June 11, 1940. H. J. BRUNK 2,204,297

MEANS FOR DISTRIBUTING LIGHT UNIFORMLY

Filed May 21, 1937 3 Sheets-Sheet 1

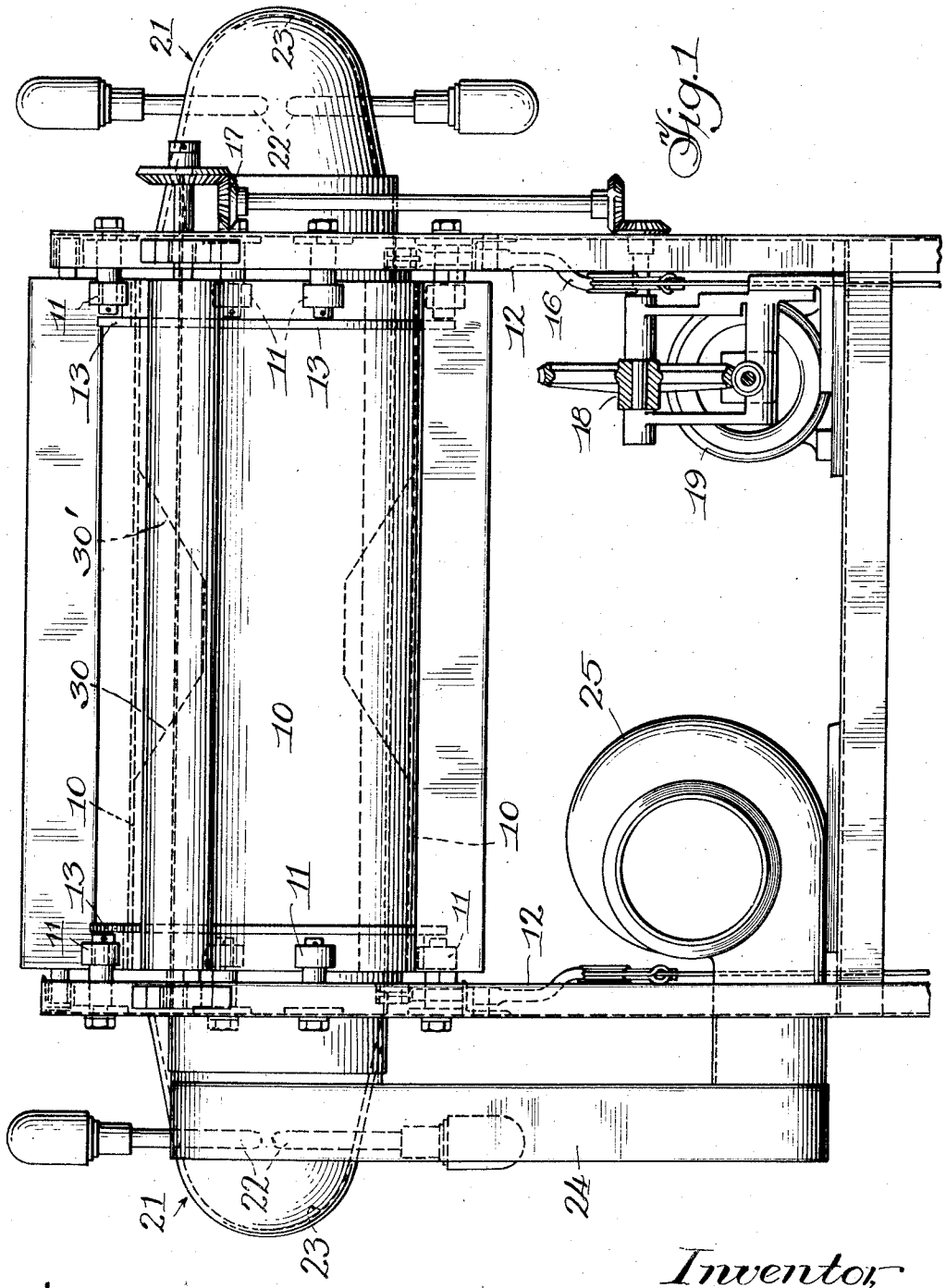


Fig. 1

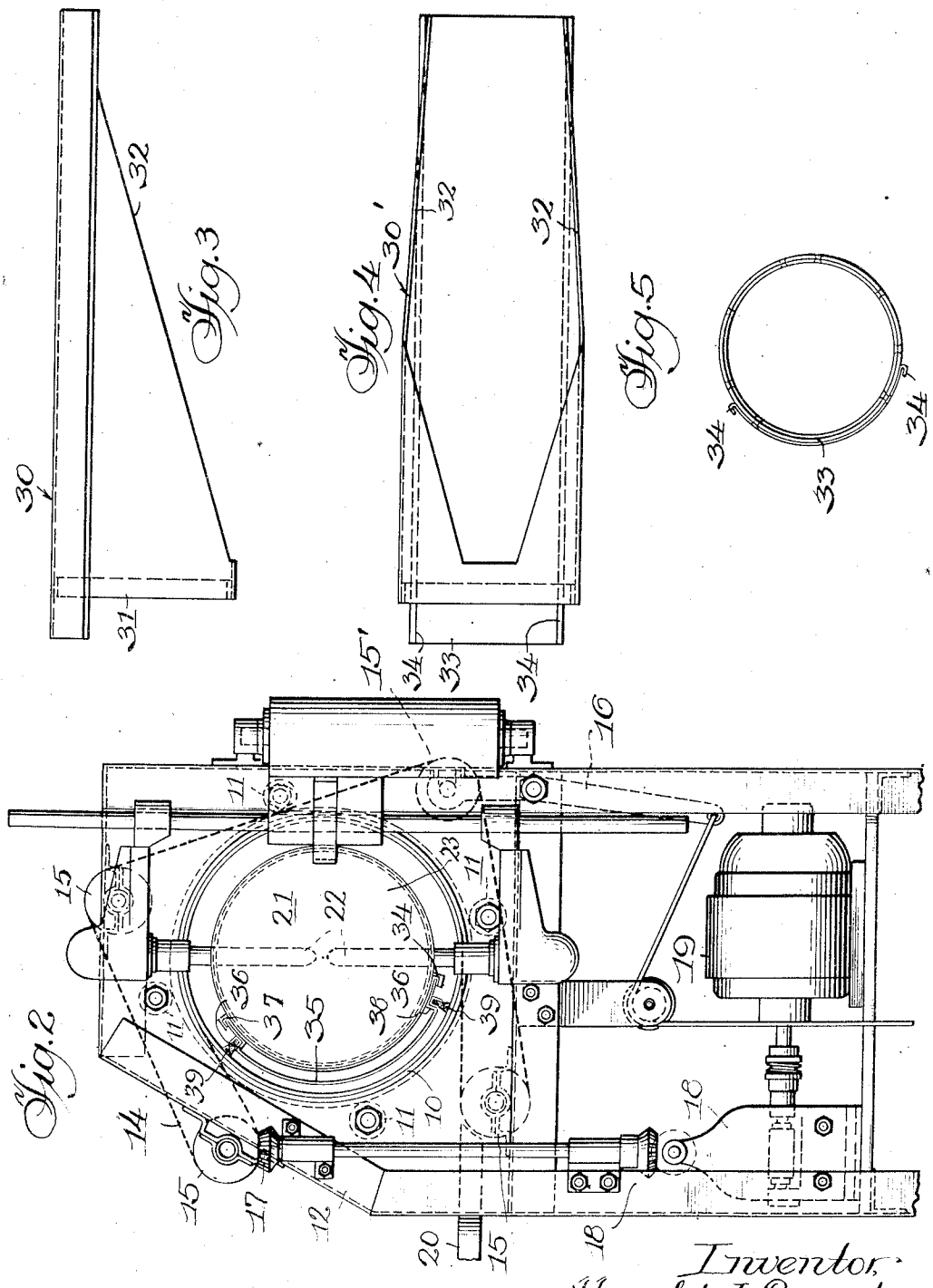
Witness:
Chas. R. Kourek.

