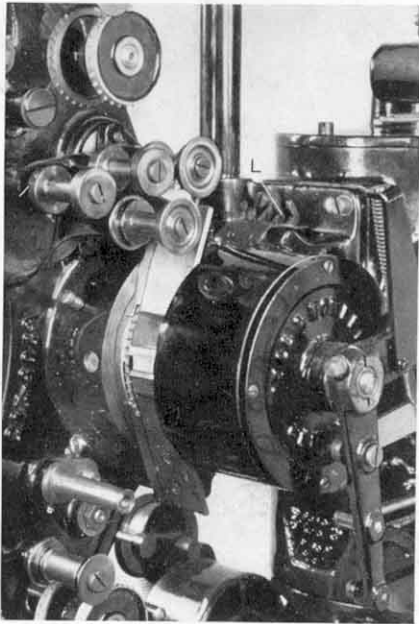


Fig. 5

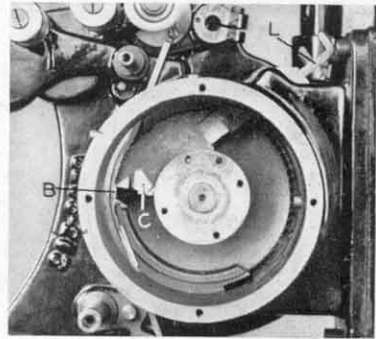


Fig. 6

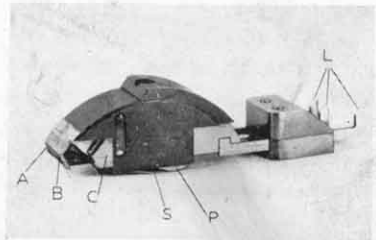


Fig. 7



Fig. 8



Fig. 9



Fig. 10



Fig. 11



Fig. 12

"A," "B" and "C"—Shutters Masking Sound and Picture Areas. "L"—Shutter Operating Levers.  
"S"—Pawl Tension Spring. "P"—Shutter Lock Pawl.

- Fig. 5—Major detail of B. & H. Printer—with gate removed.
- Fig. 6—The Triple Adjustment Sound Mask Attachment—installed.
- Fig. 7—The Triple Adjustment Sound Mask Attachment.
- Fig. 8—Shutters Retracted for full aperture printing.
- Fig. 9—Shutter "A" set for masking the sound area—forward run.
- Fig. 10—Shutters "B" and "C" set for masking picture area—forward run.
- Fig. 11—Shutter "C" set for masking the sound area—reverse run.
- Fig. 12—Shutters "A" and "B" set for masking picture area—reverse run.

## VII. The Printing Mechanism

The printing mechanism combines the use of the following:

- (a) Film Notching Cutter.
- (b) Printing Index Card.
- (c) Time Regulator Index Dial.
- (d) Magnetic Clutch.
- (e) Back Shutter Light Control.
- (f) Time Indicating Pointer.
- (g) Circuit Interrupter.
- (h) Printing Sprocket.
- (i) Printing Gate.
- (j) Combination Interlocking Switch and Starting Handle
- (k) Aperture Adjustment.
- (l) Printing Lamp Mounting Adjustment.
- (m) Film Footage Recorder.
- (n) Key Printing.

### (a) Film Notching Cutter

A Film Notching Cutter is supplied with each machine for the purpose of cutting a notch in the margin of the negative film at the proper point for an effective change of light as the change of scene passes the printing aperture. The notching cutter also serves as a gauge insuring the correct position of the marginal notch in its relation to the point where a change in light density is to be made. The notch is placed in the film following the splice or point in the scene where change is desired.

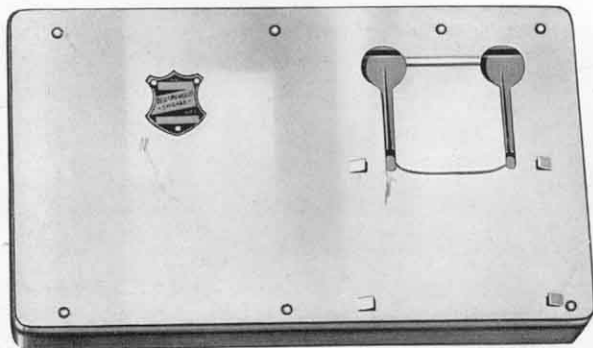


Fig. 2. Film Notching Cutter

### (b) Printing Index Card

A supply of printing Index Cards are furnished with each machine with provisions for showing the footage advance of each scene and the correct light

## STANDARD CONTINUOUS FILM PRINTERS

that should be used in printing. The Printing Index Card (Form No. 107) for use with the printer is placed in position in a receptacle above the Time Regulator Index Dial and enables the operator to set the changes to be made in the Aperture Shutter opening as they are indicated by the operation of the Time Indicating Pointer. It is the customary practice in printing laboratories to indicate plainly a short scene where a quick change of light occurs; this enables the operator to be on the qui vive, and set the lever on the Index Dial quickly for the next change.

Form 107 Title	Index No.	Scene	Tone or Tint	Part	I	R	I	Card	I	Insert No.	Feet
<i>The World Aflame</i>			<i>Blue</i>								
Start →	8	<i>Intro. Title</i>									0
	10	<i>Sub. " - The only -</i>									12
	12	<i>Interior set - Holmes at Desk</i>									22
	9	<i>Exterior - Crowds gathering</i>									32
	12	<i>Interior set - Holmes smoking</i>							1		53
	10	<i>Sub. Title - I wonder</i>									62
	15	<i>Closeup - man and woman</i>							3		74
	6	<i>Interior - Clubrooms</i>									89
	8	<i>Closeup - Watson and man</i>									108
	10	<i>Sub. Title - A big</i>									128
	4	<i>Exterior - Bridge</i>							5		133
	20	<i>" - Crowds</i>									141
	22	<i>" - Closeup Leader</i>									160
	17	<i>" - People shouting</i>									173
	18	<i>" - Soldiers</i>									192

Fig. 3. Example of Index Card for use on Printer

### (c) Time Regulator Index Dial

The Time Regulator Index Dial is a machined circular disc with graduations from 1 to 22 representing the operating range of the printing aperture. Each number effects an increase in the exposure of 10% in excess of the preceding one. The Time Regulator Index Dial is traversed by a hand operated lever through the medium of which the light control shutter is operated.

### (d) Magnetic Clutch

The chief function of the magnetic clutch is to instantaneously and automatically complete the operation of regulating the size of the Light Control Shutter Aperture (paragraph e). It consists of an electro-magnet whose armature in opera-

tion releases the shutter operating mechanism at the desired instant, thus allowing the shutter to occupy the position previously determined by the setting of the Time Regulator Index Dial. The clutch is actuated by the electric current which is established by the circuit interrupter when the roller follows the notch in the side of the film.

### {e} Back Shutter Light Control

All normal adjustments of the light intensity are taken care of satisfactorily by means of the newly developed Back Shutter. The Back Shutter is set by means of the Pointer on the Index Dial. The setting of the shutter is always one point ahead of the actual operation. This means that an instantaneous change in the light intensity is made as soon as the scene changes. This light change is effected when the Magnetic Clutch is released by the Circuit Interrupter (g).

The Back Shutter is located approximately half way between the lamp and the actual printing aperture; just in front of the ground glass diffuser. The advantage of controlling the light at this point is to obtain even distribution over the entire printing aperture. The operating range of the Back Shutter is divided into twenty-two stages. The opening of the first stage is usually set at  $5/32$  of an inch, and the last, No. 22, is approximately  $25/32$  of an inch. This enables a change in the volume of light of approximately 10% to be obtained between successive stages.

