

April 21, 1931.

H. S. SATTERLEE

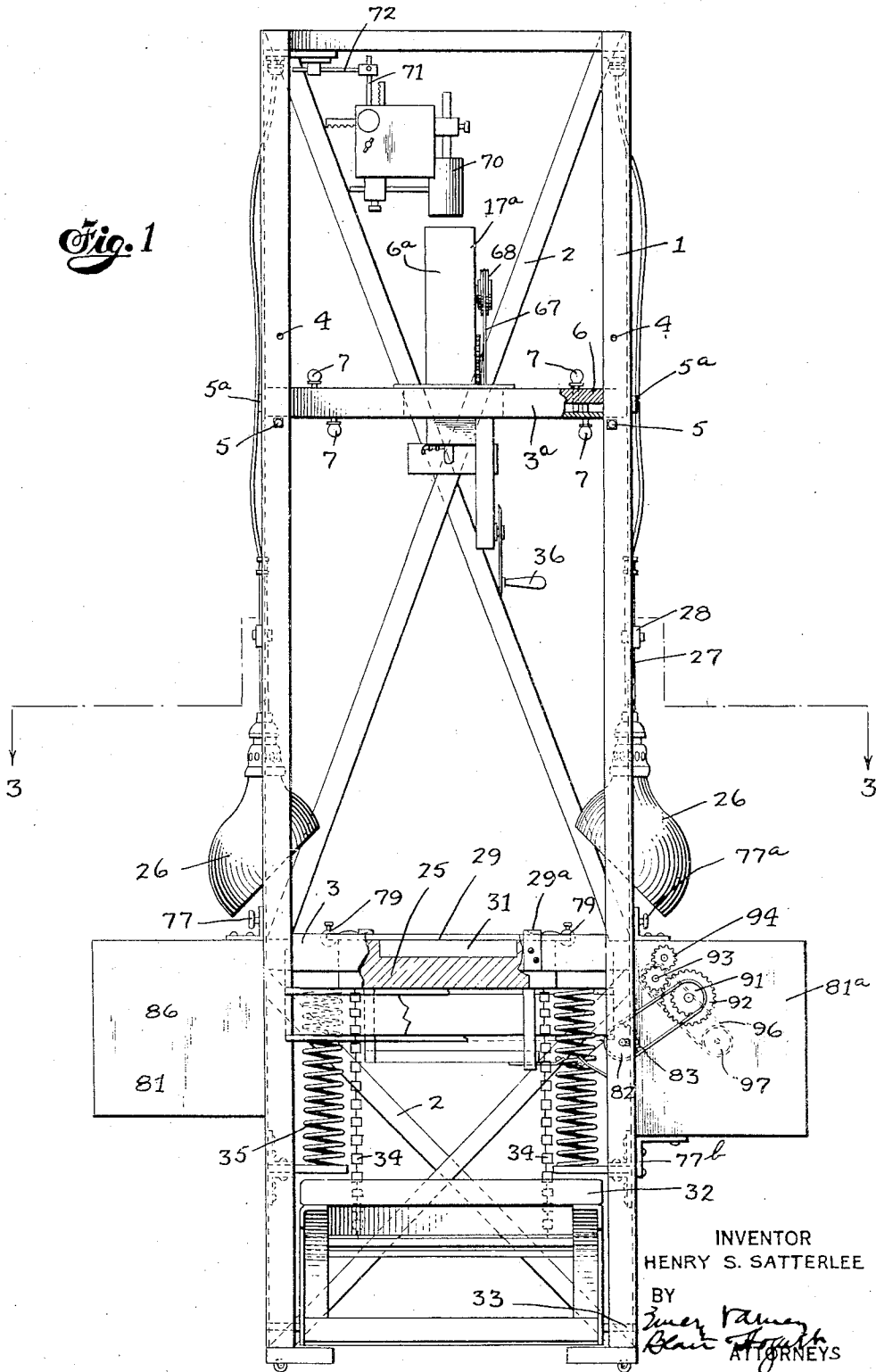
1,801,458

PHOTOGRAPHIC APPARATUS

Original Filed Jan. 20, 1922

7 Sheets-Sheet 1

Fig. 1



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H. S. SATTERLEE

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7 Sheets-Sheet 2

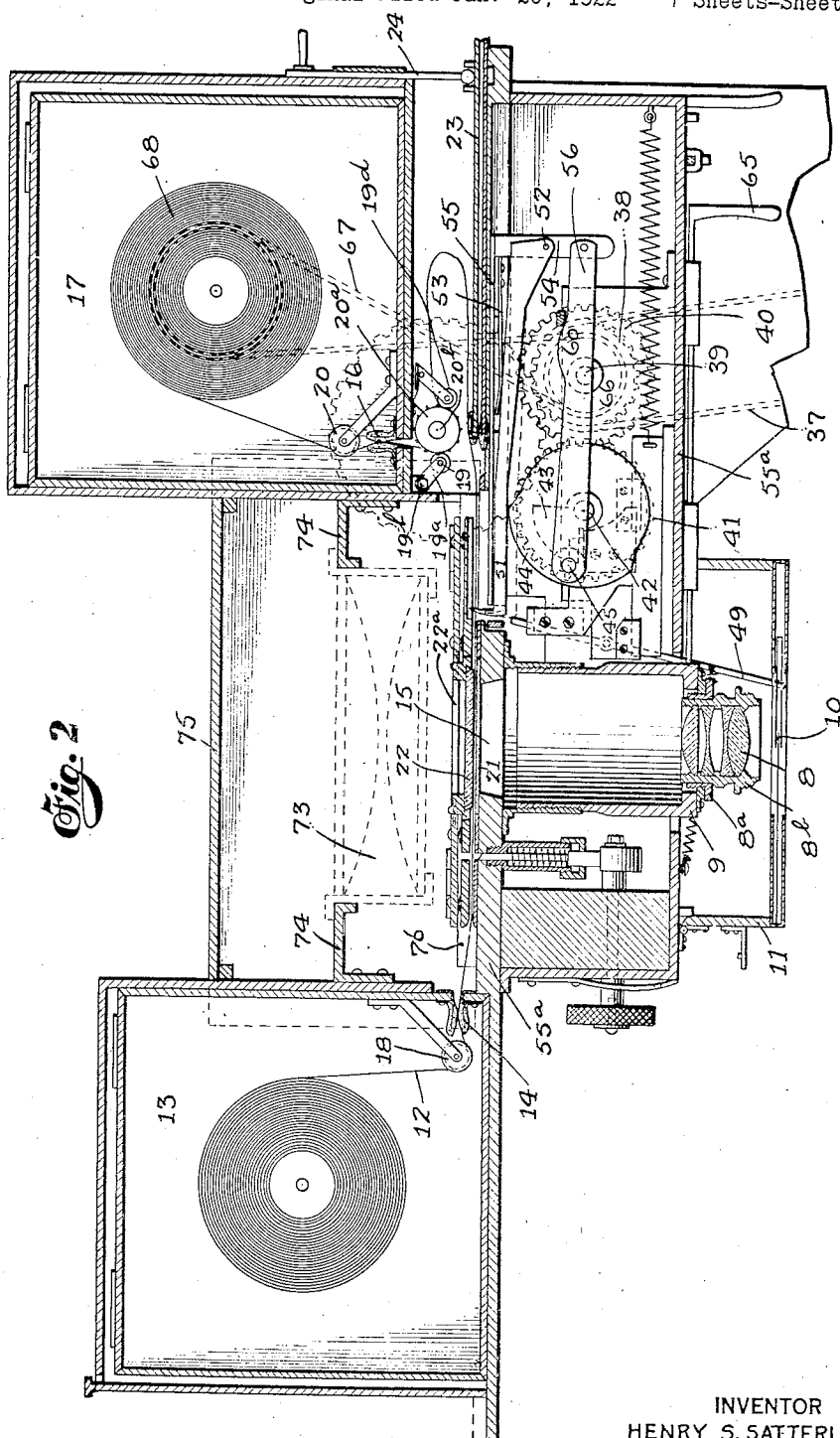


Fig. 2

INVENTOR
HENRY S. SATTERLEE

Henry S. Satterlee
ATTORNEYS

April 21, 1931.

