United States Patent

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[54] **METHOD AND APPARATUS FOR MAKING SCREENED LITHOGRAPHIC AND GRAVURE PLATES**
7 Claims, 13 Drawing Figs.

[52] **U.S. Cl.** **355/71,** 95/64, 96/45
[51] **Int. Cl.** **G03b 27/66**
[50] **Field of Search** 355/71; 95/64; 96/45

[56] **References Cited**
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ABSTRACT: The subject method and apparatus is for making screened lithographic and gravure plates for use in printing. A live film is held in spaced-apart adjustably aligned position relative to a master screen disposed parallel thereto. An exposure lamp is adjustably positioned relative to the film and the master screen on an axial path extending through substantially the center of the film and screen. The exposure lamp is adjustably positioned relative to the film and the master screen on an axial path extending through substantially the center of the film and screen. The exposure lamp is adapted to carry replaceable stops to project the image of the stop being used through the master screen to the live film. The apparatus has no housing—practice of the method and apparatus is in a darkroom.

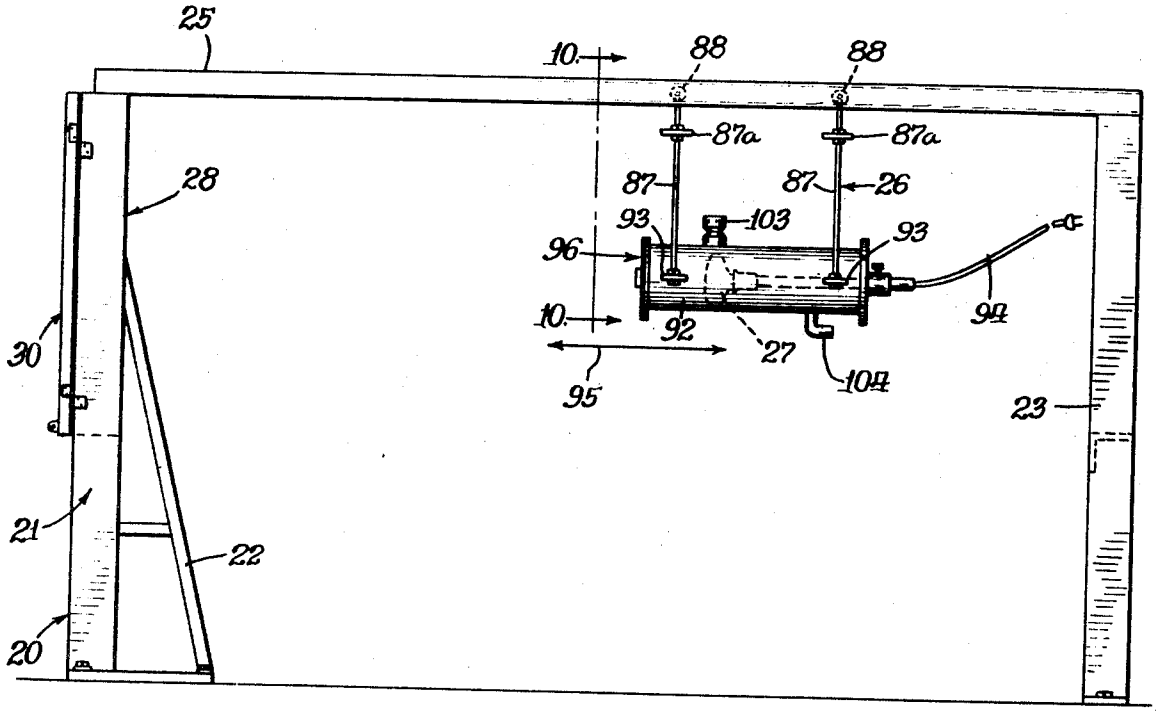
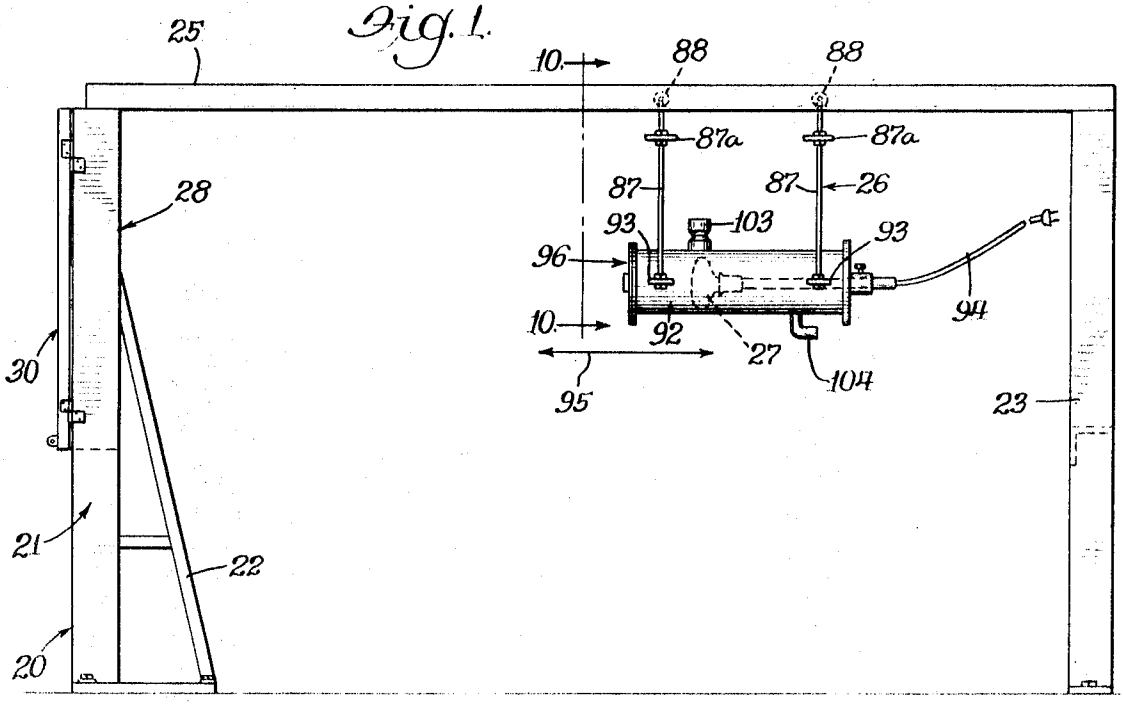


Fig. 1.



