June 24, 1930. S. A. STAPP 1,767,414

PHOTOLITHOGRAPHING PROCESS

Filed Jan. 25, 1927 2 Sheets-Sheet 1

Fig. 1.

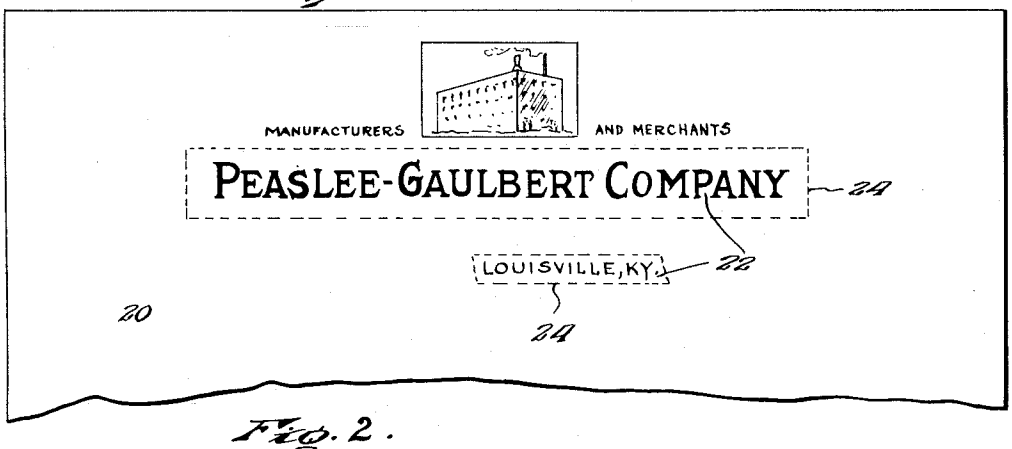


Fig. 2.

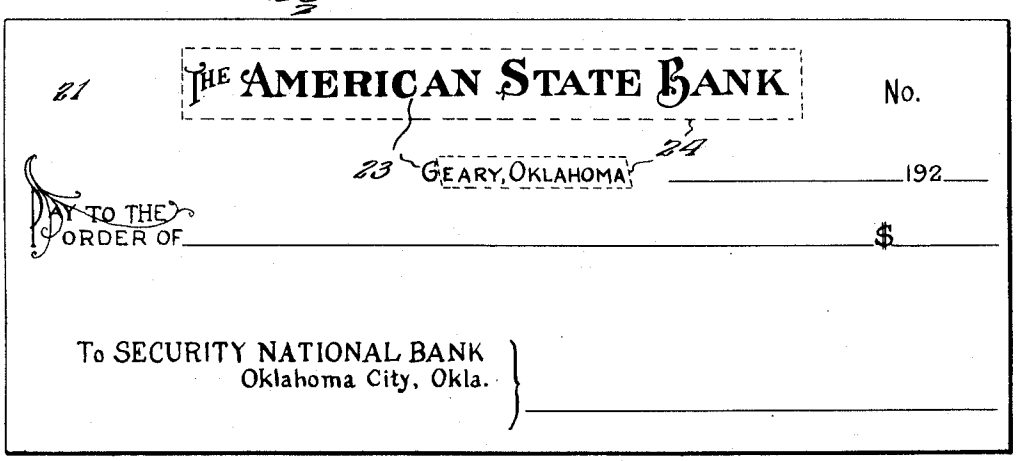
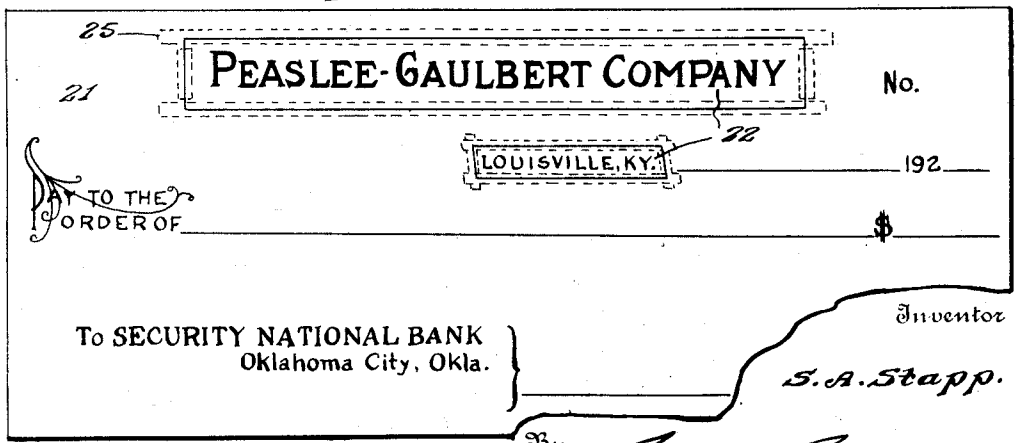


