

Dec. 18, 1934.

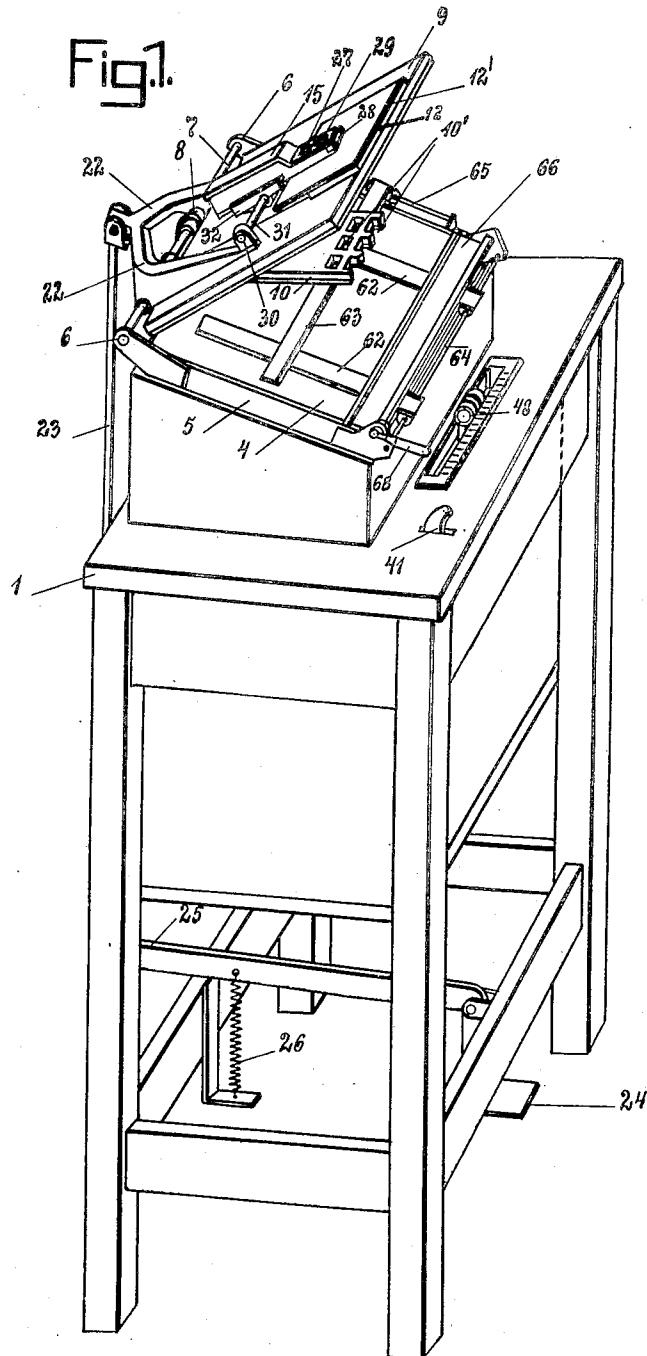
H. SCHAMBACH ET AL

1,984,898

PROCESS AND APPARATUS FOR COPYING PHOTOGRAPHS

Filed April 5, 1930

4 Sheets-Sheet 1



Inventors:
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Dec. 18, 1934.