H. S. SATTERLEE

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Fig. 3

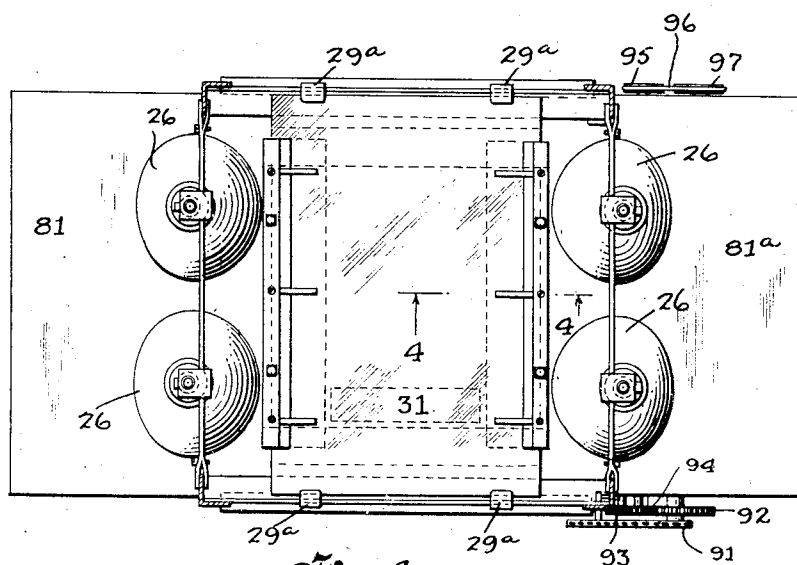


Fig. 4

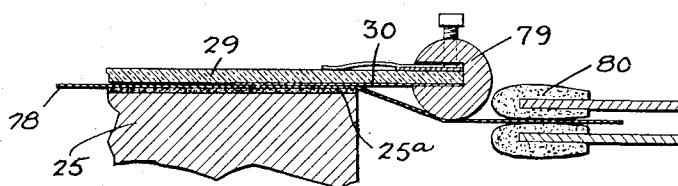
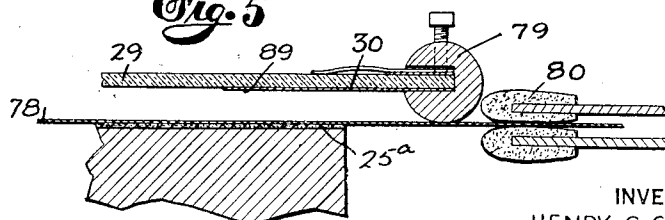


Fig. 5



INVENTOR
HENRY S. SATTERLEE

BY *Henry S. Satterlee*
ATTORNEYS

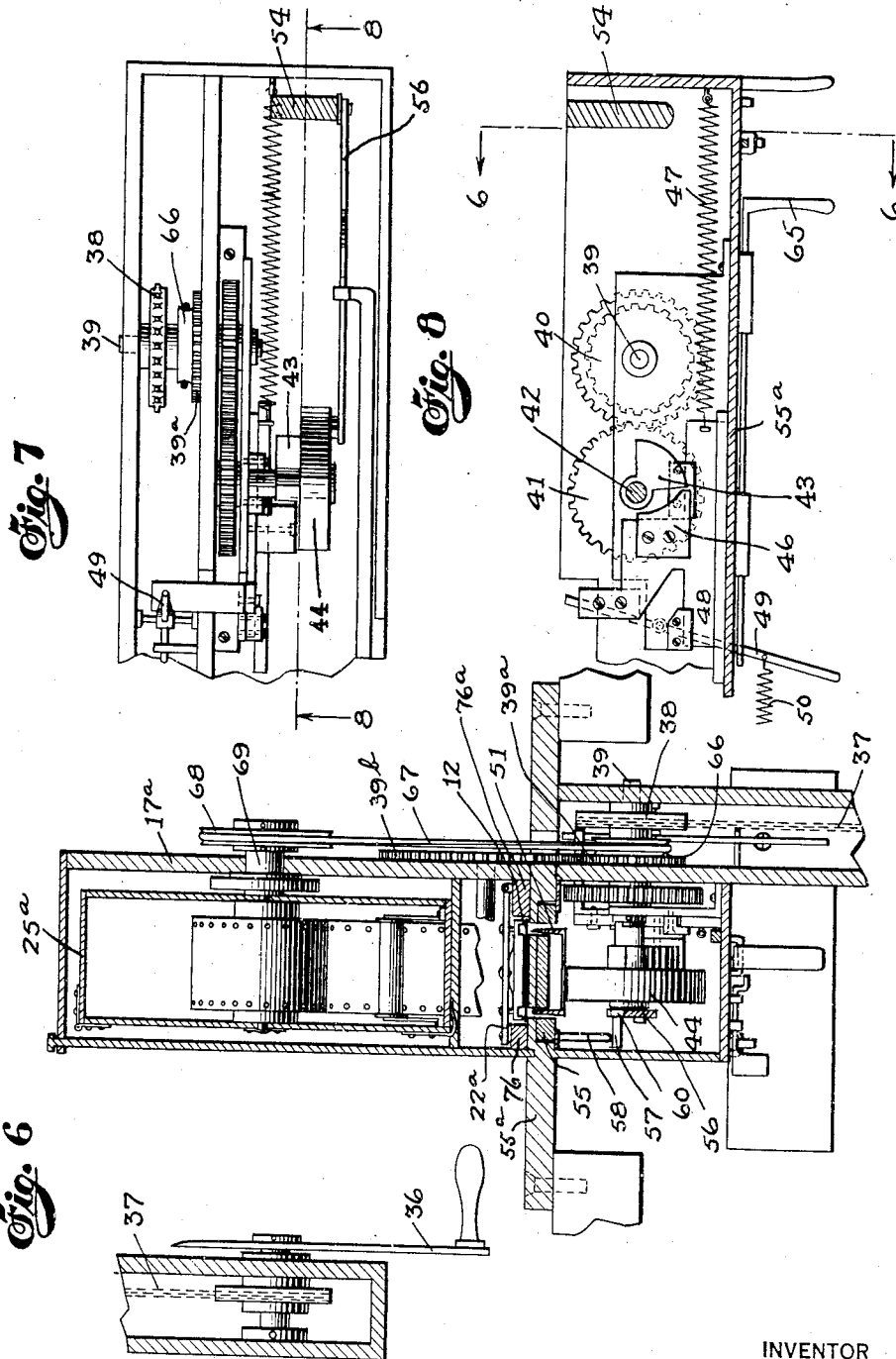
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H. S. SATTERLEE