This shutter can be adjusted so as to increase the operating range if so desired, as explained under (k) Aperture Adjustments. (Back Shutter installation can be fitted to old printers at the factory.)

### {f} Time Indicating Pointer

(f) The Time Indicating Pointer operates automatically at each change of scene and indicates by its position on the Printing Index Card the aperture opening required for the scene immediately following the one being printed. The Pointer makes an audible click each time it changes position, thereby giving an audible as well as a visual signal to the operator that the scene has changed. It therefore, enables the operator to set the Time Regulator Index Dial for the ensuing light change.

### {g} Circuit Interrupter

The back shutter operating mechanism is operated by the closing of an electrical circuit at the instant a change of light is desired. This is accomplished by the Circuit Interrupter which consists of a suitable arrangement of totally enclosed tungsten contacts deriving their movement from a roller riding in contact with the inner margin of the negative film. Upon coming in contact with a notch, as previously explained in paragraph (a) under *Film Notching Cutter*, the roller follows the indentation of the negative film, closing the circuit and operating the shutter mechanism as explained further in paragraph (d) under *Magnetic Clutch*.

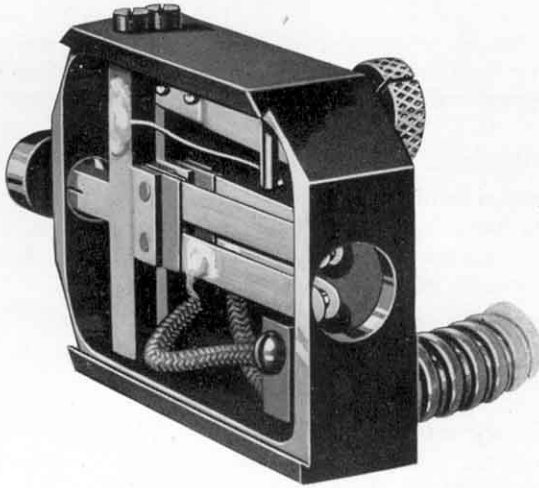


Fig. 4. Circuit Interrupter

### {h} Printing Sprocket

The principles of engineering adopted in the designing of the BELL & HOWELL Continuous Film Printers demanded that in order to insure perfect registration of the negative and positive it was necessary to have both films in engagement with a sprocket at the point of contact with the printing light. This demanded a specially constructed sprocket that would permit a free passage of the printing light and yet be of a sufficiently large outside diameter to form the curvature necessary to compensate for the difference in length of the two films, i.e., negative shrinkage.

The Printing Sprocket is built up from steel forgings carefully machined to the standards set by this Company. It has a root diameter of 3.788 inches and contains sixty-four teeth being sixteen pictures in circumference. The teeth on one side are cut to the established BELL & HOWELL gauge now universal the world over, while the teeth along the other side are smaller in width to allow for lateral shrinkage in the negative. The sprocket will therefore accommodate shrunken film or raw stock that is not perforated to the BELL & HOWELL gauge and provides perfect register for all kinds of film within practical limits.

The Printing Sprocket on the 16 mm. Continuous Printer is obviously different from that on the standard machine. The 16 mm. sprocket has a root diameter of 3.800" and contains 40 teeth, being 40 pictures in circumference.

### {i} The Printing Gate

The Printing Gate is machined to conform to the radius of the Printing Sprocket and Aperture Shutter and hardened, ground, lapped and polished. It is pivoted in the center allowing it to cradle when splices pass through the mechanism, thus assuring absolute contact.

The Printing Gate is interlocked with the Combination Switch Handle which prevents an accidental opening while the mechanism is in operation and

the printing light turned on. To open the Printing Gate it is necessary to stop the printing mechanism which automatically turns out the printing light. For accurately setting the Gate Shoe in its relation to the aperture opening, a specially designed gauge and fixture is used during the assembly at the factory.

#### {j} Combination Interlocking Switch and Starting Handle

The Combination Switch and Starting Handle is a hand operated lever which by a quarter turn starts the Printing Mechanism into operation. It automatically throws a switch for the Printing Light, and circuit interrupter. It further operates a brake insuring a quick stop of the printing mechanism.

The Starting Handle is attached by a shaft to the Printing Gate which is so arranged that it is impossible to open the gate while the printer is in operation.

#### {k} Aperture Adjustment

There are two aperture adjustments possible on the BELL & HOWELL Continuous Printer, both the printing aperture and the back shutter openings can be changed as desired. Where the negatives are consistently a little denser than usual it is generally sufficient to increase the opening on the back shutter (in this connection also see (VIII) under *Light Control*). The back shutter is normally set so that it will have an opening of  $5/32$  of an inch on the No. 1 setting. This opening can be increased to a maximum of  $5/16$  of an inch if so desired.

To adjust the back shutter, loosen the shutter operating lever screw No. 7438 (Fig. 14). Insert a screw driver through the front (printing aperture) and lift up the movable vane of the back shutter to the required opening. Clamp the shutter in position by tightening the screw No. 7438. It is generally satisfactory to adjust this opening visually, but if desired, a template can be inserted through the front aperture.

Occasionally, especially when printing badly shrunken negatives, it may be found advisable to close down the front shutter, which is normally set with an opening of  $11/32$  of an inch. To do this, loosen the two sector clamp screws, No. 8813, and move the sector lever, 01696, until the front shutter is set at the desired opening; the two screws are then tightened to lock the lever in position. We do not recommend this adjustment being made unless absolutely necessary, nor do we advise the normal opening of the front shutter being increased under any circumstances (see also under *Motor Generator and Sound Attachment*).

#### {l} Printing Lamp Mounting Adjustment

The Printing Lamp Mounting is located in the base of the lamp chamber and carries a 75 watt concentrated filament lamp, reflector and diffusing screen. It is provided with a sliding base which by the use of an adjusting screw (No. 8115) and lock nut projecting outside the lamp chamber, can be moved to or from the aperture opening.

The purpose of the Printing Lamp Mounting adjustment is to compensate for any variations in lamp efficiency due to usage and to assist in overcoming any inequalities of lamp brilliancy where a number of printing machines are to be maintained at a uniform light standard.

## {m} Film Footage Recorder

The efficiency of our printers is greatly enhanced by the use of the film measuring device which is made a feature of the construction. This device is mounted in a conspicuous place on the operating side of the machine and is connected with the feed sprocket shaft automatically registering every foot of film that passes through the mechanism. It is of great value in currently checking the progress of the printing operation as the footage registered is made to check with the footage indicated for the various scenes on the Printing Index Card or Index Strip.

## {n} Key Printing

The main casting at the aperture is cut away just along side of the sprocket to permit of Key Printing (see K, Fig. 14). While not always utilized, we find that some laboratories prefer to mark their negatives along the edges, so this feature is incorporated in the standard design to permit of key printing being done whenever desired.

## VIII. The Bell & Howell Method of Light Control

Unlike most methods of Light Changing adopted by other makers of film printing machinery this company has perfected the mechanically controlled light for film printing. The advantages are two-fold—namely:

The volume of light permitted to come in contact with the film is varied instead of the intensity. As a result of this the Printing Lamp is constantly burning at full candle power and extreme changes as from a minimum to a maximum can be accomplished instantaneously.

Due to the construction of the BELL & HOWELL Light Control Shutter greater latitude is permitted in light changing than could be accomplished by varying the voltage of the lamp.