Inventor,
Harold J. Brunk
Chritton, Wiles, Davies, Hirschl & Dawson Attys.

June 11, 1940. H. J. BRUNK 2,204,297

MEANS FOR DISTRIBUTING LIGHT UNIFORMLY

Filed May 21, 1937 3 Sheets-Sheet 2



Inventor,
Harold J. Brunk

Witness:
Chas. L. Hough. Chritton, Wiles, Davies, Nirschl & Dawson Attys

June 11, 1940. H. J. BRUNK 2,204,297

MEANS FOR DISTRIBUTING LIGHT UNIFORMLY

Filed May 21, 1937 3 Sheets-Sheet 3

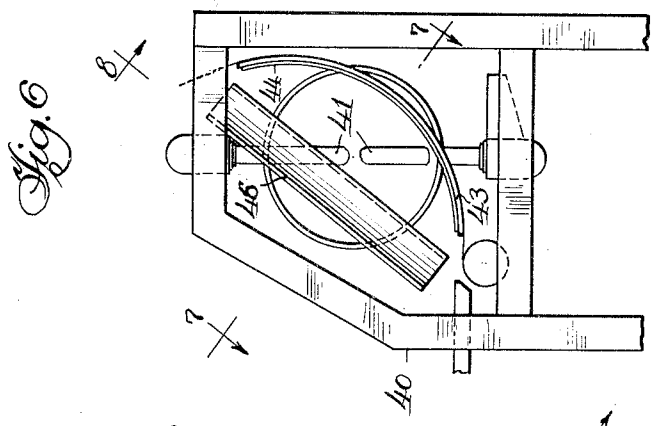


Fig. 6

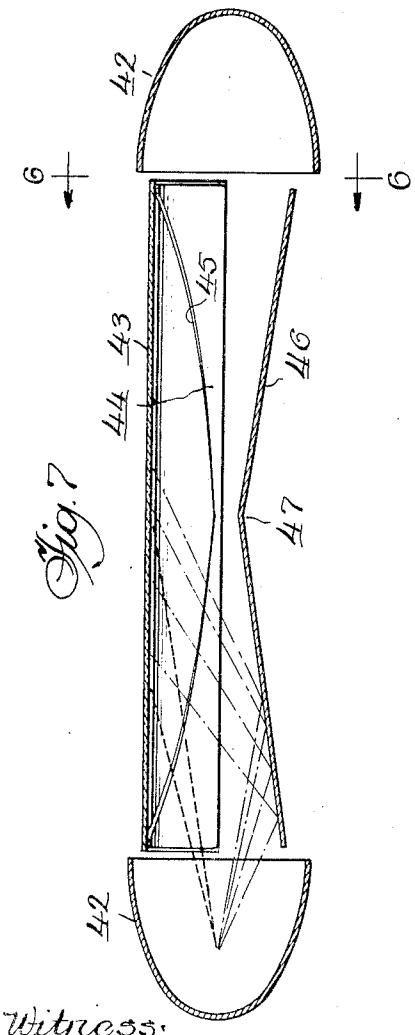


Fig. 7

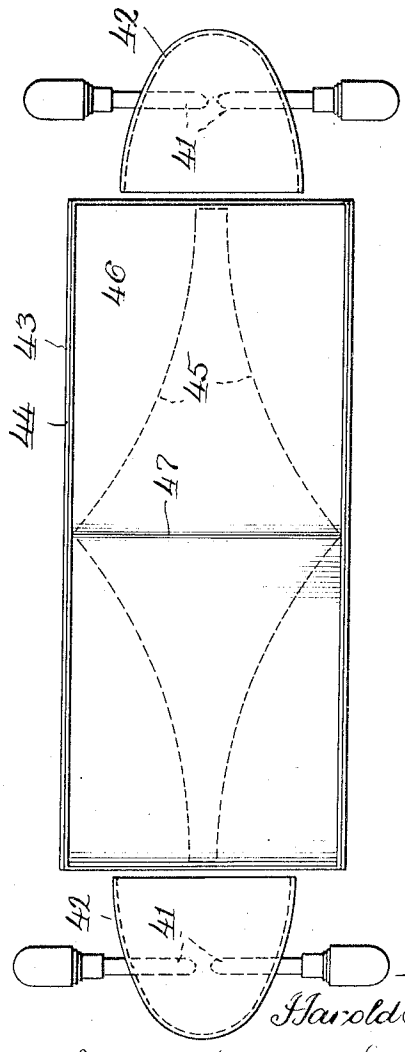


Fig. 8

Inventor
Harold J. Brunk

Witness:
Chas. L. Kounsh

Chritton, Wiles, Davies, Hirschl & Dawson, Attys.

Patented June 11, 1940

2,204,297

UNITED STATES PATENT OFFICE

2,204,297

MEANS FOR DISTRIBUTING LIGHT UNIFORMLY

Harold J. Brunk, Chicago, Ill., assignor to The C. F. Pease Company, a corporation of Delaware

Application May 21, 1937, Serial No. 144,089

10 Claims. (Cl. 240—2)

This invention relates to means for reflecting light and more particularly to means for distributing light substantially uniformly across a sheet or band of light-sensitive material, such, for example, as the light-sensitive paper used in continuous blue print machines.

In continuous blue print machines, arc lamps are employed which are mounted parallel with the printing surface. Where said printing surface is provided by a glass cylinder, said arc lamps are located inside said cylinder. The difficulties of manufacturing glass cylinders are such that at the present time accurate glass cylinders larger than twelve inches in diameter cannot be successfully manufactured. For this reason the arc lamps mounted within such cylinders are necessarily limited in size. Many continuous blue print machines, therefore, employ a curved sheet of glass, fixed in position, instead of a complete cylinder, so that larger lamps may be employed which are not necessarily restricted in size, as they are not enclosed by the glass. Modern printing, on a quantity production basis, demands higher speed machines than the present cylinder machines in which the arc lamps are mounted inside the cylinder.