1,801,458

PHOTOGRAPHIC APPARATUS

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INVENTOR
HENRY S. SATTERLEE

By *May, Day, Blair, Hogan*
ATTORNEYS

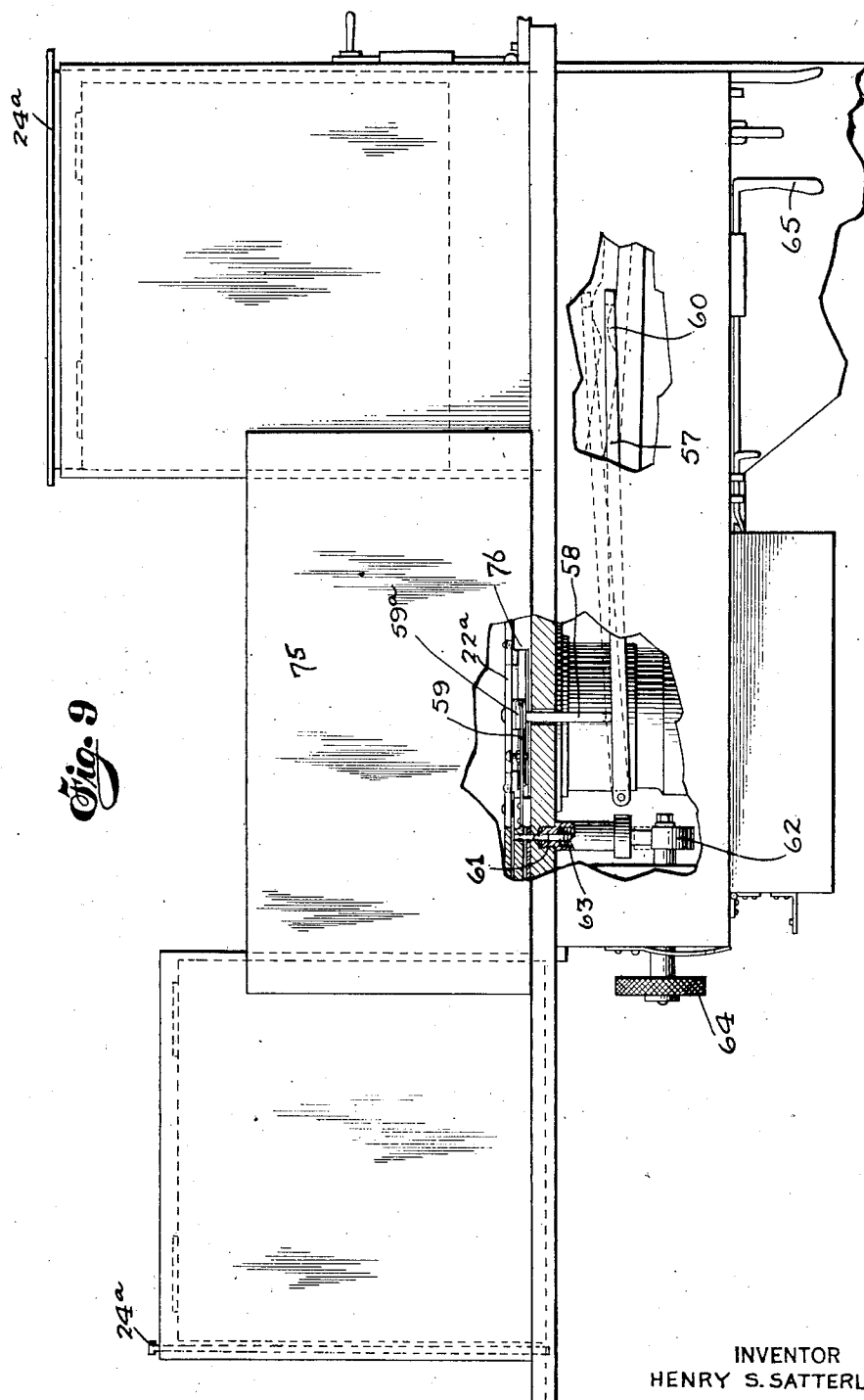
April 21, 1931.

H. S. SATTERLEE

1,801,458

PHOTOGRAPHIC APPARATUS

Original Filed Jan. 20, 1922 7 Sheets-Sheet 5



INVENTOR
HENRY S. SATTERLEE

BY

James H. Ramey, Blair Ayers
ATTORNEYS

April 21, 1931.

H. S. SATTERLEE

1,801,458

PHOTOGRAPHIC APPARATUS

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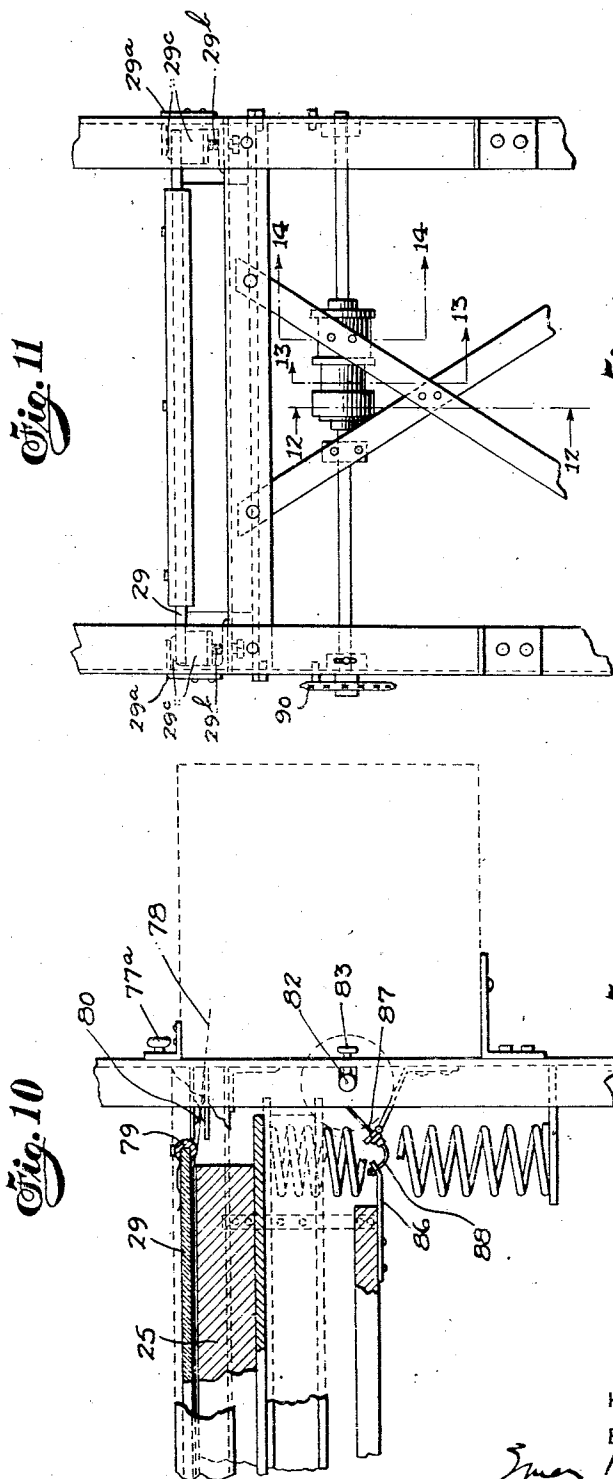


Fig. 11

Fig. 10

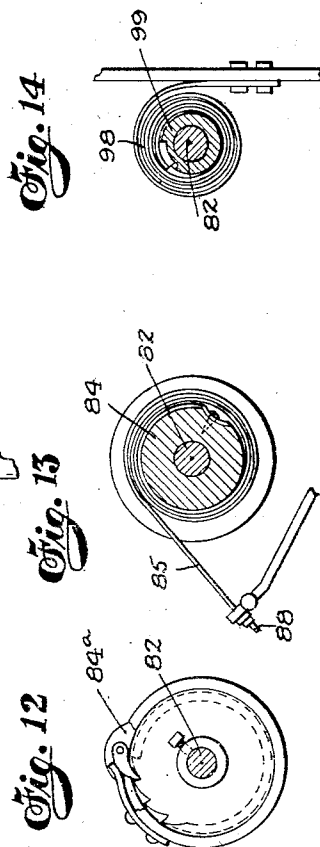


Fig. 14

Fig. 13

Fig. 12

INVENTOR
HENRY S. SATTERLEE,

BY

Imag ^{BY} Harry Blair Hyslop
ATTORNEYS

April 21, 1931.