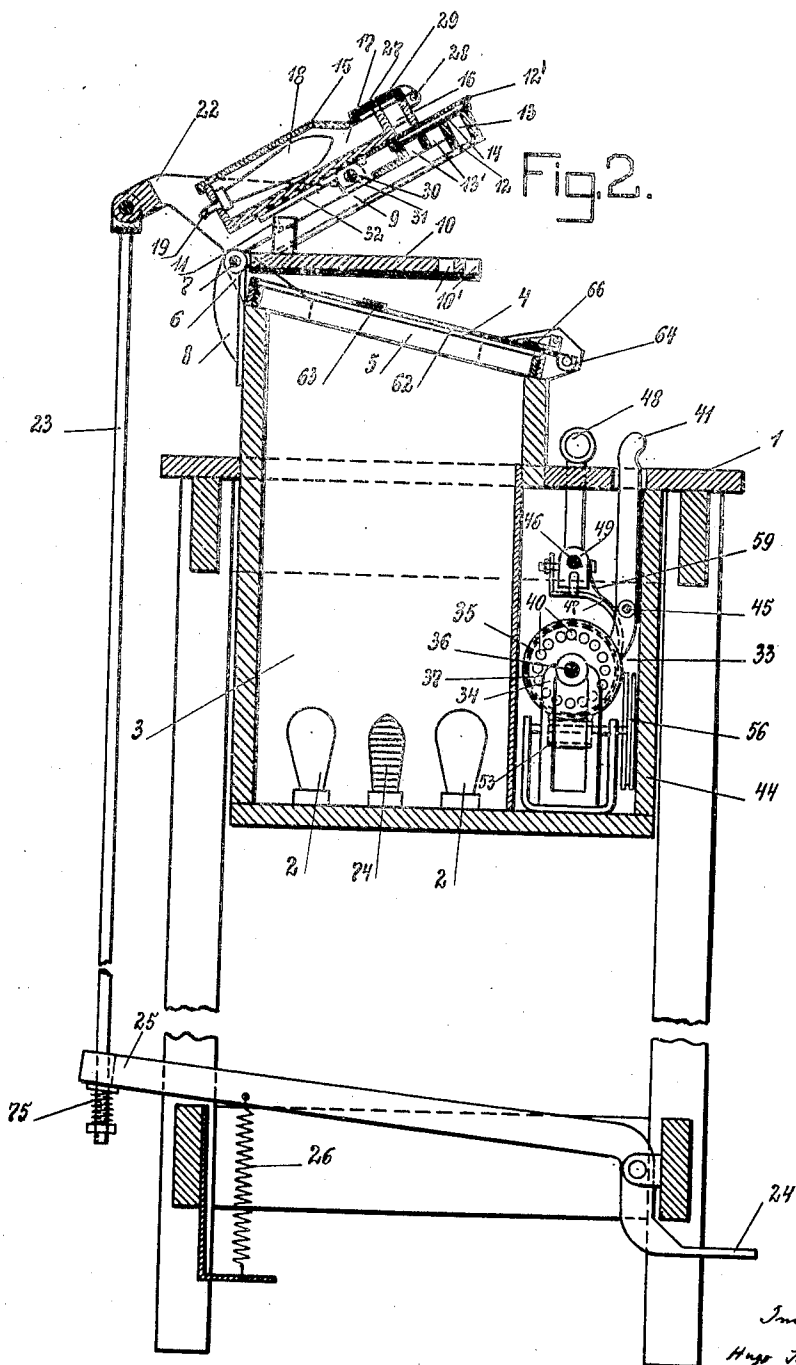
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PROCESS AND APPARATUS FOR COPYING PHOTOGRAPHS