Fig. 3.



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Fig. 4.

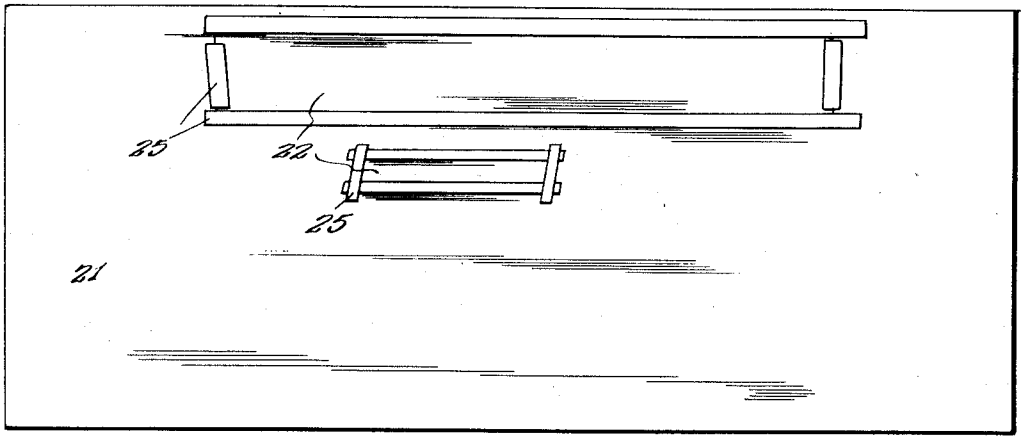
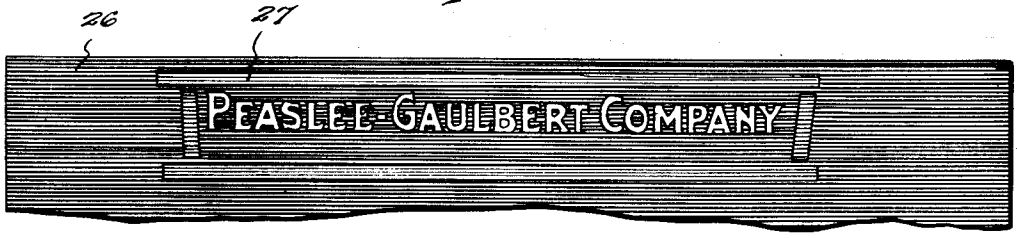


Fig. 5.



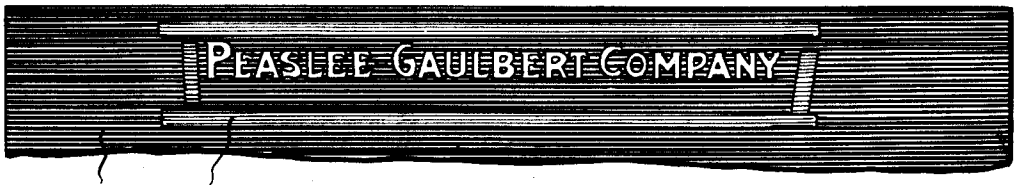


Fig. 6.

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UNITED STATES PATENT OFFICE

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PHOTOLITHOGRAPHING PROCESS

Application filed January 25, 1927. Serial No. 163,467.