H. S. SATTERLEE

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PHOTOGRAPHIC APPARATUS

Original Filed Jan. 20, 1922

7 Sheets-Sheet 7

Fig. 15

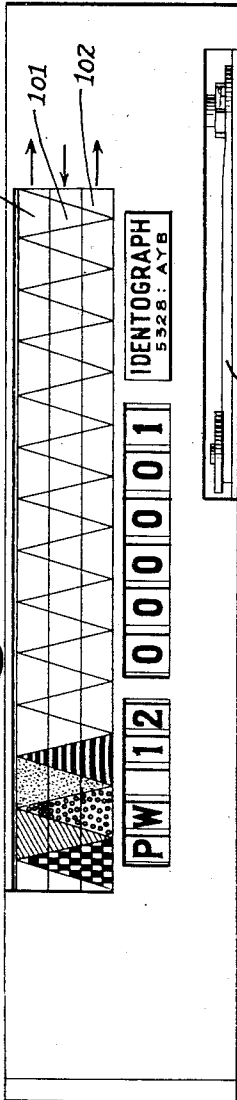


Fig. 16

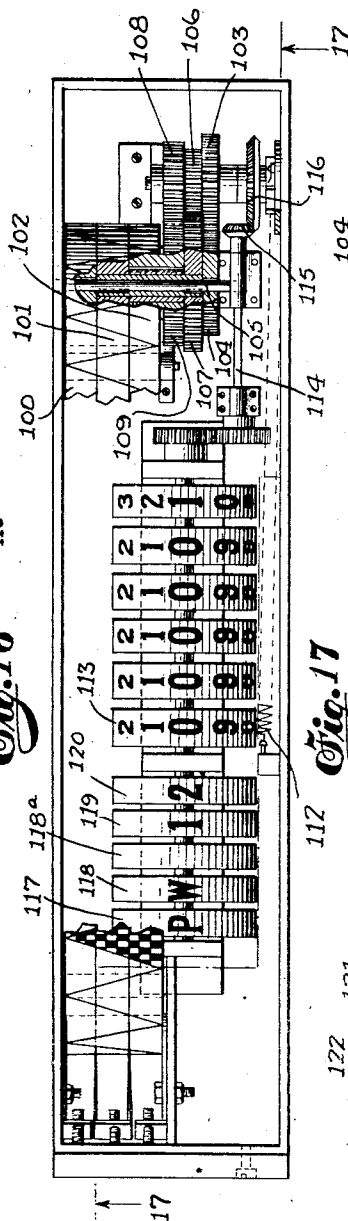
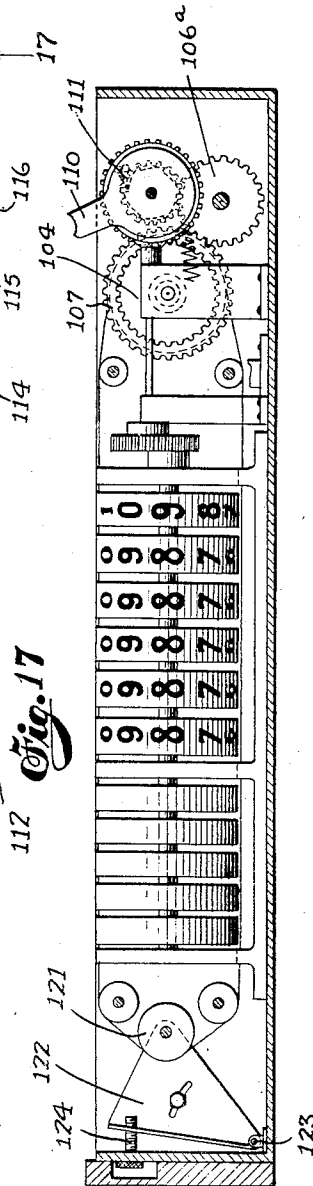


Fig. 17



INVENTOR
HENRY S. SATTERLEE

Henry S. Satterlee
ATTORNEYS

UNITED STATES PATENT OFFICE

HENRY S. SATTERLEE, OF NEW YORK, N. Y., ASSIGNOR TO THE IDENTOGRAPH COMPANY, INC., A CORPORATION OF NEW YORK

PHOTOGRAPHIC APPARATUS

Application filed January 20, 1922, Serial No. 530,504. Renewed September 27, 1929.

My invention relates to photographic apparatus which is particularly applicable to the copying and reproduction of documents, and aims to produce a machine of this character which may be operated with the greatest simplicity and economy by unskilled operators, and will incorporate in its functions and advantages which, although extremely desirable in this class of machine, have not been heretofore realized in any machine with which I am familiar.

My invention also embodies means for identifying photographic copies of documents, and reproductions of such copies, as having been executed in conjunction with a certifying machine of individual distinctive identity to prevent falsification and to make a copy or its reproduction readily and certainly traceable to its origin, to the operator who made the primary copy, and to the place and date of its execution; and moreover that enlarged reproductions of the copies made by the apparatus will necessarily bear photographic evidence of the distinguishing mark of the apparatus employed in making such reproductions.

My improved machine is designed to produce photographic copies of the documents sought to be copied with the maximum rapidity, with the utmost economy of material, and in such form that they may be readily stored without occupying more than the minimum space, while at the same time being capable of accurate and clear reproduction. Such photographic records, according to my invention, may be made either serially in a continuous strip of a very large number of copies, in a short series of copies, or singly, if desired.

I have also arranged the machine of my invention so that the identifying device referred to above is interlocked with other operating mechanisms of the copying machine, so that consecutive operation of the identifying apparatus is compelled and the copies of the documents are serially numbered and identified by identifying symbols differing from one another according to a regular progression.

Generally speaking, my improved appa-

ratus provides means adapted to the unskilled operator for making reduced photographic negative copies of documents and similar objects which will serve as accurate, permanent records of the originals, which may at any future time be enlarged to full sized positive reproductions in any number required, and which will by reason of their diminutive size occupy storage space of but a small percentage of that usually occupied by full sized copies.

My invention further provides for enlarging these negatives to the size of the original object, or other suitable size, with great rapidity of reproduction and for identifying such reproductions by automatically superimposing or surcharging upon the reproduced image of the negative the identity of the specific machine used in making the enlargement. These two processes,—the taking of reduced photographic copies and the reproduction of enlarged positive copies—may be combined in one apparatus, or each may be carried out by a separate type of machine of similar structural design simplified to comprise only such features as are necessary to the process involved. To avoid unnecessary illustration and description of these similar types of apparatus, I have chosen to describe the combined type of apparatus as representative of my invention.

The entire apparatus is arranged to be adapted to the conditions of the ordinary office, occupying the minimum space, readily movable from place to place, and operable from the source of electric current ordinarily available in office buildings.

In the drawings, I have shown one embodiment of my invention by way of illustration, it being understood that the drawings are diagrammatic in some particulars, and that I do not intend to confine myself to the precise details illustrated, since it will be evident that many of them may be considerably modified without departing from the spirit of my invention.

Figure 1 shows a side view of my machine arranged for reproducing;

Figure 2 is a sectional view of the upper portion of my improved machine;

Figure 3 is a plan view of the platen of the machine.

Figures 4 and 5 are detail views of a portion of the mechanism associated therewith;

Figures 6, 7 and 8 are detail views partly in section, showing the operating mechanism for advancing the photographic film upon which the copies are made and for actuating the photographic shutter;

Figure 9 is a side view partly in section, of the upper portion of the machine, arranged for copying, showing the mechanism for holding the film in position and for marking it;

Figures 10, 11, 12, 13 and 14 are detail views, some in section, showing the mechanism associated with the platen; and

Figures 15, 16 and 17 are views illustrating the identifying device by which copies are identified and serially numbered, as explained heretofore.

Copying

The machine comprises a supporting frame which may be conveniently made of angle irons and flat strips, including the vertical standards 1, the diagonal braces 2 and the horizontal supports 3 and 3^a, for supporting various portions of the mechanism, as will be pointed out hereafter, and to add rigidity to the upright members. The upper horizontal angle irons are securely joined to form a rigid frame 3^a which may be adjusted to a plurality of positions by means of holes 4 in the vertical angle irons 1. The horizontal angle iron frame 3^a, and the mechanism supported thereby, rests upon the supporting pins 5 at a plurality of predetermined positions and is securely held there by means of four clamps 5^a. The mechanism supported by the upper horizontal angle iron frame 3^a is carried through the medium of the platform 6. A fine levelling adjustment of platform 6 with attached apparatus may be secured and locked in the horizontal position by means of the wing bolts 7. Mounted upon the platform 6 is the photographic copying apparatus 6^a having a perpendicular optical axis. This comprises a suitable photographic objective lens 8 (Fig. 2) in a micrometer mount 9, by means of which a very accurately adjusted focus may be obtained and locked, it being understood that once the focus is accurately obtained the entire photographic system remains in the fixed position, there being no necessity of making any change of focus. A suitable shutter 10 is arranged to expose the lens 8 at suitable times, the shutter being carried by means of a case 11 which surrounds the end of the lens.