These two outstanding features have been conclusively proven by the almost universal adoption of the earlier models of BELL & HOWELL Standard Film Printers. The greatest difficulty, and one which has been overcome by us, in connection with high speed printing has become the factor of time. With film passing the exposing aperture at approximately one foot per second or sixteen individual pictures, the time required for the light changing mechanism to function must be infinitely small in order to avoid cutting out any individual images from the finished print.

In the Back Shutter Light Control, perfected by this Company, the light change is effected mechanically by the movement of the shutter control lever. This lever is operated by a powerful spring immediately on being released by the Magnet Clutch (d).

In the antiquated method of light changing, the resistance in the printing light circuit was varied each time, thereby changing the voltage and in turn, the intensity or actinic value of the light. While this method is practical for slow printing processes or where very minute changes are not required, the time necessary for the lamp filament to increase or decrease to the desired brilliance



is too great for high speed printing such as obtained with the BELL & HOWELL Continuous Printer.

In addition to the back shutter method of light control, there are several other methods of taking care of extreme requirements in the way of light control.

### Rheostats

It is customary in most laboratories to insert some form of a variable rheostat between each printer and the line. This enables the printer to be definitely adjusted to an established standard. This is not so important where only one printer is used, but it is almost a necessity where a battery of printers is in operation. By using a variable rheostat in this manner, the adjustments on the printer are left as set in the factory and are therefore left at the most efficient positions. If negatives are met with where a great change of light is needed, the rheostat can be turned up or down one or more points before starting to print. The whole roll can be printed through with the back shutter control in the regular manner. In this way, the disadvantages of the rheostatic control, while printing, are eliminated. (Note: We do not supply rheostats.)

### Aperture Adjustments

The apertures of both the back shutter and the front shutter can be adjusted as explained in (k) Aperture Adjustments, except when the Sound Attachment is installed. The printer is so adjusted that a 75 watt lamp will give the correct amount of illumination for printing the average run of negatives met with in current practice. More powerful lamps may be used, providing the height of the filament from the base is not over  $4\frac{3}{8}$ ".

## IX. Safety Features

1. Interlocking Starting Handle and Switch.
2. Brake.
3. Ruby Window.
4. Fuses.

The principal safety feature on the BELL & HOWELL Continuous Printer is the combination switch and starting handle. This is so designed that the printing gate cannot be opened while the starting handle is in the running position. The gate must be closed when this handle is turned on. This means that it is impossible to spoil any film by accidentally turning on the light while the printing gate is open. Incidentally, this handle is connected with the brake, which serves to stop the printer instantly as soon as the handle is thrown off.

A little ruby window, Part No. 7440, is provided immediately under the index card so that the operator can see at all times whether the printer lamp is burning or not. This obviates any possibility of a roll of film being developed without being exposed, if by any chance the lamp should fail.

Fuses are provided on each separate circuit, so that a maximum of protection is obtained under all conditions.

## Electrical Specifications for BELL & HOWELL Standard Continuous Film Printers

All BELL & HOWELL Standard Continuous Film Printers are equipped with 1/8 H. P. Motors to furnish the power necessary for operation. The internal circuits controlling the magnetic clutch and also the driving motor are wound to conform to the voltage of the current on which the printer is to be used. It is therefore necessary when ordering printers to specify the voltage and whether direct or alternating current. If alternating current only is available the frequency in cycles per second and number of phases must also be mentioned.

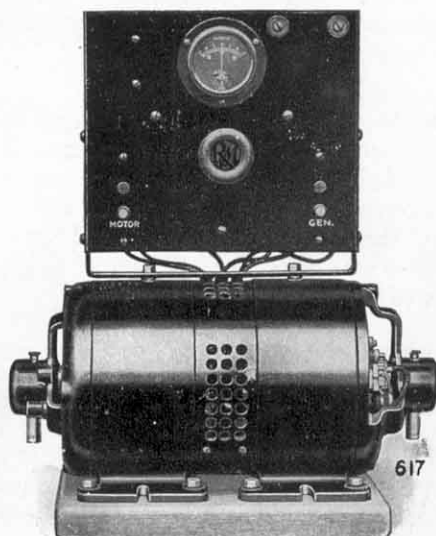


Fig. 13. Motor Generator Set

We recommend that whenever possible the BELL & HOWELL Continuous Printer be operated on direct current. In certain localities only alternating current is available. It is quite satisfactory to operate the printer by means of an alternating current motor, but it is almost imperative that the printing light itself be operated on direct current. The reason for this is that occasionally the alternations in the current will synchronize with the frames of the picture as they pass the aperture, the result is that there will be a peculiar wavy effect in the picture, that is most unpleasant. This condition is met more especially with lower frequencies and generally when the front (printing) aperture is closed down for shrunken negatives. To take care of this condition we have had a special motor generator set built which has sufficient capacity for two printing machines (larger sets can be obtained on special order). Complete electrical specifications must be given when ordering.

## X. Production—Quantity—Quality

While production must be a feature of any film printer, it becomes a distinctive feature when the printing machine leads all others in the volume and quality of its output.

### Quantity

The footage capacity of the BELL & HOWELL Standard Automatic Continuous Printer exceeds that of any other printing machine.

While we recommend its use at a speed of approximately 2500 ft. per hour or 22000 feet per day of eight working hours, with sufficient allowance for re-threading, its use is in no wise restricted to this amount. Due to the mechanical precision and other exclusive features of design it will function at higher than normal speed—though this is not recommended except for emergencies.

### Quality

Positive prints of the finest screen quality are regularly produced by BELL & HOWELL Standard Continuous Printers when operated at the maximum footage capacity. This result is achieved through the provisions made for effective film control, perfect contact between the positive and negative films at the printing aperture, and the refinements of design and construction which make it possible to suit the degree of exposure of the printing light to the varying densities of the negative film.

## XI. Framing Unnecessary

The emphasis laid upon the advantages of standardization—of suiting our camera and printer exactly to the same gauge of film perforation—has led to the impression that the BELL & HOWELL Standard Continuous Film Printers will not make good positive prints from negatives made by some other motion picture cameras. This impression is erroneous. The printing mechanism of this printer permits of making accurately framed positive prints irrespective of the location of the frame line.

## Material and Workmanship

BELL & HOWELL Standard Continuous Film Printers, embody the experience gained by our Engineering Department during a period of twenty-one years devoted to the design and development of machinery for use in processing motion picture film, as well as practical working knowledge of laboratory conditions. In the construction of these printers discriminating care in the selection of materials used is joined with skilled workmanship in reducing the ideals of the designer to an efficient working basis.

BELL & HOWELL Continuous Film Printers are of all-metal construction with the exception of the service table which is of oak. The frame is of cast iron as are all housing parts. Steel, brass and bronze are employed in the making of all operating parts.

## STANDARD CONTINUOUS FILM PRINTERS

All bearings are of phosphor bronze with ample provision for efficient lubrication. The gears are helical cut to insure smoothness of operation and are made of cast iron or bronze—the cast iron gears running with bronze and vice versa.

All wearing parts are of hardened steel. Small parts, such as screws, pins, nuts, bolts and other vulnerable parts or pieces which are not run in oil are plated or otherwise rust-proofed in our own plant.

BELL & HOWELL Standard Continuous Film Printers are fully tested before shipment and are set up and shipped complete in every detail ready to be operated when connected with an ordinary lamp socket.

### Improvements

BELL & HOWELL Printers are now being equipped with the new belt tension units, as illustrated on page 18. This progress is typical of the BELL & HOWELL policy

All improvements are so designed that they can be installed on older printers if desired (e.g., Back Shutter, Flat Belt, Tightener and sound installations).

