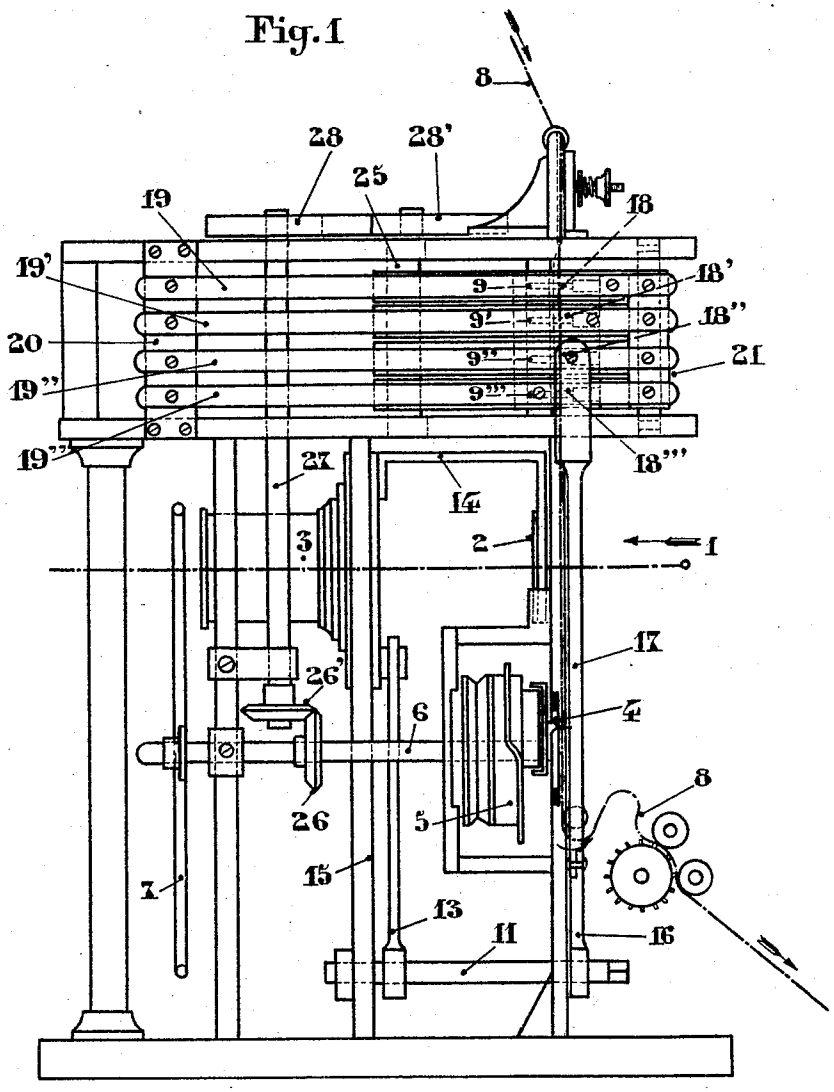
April 18, 1933. J. M. J. DELAFON 1,904,301