One object of the present invention is to provide a machine of this character, not necessarily a blue print machine, in which high powered lamps may be mounted outside of or adjacent the ends of a sheet of curved glass, the latter being provided with a curved reflector inside the same which cuts off some of the direct light near the ends of said reflector but without restricting the light reflected from the middle part of said reflector, whereby light of substantially uniform intensity is directed against the inside of the glass (which may have the form of a cylinder) in a certain zone extending from one end to the other. The invention is useful also in the mounting of arc lamps outside and at the ends of a curved glass panel which is not necessarily a complete cylinder. With the curved glass panel the sensitized paper slides over the outer surface of the glass, whereas with the cylindrical glass panel the cylinder revolves and the paper travels in contact with it and at the same rate of speed, whereby there is no slippage.

Another object of the invention is to provide a combined reflector and shield, with a source of light at each end, whereby a substantially uniform amount of light is reflected at an angle to the longitudinal axis of said reflector.

A further object is to provide a reflector and shield of this character, made in two sections, whereby each may be supported at one end in a stationary position and in alignment, with the inner ends substantially in engagement with each other to provide a substantially continuous combination reflector and light shield.

An additional object is to provide a combination reflector and light shield of substantially cylindrical form with the opposite ends thereof formed as complete cylinders but with a longitudinal slot extending nearly from one end to the other of said reflectors, said slot becoming progressively wider from the ends toward the middle thereof, and with an arc lamp and a reflector therefor at each end of the reflector cylinder, whereby the arc lamps may be larger than the diameter of the reflector cylinder and the light from the arc lamps may be reflected outwardly through said slot in a band of substantially uniform intensity.