### Guaranty

BELL & HOWELL Standard Continuous Film Printers are guaranteed against defects in material and workmanship for a period of one year. In that period repairs or replacements of defective parts will be made without charge, provided these parts are returned to us carriage charges prepaid.

The BELL & HOWELL Company reserve the right to make changes in design or to make additions or improvements upon its product without imposing any obligation upon itself to install same on its product previously manufactured.

If operated in accordance with our instructions these printers are guaranteed to produce satisfactory results, so long as they are maintained under normal operating conditions.

## Instructions Covering Operation and Care

The BELL & HOWELL Standard Continuous Film Printers require less special attention than any film printer made. However, in the operation of any automatic high speed machine turning out the volume of first-class prints of which this machine is capable, extra precaution must be taken to the eliminating as far as possible the dust and dirt which arises in the handling of negatives and in the printing room proper.

The machine should be oiled once every day. Surplus oil should be removed before printing. One drop of oil in each bearing is sufficient. More will run out and accumulate dirt on parts. Belts should always be kept in good condition, taking care that joints are properly made and that correct tension is maintained. When the machine is not in use the Aperture Shutter Gate, and Upper and Lower Stripper Plates should be oiled to prevent rusting. See Operation No. 19 for care of the machine during operation.

# BELL & HOWELL COMPANY

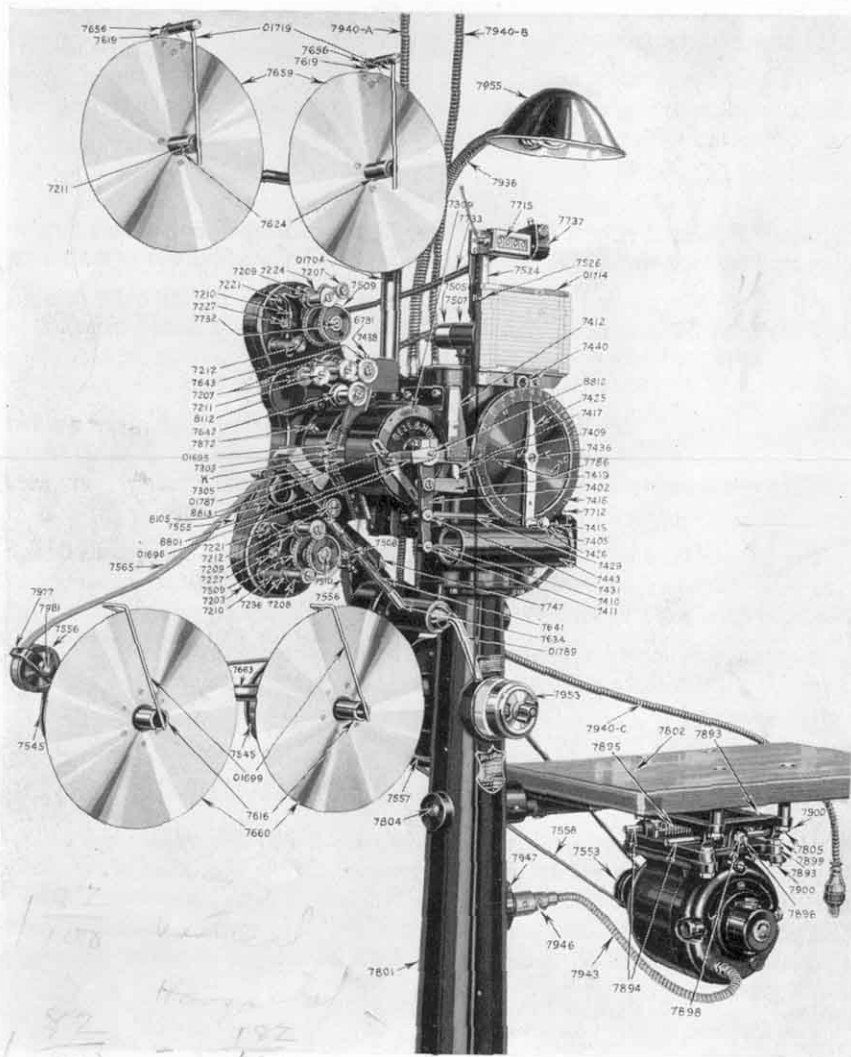


Fig. 14. Showing Principal Parts Numbered

# STANDARD CONTINUOUS FILM PRINTERS

## Key to Fig. 14, Showing Principal Parts Numbered

01695	Aperture Sprocket	7553	60 Cycle Motor Pulley
01696	Sector and Pin Assembly	7555	Main Drive Pulley
01699	Takeup Reel Guard Shaft	7556	Tightener and Takeup Pulley
01704	Feed Reel Arm Assembly	7557	Counter Transmission Sheave Wheel
01714	Index Card Holder	7558	Motor Belt
01719	Feed Reel Film Guard Assembly	7565	Driving Belt
01787	Aperture Gate Assembly Complete	7616	Takeup Reel Hub
01789	Combination Switch Handle	7619	Film Guard Carrier Bracket
Part 7203	Assembly	7624	Feed Reel Spool
7207	Main Frame	7634	Lock Lever Guide
7208	Film Tension and Guide Roller	7641	Lock Lever Spring
7208	Takeup Sprocket Roller	7642	Positive Aperture Guide Roller
7209	Feed and Takeup Sprocket Guide Roller	7643	Negative Aperture Guide Roller
7210	Feed and Takeup Sprocket Roller Lever	7656	Screw for 7615 and 7610
7211	Roller Retaining Screw	7659	Feed Reel Flange
7212	Guide Shoe and Roller Lever Screw	7660	Takeup Reel Stripping Flange
7221	Lever Latch Roller	7663	Takeup Bracket Shaft
7224	Top Guide Roller Stud	7712	Armature and Clutch Pivot
7227	Stop Screw for Sprocket Roller Lever	7715	Film Footage Recorder
7236	Takeup Sprocket Roller Stud	7732	Feed Sprocket Shaft
7303	Upper Aperture Plate	7733	Flexible Shaft Casing
7305	Lower Aperture Plate	7737	Film Recorder Bracket
7309	Shutter Bearing Flange	7747	Brake Lever
7402	Shutter Operating Lever	7755	Screw for 7443 and 7747
7405	Armature Return Spring	7786	Indicator Limit Pin
7409	Neutralizer Pawl Push Rod	7802	Pedestal Table
7410	Shutter Lever Piston Link	7804	Table Bracket Shaft
7411	Lever Link Stud	7805	Motor Bolt
7412	Push Rod Guide Bracket	7872	Oil Hole Cover for Part 7203
7415	Armature Plunger	7893	Motor Takeup Bracket
7416	Time Regulator Indicating Dial	7894	Takeup Bracket Guide Rod
7417	Quadrant	7895	Tension Spring
7419	Neutralizer Pawl	7896	Clamping Screw
7425	Shutter Time Setting Lever	7898	Clamping Screw Lock Nut
7426	Index Pin Knob	7899	Motor Assembly Bolt
7429	Clutch Rod	7900	Motor Assembly Nut
7431	Clutch Rod Connection Stud	7936	Pilot Light Arm
7436	Regulator Pinion Screw	7940	Main Line Lead Armor (A, B, C)
7438	Shutter Operating Lever Screw	7943	Motor Lead Armor (Motor to Pedestal)
7440	Ruby Glass	7946	Terminal Holder (Female)
7443	Clutch Case	7947	Terminal Holder (Male)
7505	Wire Receptacle	7953	Main Switch
7507	Magnet and Register Bar Frame	7955	Pilot Light Reflector
7508	Feed and Takeup Sprocket Film Guard	7977	Takeup Idler Arm
7509	Feed and Takeup Sprocket	7981	Takeup Idler Stud
7510	Takeup Sprocket Shaft	8105	Aperture Gate
7524	Register Bar	8112	Positive Tension Roller Lever
7526	Pointer	8801	Shutter Carrier Lever
7545	Takeup Drive Pulley	8812	Shutter Carrier Lever Screw
		8813	Sector Clamp Screw
		Des. 6781	Circuit Interrupter
		K	Key Printing Slot