MACHINE FOR PERFORATING SLOW EMULSION FILMS WHILE THEY ARE BEING SHOWN ON THE SCREEN

Filed Nov. 27, 1931 6 Sheets-Sheet 1

Fig. 1



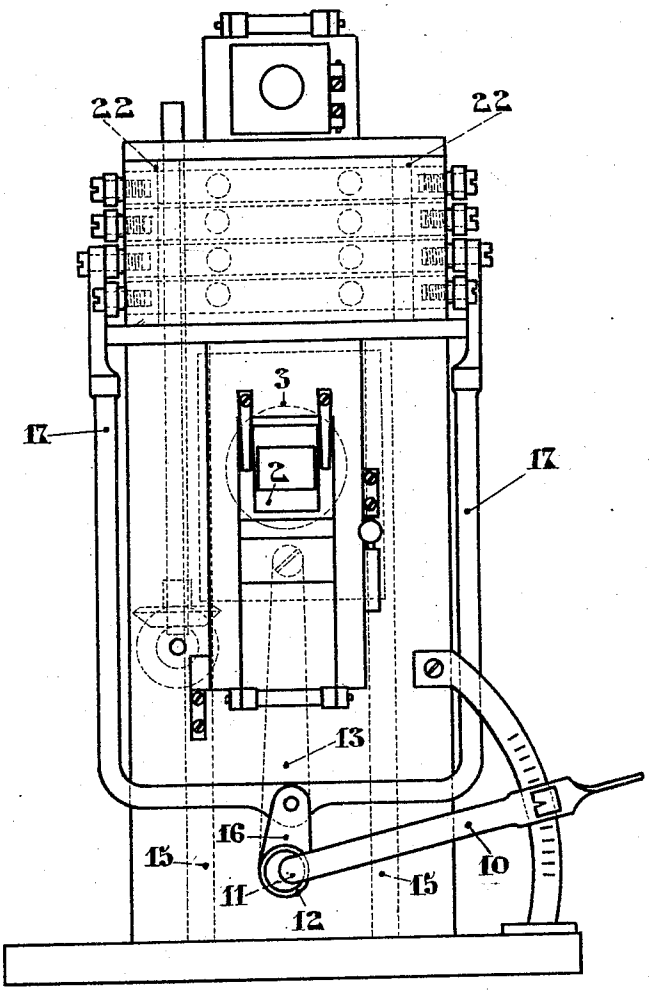
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MACHINE FOR PERFORATING SLOW EMULSION FILMS WHILE THEY ARE BEING SHOWN ON THE SCREEN

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Fig. 2



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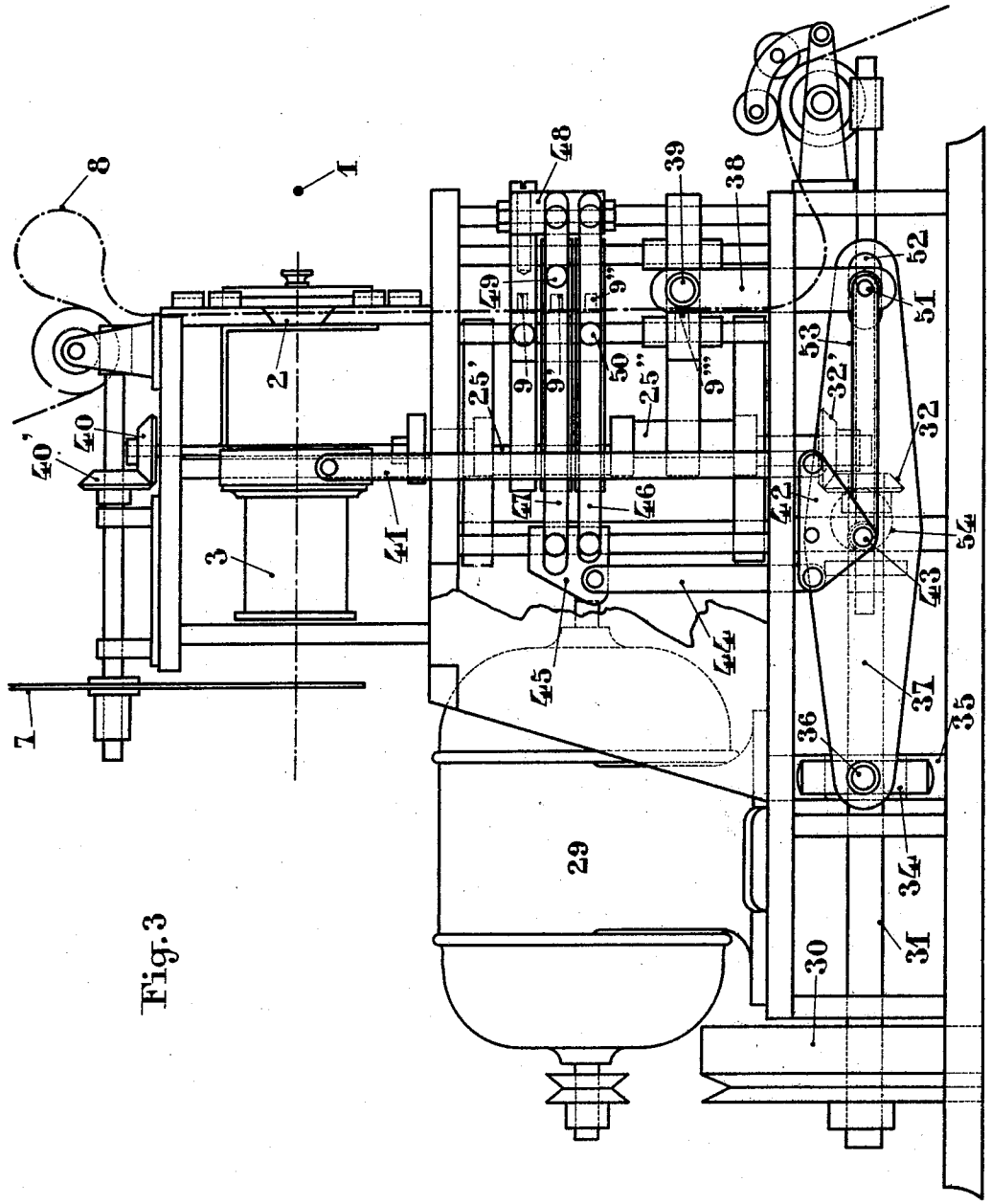