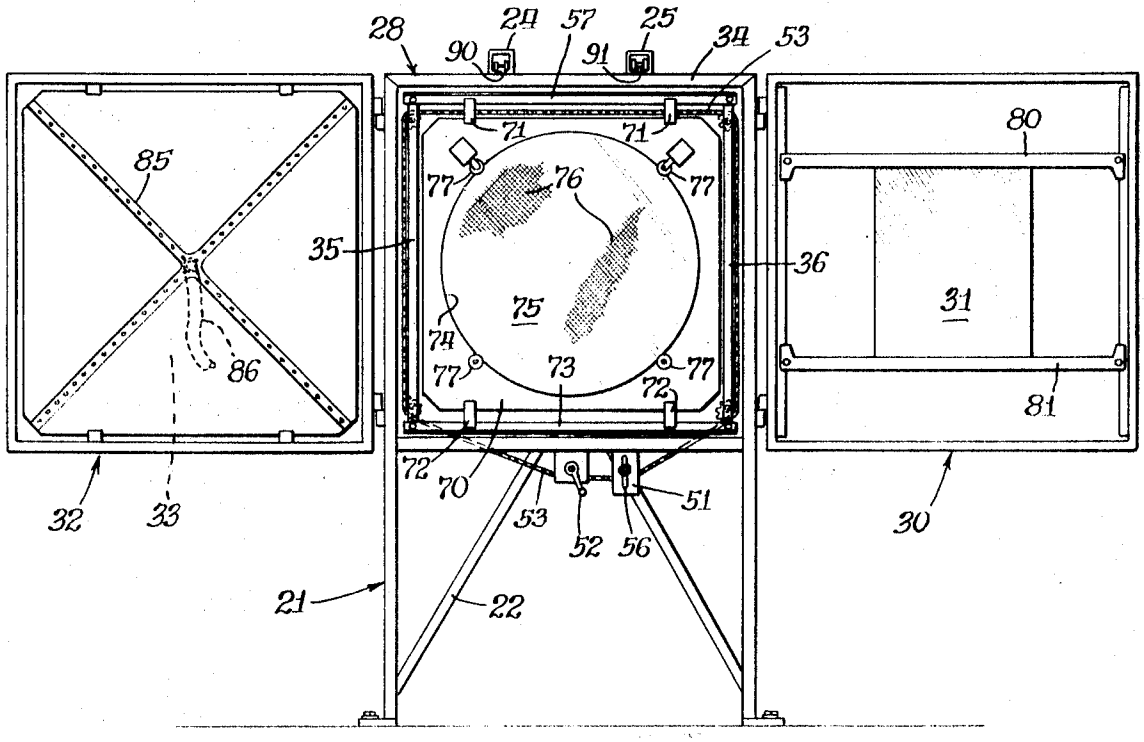


Fig. 2.

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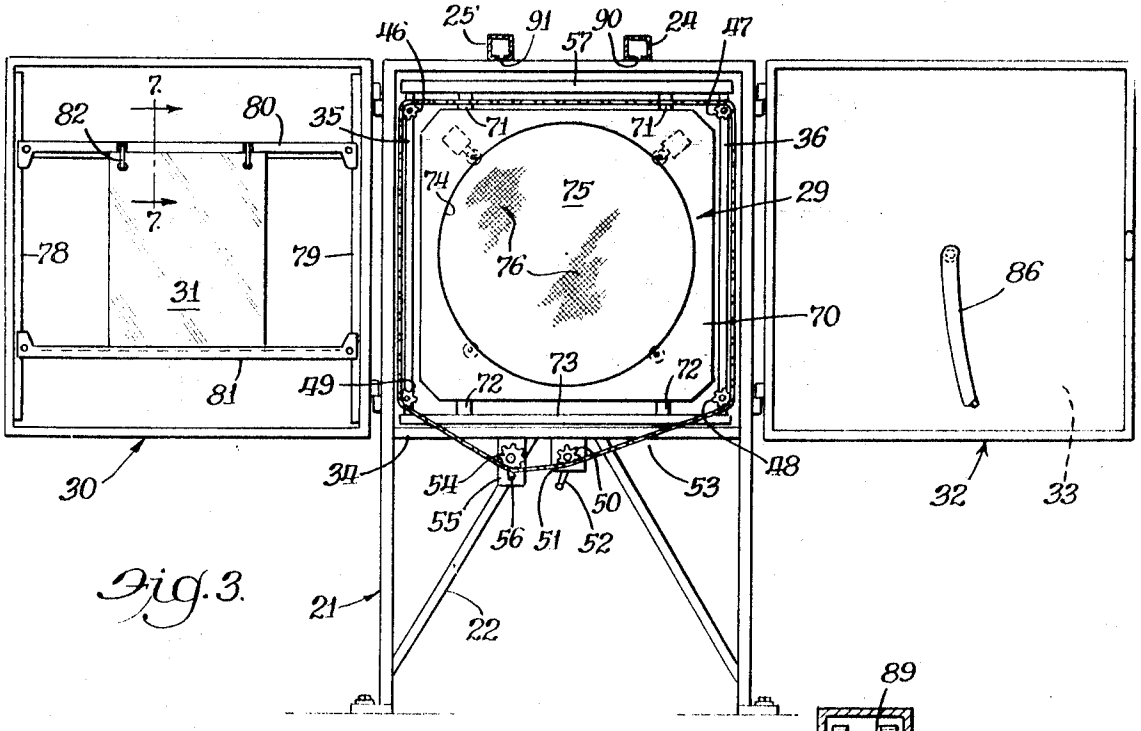


Fig. 3.

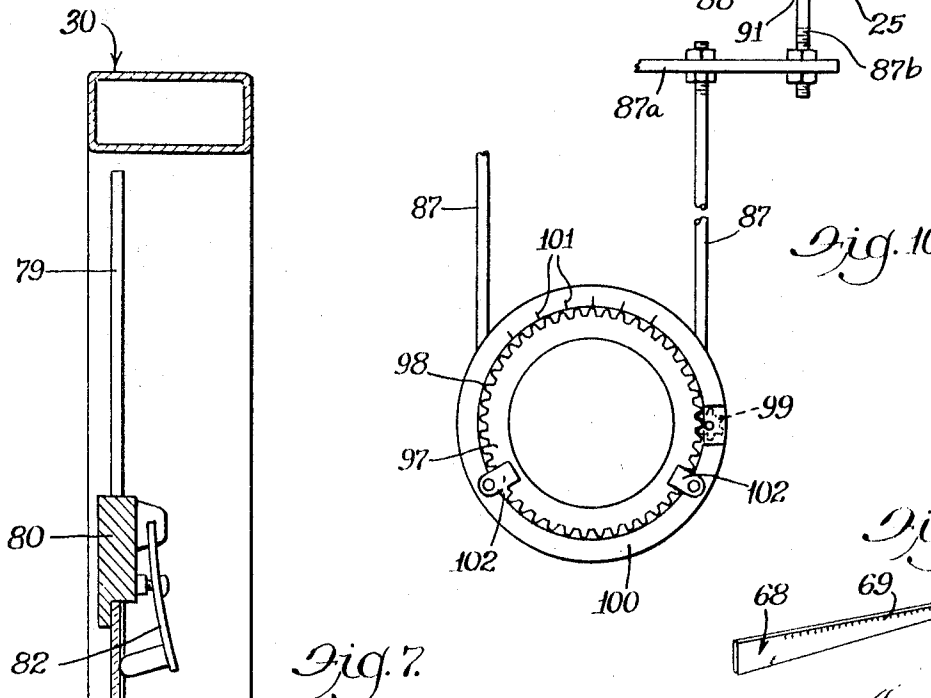


Fig. 10.