To secure an accurate focus of the lens at the predetermined scale of reduction, the focal length of the lens-system is determined with the utmost accuracy and the two conjugate foci giving the desired enlargement

or reduction are then calculated by the usual formula. The positions of the optical centre of the lens-system and of the nodal points of entrance and emergence if these are separated by a measurable distance are accurately determined for the objective and marked upon its mount; the mark representing the nodal point of emergence is then set at the calculated distance from the posterior focal plane, which is the upper surface of glass plate 21 (see Fig. 2), the final adjustments being effected by the accessory micrometer mount 9 to a high degree of accuracy. The micrometer setting is then locked and its position suitably marked to facilitate future adjustments.

The objective thus set with respect to its posterior focal plane, is next positioned at or near the calculated distance from the anterior focal plane, which is the under surface of glass plate 29. This is effected by adjusting the frame 3^a on the vertical angle irons by means of the clamps 5^a. Holes are then drilled for stop bolts 5 to maintain the platform in the predetermined position and to facilitate a return to that position without further measurement in the event of temporary removal. The anterior and posterior planes are then brought into parallelism with the aid of a spirit level applied to the bed plate of the camera and to the plate 29. The slight additional change which it may be necessary to secure by measurement of the calculated anterior focal distance from the nodal point of entrance or from the optical centre of lens to under surface of plate 29 is effected by adjustment of the plate 29. By this method of calculated and accurately measured adjustments a sharper and clearer reduced photographic image of the object to be copied may be obtained than by any known visual method of focusing. The lens 8 is furnished with a screw thread adapter 8^a, so adjusted and permanently set by means of set-screws (not shown) that its optical centre will be the same distance from the focal plane whether seated in the mount 9 by its proper thread 8^b, or by the thread of the adapter 8^a as shown in Figure 2. When the apparatus is used for copying, the lens is seated in the flange of the micrometer mount by its proper thread 8^b, whereas when the apparatus is used for reproducing, the lens is reversed, without changing the position of its optical centre in the optical axis, by simply unscrewing it from the micrometer mount and reseating it upon the thread of the adapter 8^a. This is to preserve the optical corrections for incident light rays in an asymmetrical lens of the type shown. For a symmetrical doublet the reversal would usually be unnecessary.

The object to be copied is photographed upon a sensitized film 12, which is preferably in the form commonly used in connection

with motion pictures and is stored in magazine 13, from which it passes through light trap 14 over the aperture 15, through light trap 16 into magazine 17. Suitable guide rollers 18, 19, 19^d and 20 are arranged in the path of the film. Film 12 adjacent to the aperture 15 passes between two sheets of optically flat glass 21 and 22, the upper sheet 22 being an integral part of pressure gate 22^a arranged so that it may be moved, by mechanism which will be described hereafter, in a vertical direction, to clamp the film in the horizontal position and hold it perfectly flat during exposure. The general operation of making a copy as far as the film is concerned, consists therefore in movement of the film to register with the aperture, securing optical contact with the surface of glass 21, by clamping the film in position under pressure between the glasses 21 and 22, actuating the shutter 10, releasing the film between the glasses and advancing the film another step, thus completing the cycle of operation. The repetition of this cycle of operation results in the accumulation in the magazine 17 of a continuous strip of exposed film and may be continued in this manner for a very large number of photographic exposures of objects to be copied, or until the magazine 13 is exhausted. The film then accumulated in magazine 17 is removed and developed.

Should it be desired, however, to interrupt a magazine series for a short run for immediate development, the film may be cut at the loop between the gate 22^a and the sprocket 20^a, and threaded into dark slide 23. The magazine 17 is left in place with cut end of film projecting from the light trap but disengaged from the sprocket. When operation of the machine is resumed the film is advanced into dark slide 23 by the action of the film-advancing mechanism. When the desired number of exposures have been made, the film is again cut between the gate and the dark slide and the original series in magazine 17 continued by uniting the cut end of the film coming from the gate 22^a, with the cut end of the film projecting from magazine 17, which can readily be done by two small clips through the marginal perforations of the film. The loop thus formed is then engaged with sprocket 20^a. The dark slide 23 may be held in place in any convenient manner, as by sliding in slots (not shown). The sliding door 24 is provided to permit the insertion and withdrawal of the dark slide. The doors 24^a are to provide access to the housings of magazines 13 and 17 and to the dark slide compartment to facilitate threading of the film 12. During the making of the photographic copies, the platen 25 is suitably illuminated by means of electric lights 26, with reflecting shades designed to give, with incandes-

cent filaments properly adjusted, a uniform illumination over the entire surface of the object to be copied at a low angle of incidence. The lights may be conveniently mounted to turn and be adjusted vertically by mounting them upon pipes 27, sliding in cross members 28, to which the pipes are clamped. This adjustment is desirable in order to obtain efficiency and uniformity of illumination with avoidance of flare or reflection from glass plate 29; and when so obtained may be set by the set screws provided and requires no further attention.

The lower angle irons 3 are rigidly fastened to the vertical angle irons 1 and serve as a support for the glass plate 29, which is adjustable in the vertical direction to a limited extent by means of the four screws 29^b and blocks 29^c holding it against the four angle brackets 29^a, as shown in Figures 3 and 11. The vertical adjustment of the plate 29, in addition to its levelling function, permits relatively small final adjustments to fix the plate accurately at the anterior focal plane of the lens 8, as already described. The platen 25, which is adapted to be brought into coaptation with the plate 29 by means of mechanism which will be described hereinafter, is preferably provided with a soft surface, as for instance, by a layer of felt 25^a (see Figure 4). The object to be reproduced is supported and pressed firmly against the plate 29 by the platen 25, which may be provided with a margin-defining means, such as the opaque mask 30. The platen is recessed, as at 31, to take the identifying apparatus, which I have called the "Identograph", shown in Figures 15, 16 and 17, and which will be described in detail hereafter.

Platen 25 may be operated by electric motor but, as here illustrated, is actuated by means of a treadle 32, pivotally mounted at 33 upon the frame structure of the machine, and connected by means of chains 34, or in any other manner, with the platen 25, the platen being mounted to move vertically in the vertical frames 1 of the machine against the tension of springs 35. When it is desired to insert a document for reproduction, the treadle 32 is depressed, thus lowering the platen, and the document is inserted between the upper surface of the platen and the glass 29.

The photographic mechanism, securely attached to platform 6, may be operated by a motor in conjunction with the platen but is shown here as manually driven by the operator through the crank 36, which is preferably arranged so that one revolution thereof will produce one complete cycle of operation of the machine. Crank 36 transmits its power through a chain 37 or other suitable device to the sprocket wheel 38 mounted upon shaft 39, on which the gear

wheel 40 is geared to gear wheel 41 mounted upon shaft 42, which carries the cams 43 and 44. Cam 43 is the source of motion for the shutter-operating mechanism and cam 44, upon which is mounted the wrist pin 45, is the source of motion for the film-advancing mechanism.

It will be seen from Figures 2 and 8 that the rotation of cam 43 causes it to engage the cam-follower 46, slidably mounted on the bed plate 55^a of the machine and normally held in the retracted position by means of spring 47. The forward motion of the cam-follower causes the block 48, to which it is attached, to move the pivotally mounted shutter-operating arm 49 about its pivot against the tension of the shutter spring 50, to operate the shutter 10 as indicated in Figure 2. It will be noted that the operation of the cam 43 is timed with respect to the other mechanism of the machine so that the exposure takes place only after the film has been advanced and clamped between the glasses 21 and 22 by pressure of gate 22^a, as shown in Figures 6, 7, 8 and 9.