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4 Sheets-Sheet 2



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PROCESS AND APPARATUS FOR COPYING PHOTOGRAPHS

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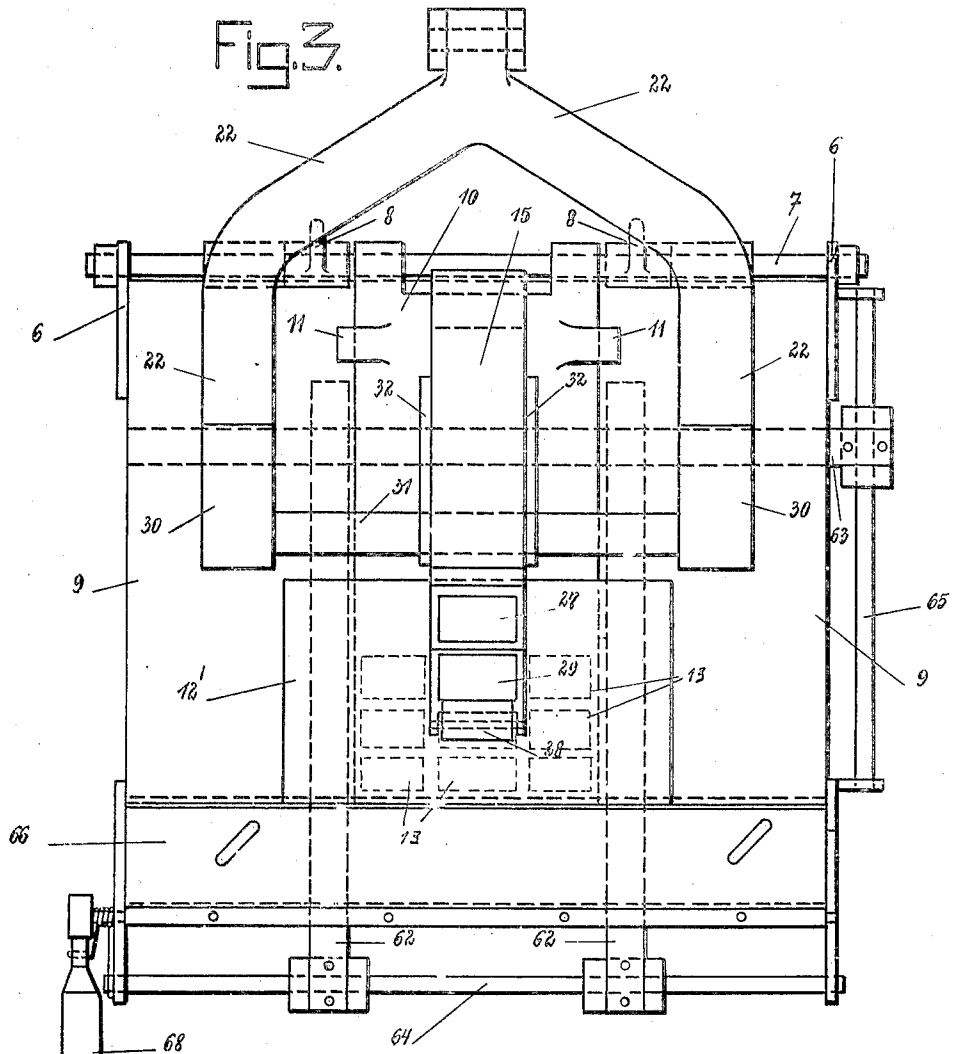


Fig. 4.

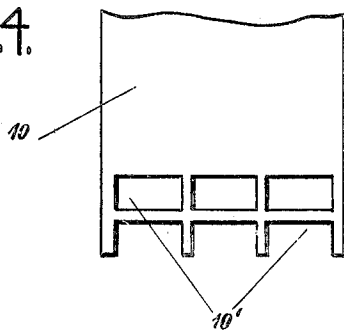
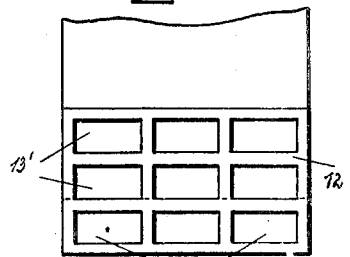


Fig. 5.