Fig. 3

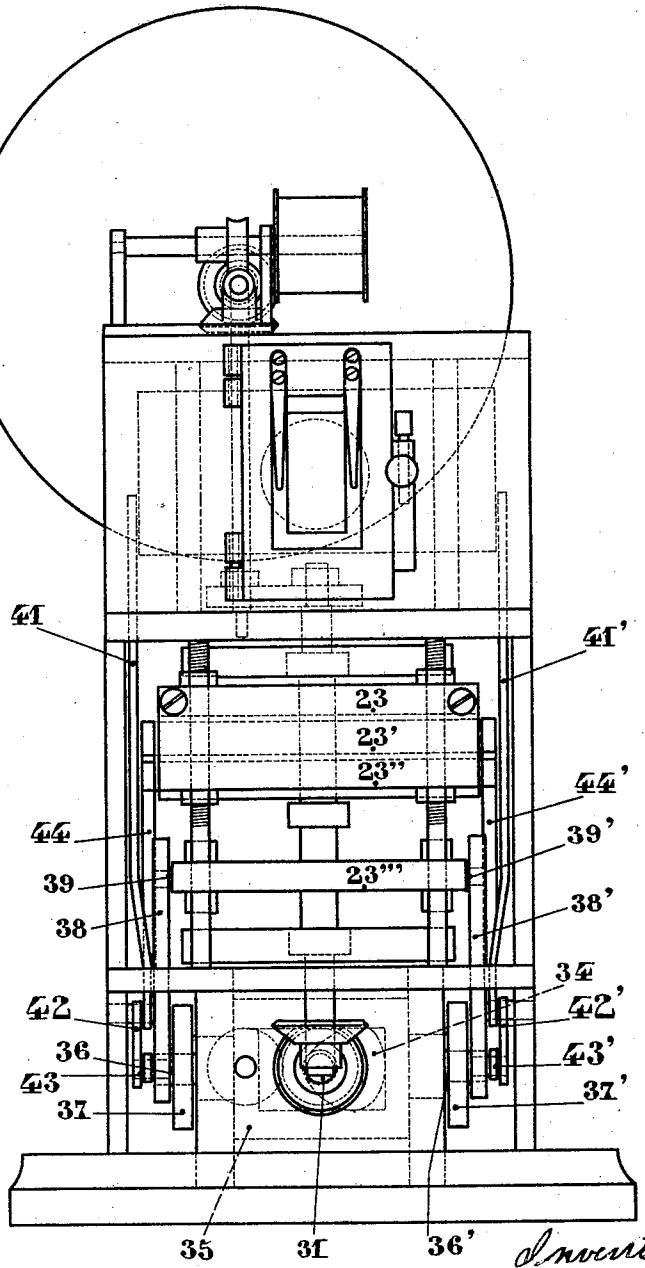
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MACHINE FOR PERFORATING SLOW EMULSION FILMS WHILE THEY ARE BEING SHOWN ON THE SCREEN