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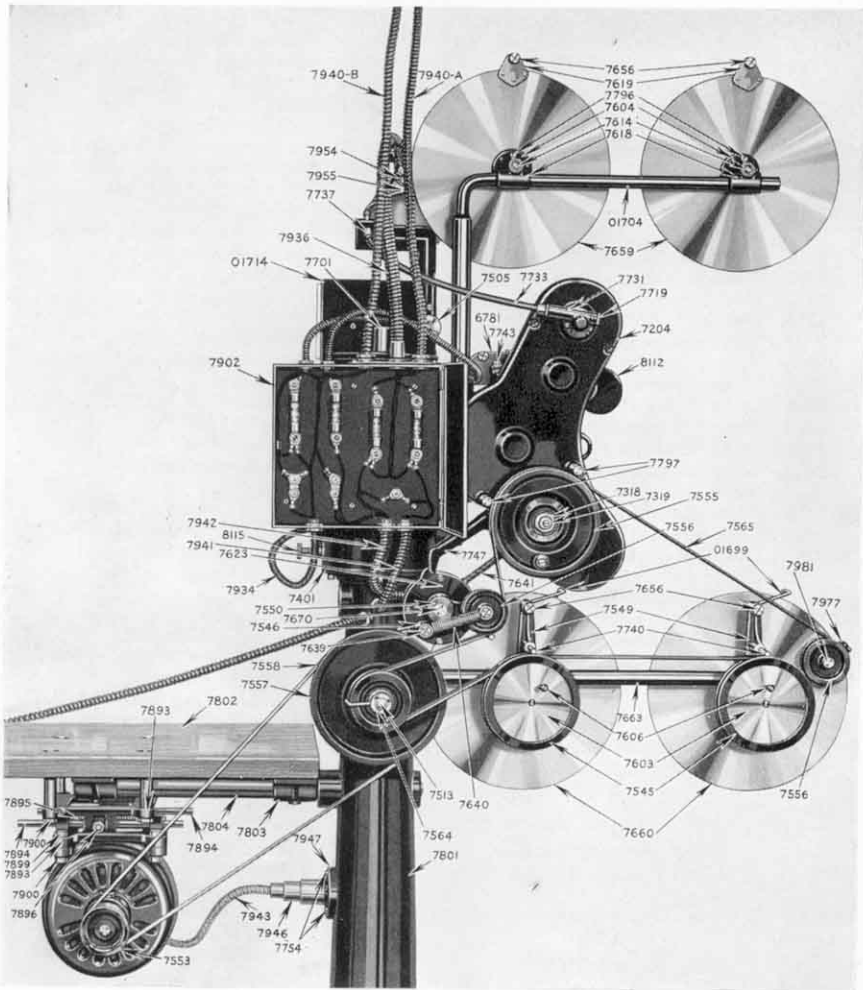


Fig. 15. Showing Principal Parts Numbered

# STANDARD CONTINUOUS FILM PRINTERS

## Key to Fig. 15, Showing Principal Parts Numbered

01699	Takeup Reel Guard Shaft Assembly	7731	Lower Intermediate Gear Bearing
01704	Feed Reel Arm Assembly	7733	Flexible Shaft Casing
01714	Index Card Holder Assembly	7737	Film Recorder Bracket
Part 7204	Gear Case	7740	Belt Guard
7318	Flywheel Nut	7743	Signal Circuit Interrupter Holder
7319	Main Drive Pinion Stud	7747	Brake Lever
7401	Lamp Case	7754	Terminal Plug Holder Screw
7505	Wire Receptacle	7796	Locking Screw for 7614
7513	Screw	7797	Belt Guard for 7204
7545	Takeup Drive Pulley	7801	Pedestal
7546	Switch Lock Spring Stud	7802	Pedestal Table
7549	Takeup Bracket	7803	Pedestal Table Bracket
7550	Switch Lock and Belt Tightener Lever	7804	Table Bracket Shaft
7553	60 Cycle Motor Pulley	7805	Motor Bolt
7555	Main Drive Pulley	7877	Motor Support
7556	Tightener and Takeup Pulley	7893	Motor Take-up Bracket
7557	Counter Transmission Sheave Wheel	7894	Take-up Bracket Guide Rod
7558	Motor Belt	7895	Tension Spring
7564	Sheave Wheel Collar	7896	Clamping Screw
7565	Driving Belt	7898	Clamping Screw Lock Nut
7603	Takeup Friction and Crank Wheel	7899	Motor Assembly Bolt
7604	Feed Reel Flange Hub	7900	Motor Assembly Nut
7606	Takeup Crank Handle	7902	Terminal Box
7614	Feed Reel Spindle	7934	Clutch Lead Armor
7618	Feed Reel Bracket	7936	Pilot Light Arm
7619	Film Guard Bracket	7940	Main Line Lead Armor (A, B, C)
7623	Switch Case Cap	7941	Lamp Lead Armor
7639	Switch Lock Spring Collar	7942	Starting Switch Lead Armor
7640	Switch Lock Lever Spring	7943	Motor Lead Armor (Motor to Pedestal)
7641	Lock Lever Spring	7946	Terminal Holder (Female)
7656	Screw for Reel Guards	7947	Terminal Holder (Male)
7659	Feed Reel Flange	7954	Pilot Lamp Socket
7660	Takeup Reel Stripping Flange	7955	Pilot Light Reflector
7663	Takeup Bracket Shaft	7977	Takeup Idler Arm
7670	Switch Operating Shaft	7981	Takeup Idler Stud
7701	Lamp Case Top	8112	Positive Tension Roller Lever
7719	Thrust Bearing for 7734	8115	Lamp Bracket Adjusting Screw
		Des. 6781	Circuit Interrupter