Fig. 7.

Fig. 9.

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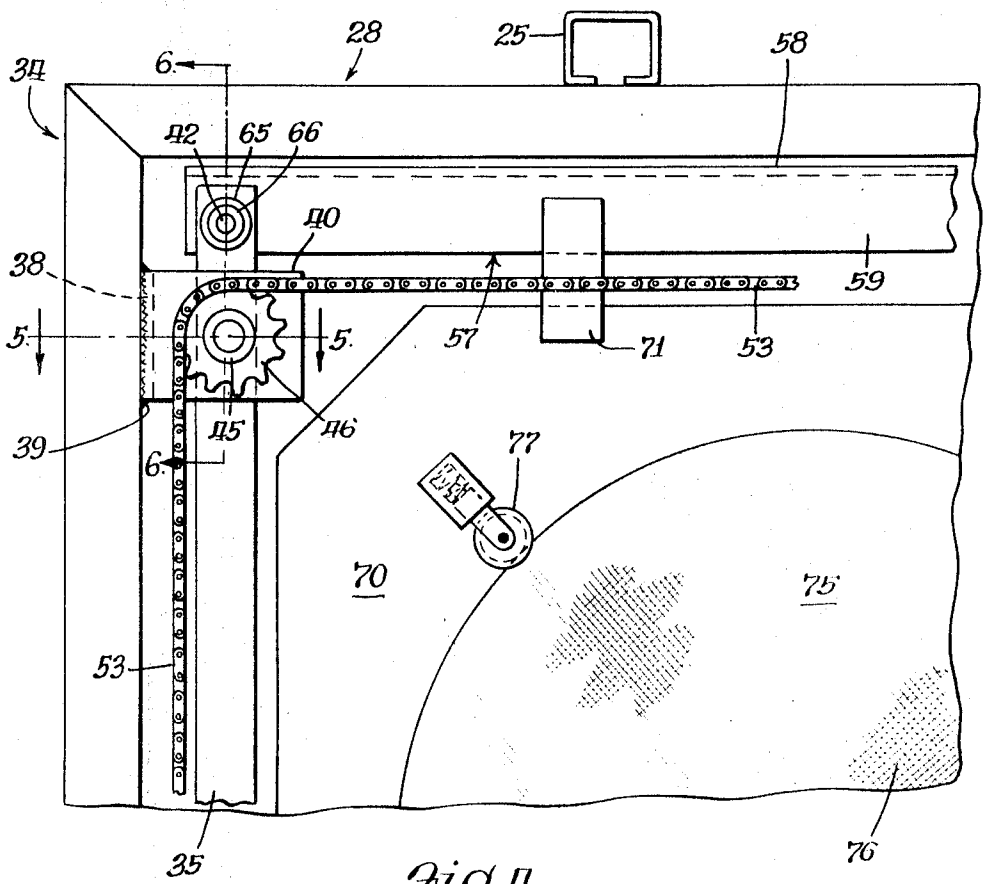


Fig. 4.

Fig. 5.

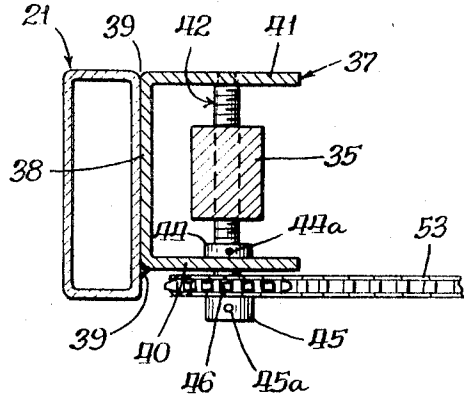
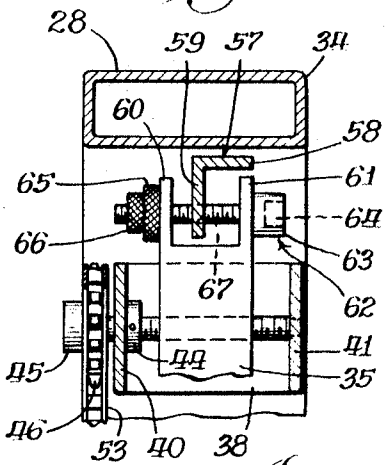


Fig. 6.



