Oct. 5, 1937. D. S. LOEB ET AL. 2,095,071

METHOD OF MAKING PRINTING PLATES

Filed April 7, 1936

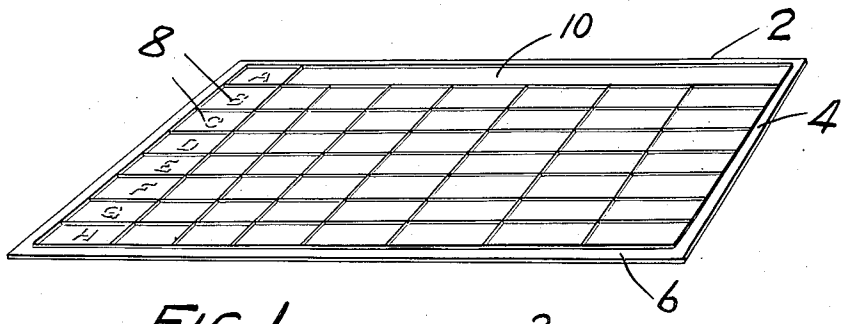

FIG. 1.

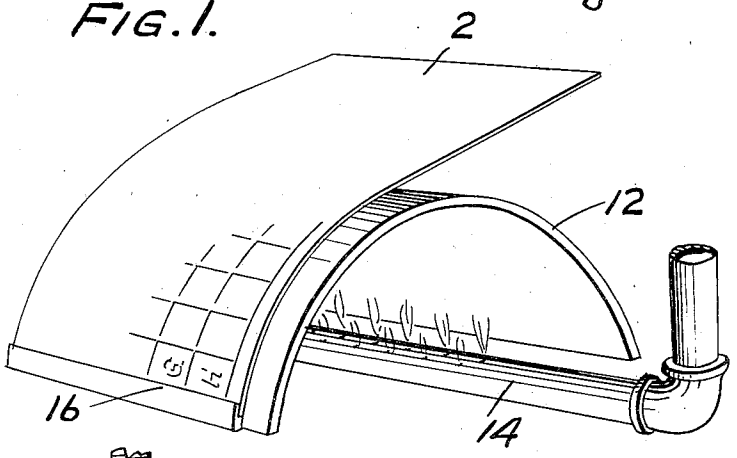

FIG. 2.

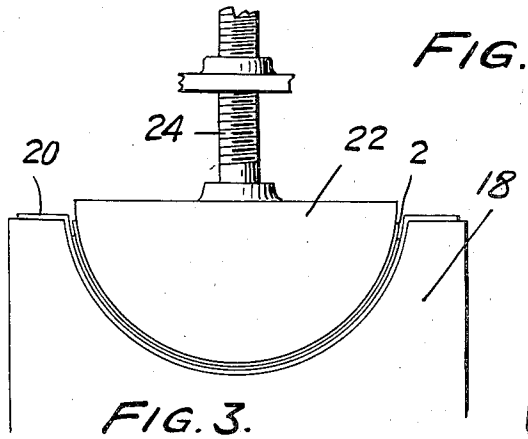

FIG. 3.

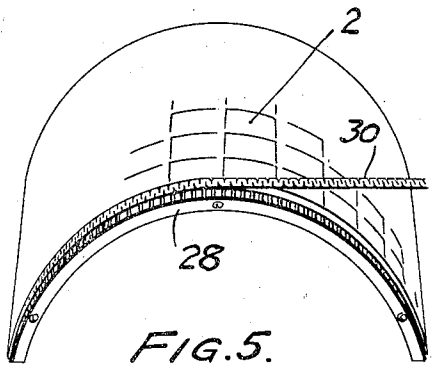

FIG. 5.

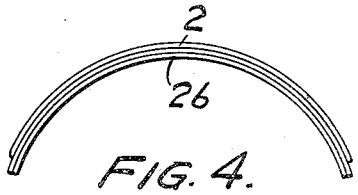

FIG. 4.

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Patented Oct. 5, 1937

2,095,071

UNITED STATES PATENT OFFICE

2,095,071

METHOD OF MAKING PRINTING PLATES

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Application April 7, 1936, Serial No. 73,060

6 Claims. (Cl. 153—32)

This invention relates to a method of making printing plates and specifically to a process of forming zinc plates suitable for use on a multigraph machine or other rotary printing machine directly from a flat zinc engraving. Heretofore the common practice pursued in forming cylindrical printing surfaces for use on multigraph machines or the like has involved the formation of a flat zinc engraving from which there was formed a matrix of wood pulp paper. This matrix was then bent to the desired curvature and stereotype metal cast therein to form the final printing plate. The old process has merely been outlined and was far more complex than the outline would indicate. As a consequence, the printing plates so formed were quite expensive. Furthermore, the process was not particularly well adapted to fine work.