## Successive Stages of Operation

1. All negative must be first notched with the Film Notching Cutter as indicated in the descriptive matter outlined under the caption "Printing Mechanism" for the purpose of making the necessary changes in the printing light.
2. After negative has been properly notched and timed (see instructions under "Timing or Testing Negatives"), it should be thoroughly cleaned.
3. Place negative, wound emulsion side out on right hand Feed Reel Spool (7624) keeping same securely against Right Flange (7659) by means of the right Feed Reel Guard (01719).
4. Place positive, wound emulsion side in, on left hand Feed Reel Spool (7624), keeping same securely against left flange (7659) by means of the left Feed Reel Guard (01719).
5. Take ends of both negative and positive (the negative should have a leader approximately 2 feet long) and advance negative leader through threading operation about a foot ahead of positive by pulling same down to Left Takeup Reel. Then with both strips hanging loose take hold of film near Feed Sprocket (7509), raise Feed Sprocket Lever (7210) and pass both negative and positive under Film Guide Roller (7207) and Feed Sprocket Guide Roller (7209) locking film against Feed Sprocket (7509), with Lower Feed Sprocket Roller Lever (7210).
6. Place negative only under Negative Tension Guide Roller (7207) and over Negative Aperture Guide Roller (7643). Then place positive under Positive Tension Guide Roller (7207) and over Aperture Guide Roller (7642).
7. Open Film Aperture Gate (8105) drawing both negative and positive over printing sprocket until tension weights carrying rollers (7207) are in the intermediate position, avoiding the possibility of getting tension beyond or lower than that indicated by the limit pin provided for the tension weights. Note: The correct degree of tension is of the utmost importance as it is one of the means provided for eliminating creepage or slippings. (See "Distinctive Features III Film Movement Mechanism.") Close Aperture Gate (8105). Important: Gate must NOT be allowed to slam shut.
8. Raise Takeup Sprocket Roller Lever (7210) and pass both negative and positive under Takeup Sprocket Guide Roller (7209) and over Takeup Sprocket Roller (7208) allowing loop of negative to be a trifle longer than loop of positive between the Printing Sprocket and the Takeup Sprocket (7509). Then lower Takeup Sprocket Roller Lever (7210) locking film against Takeup Sprocket (7509).
9. Take end of negative and insert in Right Takeup Reel Hub (7616) keeping same securely against Right Takeup Reel Stripping Flange (7660) by means of Right Takeup Reel Guard (01699). Turn stripping flange to the right taking up slack used in threading. Note: Positive film is not taken beyond this point until machine is started thereby saving approximately one foot of film in loop threading (See Par. 15).
10. Insert Printer Index Card in Index Card Holder (01714), raising Pointer (7526) to starting point. Note: First scene or density change is always indicated above pointer.
11. Set the Shutter Time Setting Lever (7425) to the first index number indicated on Index Card. Insert index finger of right hand in end opening of Clutch Case pushing Clutch so that Clutch Rod (7429) is released thus adjusting Aperture Shutter Opening to first density change.
12. Again take the Shutter Time Setting Lever (7425) and set for the next number indicated by the card. Note: This in effect causes the Aperture Shutter to be always set by the operator one scene in advance of its change.
13. Turn on Snap Switch (7953), starting motor.
14. With left hand take hold of end of positive, and with the right hand turn the Combination Starting Handle (01789) counter clockwise thus starting the Printing Mechanism, turning on the Printing Light and Circuit Interrupter (6781). Insert quickly, end of positive in Left Takeup Reel Hub (7616) keeping same securely against Left Flange (7660) by means of Left Takeup Reel Guard (01699). Note: With very little practice the operator is enabled to perform this last operation with skill and ease.
15. Look through the little Ruby Glass window (7440) immediately above dial, and make sure that the printer lamp is burning.
16. When the first scene has passed through the Printing Mechanism, the notched film passes the Circuit Interrupter (6781) momentarily closing a circuit which operates the clutch governing the Aperture Shutter Opening and drops the Pointer (7526) to the next number indicated on the Printer Index Card, concurrently causing the signal to be sounded, warning the operator to set the Shutter Time Setting Lever (7425) to the number pointed. This operation is repeated until the negative roll is finished.
17. When the end of the negative roll passes the Aperture Gate the operator immediately stops the Printing Mechanism by turning off the Combination Switch Handle (01789). Note: It is advisable not to turn off the Snap Switch (7953) as the motor operates more efficiently while warm.

18. Cut or tear off positive film at a point below Aperture Gate and put in position for succeeding prints. Then release film from Takeup Sprocket (7509) and release Takeup Reel Guards (01699). Pull out Stripping Flange (7660) which will remove the rolls of film.

19. After the printing of each roll rub over the Aperture Shutters, the Printing Sprocket, the Upper Aperture Plate (7303) and the Lower Aperture Plate (7305) with a dry cloth. Once or twice per hour—or oftener if necessary—saturate a small piece of cheese cloth with acetone, alcohol or any quick drying cleaner and wipe all of these parts, making certain that no accumulation of dirt or any foreign substance is allowed to adhere to them. Occasionally—or about twice per day—rub the same parts with an oily cloth, then with a dry cloth remove all oil from the Shutter, Plates and Sprocket. Oil all bearings once a day.

20. For use in connection with the teaching of new operators, it is recommended that two rolls of scrap stock of approximately 200 foot lengths be utilized to familiarize the beginner with the important stages of operation. One roll may be notched and Printing Index Card prepared the same as for regular printing.

### Timing or Testing Negatives

There are several methods of accomplishing the work of timing and testing negatives, but the most commonly accepted procedure—which has furnished general satisfaction is as follows:

1. Take all negatives to be printed, and splice together in logical sequence of the scenes, keeping rolls within the required length or within the capacity of the rack or drum used.

2. Examine negative closely for approximate printing time noting on the Printing Index Card or Index Strip the density number of each scene.

3. Notch film in accordance with instructions contained in paragraph (a) Film Radial Notcher. See page

4. Thread negative on Printing Mechanism. (See paragraph 5 “Successive Stages of Operation.”)

5. Take positive and eliminate threading operation, passing the film through the Printing Gate and over the Printing Sprocket only.

6. Start machine (see paragraph 14 “Successive Stages of Operation”) with time set as indicated on Printing Index Test Card.

7. Be prepared to stop machine almost immediately after it starts, thereby obtaining a test print of two or three pictures.

8. Then take out positive, marking point at which printed, and start machine again, holding out gate as far as stop will permit with left hand, allowing only the remainder of the negative for that scene to run through the machine until next scene is indicated by the signal given by the Circuit Interrupter. (Holding out gate will prevent possibility of scratching negative while idling through machine.)

9. Repeat operation as above until roll is finished. Note: For a roll of fifteen scenes, the test print should not be over four feet.

10. Develop test print.

11. Take test print before a good light and with the original Printing Index Card or Strip examine each scene and correct card or strip to numbers denoting the proper density.

## BELL & HOWELL COMPANY

12. Then make print of entire roll of negative and develop the positive. If further assurance is desired of proper timing, the positive may be screened and the time again corrected on the Printing Index Cards or Index Strip before additional copies of the print are made.

### Design Change

BELL & HOWELL Continuous Printers are now supplied with flat belts instead of the round belts formerly used.

To facilitate orders for replacement parts we list below the part numbers of the old and new type belts, pulleys, etc.

Part Numbers Printers No. 1 to 410	PartNumbers Printers No. 411 and Up	Name of Part
7602	7545	Take-up Drive Pulley
7638	7546	Switch Lock Spring Stud
7714	7981	Take-up Idler Stud
7647	7548	Belt Retainer
7601	7549	Take-up Bracket
7621	7550	Switch Lock and Belt
		Tightener Lever
7637	7551	Tightener Pulley Stud
7709	7977	Take-up Idler Arm
7501 (60 cycle)	7553	Motor Pulley
7520 (50 cycle)	7554 (flat)	Motor Pulley
		(round)
7617	7555	Main Drive Pulley
7620	7556	Tightener and Take-up Pulley
7502	7557	Counter Transmission Sheave
		Wheel
7321 (round)	7558 (flat)	Motor Belt
7322	7565	Main Drive Belt

### Dimensions, Weight and Shipping Data Semi-Automatic Continuous Film Printers

Height of printer . . . . .	60 in.
Width (over service table) . . . . .	42 in.
Depth (over service table) . . . . .	17 in.
Weight—net—approximately . . . . .	300 lbs.
Weight—gross—approximately . . . . .	440 lbs.
Weight packed for export—approximately . . . . .	440 lbs.
Dimensions of shipping case—approximately . . . . .	62 in. x 30 in. x 20 in. or 21.5 cu. ft.

### Motor Generator Set

Height over control board . . . . .	20 in.
Width . . . . .	18 in.
Depth . . . . .	10 in.
Weight (net) approximately . . . . .	95 lbs.
Weight (gross) approximately . . . . .	140 lbs.
Weight (packed for export) approximately . . . . .	140 lbs.
Dimensions of shipping case—approximately . . . . .	15x15x36 in. or 4.8 cu. ft.