Cam 44 operates to raise the double claw 51 pivotally mounted at 52 against leaf spring 53 into engagement with the film 12 which may be supplied with perforations along its edges in the manner common to moving picture films. The continued rotation of cam 44 will cause the part 54 of the claw carriage 55 to slide along the surfaces of its bearing on bed plate 55^a, as shown sectionally in Figure 6, due to the motion of link 56, thereby causing a longitudinal movement away from aperture 15, of claw 51 and film 12, and thus advancing the film a predetermined distance into registry with the aperture 15. In order that claw 51 and its associated mechanism may advance the film an exact measured distance independently of any tension which may be exerted by the film take up, I provide sprocket 20^a, positively driven by gears 39^a and 39^b and cooperating with rollers 19 and 19^a to restrict the take up of the film to substantially the same rate as its rate of advance by the claw 51.

Bearing upon the link 56 is one end of the pivoted lever 57 (see Figure 9), which operates a vertically moving plunger 58 against the tension of leaf spring 59, to raise the gate 22^a which carries upper glass 22. Lever 57 is operated by means of cam surface 60 on connecting link 56, the longitudinal and vertical motion of which, resulting from the rotation of cam 44, causes lever 57 to be raised and lowered to raise and lower glass 22 at suitable intervals timed with respect to other operations of the machine, to permit the film 12 to be advanced or to clamp it in place during exposure. Figures 2 and 9 represent the cycle of operation after completion of the shutter phase,

just before the beginning of the film-advancing phase, and at the moment of releasing the action of the pressure gate upon the film.

The alignment of the film 12, in its passage beneath gate 22^a and across aperture 15, is maintained by the lateral guide members 76 and 76^a, one of which members, preferably 76^a, may be faced with a plate or plates under light spring tension (not shown in the drawings) to insure correct alignment by contact with the edge of the film.

Gate 22^a consists of an upper rigid member which extends the entire length of the gateway and is hinged on one side. The rigid member has a rectangular opening over its central portion corresponding to aperture 15, and carries within the opening a rectangular pivoted frame in which is mounted glass plate 22. On its lateral portions on either side of aperture 15 the rigid member of gate 22^a carries a pressure plate attached to it loosely by pins as shown in Figures 2 and 6. Both these lateral pressure plates are under tension of light double leaf springs as shown in Figure 6. The latch 59^a of gate 22^a is on the side opposite to the hinges as indicated in Figure 9, where the latch 59^a is shown under pressure of leaf spring 59, the pressure relieving plunger 58 being in the down position. Leaf spring 59 is a comparatively strong spring and its pressure can be varied with the nut and screw adjustment shown in Figure 9; it exerts a strong pressure upon latch 59^a except when the plunger 58 is raised and this pressure is conveyed directly to the pivoted frame which carries glass plate 22. It will be noted, however, that the full pressure of leaf spring 59 is not conveyed to the film over the lateral sections of the gateway on account of the intervention of the light springs between the rigid member of the gate and the lateral pressure plates. The adjustment of the springs is such that during the action of the plunger 58 and while the film is being advanced within the gateway, the plate 22 is lifted so that there is no pressure whatever on the film at the middle portion of the gateway, but there is nevertheless a very slight pressure over the film from the lateral pressure plates on either side of the aperture which provides sufficient tension to insure a precise action of the film-advancing mechanism.

A suitable marking mechanism, such as punch 61, actuated by means of the cam 62 against the tension of spring 63, by means of the knurled knob 64, may be provided, and serves as a convenient guide in cutting the film before development, or in marking the position of any given exposure. Should it be desired to make a lengthened or multiple exposure without advancing the film, or when making duplicate exposures in reproduction (to be hereafter described), I

have provided a manually operable trigger release, comprising a finger piece 65, which is connected to the shutter operating rod 49, and is operable independently of the film-advancing mechanism. Mounted upon shaft 39 is the pulley 66 carrying the friction belt 67, which encircles a pulley 68, upon the shaft 69 of magazine housing 17^a. Shaft 69 may engage by slots (not shown) with lugs of the take-up spindle of magazine 17 or by any convenient method of removable engagement. Through this means the film is taken into the magazine 17 and the relation of the pulleys 66 and 68 is preferably such that a slight slippage of the belt 67 occurs thus holding the film 12 in the magazine 17 in a closely wound and taut condition. Belt 67 is temporarily removed from pulley 68 when employing the dark slide 23.

Reproduction

The reproducing apparatus comprises a source of illumination, a suitable condensing system combined with a suitable heat-ray filter, an optical system arranged for projection in a vertical axis, a shutter, and means for receiving the projected image upon a sensitized paper or other suitable medium. The source of light may comprise an arc, illustrated diagrammatically in Figure 1, contained in a suitable cover 70, and which may be adjustably mounted by means of rods 71 and 72, so that it may be removed from the machine altogether, or swung out of operative position. This arc is preferably provided with a clock work feed, and with the usual centering and approximating adjustments well known to the art.

The condenser, the position of which is illustrated diagrammatically by the dotted lines 73 (Figure 2), may be placed in position by removing the cover 75. The annular segments or brackets 74 serve to mount and maintain the condenser in a definite predetermined relation to the focal plane of the projecting lens. Any suitable heat-ray filter may be used in conjunction with the condenser but I prefer a glass screen of the proper color to prevent the heat-rays from affecting the film, and to render the projected light rays as nearly monochromatic as practicable under the conditions. The light may traverse first the heat-ray screen then the lenses of the condensing system, or vice versa, then glass 22, film negative, glass 21, and, finally, lens 8. The image of the negative is projected from the upper surface of glass 21.

The upper surface of glass 22 is minutely etched at the margin of its shorter dimension with any suitable legend, which may be, for example, "Identograph 5328" in very small letters; and in much larger letters, stretching across the breadth of the aperture 15, "Positive copy". This etching is

filled with a suitable opaque substance so that the projected image of the negative will appear to be surcharged with this legend in white upon the finished enlargement. The position of the legend in the field of projection is such that it will fall preferably upon the position of the "Identograph" image in the negative; and the distance of the etching from the focal plane is such that although its image will be legible, it will have the blurred outline characteristic of letters which are slightly out of focus, thereby expressly indicating its derivation from the reproducing machine. During the reproducing operation, the lamps 26 used in the copying operation are not employed, but one of them may be replaced by a non-actinic bulb of low luminosity to facilitate the various preliminary adjustments necessary. Extraneous light is excluded from the sensitized paper during the process of operation either by a suitable opaque curtain mounted upon the vertical angle irons 1 (Figure 1) with suitable adjustments, or by employing a light-tight housing around the source of light and operating within a darkened room.

The magazines 13 and 17 are removed and a reel containing the negatives to be reproduced is substituted for the magazine 13; or, if only a short strip, this is introduced directly beneath the gate 22^a. The negative film is then run through between the glasses 21 and 22 until the proper negative is brought opposite the aperture 15 for reproduction. If it is desired to produce only one reproduction in every instance from a number of consecutive negatives, the film may be drawn from the reel, the exposures for reproduction made, and the film advanced by using the mechanism described above for exposing and advancing the film during the copying operation. If at any time it is desired to make more than one reproduction of a given negative without moving the film, repeated exposures are made by the hand trigger shutter release 65 without moving the crank handle 36.

In applying the apparatus here described for producing enlargements of greater size than the original objects, or when enlarging in any way from a single negative made upon commercial moving picture film stock, such enlargement, if greater than twelve diameters, suffers a loss of critical definition in the enlarged photographic image and this impairment of critical definition increases progressively as the enlargement is increased beyond a certain ratio. This ratio, and the degree of impairment, varies with the size of the grains of the silver salt deposited in the photographic emulsion of the film which is employed for producing the negative. This factor determines the so-called resolving power of the particular emulsion and has very distinct limitations in the ordinary

commercial moving picture film. The lack of critical definition so entailed may be corrected to a large extent by fractional exposures from duplicate or triplicate negatives upon the sensitized material receiving the enlarged image. Such exposures are made through identical but separate negatives of the original object brought successively into exactly the same register in the focal plane of the projecting system. In the apparatus of my invention means for easily and quickly obtaining an exactly similar registry and consecutive fractional exposure by the automatic devices of registry and advance are incorporated in the mechanisms. To have the means of accomplishing it, it is only necessary, with this apparatus, to make triple serial negatives of any object which it is desired later to enlarge beyond the point of critical definition by the ordinary method. When an enlargement is to be made by fractional exposure from, say, triplicate negatives, instead of from a single negative, the diaphragm of the objective is first sufficiently closed to compensate for a triple exposure, and the strip of three identical negatives is then run through the apparatus just as for three ordinary cycles of operation with three different negatives, except that the sensitized surface which is to receive the enlargement is not moved, but is allowed to remain in situ during the three exposures.