The rather obvious solution to the problem appeared to be the bending of the zinc engraving into the proper curvature to act directly as the printing surface and many attempts to do this were tried by the use of heat and pressure in various ways. The results, however were never satisfactory, inasmuch as the attempts at bending always resulted in damage to the printing surface.

It is a general object of the present invention to provide a process whereby flat zinc engravings or similar flat printing plates, such as stereotype plates, or the like, may be curved to directly provide a printing plate and more specifically in such fashion as to eliminate entirely or minimize the make-ready which is necessary. The process has been found excellently adapted to all types of engraving, including line and half-tone engravings, fine screen engravings, and engravings of combination types. It is particularly adapted to the formation of printing plates for multigraph machines to be used either alone or in conjunction with type, the plates for this purpose being formed from zinc engravings which are composed of well known zinc alloys.

The broad object of the invention and also subsidiary objects relating to details of construction will be apparent from the following description read in conjunction with the accompanying drawing, in which:

Fig. 1 represents in perspective a flat zinc engraving to which the process is to be applied;

Fig. 2 is a perspective view of a furnace over which the plate is curved;

Fig. 3 is a fragmentary elevation of a press in which the plate is given its final shape;

Fig. 4 is an end elevation showing the plate after it is curved and backed with paper; and

Fig. 5 is a perspective view showing the finished plate applied to a multigraph drum.

There is indicated at 2 in Fig. 1 a flat zinc engraving formed of a suitable zinc alloy and which has been prepared in conventional fashion. This engraving is provided with flanges 4 and 6 for reasons mentioned hereafter, and is provided with relief printing surfaces indicated at 8. If the original engraving contains any large areas which are in the nature of depressions and which are therefore comparatively thin and unreinforced by the relief printing surfaces, for example such as indicated at 10, such low parts and also the flanges may be packed with stereotype packing prior to the bending step. The stereotype packing consists of cardboard provided in various thicknesses which may be secured in the low parts of the face of the engraving by means of glue. Such packing is found desirable where considerable low areas exist in order to avoid buckling which may take place in the relatively thin areas corresponding thereto.

Zinc engravings are normally of sixteen gauge and if applied directly to a multigraph drum will be below type level. Thirteen gauge zinc engravings would be type high. However, it is desirable to use sixteen gauge engravings not only because, being standard, they are cheaper since they can be handled in usual fashion, but also because the board which is used to back them to make them type high is resilient and automatically provides for automatic adjustability, which greatly minimizes the make-ready which is necessary. The process will consequently be described as applied to a sixteen gauge zinc engraving for use on a multigraph machine.

A furnace 12 heated by burners 14 is provided having an external surface with a curvature the same as that of the multigraph drum to which the plate is to be applied. This furnace is preferably provided with a flange arrangement indicated at 16 desiged to receive and line up an edge of the zinc engraving with a straight line element of the cylindrical surface. It is particularly desirable to provide such an aligning flange inasmuch as otherwise a slight error in locating the plate on the furnace may result in skewing to an uncorrectable extent.

A particularly distinctive feature of the process herein described is the proper heating of the zinc engraving during the bending process. The zinc engraving at ordinary temperatures is quite resilient and while it may be bent to the desired

radius of curvature, if such bending occurs about a surface having that curvature the plate will spring to a condition of less curvature as soon as the pressure is released. At the same time, it will have been strained beyond its elastic limit and, inasmuch as the printing surface is outside, damage will almost invariably occur.

Typical zinc engraving plates melt at about 780° F. and quite substantially soften well below that temperature. It is found, however, that by heating the plate above 250° F., and preferably between 300° F. to 500° F., the plate becomes pliable and loses its resiliency without, however, there being any danger of damaging the engraved surface. It may be remarked that the temper of the plate is considerably removed during the heating, which occurs in conjunction with the etching process, so that if the plate has a hardness, measured by the scleroscope, of 26 points before it is etched, it finally has a hardness of only 15 points when finished in flat form. When heated in the range of 300° to 500° F., its hardness drops to approximately 5 points or less, but the hardness of 15 points is regained upon cooling.

Assuming that the furnace has been heated to secure the desired temperature of the plate as indicated above, the plate is applied to the furnace **12** with one edge engaged by the flange **16**, though it will be understood that with skill the flange may be omitted and the plate applied to the furnace along a straight line element thereof and then bent, as will be now described. After application of the plate to the furnace, moderate pressure is applied thereto to cause it to conform gradually with the curvature of the furnace. In the case of a 65 gauge plate, the weight of the overhanging portion of the plate is generally insufficient and some slight extra pressure must be applied to cause it to bend. The bending must be so performed, however, that at no time is any portion of the plate bent which has not attained the temperature indicated above. Since the temperature of the plate is maximum where it engages the furnace and diminishes through the portion which is not in engagement with the furnace, it will be clear that the bending process takes place progressively, as indicated in Fig. 2, the successive portions of the plate bending as they lose their resiliency at the temperature of the furnace. When the entire plate is curved about the furnace, it has no tendency to spring away from the furnace, at least to any substantial degree. By the progressive bending which has been described, no damage is done to the engraved surface.