# The BELL & HOWELL Standardized Line for the Efficient Processing of Motion Picture Film

## *Improvement Through Standardization*

The development of the BELL & HOWELL Company's standardized line of motion picture machines and instruments has been an evolutionary process.

### **1st—Bell & Howell Standard Film Perforator**

As absolute accuracy in film perforation is necessary to the making of fine pictures, it was natural that the first machine produced should be a film perforator—built to a definitely established perforation gauge—which was promptly accepted as the standard as to accuracy in performance, capacity of production and correctness of gauge. This machine has been adopted to the exclusion of other perforating machines by the manufacturers of film and makers of motion pictures in the United States, where 100 per cent of the film used is perforated to BELL & HOWELL standard gauge.

### **2nd—Bell & Howell Standard Cinematograph Camera**

But a camera of faulty construction will prevent the making of good pictures in spite of perfect perforation. And so a camera of superior design—suited exactly to the BELL & HOWELL gauge of film perforation—was offered as another step in this evolutionary process. Its superiority over other similar instruments has been recognized from the first, and has led to its adoption by the leading makers of motion pictures throughout the world, as well as by scientists, explorers and leaders in industry.

### **3rd—Bell & Howell Standard Continuous Film Printers**

Then because neither correct film perforation nor high camera efficiency can compensate for poor positive prints, there was offered a film printing machine capable of producing pictures of surpassingly fine "screen quality" and depending in part for its efficiency on the same element of standardization. The film movement mechanism of this machine is so constructed as to conform exactly to the gauge of film perforation established by the BELL & HOWELL Standard Film Perforator. Accurate register of the film before the printing aperture is thus assured. Provision is made to prevent the creepage or slippage of the film, and to secure perfect contact between the positive and negative films at the printing aperture. Because of these features of design and construction, the BELL & HOWELL Continuous Film Printer is rapidly replacing other printing machines in the leading motion picture laboratories of the United States.

### **4th—Bell & Howell Standard Film Measuring Machine**

Next there was produced the BELL & HOWELL Standard Film Measuring Machine—a simple, accurate and highly efficient device for the measuring of

film in studio or laboratory. Through its use certainty may be substituted for guess work, economy for waste, in the handling of motion picture film. A special double sprocket measuring machine is now available for sound work. This is equipped with a special indicator to show individual frames, as well as the regular footage dial. A 16 mm. measuring machine is also available.

### *5th*—Bell & Howell Standard Film Splicing Machine

Having standardized the major processes in the making of motion pictures—attention was given to a minor process of great importance, and there was produced the BELL & HOWELL Standard Film Splicing Machine. The introduction of this machine marks a new departure in the splicing of film. Through the use of it the efficiency of the operator is greatly increased with a corresponding improvement in the quality of the work done. The machine makes a splice depending on the style used, viz.: Splicers are now available making splices which vary from  $1/32$  to  $3/32$  of an inch. A splicer is also available for handling the 16 mm. film. Combination models are also available now.

Apart from the fact that splices are made quicker by these machines, they are stronger and last longer. The splice itself is barely perceptible, adding but two and one-half thousandths of an inch to the thickness of the film. This splice is such that the film is strengthened rather than weakened and its flexibility is in no way interfered with by the splicing operation.

### *6th*—Title Pedestal

The Title Pedestal is modeled after the idea of the BELL & HOWELL Tripod Head but is made very much heavier. This unit is milled from a heavy "U" shaped casting. One side of the casting is milled to give it a slight spring, and clamps are provided so that the camera can be locked rigidly in position after the title has been lined up.

### *7th*—FILMO and Eyemo Automatic Cameras

Prior to the establishment of the 16 mm. film, we had already designed the now well-known FILMO Camera. When the dimensions of the 16 mm. film were finally decided on, we adapted this camera to accommodate this film. The success of this machine in the amateur field opened the way for developing the EYEMO Camera, which fills a unique place, owing to its ability for taking perfect pictures in confined spaces and from awkward positions. EYEMOS have been used by practically every expedition of importance since it has been brought out.

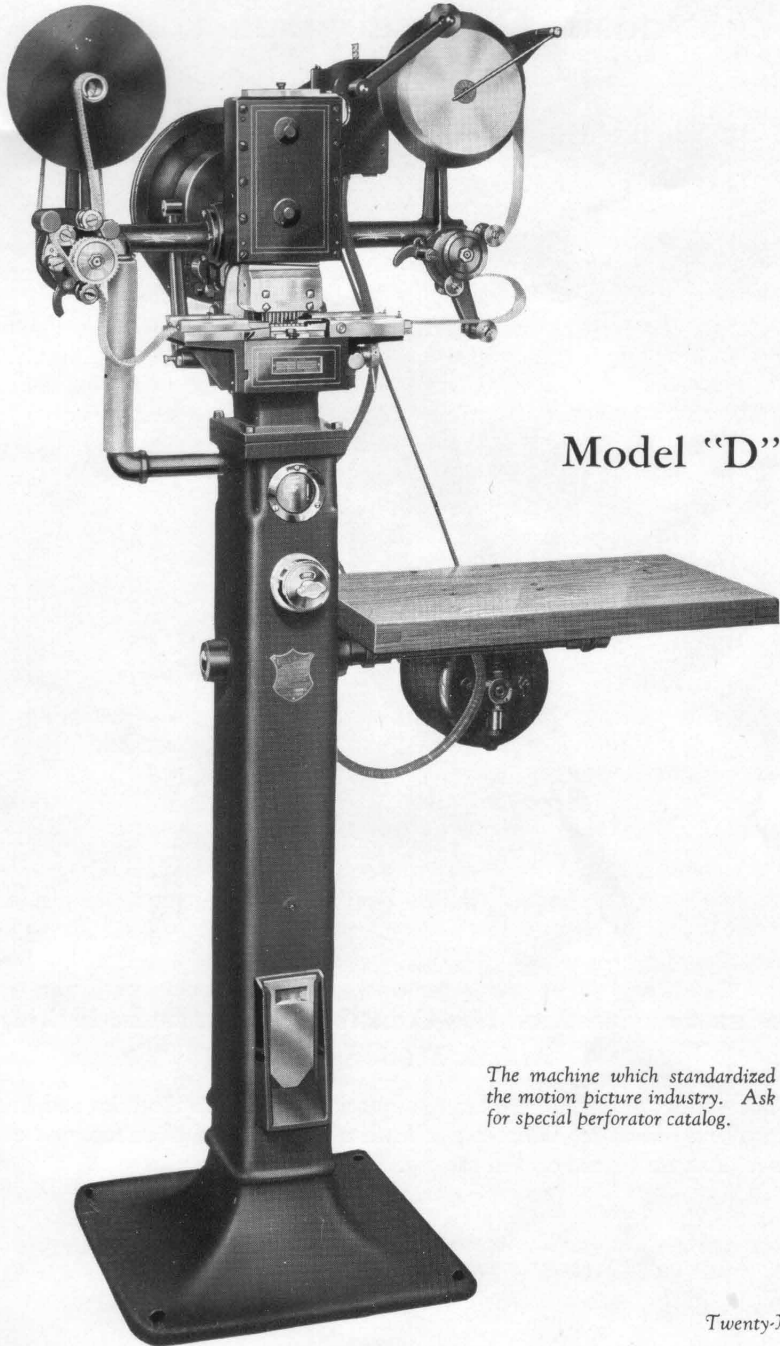
## Engineering Service

The BELL & HOWELL Company is prepared to render expert service in connection with laboratory design, construction and equipment.