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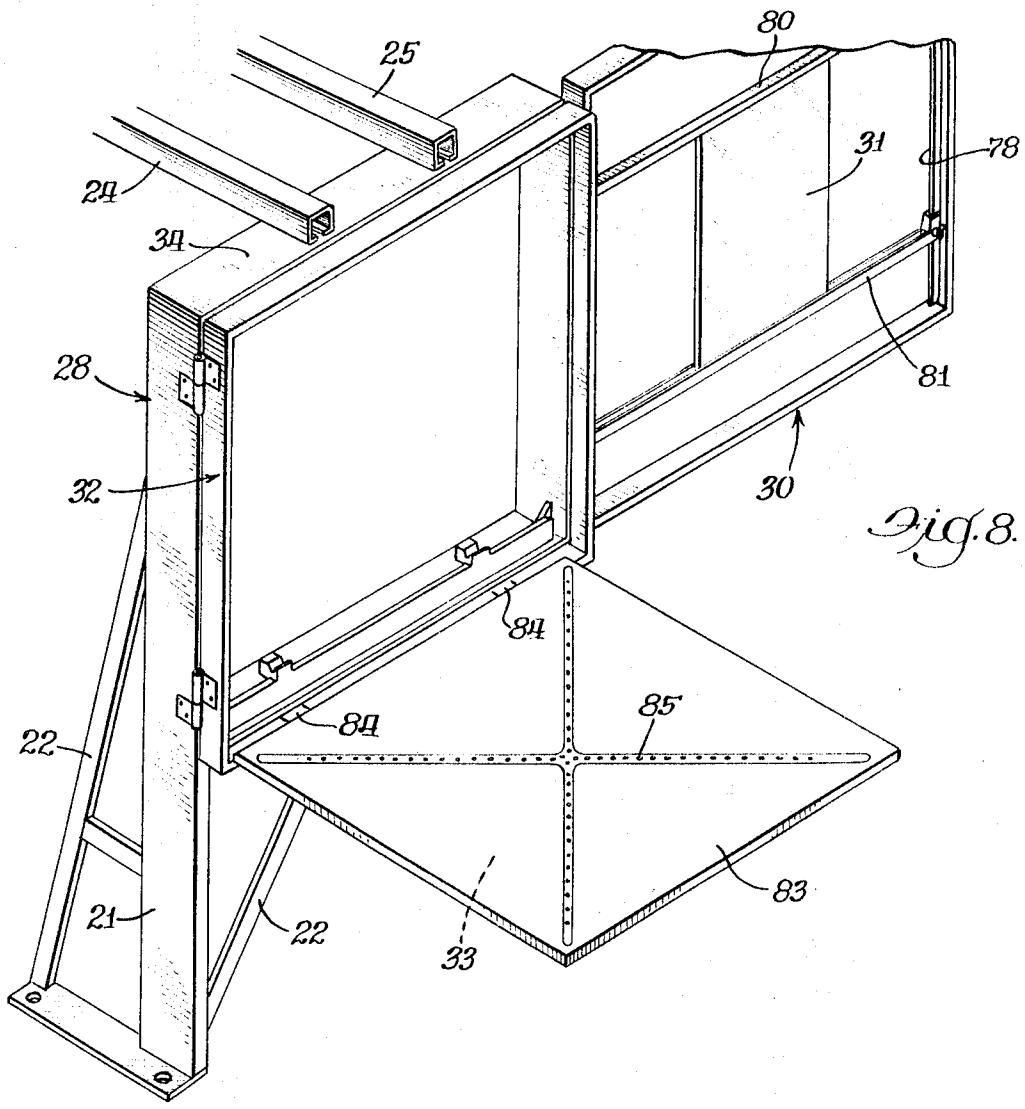


Fig. 8.

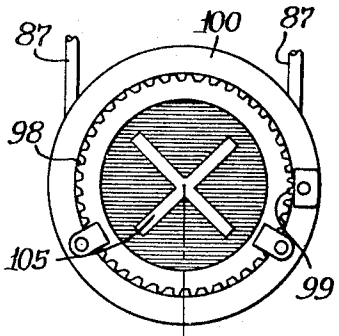


Fig. 11.

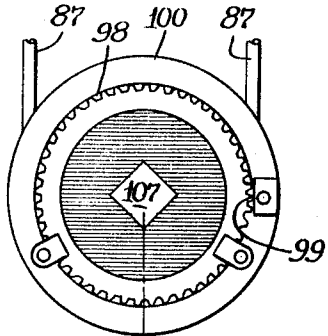


Fig. 12.

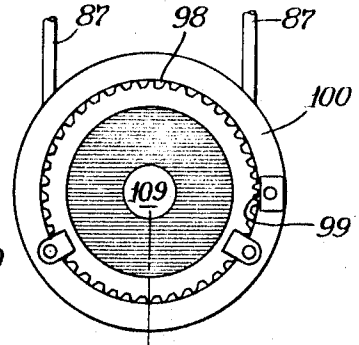
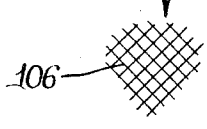
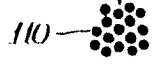


Fig. 13.







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METHOD AND APPARATUS FOR MAKING SCREENED LITHOGRAPHIC AND GRAVURE PLATES

BACKGROUND OF THE INVENTION

1. Field of the Invention

The printing industry is highly sophisticated with its many forms and types of printing processes. The magnificent results of this sophistication are everywhere about us in every piece of printed matter we pick up. One phase of these printing improvements lies in the advancement in screening technologies in the production of lithographic and rotogravure plates. The superimposition of a desired screen over a picture or material to be reproduced on a printing plate for subsequent printing has been, and is being accomplished by large laboratory-type cameras. The physical dimensions of these laboratory cameras are limited because of various components which must be used in conventional camera constructions. For example the bellows can only be made so large, the exposure lamp within an enclosure can only be so large, the practical size of the camera lens is limited, and the aperture mechanisms employed are limited in size. It is because of these limitations that the present inventor conceived of a new concept in camera construction to permit the making of lithographic and gravure screened plates of substantially unlimited size and with a quality heretofore unknown.

Before the present invention the apparatus used to make lithographic and gravure plates comprised an arrangement of a bellows camera of the type having a lens and stop at one end and a live film holder at the other end, a spaced-apart copy board holder to receive the master screen, and a light source beyond the master screen, all in axial alignment with the camera lens and its live film holder.

2. Description of the Prior Art

Many patents have issued in recent years which disclose printing processes and methods of the general type with which the present invention is concerned. Several of these are: U.S. Pat. No. 2,984,566 to Caine assigned to R. R. Donnelley & Sons Company; U.S. Pat. No. 2,997,392 to Consaul et al. assigned to Art Color Printing Company; and U.S. Pat. No. 3,122,436 to Wattier. Very little appears to have been patented on the large cameras used to put the above processes into application. The recent patent U.S. Pat. No. 3,325,285 to Harris et al. assigned to Art Color Printing Company recognizes that a different type of light source might improve the screened plates made for printing by lithographic or rotogravure processes.

SUMMARY OF THE INVENTION

The present invention relates to a new and improved method and apparatus for making screened lithographic and gravure plates.

An important object of this invention is to provide a novel apparatus to obtain fine alignment between a master screen and the live film to be exposed.

Another important object of this invention is to provide a novel live film holder, a spaced-apart master screen and an adjustably positioned exposing lamp with a holder for removably positioning a desired stop.

Still another important object of this invention is to provide a novel method of printing lithographic and gravure plates without the usual cameras or enclosures ordinarily accompanying the making of such plates.

Another and still further important object of this invention is to provide a novel apparatus for optionally positioning a ground glass viewing screen or a live film in the same plane and including means to adjustably position a master screen in general parallelism to the spaced-apart ground glass viewing screen of the live film.

An important object of this invention is to provide a novel method of making screened pictures wherein a first exposure is made on a live film to create a latent image and thereafter a second and longer exposure of the live film is made through the screen and continuous tone films to produce a screened picture for use in printing.

Other and further important objects and advantages will become apparent from the disclosures in the following specification and accompanying drawings.

IN THE DRAWINGS

FIG. 1 is a side elevational view of the entire apparatus for making screened lithographic and gravure plates.

FIG. 2 is an elevational view of one end of the device of FIG. 1 looking toward the master screen support on the side thereof opposite the exposure lamp and with the hinged doors of the master screen housing opened to show the interior construction.