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Fig. 4



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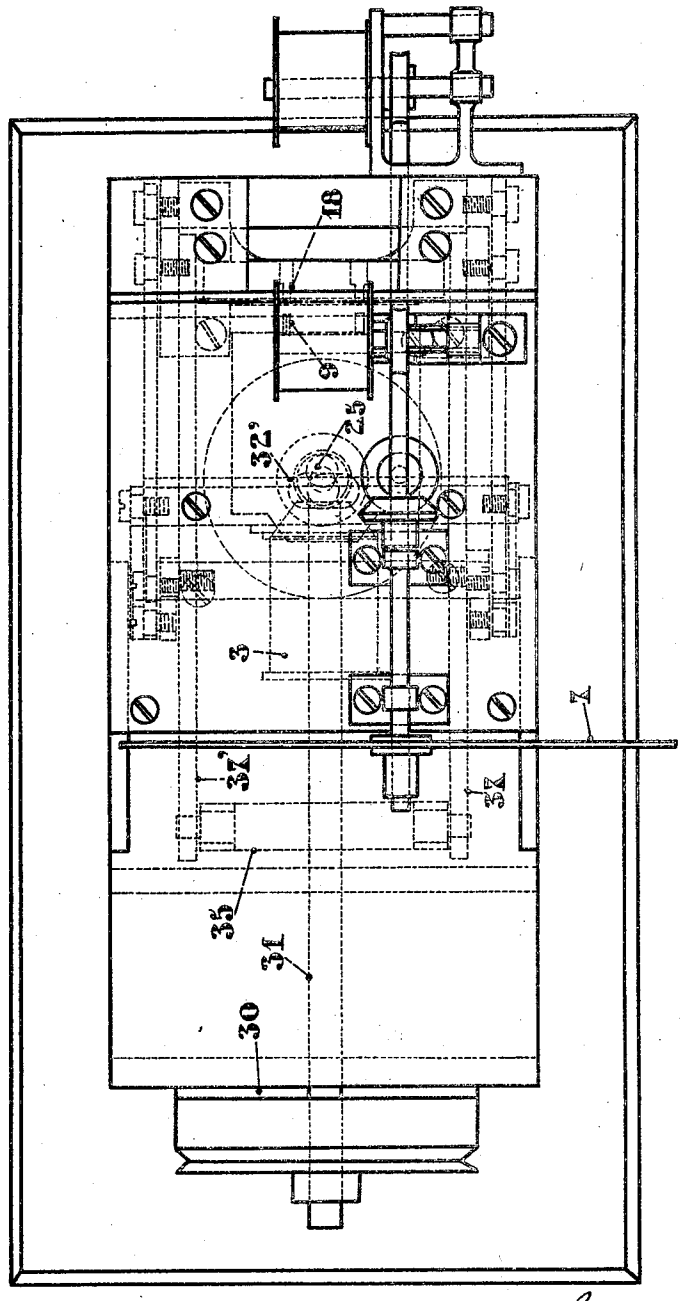


Fig. 5

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MACHINE FOR PERFORATING SLOW EMULSION FILMS WHILE THEY ARE BEING SHOWN ON THE SCREEN

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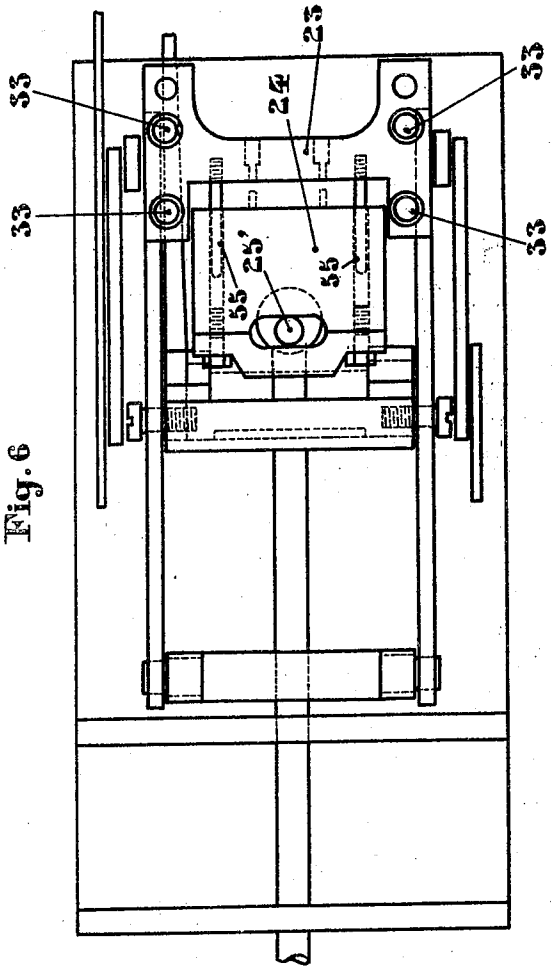


Fig. 6

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Patented Apr. 18, 1933 1,904,301

UNITED STATES PATENT OFFICE

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MACHINE FOR PERFORATING SLOW EMULSION FILMS WHILE THEY ARE BEING SHOWN ON THE SCREEN

Application filed November 27, 1931, Serial No. 577,670, and in France December 16, 1930.