A further object is to provide equipment which combines arc lamps, mounted in spaced relation to each other, with a transparent support for the sheet of material which is to be moved past said arc lamps and exposed to the light emitted by the same, and with a shield mounted adjacent said transparent support and provided with a longitudinal opening of variable width to admit less light rays where the intensity of the same is greater than at other points, and vice versa.

Another object is to provide a machine for subjecting material to light rays from an arc lamp or other source of light, in which a curved sheet of glass is used to guide the material past the light source, and in which the light is directed in such a manner that the size of the light-emitting device is not restricted by the radius of said curved sheet of glass.

In the accompanying drawings, two forms of the invention are illustrated.

Fig. 1 is a front elevation of a blue print machine having a glass cylinder therein, certain parts being removed so as not to obscure said cylinder;

Fig. 2 is an end elevation of the right hand side of said machine;

Fig. 3 is a top plan view on a larger scale, of one-half of the reflector;

Fig. 4 is a rear view thereof;

Fig. 5 is an end view thereof; and

Figs. 6, 7 and 8 are views of a modification of the invention.

In the first form of machine described, a glass cylinder 10 is employed which is supported on suitable rollers 11, which latter are mounted in the two side frames 12, 12, as shown in Figs. 1

and 2. A metal ring 13 surrounds the cylinder near each end thereof, as shown particularly in Fig. 1, and prevents side movement thereof. A fabric band 14 which is usually made of canvas, is mounted on a series of parallel rollers 15, 15, and 15', as shown in Fig. 2. The endless band or belt 14 passes more than half way around the cylinder in the conventional manner. The roller 15' is mounted on a pivoted lever 16 which may be adjusted by means of a tension member or cord secured to the lower end thereof, said cord passing over a suitable pulley and extending downwardly, with a weight, not shown, secured to the lower end thereof. With this arrangement, the roller 15' is normally impelled away from the glass cylinder to maintain the belt tension. Said weight may be raised by a suitable foot pedal, not shown, when it is desired to relax said tension.

One of the rollers 15 is driven by beveled gears 17, which in turn are rotated by a gear reduction unit 18 and motor 19 whereby the endless belt 14 rotates the glass cylinder.

A shelf or table 20 is provided at the front of the machine over which the tracings are fed onto the belt 14 and are thus carried around on the surface of the glass cylinder at least half a turn, as is customary in machines of the glass cylinder type.

A source of light 21 is mounted preferably at each side of the machine outside of the rotatable glass cylinder, as shown in Fig. 1. The source of light is preferably an arc lamp and may be, for example, a high powered, enclosed or open flame lamp having the usual carbons 22. Each lamp is provided with a reflector 23, preferably of the parabolic type, to reflect most of the light inwardly, more or less along the longitudinal axis of the glass cylinder.

An air conduit 24 is connected at one end to a suitable blower and motor unit 25 and connects with the arc lamp housing to provide the necessary ventilation.

Within the glass cylinder is a reflector which is, in effect, formed as an incomplete cylinder, but is manufactured in two complementary sections 30 and 30'. The section 30 is shown on a larger scale in Figs. 3 and 4. The metal, of which the reflector is made, is bent around at the left hand end to form a complete cylinder 31 but is provided with a slot, the edges 32 of which diverge from each other, as shown in Fig. 4 so that the opposite end of the reflecting surface is of minimum length circumferentially. Otherwise described, it will be seen that if a series of sections were taken at progressive, uniform distances from the left circular end of the reflector to the other end thereof, said sections would show arcs of circles of progressively shorter length. Considering the two sections as arranged end to end in alignment, the same comprise, in effect, a cylinder with a longitudinal slot therein extending almost from end to end, said slot tapering toward opposite ends to form a shield which cuts off a considerable portion of the light directed into opposite ends of the reflector by the two arc lamps. Thus, considering Fig. 4, it will be seen that the light reflected horizontally and to the rear, i. e., toward the observer, is cut off in great part at the left hand end of said section, but the slot widens toward the right, whereby more light is reflected from the right hand end than from the left hand end. Also the amount of direct light perceived by the observer is increased. The increased reflection is, generally speaking, in proportion to the distance from the arc lamp, with the result that the complete reflector (both sections) throws out a band of light toward the rear and against and through the rear part of the curved wall of the glass cylinder, in a zone which is transverse with respect to the travel of the endless band 14 and is substantially of uniform intensity from one end of said slot to the other. Uniform printing is thereby obtained where the reflector is used in a blue print machine. The equipment may also constitute part of other types of devices wherein a band or zone of light of substantially uniform intensity from one end to the other is desired.