The sensitized paper or other medium upon which the reproduction is made may conveniently be stored in a magazine 81 removably attached to the vertical side frames 1 of the machine by means of the hand screws 77 or in any other suitable manner. The paper 78 (see Figures 4, 5 and 10) is led over the platen 25 under the glass 29. At the edges of glass 29 I provide the tension rods 79, which serve to elongate the path as shown in Figures 4 and 5, when the platen 25 is raised, thus causing the paper 78 to be stretched taut over the platen and lie perfectly flat. One of the marginal masks 89 is provided with a series of marginal pins 89, on its under surface, which serve to indent the paper between margins of exposure with the lines on which it may be cut. The paper, before and after exposure, passes through suitable light traps 80 and after exposure passes into magazine 81^a. If it is desired to make a single reproduction, a single sheet of sensitized paper may be introduced by hand beneath the glass plate 29 to register with the marginal masks 89. If it is desired to make a plate for multiple reproduction by any photo-mechanical process, the sensitized plate of glass or zinc or whatever substance is similarly introduced by hand.

The paper 78 is taken up into magazine 81^a by means of the following apparatus.

Mounted in the vertical angle irons 1 of the frame is shaft 82, and adjustment for which is provided by means of the nut 83 or by any other suitable means. Mounted on shaft 82 is the reel 84. Reel 84 is caused to rotate shaft 82 by means of the strap 85 which is coiled about it and which is connected to the platen-operating mechanism by arm 86. The movement of strap 85 is limited by stop 87 and between the stop 87 and arm 86 extends a loose portion 88 of the strap, the arrangement being such that the platen may be depressed a predetermined distance before the strap 88 and its continuation 85 becomes taut, to actuate the reel 84, in order to permit the paper to be released from between the platen and glass 29 and from the marginal pins 89 by the action of the tension rods 79. The rotation of reel 84 which is a part of pawl member 84^a and the consequent rotation of shaft 82, causes the rotation of sprocket 90, which drives sprocket 91 and gear 92 on magazine box 81^a. Gear 92 engages one of a pair of cooperating gears 93 and 94, which drive feed rollers (not shown) between which the paper passes inside of the magazine box 81^a and through pulley 95 and friction belt 96 drives pulley 97 which is mounted upon the shaft of the take-up reel (not shown) located in the magazine 81^a (see Figure 3). Magazine 81^a is removably attached to the vertical side frames 1 of the machine by means of hand screws 77^a and supported rigidly in any convenient manner, as by slotted brackets 77^b. The rotation of reel 84 which is continuous with drum 99 serves to wind up spring 98, one end of which is fastened to a stationary part of the machine and the other end of which is fastened to the drum 99. A suitable ratchet mechanism, illustrated in Figure 12, is provided so as to permit the intermittent rotation in the same direction of the sprocket 90 and the mechanism associated therewith.

The identifying mechanism

The identifying mechanism which I have called the "Identograph" is arranged with a view to producing a complex pictorial symbol which is susceptible of almost infinite change of arrangement in a predetermined series of patterns so that the symbol photographed in juxtaposition to a document which is to be copied will differ very distinctly from the symbol similarly displayed in the process of photographing any other document. This machine is so mounted upon the platform which is adapted to support the object that its face is exposed in the field of the lens adjacent to the object and in substantially the same photographic plane. The machine in its preferred form has one set of figures fixed, and two sets of figures and symbols movable. The fixed

figures and symbols give the identity of the machine used, the manufacturer, or any other notation desired, upon all copies made with the machine. One set of the movable symbols are selectively changeable and constitute identifying office marks which may be set at will by the operator by adjusting the wheels 117, 118, 118^a, 119 and 120. The wheels have suitable ratchet notches and wire spring detents (not shown in the drawings) for proper registry, by which they may easily be rotated to any position by inserting a pencil or other pointed instrument.

The second set of movable symbols serially and automatically numbers and otherwise designates the various documents which are copied. The movement of this system of symbols is without means of control by the operator. To accomplish these functions I have provided a mechanism comprising a plurality of endless belts 100, 101 and 102, which may be in the form of flat strips or may be made in the form of chains and may be in positive driving engagement with the driving means if desired. Obviously the form of the belts and their driving means may be greatly varied. As illustrated, the belts comprise flat strips which carry a plurality of distinctive designs. In the example illustrated in the drawings, the patterns are in the form of triangles, which are marked with designs of distinctive character, the designs being chosen with regard to their distinctiveness and ease of accurate reproduction. These designs are arranged in series, usually three or four repetitions for a complete belt. Belts 100, 101 and 102 are moved in opposite directions at varying rates of speed, by means of the gear trains illustrated in Figure 16. It will be noted that pinion 103 actuates gear 104 which through shaft 105 moves belt 100 to the right at a given rate of speed. Pinion 106 cooperating with gear 107 through the countershaft gear 106^a moves belt 101 to the left at a slower rate of speed, and pinion 108 cooperating with gear 109 moves belt 102 to the right at an intermediate rate of speed. The pinions 103, 106 and 108 are mounted upon a common shaft which is given an intermittent progressive movement of a definite extent, by means of the movement of the arm 110 and the ratchet and pawl mechanism 111, and the ratios of the gearing are such that the incidence of a common multiple of revolution between gears 104, 107 and 109 is avoided or rendered highly infrequent. The method chosen for operating arm 110 in the present application of this device is to cause it to be depressed by bringing it in contact with glass 29 through the elevation of the platen 25, it being remembered that the identifying mechanism is preferably placed in the recess 31 of the platen 25. The arm

is returned to its normal position when the platen is lowered by means of spring 112. It will thus be apparent that a very large number of permutations of the positions of designs upon belts 100, 101, and 102 may be obtained without reduplication and that knowing the extent of movement of each of said belts at each step, a check upon consecutive copies may be obtained. The position for operation of the identifying mechanism is such that the operation of the belts and of the automatic counter 113 is independent of the operator and movement thereof must occur upon the placing of each document to be copied in the position to be exposed.

Inseparably connected to the driving mechanism of the belts is a numbering mechanism which may be of any suitable variety and comprises a plurality of number wheels 113, which receive motion through the shaft 114 driven through the beveled pinion 115 from the beveled gear 116 mounted upon the shaft actuated by the arm 110. The tension of the belts 100, 101, and 102 is adjusted by mounting rollers 121 in journals carried by yokes 122 pivoted at 123, the positions of which may be adjusted by means of the set-screws 124. If desired, the belts may be positively driven by methods well known in the art, thereby eliminating any possibility of slip between the belts and pulleys.

As an example of the operation of the identifying mechanism, it carries a number, for instance "5328", being the manufacturer's serial number; and the code letters "A Y B", which may be used to indicate the particular belts used in the machine and the gear ratios employed. The left-hand letter wheel 117 may be used to identify the operator. For instance, in the example shown, it may be used as the initial letter of the operator's name—say for instance, Perkins. The second letter wheel 118 may be used to identify the matter upon which the operator is working, for instance, the letter "W", from which it will appear that Perkins is working upon—say, the Walker case. The wheel 118^a is left blank in this instance, and the identifying wheels 119 and 120 may be used to indicate the operator's serial number of the document in the Walker case which is being copied, so that it would appear that this is the twelfth document of the Walker case of which a copy is being made. As explained above, the automatic numbering device 113 gives the machine's serial number of the copy made and the belts the serial symbol. If desired, an office name plate or a tablet may be included on the face of the machine to display the signature of the operator; and, if desired, a calendar clock or other device for special data may be incorporated.