FIG. 3 is an elevational view, partially in section, of the other side of the master screen housing from that shown in FIG. 2.

FIG. 4 is an enlarged detail view of a portion of the screen holding housing as shown in the central portion of FIG. 3.

FIG. 5 is a sectional view taken on the line 5–5 of FIG. 4.

FIG. 6 is a sectional view taken on the line 6–6 of FIG. 4.

FIG. 7 is a sectional view taken on the line 7–7 of FIG. 3.

FIG. 8 is a perspective view of the master screen housing looking at it from the same side as in FIG. 2.

FIG. 9 is a perspective detail of a gauging and measuring wedge as used in the adjustment of the device of this invention.

FIG. 10 is an enlarged front elevational view of the stop holder as used on the exposure lamp and as viewed on the line 10–10 of FIG. 1.

FIG. 11 is a view similar to FIG. 10 with one representative light stop in the stop holder to produce one type of screen as shown in the detail therebelow.

FIG. 12 is another view similar to FIG. 10 with another representative light stop in the stop holder to produce another type of screen as shown in the detail therebelow.

FIG. 13 is still another view similar to FIG. 10 with still another representative light stop in the stop holder to produce still another type of screen as shown in the detail therebelow.

AS SHOWN IN THE DRAWINGS

The reference numeral **20** indicates generally a supporting structure for the screened plate making device of this invention. One end of the device comprises a first floor engaging standard **21** which constitutes a part of the supporting structure **20**. Angularly disposed brace members **22** forming a part of the structure **20** give stability to the standard **21**. As will later be described the first standard **21** houses the adjustable master screen, a viewing apparatus to obtain the proper setting, and the ultimate holding of a live film to receive the projection of the master screen thereon.

The supporting structure further includes a spaced-apart second standard **23** which may either be floor engaging or may constitute a part of the wall of a room in which the subject invention is operated. Spaced-apart parallel track members **24** and **25** are disposed over the tops of the spaced-apart standards and span these standards. A carriage **26** is mounted on and moves longitudinally of the tracks **24** and **25**. The carriage **26** is adapted to support an exposure lamp **27** which is utilized as the source of light for making the exposure of the screen on the live film of this invention. The first standard **21** includes a housing designated generally by the numeral **28**. Within the housing there is carried a master screen **29**. A first hinged door **30** is mounted on the housing **28** and is adapted to carry a ground glass viewer **31**. A second hinged door **32** also mounted on the housing **28** is adapted to carry a vacuum chamber designated by the numeral **33**. It is the purpose of this vacuum chamber to firmly hold a live film in fixed flat planar and parallel position relative to the master screen to provide for the effective reproduction of the screen by projection on the live film.

The housing 28 comprises a generally square or rectangular frame 34. The frame is preferably made of tubular steel which is rectangularly shaped in cross section. As shown in FIGS. 2 and 3 the first hinged door 30 is disposed on one lateral side of the rectangular frame 34 while the second hinged door 32 is mounted on the other lateral side of the frame 34. Both doors are arranged and constructed to be swung to a position in longitudinal alignment with the frame 34 so that when the door 30 is closed position the ground glass viewer 31 is positioned in axial alignment with the master screen 29. A user employs the ground glass to make the proper settings preliminary to making the screened lithographic and gravure plates. After an adjustment has been made through the viewing glass the door 30 is swung open to its position as shown in FIGS. 2 and 3 and the second door 32 is swung about its hinge into position in axial alignment with the frame member 34 so that a live film placed over the vacuum chamber 33 will assume the identical position previously held by the ground glass of the first door 30 when adjustments were being made.

It is on the rectangular frame member 34 and within its confines that the master screen is supported. Within the rectangular frame 34 there is provided parallel spaced-apart side members 35 and 36 which are vertically disposed at a position spaced slightly inwardly from the sides of the frame 34 so there will be no interference between the two and the inner side members 35 and 36 may be moved longitudinally relative to the outer frame 34. It is to these inner side members 35 and 36 that the master screen 29 is indirectly attached so they can move together in a longitudinal direction toward or away from the live film. Means are provided for effecting adjustments of the master screen relative to the stationary or outer frame 34 for longitudinal adjustment and for individually adjusting the corners of the screen relative to the side members 35 and 36 so that the screen may be positively put in parallelism with the live film by correcting the spacing between the master screen and the live film or the ground glass.

The vertical side members 35 and 36 are carried in four strategically placed brackets which are mounted on the inside of the stationary rectangular frame 34. A representative one of these brackets is shown in FIGS. 4 and 5. The bracket, designated by the numeral 37, is U-shaped and comprises a base 38 which is welded or otherwise attached at 39 to the inside of the side member of the stationary rectangular frame 34. The U-bracket further includes spaced-apart side arms 40 and 41. A threaded bolt 42 is journally mounted in the spaced-apart side arms 40 and 41 of the U-bracket 37. The vertical side member 35 includes a transversely disposed passage 43 which is internally threaded to receive the threaded bolt 42. The vertical side member 35 is thus disposed between the side arms 40 and 41 of the U-shaped bracket 37 and by means of rotation of the bolt 42 the vertical side member 35 is adapted to move longitudinally within the housing 34 and within the confines of the longitudinally spaced-apart arms 40 and 41 of the U-shaped bracket. A collar 44 and a collar 45 are adapted to be mounted on the bolt 42 to prevent axial movement of the bolt relative to the side members 40 and 41 of the member 37. These collars are affixed to the bolt 42 by means of pins 44*a* and 45*a* to thus hold the collar 44 just inside the wall 40 of the U-shaped bracket 37 and to thus hold the collar 45 at a position just outside a sprocket 46 which is affixed to the bolt 42 located outside of the wall 40 of the U-bracket 37. The collar 45 constitutes a hub of the sprocket 46 and the two members are preferably made as a unit. It should thus be understood that as the sprocket 46 is rotated and the bolt held against axial movement within the U-bracekt 37 a movement of the vertical side member 35 is effected. As best shown in FIG. 3, similar sprockets 47, 48 and 49 are disposed in each of the four corners of the rectangular housing 34. These other corner located sprockets cooperate with corresponding threaded bolts to effect movement of the upper and lower ends of the vertical side members 35 and 36 in unison when a roller chain joining the sprockets is moved. Further as shown in FIG. 3 a sprocket 50 is journaled on a supporting post 51 affixed to the underside of the bottom of the rectangular frame 34. The sprocket 50 is in planar alignment with the four corner sprockets and is provided with a handcrank 52 to cause its rotation whereupon a roller chain 53 mounted over all of the sprockets effects their uniform rotation and similarly uniform longitudinal movement of the vertical side members 35 and 36. An idler sprocket 54 is mounted in a bracket 55 carried on the stationary member 34. An elongated slot 56 is provided in the bracket 55 to permit adjustable positioning of the sprocket 54 thereon. The roller chain 53 may thus be tightened or loosened as necessary to effect the longitudinal adjustment of the master screen within the housing 28.