This invention relates to photolithography and has for its object the reduction of cost and expediting of the work through elimination of a camera in producing the negative. The invention resides in certain novel features which will be fully described hereinafter and then particularly pointed out in the appended claim.

In the drawings:

Figures 1 and 2 are face views of elements, portions of which are to be combined to produce a copy.

Figure 3 is a face view of the copy prepared from elements shown in Figures 1 and 2.

Figure 4 is a back view of the copy.

Figure 5 is a view of a portion of a negative made by light passed through the copy, the negative being in a preliminary stage of production.

Figure 6 is a view similar to Figure 5 indicating a more advanced state in the production of the negative.

My invention may be practiced in connection with any lithographing transfer machine and in the reproduction of any form of copy, such as letter heads, drawings, maps or other subjects. The copy may be an unaltered original, or it may be an original to which additions have been made by drawing, or it may be a copy made by pasting upon a blank sheet of paper or similar material separate strips or pieces containing cuts, printed matter or other material which it is desired to reproduce in a specified relation. The copy is also sometimes prepared by combining two or more copies or prints or parts thereof into one copy, as illustrated in Figures 1, 2, 3 and 4 by way of example. Figure 1 shows a letterhead 20 and Figure 2 shows a bank draft or check, it being desired to produce checks having the name appearing upon the letterhead substituted for the heading of the check. Cuts, indicated by the dotted lines 24, are then made through the letterhead and check around the heading and address 22 of the letterhead and corresponding portions of the check, it being evident that the cut-out parts will be exact duplicates in size and shape so that the part removed from the letterhead will fit exactly in the opening made in the check. The strips cut from the letterhead are then fitted in the openings cut in the check, as shown in Figure 3, and the seams closed by the application of clear gummed tape 25 to the back of the check, the inserted strips being thus secured in place flush with the face of the check. The copy, whether it be an altered or unaltered original, is made translucent by being dipped in clear petroleum oil or other oils or liquids which will not injure the copy, or by placing the copy in a suitable pan or other receptacle and pouring the oil or other liquid thereon so that the entire surface of the copy will be reached by the oil. The copy which has been saturated is then placed between blotters or other material which will not readily adhere to the copy or damage the same and subjected to pressure so that the greater portion of the surplus oil will be removed. I then apply a moderate degree of heat to the copy, as by holding it for a short period over a flame or other source of heat or by ironing the same with a hand iron or other mechanical device, so that, as a result of the treatment, all the surplus oil in the fiber of the copy will be evaporated or withdrawn while the copy will retain its translucent quality resulting from the application of the oil. All the surface oil must be removed in order to avoid contact of oil with the sensitized film as such contact destroys the usefulness of the film and it cannot be developed after exposure. The application of pressure irons out the surface of the copy so that there will be no particles of paper fiber projecting from the surface of the paper, as I have found that such particles, if any, in contact with the sensitized surface of the film, impair the negative and render it unfit for use. The copy thus prepared is placed with a printing frame with its face side up and is smoothed so that it will rest throughout its area in contact with the transparency 6. The film which is to become the negative is then placed over the copy and pressed into smooth intimate contact therewith by application of the board 11 and the cooperating parts, it being noted that the tapes 25 will be on the under side of the copy so that the film may have intimate contact

with the entire surface of the copy and fogging of the negative due to improper contact or lack of contact is consequently avoided. Light passes through the copy to the surface of the film to produce a negative of the copy by the direct exposure through contact with the copy. While I prefer to expose the film to electric light, it must be understood that it may be possible, under some conditions, to make the exposure through natural light, and the invention contemplates the employment of either natural or artificial light in the production of the negative, the essential feature being the making of the negative by the transmission of light through a copy which is in direct contact with the sensitive film, and from which all lateral light is excluded, instead of by means of a camera which is the usual practice.