Producers and others about to engage in the making of motion pictures are invited to submit to us problems pertaining to laboratory practice as well as those relating to building construction, improvements and new developments.

STANDARD CONTINUOUS FILM PRINTERS

The BELL & HOWELL Standard Film Perforator



Model "D"

*The machine which standardized the motion picture industry. Ask for special perforator catalog.*

BELL & HOWELL COMPANY

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The BELL & HOWELL  
Standard Cinematograph Camera

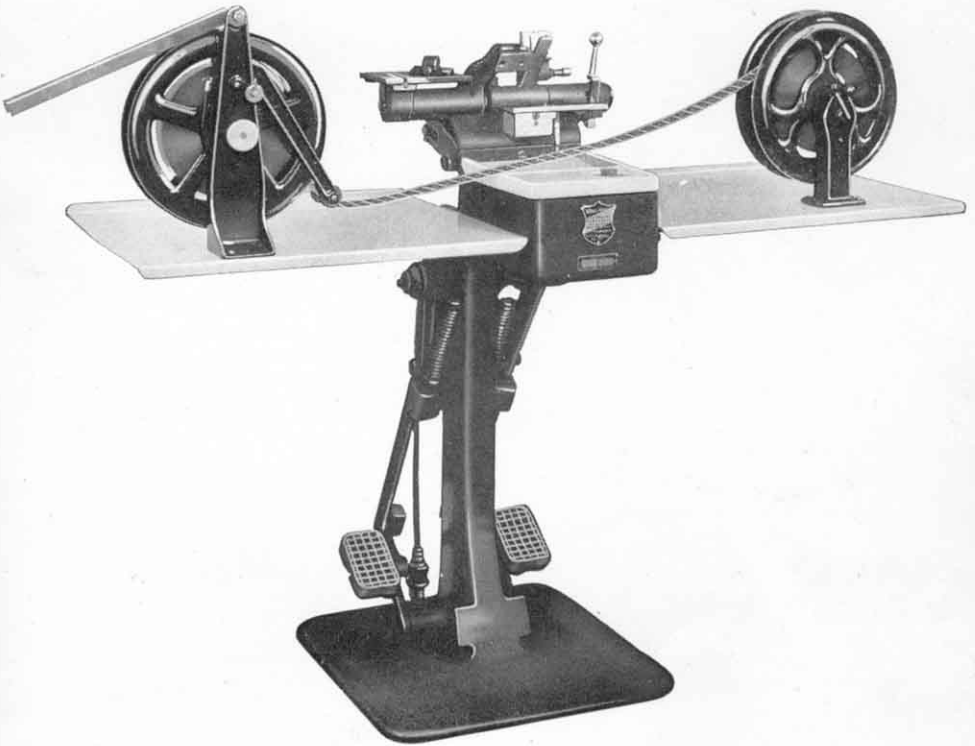


The Instrument Which Has Contributed Most to the Making of  
Artistic Motion Pictures

The verdict of leading producers of motion pictures in America and Europe of travelers, scientists, explorers; of leaders in industry; of cameramen everywhere. Ask for special camera catalog.

STANDARD CONTINUOUS FILM PRINTERS

The BELL & HOWELL Standard Film  
Splicing Machine



The model Standard Film Splicing Machine embodies many exclusive improvements, among which are the following:

- (a) Safety toggle links permitting of a firm pressure upon the film for splicing, but limiting this pressure to a degree that will insure against injury to the operator's fingers;
- (b) Interchangeable cutting blades for use in splicing either negative or positive film. The splice obtained by negative blades being 1-32 of an inch wide or approximately the width of the frame line, while the splice obtained by using the positive blades is three times this width, in view of the heavier duty imposed in the subsequent handling of positive film. Special full hole lap model also available.
- (c) Several combination models available. Invaluable for small laboratories, etc.
- (d) All metal construction;
- (e) Improved service shelf with built-in setting gauge for adjusting blade in scraping block;
- (f) New metal waste receptacle situated immediately in front of the operator;
- (g) Reversible cutter blades with improved pilot holes—stainless steel—giving maximum of durability and convenience. Blades can be sharpened many times, giving long life.



## Some of the Many Users of BELL & HOWELL Standard Continuous Printers

- Action Film Company  
 Agfa AnSCO Corp.  
 Air Service  
 Alexander Film Co.  
 Amer.-Anglo Corp.  
 American Film Company—Chicago  
 American Film Company—London  
 Army Medical Museum—U. S.  
 Associated Screen News, Ltd.  
 Australasian Films, Ltd.
- Baltic Film Company—Sweden  
 Battle Creek Sanitarium  
 Bell Telephone Co.  
 Blache Film Lab.  
 Brinner Film Service  
 Bristol Co.
- Chaplin, Chas. Studios  
 Chenoweth Film Company, The  
 Chester Bennett Laboratories  
 China Sun Motion Picture Co., Ltd.  
 Clune Studios  
 Columbia Pictures Corp.  
 Consolidated Film Laboratories  
 Craft Film Laboratories
- Davidge, Roy, Laboratories  
 De Forest Phonofilms, Inc.  
 Department Trade and Commerce (Canada)  
 Director Gunnery Exc. and Eng. Performances  
 —U. S. Army  
 Duart Film Laboratories
- Eastman Kodak Company  
 Empire Film Laboratories  
 Engineer School—U. S. Army  
 Essanay Film Mfg. Company
- Famous Players-Lasky British Producers, Ltd.—  
 London  
 Film Lab., Inc.  
 Finance Section Eng. Div.—U. S. Army  
 Fleet Camera Party—U. S. Navy  
 Ford Motor Company  
 Fox-Case Corporation  
 Fox Film Corporation  
 Fox, Wm. Vaudeville Company, L. A.
- General Electric Company
- H. E. R. Laboratories  
 Holmes, Burton Lectures, Inc.  
 Honjo & Co.  
 Horsley, Wm. Laboratory
- Imperial Japanese Government
- Jury's Film Company, Ltd. (London)
- Konishi & Co.—Japan  
 Krasnoye Xnamia, Moscow
- Liberty Laboratories—Havana
- Malcolm Laboratories  
 Metro-Goldwyn-Mayer Pictures Corporation
- Navy Department  
 Nippon Shoji Kaisha, Ltd.  
 Nordisk Tone-Film—Denmark
- Pacific Film Laboratory  
 Pacific Studios Corporation  
 Palisade Film Laboratory  
 Paramount Famous-Lasky (all studios)  
 Pathe Cinema, Paris  
 Photocol Corporation  
 Pickford Company, Mary  
 Porto Rico International Corporation (P. R.)
- Raths, Mills & Bell, Inc.  
 R. C. A. Corporation  
 Realart Pictures Corporation—Hollywood  
 Reelcraft Film Laboratory  
 Roach, Hal, Comedies  
 Roberts, Inc.—Mania  
 Rockefeller Foundation  
 Rothacker-Allers Film Laboratory
- Salem, Ltd.  
 Sennett, Mack Film Corporation  
 Stewart-Warner Mfg. Corp.  
 Supply Officer of the Navy Yard  
 Svensk Filmindustri—Sweden
- Technicolor Motion Picture Corp.
- Universal Film Mfg. Company  
 University Film Foundation—Cambridge  
 University of Illinois  
 Unione Cinematographica Italiana  
 United Artists  
 U. S. Department of Agriculture  
 U. S. Naval Observatory  
 U. S. Army  
 U. S. Navy
- Vitagraph Company of America
- Warner Bros.  
 Westinghouse Electric & Mfg. Co.
- Zeiss, Carl, Inc.—Germany



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