As best shown in FIG. 4 a horizontally disposed angle member 57 is located across the top of the housing 28 just beneath the top member of the rectangular frame 34. The cross angle member 57 includes a horizontally disposed flange 58 and a vertically depending flange wall 59. It is on this member 57 and a similar member at the bottom of the housing just above the lower member of the rectangular frame 34 that the master screen 29 of this invention is carried. The upper end of the vertical side member 35 is bifurcated with upwardly extending spaced arms 60 and 61. A threaded bolt 62 is journaled in and spans the spaced arms 60 and 61. The bolt 62 has an enlarged head 63 at one end thereof with a polygonally shaped socket 64 in the outer end. The head 63 is adapted to abut the side of the bifurcated arm 61 at the upper end of the vertical side member 35. The other end of the bolt is provided with a nut 65 and a second locknut 66 to thereupon hold the assembly to the bifurcated ends of the vertical side member 35. The threaded bolt 62 is threadedly engaged in a transverse passage 67 in the vertical wall 59 of the angle member 57. A slight clearance is provided between the locknuts and the side of the arm 60 to permit free rotation of the bolt 62 for adjustment. Thus when a suitable tool is inserted into the socket 64 and the bolt 62 rotated, there is effected a shifting movement of the angle member 57 either toward or away from either of the bifurcated ends 60 and 61 of the vertical side member 35. It is thus apparent that in addition to the vertical side members 35 and 36 having uniform longitudinal movement by operation of the sprocket and chain assembly as described above, the horizontal angle member 57 and its counterpart angle member located at the bottom of the housing 28 may have independent movement at each corner of the rectangular frame 34 by separate operation of the threaded bolt 62. Inasmuch as the master screen is carried on the member 57 and a similar member at the lower end of the housing it is imperative that this auxiliary adjustment be permitted in order to bring the master screen into parallelism with the ground glass viewer 31 or the live film positioned on the vacuum chamber 33. This adjustment is preferably occasioned by utilization of a small calibrated wedge member 68 as depicted in FIG. 9. The calibrations 69 on the wedge member 68 permit an operator to insert the wedge member between the ground glass viewer 31 when the first hinged door 30 is closed to accurately measure the spacing between the master screen and the ground glass viewer. The amount of insertion of the wedge member permitted gives the spacing in sixty-fourths of an inch. Adjustment may be made at each corner by rotating the threaded bolts 62 to bring all four corners into the same spaced-apart position from the ground glass viewer.

As best shown in FIGS. 2, 3 and 4 the master screen 29 includes a generally rectangular supporting plate 70. The rectangular plate preferably has its corners cut off so there is an angular surface at the position of each corner providing for space in the corners between the plate and the frame 34 within which the master screen is mounted. The plate 70 may be made of numerous materials, such as metals or plastics, providing only that the material used is sufficiently rigid to securely carry a central screen in a manner to prevent shifting of the screen once proper adjustments have been made. The upper edge of the plate 70 is provided with spaced-apart clips 71 which are affixed to the plate and are adapted to engage and hold the plate to the horizontal angle member 57. Similar

spaced-apart clips 72 are provided on the lower edge of the generally rectangular plate 70 and provide the means of attachment of the plate to a horizontal angle member 73 which is located adjacent the lower side of the housing frame 34. The angle member 73 is the counterpart of the top angle member 57. The rectangular frame 70 is provided with a central circular-shaped cutout or aperture 74 to receive a circular plate screen 75 which is generally transparent and has inscribed thereon a plurality of intersecting lines 76. These intersecting lines covering the whole surface of the plate screen 75 have equal spacing throughout. Usually there is a particular number of equally spaced lines to the inch. Thus there are various sizes of screens identified by the number of lines per inch.

The master screen 29 thus comprises the plate 70, the centrally located circular screen 75, and the attaching clips 71 and 72. With this construction a master screen may be conveniently removed or replaced as a unit within the housing 28 provided on the first vertically disposed floor engaging standard 21. It is obvious that a variety of master screens of different line sizes and spacings may be easily inserted in the device of this invention.

The circular screen 75 may be rotated within the circular aperture 74 within the rectangular plate 70 to thereby place the crossed lines 76 at any angular disposition desired to accomplish the making of a correctly screened picture. Spring urged detents 77 are mounted at spaced positions on and around the rectangular plate 70 and are adapted to engage the circumferential surface of the circular plate screen 75 to thereby provide for a secure holding of the circular screen in any desired adjusted position.

As best shown in FIGS. 3 and 7 the first hinged door 30 is equipped with laterally spaced-apart, vertically disposed guide members 78 and 79. Horizontally disposed, vertically spaced-apart crossmembers 80 and 81 are adapted to have their ends slidably engage the vertical guide members 78 and 79. The engagements of the ends of the crossmembers 80 and 81 with the vertical guides are such that the crossmembers may be held in any desired adjusted position. The ground glass viewer 31 is carried on and between the horizontally disposed crossmembers 80 and 81. With this construction the glass viewer may be positioned in any required location within the door 30 forming a part of the housing 28 of this invention. A plurality of spaced-apart pinch clips are carried on the crossmember 80 and are adapted to engage the backside of the ground glass viewer 31 and thus hold it in fixed position relative to the crossmembers 80 and 81 within the door 30 when the device of this invention is in operation.

As best shown in FIGS. 2, 3 and 8 the second hinged door 30 comprises a door 83 within the door 32. This door 83 contains the vacuum chamber 33 which is equipped to securely hold the live film to be imprinted during the exposure of that film to the combination picture and screen to be reproduced. A hinge 84 is provided for the door 83 along the horizontal bottom thereof. Thus, whereas the door 32 swung in a horizontal path about a vertical hinge to a position laterally of the stationary frame 34, the door 83 swings in a vertical path about the horizontal hinge 84 and thus is capable of swinging to a position below the stationary frame 34 to provide for insertion and removal of the film. An X-shaped outline 85 is provided on the inner surface of the door 83. This outline comprises a plurality of small openings therein for passage to the inner vacuum chamber 33. The creation of a vacuum within the door provides a suction through these small openings along the outline of the X-shape and the door 83 is thus capable of holding a live film perfectly flat against its surface at a time when the film is being exposed. A hose conduit 86 engages the backside of the door 83 and is the means of joining the vacuum chamber 33 with a pump or other source of creation for the vacuum. The vacuum pump has not been shown in the drawings as it does not form a necessary part of the present invention. The location of the live film on the door 83 is identical to the location of the ground glass viewer on the other door when those elements are in position on the end of the housing 28.