It will be understood that the direct light from the arc lamps is also cut off by said reflector, the narrow part of the slot near its ends cutting off the major portion of the direct light rays where they would be the most intense, and admitting a greater proportion of said rays at the middle of the slot where the distance from the arc lamps is more remote. Thus the reflected light supplements the direct light where the latter is weakest and thus substantial uniform intensity of the light is provided. It will also be understood that in certain cases the slotted shield or double shield need not perform the function of a reflector but may be used merely to cut off the direct rays progressively from a point near the source of light to a more remote point, so as to provide for substantially uniform distribution of direct rays without the supplemental effect of reflected rays.

The two reflector sections are supported preferably at their outer ends in non-rotatable position. This may be accomplished in various ways, as for example by securing to the front outer surface of each reflector section an arc-shaped supporting member 33 (see Fig. 5) having its upper and lower edges flanged over at 34 to provide guides or ways enabling the device to be slidably mounted on a supporting strip of sheet metal 35. See Fig. 2. This supporting strip is suitably mounted on the frame and extends into the glass cylinder, and has its margins offset inwardly at 36 and its edges bent over to provide reinforcing beads 37. Small channel members 38 are secured to these offsets and contain brushes 39 which may, for example, comprise a strip of felt to engage the inner surface of the rotating glass cylinder and keep the same clean.

A modified form of the invention is shown in Figs. 6, 7 and 8, in which the blue print machine is of the type previously described as one wherein a sheet of glass is employed which is curved, but does not form a complete cylinder, and which does not rotate. The arc lamps, as in the previously described form of the invention, are mounted at opposite ends of the glass, i. e., at the sides of the machine, the frame of which is indicated at 40. The carbons 41 are mounted so as to pass through the end reflector 42.

The curved sheet of glass 43 is mounted in the conventional manner, the supporting structure being omitted to simplify the disclosure. Mounted against the inner surface of the curved glass is a cut-out guard or light shield 44. This curved shield has its center cut away as shown at 45. In other words, an opening is provided which is very narrow at opposite ends of the shield but which increases in width toward the center. A reflector 46 is mounted adjacent the curved sheet of glass, as shown in Figs. 6 and 7. In this instance it consists of a flat sheet of metal bent slightly at the middle 47 so that the middle portion is near

said curved sheet of glass, whereas the distance from said curved glass increases toward the opposite ends of said reflector, as best shown in Fig. 7. Thus the light emitted by the arc lamp is reflected onto the light shield and onto the glass exposed through the opening in said shield, in about the manner illustrated by the dot and dash lines in Fig. 7. The inner surface of said light shield also reflects some of the light striking it, back toward the reflector 46. Said reflector directs the light impinging on it toward the center of the glass where the direct rays of light (shown by the dash lines) are the weakest, due to the greater distance from the light source. Said shield reduces the amount of light radiated directly onto the ends of the curved glass sheet. In other words the arrangement of the shield and the reflector is such that the area representing the exposed portion of the curved glass sheet receives both direct light rays and reflected light rays, and in such proportion that the composite light provides a substantially uniform total quantity of light lengthwise of the cylinder.