Cinematographic films printed on bromide sensitized gelatine are printed on virgin film which is perforated prior to printing. Such printing is effected picture by picture.

On the contrary slow emulsion films (such for instance as bichromate sensitized gelatine on cellulose films) are, as a rule, printed on a film which can not be perforated prior to printing for reasons with which professionals are familiar.

They must therefore be perforated after having been printed and developed. The machines at present in use make it possible to obtain this result on condition that the perforating machines be modified in such a way that the operator may be enabled to follow, with his eyes, the position of the picture of the perforation of the negative reproduced on the film and at the same time constantly correct the pitch of the perforating machine the moment the latter departs from the pitch of the negative.

This method of procedure presents the serious drawback of being rather long since perforating machines only make one perforation at a time on each side of the picture.

It is necessary, on the other hand, when a film is finished, to check it by showing it on a screen prior to its being delivered, in order to make sure that it is free from defects as regards perforation.

There are two distinct operations therefore necessitating two distinct apparatuses and in consequence one operation for each apparatus.

The object of the present invention is to reduce to one only the two aforementioned operations, the single operation consisting in perforating the still unperforated film while it is passing through an apparatus which serves at the same time for the purpose of throwing the picture on the screen and of perforating. When the film emerges from the said apparatus it is perforated regularly.

It is a well known fact that the passing of a cinematographic film in water or in any bath whatsoever, whatever the temperature may be, followed by drying of the said film, invariably causes a shrinkage of the film whatever apparatuses are used.

It is therefore evident that the pitch of the positive film cannot be exactly that of the negative from which it was printed.

It may happen that over a certain length of film there may be variations, which are very small it is true but at the same time appreciable, of the said pitch.

On the other hand the position of the perforations with respect to the corresponding pictures must be strictly identical over the whole length of the film.

It is therefore necessary that it should be possible, in case of need, to correct the pitch of the perforation in order that there may be no rising or dropping of the picture on the screen during the time it is thrown on the screen.

The apparatus which forms the subject matter of the present invention complies with these conditions.

By means of this apparatus the usual perforations are made through the edges of the film once it is finished and dry while observing the position of the picture on a screen and when the position of the picture changes on the screen, either towards the top or towards the bottom the operator, by acting on the centering lever can constantly keep on bringing the said picture back to its normal position. In doing this he corrects the pitch of the perforations which are thus always positioned in the same spot relatively to the picture.

On the attached drawings two methods of execution of the present invention have been shown as examples. On the drawings:

Figure 1 is a side elevation of a machine for perforating cinematographic films while they are being shown, said machine being provided with a claw feed device;

Figure 2 shows the same machine viewed from the back;

Figure 3 is a view, similar to Figure 1, of a machine in which the film is fed by one of the perforating punches;

Figure 4 shows the apparatus shown in Figure 3 viewed from the back;

Figure 5 is a plan view of the same apparatus;

Figure 6 is a plan view, in detail, of the perforators of the same apparatus.

The apparatus shown in Figures 1 and 2 is composed of two parts which have different functions to perform: One is the apparatus for throwing the picture on the screen and the other is the perforating machine proper.

The apparatus for throwing the picture on the screen includes a source of light 1, a window 2, opposite which the film to be shown passes, and a lens 3.

The displacement of the film is effected by a "Lumière" claw device 4 driven by a "Lumière" cam 5 mounted on a shaft 6 which, in turn, operates a shutter 7. This feed device may of course be replaced by other feed organs such as a Maltese cross. The film, which has been indicated by 8, moves in a downward direction, the perforations are made through both sides of the film before it passes opposite window 2 by perforators which support punches 9, 9′, 9″ and 9‴.

If the perforations are not situated on the film exactly at the correct height in relation to the picture, said film rises or drops and the operator must center it exactly in the frame by observing the screen and actuating a lever 10 keyed to a shaft 11 which, by means of an eccentric 12 and a link 13 which are connected to it, controls both lens 3 and window 2 which are made integral with one another by a part 14 in the form of an inverted U sliding on vertical columns 15.