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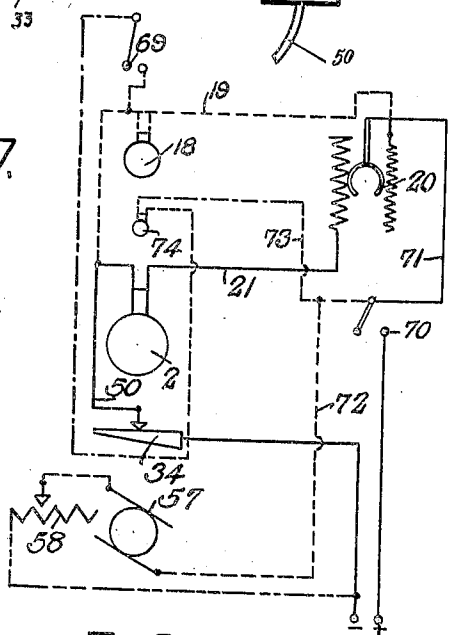
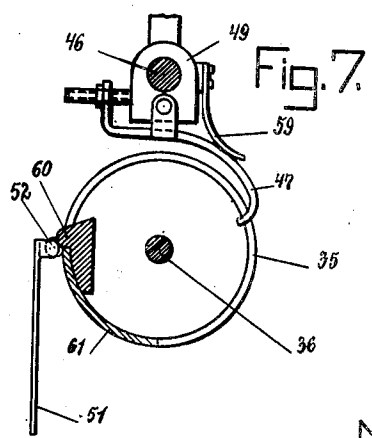
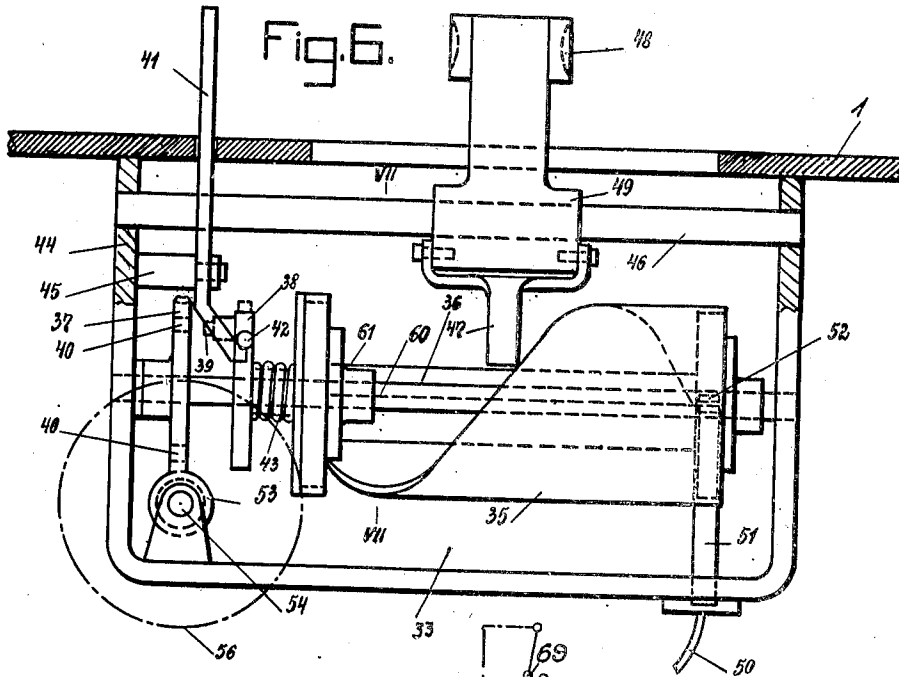


Fig. 8.

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UNITED STATES PATENT OFFICE

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PROCESS AND APPARATUS FOR COPYING PHOTOGRAPHS

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In Germany February 21, 1930

4 Claims. (Cl. 95-73)

The known apparatuses for the photographic printing of pictures require operators having a certain experience in the judging of the negatives, especially as it sometimes happens that thousands of different negatives have to be printed in a day. The necessary exposure for each individual negative must be judged by the operator. It is a known fact that wrong exposures often occur. The object of the invention is to easily determine the necessary time of exposure and the necessary intensity of light required, and this is attained in that the source of light serving for copying is brought into conformity with a comparison light for the purpose of adjusting the relative intensities of the two lights.

An apparatus for carrying out this process is illustrated by way of example in the accompanying drawings in which:—

Fig. 1 shows the apparatus in perspective view.

Fig. 2 is a longitudinal section through the copying apparatus.

Fig. 3 is a top plan view of the covering device.

Fig. 4 shows the intermediate cover plate in top plan view.

Fig. 5 shows the sections of the cover plate in top plan view.

Fig. 6 is a section through the box containing the time switch.

Fig. 7 is a cross-section through the current feed cylinder taken on line VII—VII of Fig. 6.

Fig. 8 is a wiring diagram.

According to the process, the source of light used for the printing is brought to correspond with a comparison light, the two sources of light being connected to a regulator in such a manner the source of light serving for the exposure, is made to correspond with the comparison light.