Although the reflector 46 is shown as formed from a sheet of metal which is flat in transverse section, said reflector may be curved, depending on the design and location of the adjacent parts.

I claim:

1. In a device of the class described, an incomplete cylinder having an inner reflecting surface, the wall of said cylinder having a longitudinal slot therein of maximum width near the middle of said cylinder and decreasing in width to the two ends thereof, and a source of light near each end of said cylinder positioned to direct the light toward the inner surface of said cylinder.

2. A device as in the preceding claim in which said light sources are located substantially on the longitudinal axis of said cylinder.

3. In a device of the class described, an incomplete cylinder having an inner reflecting surface, the wall of said cylinder having a longitudinal slot therein of maximum width near the middle of said cylinder and decreasing in width to the two ends thereof, an arc lamp at each end of said incomplete cylinder and a reflector for each of said lamps to direct light therefrom toward the middle of said cylinder, whereby the light issuing from said slot at an angle to said cylinder is substantially uniform throughout the length of said slot.

4. Means for distributing light substantially uniformly over a given area, comprising a curved shield adjacent to a curved sheet of glass, said shield having a longitudinal opening therein which is wider at the middle than at opposite ends, a reflector adjacent said shield and an arc lamp adjacent each of the ends of said reflector to reflect light toward the center of said opening, both of said arc lamps being positioned to directly illuminate said opening.

5. Means for distributing light over a curved sheet of glass comprising a shield curved to fit the inside of said glass and having an opening therein which is narrower at opposite ends than at the middle thereof, a reflector comprising a flat sheet of material having two portions arranged at a slight angle with each other near the middle thereof, said reflector being mounted adjacent said shield with its middle part nearer said shield than the ends thereof.

6. A source of light for a blue print machine, having a curved sheet of glass therein, comprising a shield fitting the inner surface of said curved glass and having a longitudinal opening therein which is wider at the middle than at the ends, a reflector adjacent said shield and facing the same, and an arc lamp at each end of said shield, said lamps being arranged with their axes on a line between said reflector and said shield to illuminate the exposed area of said curved glass both by direct rays and by reflected rays.

7. In a device of the class described, a sheet of glass curved to approximately the surface of a cylinder, a sheet of metal arranged longitudinally thereof and closely adjacent thereto, said sheet of metal being cut out to expose a limited area of said glass, said cut out portion tapering toward opposite ends, an arc lamp mounted adjacent each curved end of said glass, and a reflector for each arc lamp mounted to reflect the light of said lamps toward each other, whereby each supplements the other.

8. In a device of the class described, an incomplete cylinder the wall of which has a longitudinal slot therein of maximum width near the middle of said cylinder and decreasing in width to the two ends thereof, a source of light at each end of said incomplete cylinder and a reflector for each of said light sources to direct light therefrom toward the middle of said cylinder, whereby the light issuing from said slot is substantially uniform throughout the length of said slot.

9. In a device of the class described, an incomplete cylinder the wall of which has a longitudinal slot therein of maximum width near the middle of said cylinder and decreasing in width to the two ends thereof, a source of light at each end of said incomplete cylinder, a reflector for each of said light sources to direct light therefrom toward the middle of said cylinder, whereby the light issuing from said slot is substantially uniform throughout the length of said slot, and a cylinder of transparent material surrounding said incomplete cylinder, against which the material to be exposed to said light may be positioned.

10. In a device of the class described, an incomplete cylinder the wall of which has a longitudinal slot therein of maximum width near the middle of said cylinder and decreasing in width to the two ends thereof, a cylinder of transparent material enclosing said incomplete cylinder with its longitudinal axis substantially coinciding with that of said incomplete cylinder, a source of light at each end of said incomplete cylinder located substantially on said longitudinal axes to direct light toward the middle of said cylinder, whereby the light issuing from said slot is substantially uniform throughout the length of said slot.

HAROLD J. BRUNK.