This same shaft 11 actuates a second eccentric which acts on a double link 17 which is U shaped through a single link 16. This double link controls the vertical displacement of punches 9, 9′, 9″ and 9‴ and of corresponding die-plates 18, 18′, 18″ and 18‴, all these parts being positioned above the apparatus for throwing pictures on the screen so that they are capable of being moved closer to, or further away from, the axis of the said apparatus for throwing pictures on the screen by whatever amount may appear necessary in order to bring the perforations of the film back to the exact position they should occupy, relatively to the pictures in cases when observation of the screen shows that such perforations have moved away from such position. By this means this position is corrected and can be maintained constant, the ratio between the travel of the eccentrics which control links 13 and 17 having been calculated for this purpose.

But if one were content merely to modify the height of the perforators, the four perforations corresponding to either side of a picture would retain the same spacing and the only variation obtained would be that of the distance between the last perforation of the last group of four perforations made on either side of the film and the first perforation of the new group of perforations made immediately after. This would make the film useless.

In order to remove this drawback it is necessary not only to bring the new group of perforations nearer to, or remove it further from, the perforations of the previous group of perforations, but it is also necessary to determine a variation, in suitable proportions, in the spacing of the new perforations relatively to one another, in order to apportion, between these perforations, the amount by which the pictures are out of center relatively to the frame as observed on the screen so that the change of pitch necessary to bring back the picture to perfect centering in the frame may be rendered imperceptible, the new perforations being relatively equidistant.

This result is obtained by only acting directly on the perforator carrying punch 9″ and die-plate 18″ through double link 17, the simultaneous displacement of the other perforators corresponding to the other punches and to the other die-plates being obtained by means hereinafter described. When it moves vertically, double link 17 acts on a lever 19″ the left hand extremity of which is articulated to a part 21 which moves vertically, each time the perforator, bearing punch 9″ and die-plate 18″, moves upward or downward, said perforator being actuated by the articulation of lever 19″, the displacement of part 21 depending on that of the point of articulation of double link 17 on lever 19″ and being proportionate to such displacement of the link in the same ratio as exists between the lever arms of lever 19″.

Three other levers 19, 19′, and 19‴, articulated in the same manner as lever 19″, on the one hand on the fixed part and on the other hand on movable part 21, actuate three perforators bearing punches 9, 9′ and 9‴ and die-plates 18, 18′ and 18‴, by means of articulations positioned at suitable distances between said two parts. Said distances are so adjusted that the displacement shall be greater in proportion as the levers, and consequently the perforators bearing the punches and the corresponding die-plates, are further removed from the axis of the apparatus for throwing pictures on the screen. The result is that the displacement of double link 17 not only corrects the spacing between said axis and the group of perforations which are about to be made but also, and in a strictly proportionate manner, the spacing between the perforations in question.

The perforations are made by four perforators made up on the one hand by die-plate supports in the shape of an I, similar to those indicated by 23 on Figure 6 and in

each of which are provided two die-plates 18, 18′, 18″ or 18‴ and, on the other hand punch holders similar to those indicated by 24 on Figure 6, each holding two punches 9, 9′, 9″ and 9‴. The die-plate supports 23 cannot move in a horizontal direction but can move in the vertical direction, along the two columns 22 and on movable part 21 on which they rest. The punch holders 24 and the punches they carry are controlled, in a horizontal direction by a crank shaft 25 which causes them to perforate the film; they are actuated, in a vertical direction, by two gudgeons (similar to gudgeons 55 in Figure 6) which make them integral, vertically, with the die-plates, while permitting of the horizontal displacement of said punches and which guide parts 24 in such a manner that they may penetrate in proper register with the corresponding holes in the die-plates.

During the time when the film is moving down opposite the window the punches must, of course, be withdrawn from the perforations they have made in the film and must leave it free to move downwards, perforation occurring during the time the film is at rest that is to say while the claws are rising again and while the shutter is giving free passage to the rays proceeding from the source of light and the picture.

Control of these parts and concordance of their movements are obtained as follows: On shaft 6 which bears cam 5 and shutter 7, a bevel pinion 26 is fitted which meshes with another bevel pinion 26′ mounted on a vertical shaft 27 which drives crankshaft 25 through two straight gear wheels 28 and 28′, in such a way that the withdrawal of the punches may occur before claw 4 begins its downward movement.

The apparatus naturally includes the normal accessories common to apparatuses for projecting pictures on screens such as feed and winding-in reels etc.