The apparatus for carrying out the process consists of a working table, in which the printing lamps 2 are accommodated in a partitioned off compartment 3 which also contains the continually burning brown red lamp 74. This compartment is closed by a cover 5 provided with a glass pane 4, and is fixed by means of links 6 on a bolt 7 carried by brackets 8. Cover-plates 9 and 10 are also hingedly mounted on the axle 7. The cover plate 10, which rests loosely on the axle 7, has cams 11 provided with projections. These projections are so arranged that when the cover plate 9 is lifted, the cover plate 10 is only raised after the cover plate 9 has reached a certain height, so that when the cover

plate 9 is lowered, the cover plate 10 first rests on the negative to be printed owing to its weight. An element 12 is arranged on the cover plate 9 and has several inspection apertures 13 (Figs. 2 and 3) arranged side by side and one behind the other. The inspection apertures 13' register with apertures 10' provided in the cover plate 10. The inspection apertures 13 are covered by a blue-green transparent pane 14. Behind the element 12, a casing 15 bearing with its front portion on the element 12, is arranged and contains the comparison chamber 16 open at the bottom. In the comparison chamber 17 the comparison lamp 18 is accommodated which is connected by a wire 19, to a variable resistance 20, in the circuit of which the copying lamps are connected by a wire 21 (Fig. 3). The resistance 20 influences the lamps in such a manner that, when the copying lamps become brighter the comparison lamp 18 becomes dimmer and when the copying lamps 2 become dimmer the comparison lamp 18 becomes brighter, so as to establish uniformity of light in the comparison chambers 16, 17. Arms 22 are rigidly connected to the cover plate 9 and a connecting rod 23 extends from one of these arms to a lever 25 provided with a pedal 24. A spring 75 is mounted on the lower end of the connecting rod and supports the lever 25, which spring 75 is compressed when the cover plates are raised by the traction force spring 26 which pulls the lever 25 in downward direction. After the pedal 24 of the lever 25 has been released, the spring 26 returns the cover plate 9 and also the cover plate 10 into their raised position. The comparison chamber 17 of the casing 15 is covered by a stationary film-like blue-green transparent pane covered by a milk-glass pane 27, whereas the comparison chamber 16 has a milk glass pane 29, also covered with a film-like, blue green transparent pane, oscillatably mounted on a hinge 28. Bearing brackets 30 carrying a rod 31 are mounted on the arms 22. A carriage 32 is shiftable on this rod, and in this carriage the casing 15 is longitudinally shiftable, so that the casing 15 can be shifted both laterally and longitudinally on the element 12. Below the casing 15, a thin plate 12' is arranged, which is so dimensioned that, during the shifting of the casing 15, all the inspection apertures 13 are continually covered with the exception of that aperture, which is actually covered by the comparison chamber 16. In front of the compartment 3, a compartment 33 is arranged, which contains a time-switch 34. The time of illumina-

nation of the exposure lamps 2 is regulated by this time-switch, which for this purpose has a current feed cylinder 35, keyed on a shaft 36 and having a portion of its wall removed in spiral shape. The shaft 36 carries a loosely mounted worm wheel 37 and a rigid clutch disc 38. The clutch disc 38 is longitudinally shiftable on the shaft 36, and has a projection 39 engaging in one of the bores 40 (Figs. 2 and 6) of the worm wheel 37 under the action of a spring 43 as soon as the lever 41 liberates a further projection on the circumference of the clutch-disc 38. The lever 41 is laterally oscillatable on a bolt 45 fixed on the housing wall 44 of the time switch. On the spiral surface of the current supply cylinder 35, a brush 47, shiftable in longitudinal direction on a bar 46, bears and conducts the current to the copying lamp 2 by means of a cable. The brush 47 is shifted on the current supply cylinder 35, by means of a block provided with finger handles 48. The supply of current to the cylinder 35 is effected by a lead 50, which is connected to a strut 51 and a roller 52 serving as current feed element (Figs. 6 and 7). The worm wheel 37 is driven by a worm 53 rigidly connected to the driving wheel 56. This driving wheel is driven by a motor 57 situated on the outer side of the controlling mechanism, and has a variable resistance 58 as shown in the diagram (Fig. 8). On the block 49 of the brush 47 a spring 59 is mounted, which presses the brush against the edge of the cylinder wall. On the longitudinal edge of the wall of the cylinder 35 an insulating element 61 is arranged and serves for facilitating the easy sliding of the brush 47 on this cylinder 35 during its rotation.

Fig. 8 shows the wiring diagram, wherein the main switch is designated by 70, from which a wire 71 leads to the resistance 20 and the wire 72 to the motor 57, whereas the wire 73 leads to the continually burning lamp 74.