The film employed may be on any preferred material and may be of any approved composition. After the desired exposure has been made, the film is placed in a developing solution and is treated with this solution so that it is not fully developed, the action preferably being given only one-third or one-fourth the strength or the time that a film is ordinarily developed, the negative 26 then being substantially in the condition indicated in Figure 5. In making a negative through contact with copy by light passing through the copy, the fiber of the paper tends to obscure the negative and the ink on the copy sometimes permits the light to penetrate where it should be shut out so that, if the negative were developed to the usual full degree, the parts where the light went through would be black and the negative, therefore, would be unfit for use. I overcome this objection by under-developing the negative and subsequently intensifying it. After the film is developed to the desired degree, it is thoroughly washed in running water and then treated in the usual manner in any approved fixing bath. The film developed and fixed as thus far described will not be sharp or strong enough for use and I, therefore, intensify the same by thoroughly washing it after it is fixed and then, while it is still wet, place it in a bleaching solution until it is thoroughly bleached. The bleached negative is washed sufficiently to get rid of any chemical that may adhere to it and, while it is still wet, it is put into an intensifying solution and allowed to stand in said solution until it is thoroughly blackened. The negative is then again washed in water and allowed to dry, and, after it is dry, it is retouched so that all defects are painted out or added to where necessary. The intensification of the negative makes the background darker or denser, as indicated in Figure 6, so that the arc light to which it is later exposed will not pass through the background onto the sensitized plate. The tape 25 causes light spaces or stripes 27 to appear in the negative, as shown in Figures 5 and 6, and these spaces are painted out by the retoucher. The negative is then ready for use in any photolithographing transfer machine or any branch of printing where a negative is used.

If the negative were developed fully according to usual custom, the fine lines and other transparent parts would become muddy or partly blackened and the under-developed negative is not of sufficient density in the background to prevent light going through the background onto the sensitized printing plate when an exposure is made. I, therefore, intensify the under-developed negative so that the background or black part thereof is made more dense. This intensifying of the background does not detract from the transparent part of the negative so that, as a result of the under-development, the transparent parts of the negative are clear and clean, and the intensification of the background produces a perfectly clear and transparent negative which will result in a sharp clearly defined print. By making the negative by light going through the copy or print I eliminate the expense of installing a camera and the cost of operating and maintaining the camera.

It sometimes happens that the copy submitted for use in producing photolithographs has matter on both sides of the sheet and in order to obtain a negative from such copy, I strip the same. The stripping is accomplished by providing two sheets of transparent gelatine somewhat longer than the copy so that they will present a marginal portion to facilitate handling and moistening of one side of each sheet of the gelatine. The copy is then laid on one sheet of gelatine so that it rests upon and in contact with the wet side of the same and the other sheet of gelatine is placed on top of the copy so that the wet side thereof is next to the copy. The three sheets are then run through a press or subjected to pressure through other means and the three sheets, pressed together, are then dried. After drying, it will be found that the three sheets stick together so that by pulling the sheets of gelatine in opposite directions the sheet of copy will be split or stripped into two parts, one side adhering to one sheet of gelatine and the other side adhering to the other sheet of gelatine. Each sheet of gelatine with the copy adhering thereto is then placed in the printing frame and a negative made thereof by direct contact exposure as hereinbefore described.

From the foregoing description, it will be readily seen that the practice of my process eliminates the use of a camera in the making of a negative so that the cost of equipping a plant is materially reduced and the cost of maintenance or operation is also reduced inasmuch as it is not necessary to employ a pho-

tographer or camera operator for making the negatives. The negatives produced by my process are clear and equal in quality to negatives produced by any process now practiced while, as has been said, the cost is much less.

Having thus described the invention, I claim:

The process of preparing a negative for photolithographing herein described consisting in cutting a sheet to remove thereon a section containing matter to be used and cutting another sheet to form an opening of the same outline and dimensions as the section removed from the first sheet, inserting the section cut from the first sheet in the opening cut in the second sheet to form a copy to be reproduced, applying adhesive tape to the back of the copy to cover the seams, imparting translucency to the prepared copy, transmitting light through the copy to a sensitized film in contact with the copy, underdeveloping the film, and then intensifying the background of the film.

In testimony whereof I affix my signature.

SIDNEY A. STAPP.