The machine shown in Figures 3, 4, 5 and 6 also includes a source of light 1, a window 2 allowing the film which is to be shown to pass picture by picture, a lens and a shutter.

In this machine the feeding of the film, instead of being obtained by the usual means (Maltese cross, cogged drums or claws and cam), is produced by a pair of punches of one of the perforators.

As in the case of the foregoing machine four perforators are provided but in this case they are positioned beneath the lens.

Three of the perforators only move in a vertical direction to the extent necessary to correct the positioning of the perforations; the fourth perforator, the lowest perforator in Figures 3 and 4 can move, in a vertical direction, to the whole extent of the height of a picture and it is this perforator which causes the feed of the film picture by picture. For this purpose it drops immediately the two punches it carries have pentrated through the film and it only rises after having withdrawn its punches.

The machine is powered by a motor 29 which engages with a grooved pulley 30 keyed to a horizontal shaft 31. This shaft drives two bevel pinions 32 and 32′ which are in mesh together. Bevel gear 32′ is keyed to a crankshaft provided with two throws 25′ and 25″ offset by 180 degrees, crankpin 25′ driving the three upper perforators whilst crankpin 25″ drives the lower perforator. The result is that when punches 9‴ of the perforator which effect the feed of the film are engaging with the perforations in the film, the punches of the other three perforators are, on the contrary, disengaged and cannot prevent the dropping of the film with the movable perforator.

The perforator which ensures the feed of the film slides vertically on two pairs of columns 33 which penetrates through die-plate carrier 23‴ at either side. For its part the punch holder slides vertically on the crankshaft. The vertical displacement of this perforator is caused by shaft 31 to which is keyed a heart-shaped cam 34 rotation of which lowers and raises a frame 35 guided by slides and provided with pivots 36 and 36′ at its extremities, said pivots acting on two rocking levers 37 and 37′. These rocking levers oscillate about a central pivot and their right-hand extremity oscillates in an opposite direction by a length of stroke equal to their left-hand extremity the latter being actuated by cam 34. At their right-hand end these two rocking levers act on two vertical links 38 and 38′ and thus transmit a vertical movement to die-plate carrier 23‴ through two gudgeons 39 and 39′ (see Figure 4).

As the amount of eccentricity of the cam is equal to the height of one picture the lower perforator will therefore be subject to an alternating movement of equal height.

The crankshaft and its crank 25″ are driven by bevel pinions 32 and 32′ in such a manner that the punches remain engaged in the film during the whole duration of the downward movement of the lower perforator and are then withdrawn and remain in their withdrawn position, on the contrary, during the whole upward travel of the said perforator.

The consequence is that this perforator causes the film to move downwards to the extent of one picture each time it perforates it.

It goes without saying that the positions of the three other perforators placed one above the other as well as the position occupied by the lower perforator at the moment when it perforates the film, that is to say when it is in its uppermost position, are so adjusted that each of the perforators makes

one of the four perforations which are situated on either side of the picture.

The shutter which is to intercept the luminous beam which serves for projection while the film drops is controlled through two equal bevel pinions 40 and 40′ rotating at the same angular speed as the crankshaft and cam. The bevel gears are of course keyed in such a position that obturation occurs at the proper moment.

In order to compensate for the shrinkage of the film when drying and to perforate the positive film correctly it is indispensable to check the variations in the pitch of the perforations so that the picture may always remain perfectly centered throughout the showing of the film. In order to avoid having to constantly be centering the picture in the frame during the performance it is necessary to alter the pitch of the perforations of the film in the same proportion as the decentration observed during the throwing of the picture on the screen and at the same moment. As pictures are inverted when they pass through the machine which shows them on the screen the window of the projecting apparatus should be lowered when the picture moves towards the upper part of the screen.

The assembly formed by the lens and the window of the projection apparatus is connected by two links 41 and 41′, to two bell-crank levers 42 and 42′ articulated in 43 and 43′ respectively and controlling two other links 44 and 44′. The latter actuate vertically a part 45 sliding along two vertical columns.