The negative to be photographically printed is placed on the glass pane 4 of the cover 5. The cover plates 9 and 10 are then lowered on to the negative by means of the lever 25, the negative being held in position by a clamping bar, provided with a handle 68 (Fig. 3) and acted upon by a spring. The negative is held tightly on the glass pane 4, so that the apertures 10' in the cover plate 10, and the inspection apertures 13 in the element 12 cover the negative. The switch 69 (Fig. 8), the exposure lamps 2, and the comparison lamp 18 provided in the comparison chamber 17, are then switched in by a key, preferably arranged on the casing 15, whilst the time switch 34 is still switched out. The milk-glass pane of the compartment 16 is then swung back and the densest or the greatest value thereof is sought by the operator in one of the inspection apertures of the element 12, by laterally and longitudinally shifting the casing 15. When this has been found, the milk glass pane 29 is returned into its initial position and the variable resistance adjusted until the light of the comparison lamp 18 and that of the copying lamps 2, which penetrate into the comparison chamber 16, through the inspection aperture covering same, conform so that the same intensity of light exists on the milk-glass panes 29, 27. This shows that the intensity of light of the copying lamps 2 is adapted to the density of the negative. By releasing the pedal 24 the cover plates 9 and 10 will be raised together with the casing 15 situated thereon, and

the printing paper is then placed on the negative. In taking prints, photographic papers, having different degrees of hardness, as is known, are employed. As the papers are more or less sensitive to light, the length of the exposure must be different. Consequently the copying lamps 2 must burn for a longer or shorter period. This possibility of adaptation is attained by the current supply cylinder 35 inserted in the control mechanism 34. The brush 47 is shifted on the rod 46 by means of the block 49 provided with handles 48, according to whether the photograph is to be exposed for a longer or shorter period. A scale showing graduations is provided, preferably on the longitudinal slot in which the block is shifted, above the working table at the plane where the handles 48 of this block project from the working table 1. The block 49 is shifted with the brush 47 to a point on the scale corresponding to the light sensitiveness of the paper. By engaging the current supply cylinder 35, this is rotated so that the brush 47 slides along a longer or shorter length of the edge of the remaining wall of the cylinder 35 and supplies the current coming from the wire 50 to the copying lamps until it no longer contacts with the cylinder wall. The current cylinder 35 is then disengaged by the lever 41. Thin steel strips 62, 63 shiftable on bars 64, 65 are arranged in front of and laterally of the cover plates for producing a mask on the paper.

It is evident that some other time switch may be employed instead of the switch 34 referred to in the description.

Further a grey wedge (a glass strip which is colored a very dark grey, almost black, and the color density of which is graded from very light grey to black by grinding in wedge shape) is, according to the invention, employed which is mounted in one corner of the apparatus and is connected by an arrangement with the variable resistance of the exposure lamps in such a manner that, when the lamps are dimmest, the grey wedge shows its lightest portion. During the regulation of the resistance, whereby the lamps become brighter and the grey wedge is shifted, the same conformity is attained as both devices have the same brightness.

We claim:—

1. A process for copying photographic negatives by means of a copying apparatus, consisting in regulating to the required intensity a comparison light, and simultaneously regulating the intensity of a copying light, but in opposite sense in accordance with the regulated light of the comparison lamp.

2. In an apparatus for copying photographic negatives the combinations of a comparison lamp, shiftable in all directions directly above the negative, a copying lamp arranged below the negative, and resistances adapted to regulate the relative strengths of said comparison and copying lamps.

3. In an apparatus for copying photographic negatives the combination of a comparison chamber divided into two compartments and arranged above the negative, a ground glass screen covering said chamber, a comparison light, shiftable in all directions, and a copying light arranged below the negative and projecting a portion of its rays through the other of said compartments and resistances adapted to regulate the relative strengths of said comparison and copying lights.

4. In an apparatus for copying photographic

negatives the combination of a comparison chamber divided into two compartments and arranged above the negative, a ground glass screen hingedly mounted on and covering said chamber, a comparison light, shiftable in all directions in one of said compartments, and a copying light arranged below the negative and pro-

jecting a portion of its rays through the other of said compartments, a resistance for each light, and interconnected means adapted to be operated for simultaneously regulating the strengths of the comparison and copying lights. 5

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