As best shown in FIGS. 1, 10, 11 and 12 the carriage 26 on which the exposure lamp 27 is moved, comprises four vertically disposed rodlike members 87. These vertical rods define a rectangular shape to thereby create a balanced carriage 26. The upper ends of the two rods located closest to the first standard 21, and similarly the upper ends of the pair of rods closest to the second standard 23 are equipped with cross plate members 87*a* which join the upper ends of the front rods and the upper ends of the rear rods 87. The outer ends of these crossmembers have vertically disposed stub posts 87*b* and it is these stub posts 87*b* located generally laterally outwardly of the posts 87 which engage the track members 24 and 25 for movement of the carriage longitudinally between the standards 21 and 23. As best shown in FIG. 10 each of the stub posts 87*b* is provided with a pair of spaced-apart rollers 88 which are journally mounted on a horizontally disposed cross-shaft 89. As further best shown in FIG. 10 the undersides of the spaced-apart longitudinally disposed tracks 24 and 26 are provided with elongated open slots 90 and 91 respectively. The slots extend longitudinally of the tracks and are just wide enough to freely pass the stub post members 87*b*. The spaced rollers 88 located above the slots, ride on the inside bottom portions of the tracks adjacent to the bottom opening slots 90 and 91. A horizontally disposed, longitudinally extending cylinder 92 is carried on the lower ends of the four vertically disposed rodlike members 87. The cylinder 92 is in general axial alignment with a path through the center of the master screen and the live film located to the rear of the master screen. A bracket 93 is provided at the lower end of each of the rods 87 to provide for the attachment of the cylinder 92 to the rods 87. The exposure lamp 27 is equipped with an electrical cord 94 which extends out the end of the cylinder 92. When the cord 94 is attached to an electrical outlet supplying electrical energy the lamp 27 housed within the cylinder 92 is illuminated. A double ended arrow 95 shows the direction of possible adjustable movement of the carriage 26 along the tracks 24 and 25 either toward or away from the housing 28 which carries the master screen 29.

The cylinder 92 is provided with a light stop holder 96 at its end directed toward the master screen. The light stop holder includes an annular ring 97 having a plurality of gear teeth 98 disposed around the outer circumference thereof. A pawl 99 in the general shape of a gear tooth is mounted on an outwardly projecting annular flange 100 of the cylinder 92. The pawl 99 is adapted to selectively engage one of the circumferential gear teeth 98 of the annular ring 97 and to thereby hold the ring 92 at some desired fixed angle relative to the stationary annular flange 100 of the cylinder 92. The annular ring 97 may be rotated relative to the annular flange 100 by retracting the pawl 99 and permitting it to reengage the fixed teeth 98 when the desired adjusted position is obtained. The annular flange 100 serves as the surface for calibration markings 101. Thus, when certain types of screens are to be made, the light stop holder is arcuately adjusted for a setting commensurate with the types of screened picture to be produced. The calibrations 101 can be equipped with legends to indicate the settings for the various types of work to be accomplished. As best shown in FIGS. 10 through 13 anchor clips 102 are fastened to the flange 100 and are adapted to press against and hold the ring 97 within the cylinder 92.

As best shown in FIG. 1 the exposure lamp cylinder 92 is equipped with a ventilating fan 103 located in the top thereof. A vent 104 is provided in the bottom of the cylinder 92. The fan and vent cooperate to prevent overheating of the cylinder 92 when the exposure lamp is illuminated for long periods of time.

The light stops used with this invention have the annular ring 97 as an integral part thereof. Centrally disposed within the ring 97 are various shaped openings to provide different patterns in the projection of the exposure lamp therethrough. Several examples of the light stops used with this invention are shown in FIGS. 11, 12 and 13. FIG. 11 is provided with an X-shaped opening 105 and when light passes through this X-

shaped opening it is projected through the master screen **29** onto the ground glass viewer **31** or a live film. The projection through the cross-shaped opening results in a crosshatching effect on the viewer or film, such as shown at **106** in FIG. **11**. FIG. **12** shows the light stop as having a square- or diamond-shaped opening **107** and such an opening at the particular arcuate setting of the light stop relative to the stationary flange produces a plurality of solid black squares **108** on either the viewing screen or the live film. In FIG. **13** the light stop has a relatively small circular opening **109** and this produces a plurality of black circles on either the viewing screen or the live film. The rotation of the light stops within the annular flange **100** of the cylinder **92** results in different patterns being produced. More effective use of different colors may be made by adjusting the angular disposition of the light stops for more authentic reproduction.

The operation of the device of this invention takes place in a darkroom. The first step is for the operator to illuminate the exposure lamp **27** and close and latch the first door **30** on the backside of the housing **28**. This puts the ground glass viewer **31** directly behind the black line screen **29**. A gauge in the form of the wedge member **68** of FIG. **9** is inserted by the operator between the ground glass and the circular black line screen **75** of the master screen **29**. This insertion takes place at each of the four corners of the screen and in the event the plastic wedge penetrates an equal distance into the space between the ground glass and the screen there is no need for further adjustment to bring the screen into parallelism with the ground glass. However, in the event the calibrated wedge does not penetrate the same distance when the screen has its corners separately and individually adjusted by reason of rotating the threaded bolts **62** until such time as the screen is brought into true parallelism with the ground glass viewer **31**. As previously stated the surface of the ground glass and the vacuum back of the door **32** which receives the live film are in the same plane when either one occupies the closing position at the end of the housing **28**. The operator now preferably takes a magnifying glass and examines the screen pattern as projected on the ground glass viewing screen **31**. If the design is what he is seeking then no further adjustment is necessary, but in the event it is not what he is seeking then the crank **52** is turned causing the chain **53** to be driven and to simultaneously adjust the threaded bolts **42** and thereby cause a translational movement of the black line screen relative to the viewer **31**. Minute movements of the screen relative to the viewer cause variations in the pattern of the screen as it is projected onto the viewer. The operator thus has great latitude in accomplishing the exact pattern he desires. At the same time the operator must decide on the particular light stop he is going to use with the exposure lamp such as those shown in FIGS. **11**, **12** or **13**. The exposure lamp **27** is a much larger variety than heretofore used which, in turn, enables much larger light stops to be used. Due to this fact the lamp **27** can be used further away from the black line screen **29**. These elements cooperate to produce a more even and uniform exposure. When the operator sees exactly what he desires on the ground glass he then opens door **30** and swings door **32** into the place behind the housing **28** which was previously occupied by the door **30**. The exposure lamp **27** is extinguished and a live film is placed onto the door **83** carrying the vacuum chamber **33**. A vacuum is then applied to the chamber **33** through the vacuum hose **86**. The suction of the vacuum draws the live film tightly against the surface of the door **83** through the multiple apertures defining the X-shaped outline **85**. The door **83** is then closed into the outer door **32** thus bringing the live film into exactly the same plane previously held by the ground glass viewer **31**. With the live film in this position and locked by means of latch members the exposure will be made by relighting the exposure lamp **27** for the desired period of time.