It will be noted that while the identifying apparatus described above is particularly adaptable to the copying and reproducing machine I have described, it may, by being suitably changed, apply to other copying and reproducing machines and I therefore do not wish to confine myself to its use in connection with any particular machine. It will also be evident that certain other groups of mechanism described above may be adapted to other photographic reproducing or copying machines and I therefore do not wish to confine myself to their use in connection with the machine described above.

I claim as my invention:

1. In a machine of the kind described, photographic copying means adapted to be reversed to constitute photographic reproducing means for the copies, and means automatically operable by said copying and reproducing means for exposing identifying symbols in the photographic field when a copy is being made and for superposing identifying symbols on the image of said copy when reproducing the same.

2. In a machine of the kind described means for photographically copying a document, means for holding the photographic copy of said document, means consisting of said photographic copying means in reversed position for reproducing said document copy and identifying means automatically operable by the copy-holding means for superposing identifying symbols on the image of said copy when reproducing the same.

3. In a machine of the kind described, in combination, means for photographically copying a document, means for holding said document, means for holding the photographic copy of said document, said photographic copying means being capable when reversed to reproduce said copy, identifying means automatically operable by the document holding means for exposing identifying symbols in the photographic field when a copy is being made, and identifying means automatically operable by said copy-holding means for superposing identifying symbols on the image of said copy when reproducing the same.

4. A photographic copying and reproducing device comprising a photographic objective consisting of a suitable asymmetrical combination of lenses, means for positioning alternatively an object to be copied or a sensitized medium in any of a plurality of predetermined planes anterior to the objective, means for positioning alternatively a sensitized film or a photographic film transparency in a predetermined plane posterior to said objective, and means for accurately positioning said objective with respect to said planes, so that said planes shall coincide with predetermined conjugate foci of said objective within the structural limitations of

the apparatus, and means for reversing the objective of said device without changing the position of its optical center with respect to said planes.

5. A photographic copying and reproducing device comprising a suitable objective consisting of an asymmetrical combination of lenses, means for positioning alternatively an object to be copied or a sensitized medium in a plane anterior to the objective, means for positioning alternatively a sensitized film or a photographic film transparency in a plane posterior to said objective, means for accurately positioning said objective with respect to said planes, so that said planes shall be perpendicular to the optical axis and shall coincide with predetermined conjugate foci of said objective within the structural limitations of the apparatus, and means for reversing said objective and at the same time automatically repositioning its optical center correctly with respect to said planes.

6. A photographic copying device comprising a suitable objective lens, means for supporting and illuminating an object to be copied in a predetermined plane anterior to said objective, means for supporting a sensitized medium in a predetermined plane posterior to said objective and perpendicular to its optical axis, means for accurately positioning said objective without visual focusing so that said planes shall coincide with any predeterminable conjugate foci of said objective, and means for adjusting said planes in parallelism.

7. A photographic reproducing device comprising a suitable objective lens, a source of light for projection, means for supporting a photographic negative in a predetermined focal plane of said lens which is proximate to the light, means for supporting a sensitized medium in the focal plane of said lens which is conjugate to the first plane and remote from the source of light, a condensing system of lenses between said objective lens and said source of light, means for accurately positioning said objective lens without visual focusing so that said planes shall coincide with the predetermined conjugate foci of said objective, and means for adjusting said planes in parallelism perpendicular to the optical axis.

8. In a device of the class described, in combination, a plurality of rigid vertical members, a plurality of adjustable horizontal supports associated therewith, a photographic copying and reproducing device mounted on one of said horizontal supports and comprising a photographic objective consisting of a suitable combination of lenses, said device when in one position being adapted to make reduced copies of an object and when in reversed position being adapted to reproduce the original from the

copies so made, a copy-holding device mounted on another of said horizontal supports and adapted to support an object to be copied in a focal plane of said copying and reproducing device, and means for operating said copy-holding device to receive said object.

9. In a device of the class described, in combination, a photographic reproducing device, an objective lens in said device, a source of light for projection, means for supporting a photographic negative in the focal plane of said lens which is proximal to the light, means for supporting a sensitized medium in the focal plane of said lens which is distant from the source of light, a condensing system of lenses between said lens and said source of light, and a fixed member interposed between said source of light and said lens adapted to superpose an identifying image upon the image of said photographic negative projected upon the sensitized medium.

10. In a device of the class described, in combination, a plurality of frame members, a plurality of adjustable supports mounted on said frame members, a photographic reproducing device on said supports, means associated with said reproducing device for supporting a roll of negative film, means for holding selected portions of said film in the desired focal plane, and means actuated by the movement of said holding means for feeding said film.

11. In a device of the class described, in combination, a plurality of frame members, a plurality of adjustable supports mounted on said frame members, a photographic reproducing device on said supports, a supply of negative film, a transparent member defining the desired focal plane, a transparent plate for holding a selected portion of said film against said member, resilient means for pressing said plate against said member in the desired focal plane and means actuated by the movement of said plate for feeding said film.

12. In a device of the class described, in combination, a plurality of frame members, a movable support on said frame members, a photographic reproducing device mounted on said support, means associated with said reproducing device for supporting a film, and means for advancing said film operative upon movement of said supporting means.

13. In a device of the class described, in combination, a transparent plate interposed between a source of light and a photographic transparent film bearing a negative image, suitable means for projecting light through said transparent plate and through said film, and means in the plane of the surface of said plate which is proximal to the source of light to produce a shadow on said film, effecting a surcharged legend or sym-

bol upon the projected image of said film.

14. In a device of the kind described means for making reduced photographic copies of documents comprising a photographic objective, means for positioning alternatively an object to be copied or a sensitized medium in any of a plurality of predetermined planes anterior to the objective, means for positioning alternatively a sensitized film or a negative photographic film transparency in a predetermined plane posterior to said objective, said photographic copying means being capable of being reversed and being adapted when reversed to reproduce said documents in substantially their original size from the reduced negatives so made.

15. In a machine for the photographic reproduction of reduced photographic transparencies, a film transparency containing a plurality of series of identical reduced photographic negatives, means for intermittently advancing the film measured distances, means for registering the film when advanced, a sensitized medium adapted to receive the projected images of said negatives, means for exposing said medium during stationary periods of registration of the film and means for advancing the sensitized medium measured distances between series to expose successive portions thereof to the projected images of said serial identical negatives.

16. In a device of the class described, in combination, a plurality of frame members, a plurality of adjustable supports mounted on said frame members, a photographic reproducing device on said supports, a strip of film negatives, a transparent member defining a desired focal plane perpendicular to the optical axis of said reproducing device, a transparent plate for holding a selected portion of said strip of film in flat contact against said member, resilient means for compressing said strip of film between said plate and said member in the desired focal plane and means actuated by the release of said plate for feeding said film step by step.

17. In a machine for the photographic reproduction of reduced photographic transparencies by projection, a strip of film transparencies containing a plurality of series of identical photographic negatives, means for intermittently advancing the strip of film measured distances, means for accurately registering the film series of negatives when advanced, a sensitized medium adapted to receive the composite projected images of said negatives in accurate register means for exposing said medium to the projected images during stationary periods of registration of the identical film series of negatives and means for advancing the sensitized medium step by step between series to expose

successive portions thereof to composite projection of said serial identical negatives.

18. In a device of the class described, in combination a plurality of frame members, a plurality of movable supports on said frame members, a photographic reproducing device mounted on said supports, transparent means associated with said reproducing device for supporting a film negative or transparency in a plane perpendicular to the optical axis of said reproducing device, an identifying member associated with said supporting means, means for compressing said film against said supporting means and said identifying means, and means for advancing said film operative upon release of said compressing means.

In testimony whereof, I have signed my name to this specification this 19th day of January, 1922.

HENRY S. SATTERLEE.

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