When the lens and the window of the projection apparatus assembly moves downwards the bell cranks tilt and cause sliding part 45, which supports on its sides two levers 46 and 47 respectively the fixed points of which are positioned at the other extremity of said levers, on a fixed part 48, to rise. These levers, at points 49 and 50, actuate the two perforators corresponding with the die-plate supports 23′ and 23″ in Figure 4. Die-plate support 23 in the same figure corresponds to a fixed die-plate; the other two are free to move vertically over a small distance. Their vertical displacement is such that when the assembly formed by the lens and the window come nearer to the fixed perforator, the die-plate supports 23′ and 23″ also move nearer, and to a suitable extent, to the fixed perforator thus correcting the pitch of the perforation.

The lower perforator, which serves as a feed claw, must also undergo the same correction for position; for this purpose gudgeons 51, which actuate its two feed links, are articulated on the two rocking levers 37 and 37′ in two slots 52 which make it possible, by moving gudgeons 51 further away from, or nearer to, the fixed axis of said rocking-levers, to vary the length of the lever which controls them. As these gudgeons are connected to bell-crank 42 by two links 53, the downward movement of the shutter and window assembly, by diminishing the length of the lever-arm of rocking levers 37 and 37′, causes a reduction in the distance between the extreme positions of the perforator which acts as a feed claw. On the contrary when the said assembly moves upwards, the spacing between the two extreme positions of said perforator increases in such proportions that the pitch of the perforations is corrected.

This correction is not the only one it is necessary to make in the position of this perforator as the correction which has just been indicated refers only to the extreme positions of said perforator. Its intermediate position must also be corrected in the same proportions as the variation in pitch.

For this purpose the central pivoting points of the rocking levers are mounted on an eccentric 54 connected by links (which are not shown) to the bell crank levers and any movement of these bell-crank levers, by causing the eccentric to rotate, causes a displacement of the said pivotal points.

A displacement in proportion with the intermediate position of the lower perforator is thus obtained and a constant rectification of the pitch of the perforations in proportion with the amount by which the picture is out of center as shown on the screen is obtained together with the displacement of the two movable perforators of the upper group of three perforators and with the displacement of the perforator which acts as a claw.

The machine, as in the case of the Figures 1 and 2, is provided with all the usual accessories of apparatus for showing pictures on screens.

What I claim is:

1. In a moving picture machine provided with a window adapted to frame individual pictures,—means for manually displacing said window, a film perforator adapted to perforate a film traversing said machine, means operative to reciprocate said perforator and means operative by displacement of said window to change the position of said perforator.

2. In a moving picture machine provided with a window adapted to frame individual pictures,—means for displacing said window so as to center a picture being projected, a plurality of perforating elements adapted to perforate a film traversing said machine, means for actuating said perforating elements, and means operative by displacement of said window to displace at least two of said perforating elements.

3. In a moving picture apparatus provided with a window adapted to frame individual pictures,—means for displacing said window so as to center successive pictures, a

perforating element, and means for displacing said perforating element while in engagement with, and after having traversed a film whereby said firm may be advanced by said perforating element.

4. A structure as defined in claim 3 in combination with means operative by the movement of said window to alter the course of said perforating element.

5. A structure as defined in claim 3 in combination with a second perforating element, said second perforating element being moveably supported, and means operative by the movement of said window to change the position of said second perforating element.

6. A structure as defined in claim 3 in combination with a second perforating element, said second porforating element being moveably supported, and means operative by the movement of said window to simultaneously alter the course of said first named perforating element and the position of said second perforating element.

7. A structure as defined in claim 1 in combination with means for advancing a film past said perforator.

8. In a moving picture machine provided with a window adapted to frame individual pictures and an objective connected to move with said window,—means for manually displacing said window so as to center a picture being projected, a plurality of perforators, means for reciprocating said perforators, and means including a link connected to said first named means and operative to change the relative position of at least two of said perforators.

9. In a moving picture machine provided with a window adapted to frame individual pictures and an objective mounted to move with said window,—manually operated means for displacing said window so as to center a picture being projected, a lever and link system connected to said window, a plurality of perforators connected to said lever and link system, and means for actuating said perforators.

10. In a moving picture machine provided with a window adapted to frame a picture and an objective mounted to move with said window,—means for manually displacing said window, a first film perforator, a lever and link system connected to said perforator and to said window, said lever and link system being operative to move said perforator along the path of movement of a film traversing said machine, a plurality of additional perforators, and means operative by the movement of said window to change the position of at least a pair of said plurality of perforators relatively to one another.

In testimony whereof I have signed this specification.

JEAN MAURICE JACQUES DELAFON.