The light stop of FIG. **11** is used for the making of rotogravure plates and will create a screen with clear square and thin black line separations as shown at **106**. The light stop of FIG. **12** is also used for rotogravure and creates black squares with thin clear line separations. The light stop of FIG. **12** may also be used for the making of lithographic plates and is capable of creating alternate clear and solid black squares such as in a checkerboard. The light stop of FIG. **13** may also be used for making of rotogravure and lithographic plates and will create black circles and a clear background such as shown at **110** in FIG. **13**. The light stops that can be used with this invention are really unlimited.

The invention may be used to create an intermediate screen for the subsequent superimposing of a picture thereon. A live film is placed on the vacuum back and the door **83** then moved up to its closed position behind the master screen **29**. At this time a limited lighting of the exposure lamp is made whereby a latent image of the screen or grid only is provided on the live film. The exposure lamp is then extinguished and the vacuum back reopened at which time a continuous tone negative is placed emulsion to emulsion under contact with the live film. The continuous tone negative to be used preferably has a density range of 1.6 in the minimum tone to 0.4 in the maximum tone or open end of the negative. The vacuum back with both films in position will now be closed and relocked in position against the housing **28** and a second and longer exposure is made through the screen and through the continuous tone negative. When the live film is developed there will be a hard dot positive having a large square dot with a clear thin wall in the solid portion and a fine round black dot in the minimum portion with the background clear. By using a continuous tone positive in the same manner as just described for the continuous tone negative it is possible to obtain a hard dot negative.

The same master screens can be used for both gravure and lithography. Certain of the common angles of disposition of the screen **75** within the rectangular frame **70** are 45° for the black, 60° for the yellow, 75° for the red, and 105° for the blue. Any black line master screens can be used, such as, 75, 85, 100, 120, 133, 150, 175, and 200 lines per lineal inch.

What I claim is:

1. An apparatus for making screened lithographic and gravure plates comprising:

A. A supporting structure;

1. A master screen adjustably held in a generally vertically disposed plane on said supporting structure;
2. A live film positioned on said supporting structure in spaced-apart parallel relationship with said master screen;

B. Track members having their ends carried by said supporting structure and said track members extending in a generally axial direction away from said master screen and in alignment with the master screen and the live film;

C. An exposure lamp having means cooperatively engaging said track members whereby the lamp may be adjustably positioned toward or away from the master screen; and

1. Means on said exposure lamp for receiving various light stops to vary the light image projected on and through the master screen and ultimately on the live film.

2. An apparatus for making screened lithographic and gravure plates comprising:

A. A supporting structure; said structure including;

1. A stationary rectangular frame disposed in a generally vertical plane;
   a. A master screen disposed in said stationary rectangular frame,
   b. holder means in said stationary rectangular frame for holding said master screen,
      1. Means adjustably positioning said holder means in an axial direction in said stationary rectangular frame,
2. A first swingable rectangular door hinged at one vertical adjoining edge to the stationary rectangular frame;
   a. A ground glass viewer in said first swingable rectangular door,

3. A second swingable rectangular door identical in size to the first swingable rectangular door and hinged at the other vertical adjoining edge of the stationary rectangular frame;
a. A live film holder in said second swingable rectangular door,
1. Said live film holder hinged in said second swingable rectangular frame on a horizontal hinge along the bottom thereof,
2. Said live film holder comprising an apertured surface and an enclosed chamber therebehind and,
a. suction means associated with said chamber to hold said live film against the apertured surface;
whereby either the first or second swingable rectangular doors may be optionally placed against the stationary rectangular frame so that the ground glass viewer and the live film are in identical planar positions in the supporting structure to permit proper setting of the equipment by viewing the ground glass.

3. An apparatus as set forth in claim 2 in which the holder means (A–1–b) includes separate screw thread adjusting devices at each of the four corners of the stationary rectangular frame whereby the master screen may be accurately set in parallelism relative to the ground glass viewer of the live film.

4. An apparatus as set forth in claim 2 in which the holder means (A–1–b) includes a plurality of threaded bolts joining said master screen to said stationary rectangular frame, a sprocket on the end of each of said threaded bolts, chain means joining all of said sprockets and means driving said chain means to cause translational movement of said master screen relative to said stationary rectangular frame.

5. An apparatus as set forth in claim 4 in which said holder means (A–1–b) further includes separate screw thread adjusting devices at each of the four corners of the stationary rectangular frame separate from the threaded bolts whereby the master screen may be accurately set in parallelism relative to the ground glass viewer on the live film.

6. An apparatus for making screened lithographic and gravure plates comprising:
A. A supporting structure; said structure including;
1. A stationary rectangular frame disposed in a generally vertical plane;
a. A master screen disposed in said stationary rectangular frame,
b. Holder means in said stationary rectangular frame for holding said master screen,
1. Means adjustably positioning said holder means in an axial direction in said stationary rectangular frame.
2. A first swingable rectangular door hinged at one vertical adjoining edge to the stationary rectangular frame;
a. A ground glass viewer in said first swingable rectangular door,
3. A second swingable rectangular door identical in size to the first swingable rectangular door and hinged at the other vertical adjoining edge of the stationary rectangular frame;
a. A live film holder in said second swingable rectangular door,
1. Said live film holder hinged in said second swingable rectangular door on a horizontal hinge along the bottom thereof,
2. Said live film holder comprising an apertured surface and an enclosed chamber therebehind and,
a. Suction means associated with said chamber to hold said live film against the apertured surface,
whereby either the first or second swingable rectangular doors may be optionally placed against the stationary rectangular frame so that the ground glass viewer and the live film are in identical planar positions in the supporting structure to permit proper setting of the equipment by viewing the ground glass,
B. Spaced-apart track members carried on said supporting structure and extending in a generally axial direction away from the master screen or the side opposite the ground glass viewer and the live film and in alignment with the master screen and the live film;
C. An exposure lamp having means cooperatively engaging said spaced-apart track members and arranged and constructed so the exposure lamp may be adjustably positioned on said track members at varying spaced positions from the master screen, and
1. Means on said exposure lamp for receiving a light stop whereby using light stops of varying configurations will vary the light image projected through the master screen and onto the live film.

7. An apparatus as set forth in claim 6 in which the light stop (C–1) is very large whereby the exposure lamp and light stop may be used at a substantial distance from the master screen to obtain a more even exposure of the screen on the live film.