After the bending is completed, the curved plate is immediately removed to a press **18** containing a depression lined with a copper sheet, indicated at **20**, the inner surface of which has exactly the curvature of the printing surface desired on the completed plate. The male member **22** of the press is provided with a pressure surface which has the desired inner curvature. The plate located between the two pressure surfaces is then pressed by means of a screw and nut arrangement indicated diagrammatically at **24**. The soft copper lining is provided to avoid damage to the engraved surface during the pressing operation, it being softer than the zinc alloy. This preliminary pressing while the plate is still hot is necessary to insure the precise curvature which is desired, inasmuch as this can only be approximated on the furnace. Alternatively, of course, a pressure member might be provided above the furnace to press the plate on its surface, which is formed with a curvature corresponding to the desired inner curvature of the plate. The cooling in such case is slow since the entire furnace must be allowed to cool.

After removal from the press, any paper packing used in the low spots is removed by soaking in warm water and scrubbing.

The curved plate is now backed by pasteboard **26** which is secured to the plate by paste. The laminated structure thus obtained is returned to the press **18** and repressed to insure that both the inner and outer curvatures are correct and to secure uniform adherence of the paper to the plate. Only a slight pressure is used at this time to avoid squeezing up the low portions which might make them print.

The finished plate is now ready for application to the cylinder indicated at **28**, which may, for example, be the slotted cylinder of a multigraph machine. The plate may form the entire printing surface or only part thereof, the remainder of the printing surface being formed by type fitted into slots in the cylinder. The plate may be held upon the cylinder by bands such as indicated at **30**, which are of the type generally used for holding electrotypes.

The resilient backing provided by the paper board **26**, together with the bending process which has been used and which avoids damage to the engraved surface, goes far toward eliminating the necessity for make-ready. If it is found, however, that the first proofs are unsatisfactory, the usual make-ready procedure may be adopted and paper secured under the low portions of the plate so as to cause them to print to the proper density. Sandpapering of the backing board under high portions will serve to correct them. It is found, however, that generally little or no make-ready is necessary to secure good results.

The process described herein is applicable not only to zinc plates but also other types such as stereotype and electrotype plates. In the case of stereotype plates somewhat greater care must be exercised since the metal melts at a considerably lower point than the zinc alloy and the range of temperatures in which the bending may be properly effected is more limited. In handling such plates, it is desirable to cover the surface of the furnace with asbestos or some other relatively poor conductor of heat so as to secure a better distribution of the heat and slower transmission to the plate. Similar variations in procedure may be adopted to suit various other materials.

It will be obvious that changes in details of the process may be adopted without departing from the invention herein described.

What we claim and desire to protect by Letters Patent is:

1. The process of forming a curved printing plate from a flat printing plate including heating a cylindrical surface to a temperature at which the plate would be non-resilient but below the melting point of the plate, applying the back of the flat plate to said heated cylindrical surface along a straight line element of the surface, exerting a bending force upon portions of the plate remote from the region of contact of the plate and cylindrical surface, while avoiding direct pressure on the outer face of the portions being bent, to effect a gradual progressive conformity of the plate with the heated surface as portions of the plate adjacent those in contact

with the surface are progressively heated to said temperature, the bending force being so moderated that bending to the curvature of the surface takes place only at the portions of the plate progressively heated to a temperature at which they are non-resilient, and thereafter pressing the curved plate while still hot in a press having pressure surfaces corresponding to the desired inner and outer surfaces of the final curved plate.

2. The process of forming a curved printing plate from a flat printing plate including heating a cylindrical surface to a temperature at which the plate would be non-resilient but below the melting point of the plate, applying the back of the flat plate to said heated cylindrical surface along a straight line element of the surface, exerting a bending force upon portions of the plate remote from the region of contact of the plate and cylindrical surface, while avoiding direct pressure on the outer face of the portions being bent, to effect a gradual progressive conformity of the plate with the heated surface as portions of the plate adjacent those in contact with the surface are progressively heated to said temperature, the bending force being so moderated that bending to the curvature of the surface takes place only at the portions of the plate progressively heated to a temperature at which they are non-resilient.

3. The process of forming a curved printing plate from a flat printing plate including heating a cylindrical surface to a temperature at which the plate would be non-resilient but below the melting point of the plate, applying the back of the flat plate to said heated cylindrical surface with an edge of the plate contacting a straight line element of the surface, exerting a bending force upon portions of the plate remote from the region of contact of the plate and cylindrical surface, while avoiding direct pressure on the outer face of the portions being bent, to effect a gradual progressive conformity of the plate with the heated surface as portions of the plate adjacent those in contact with the surface are progressively heated to said temperature, the bending force being so moderated that bending to the curvature of the surface takes place only at the portions of the plate progressively heated to a temperature at which they are non-resilient, and thereafter pressing the curved plate while still hot in a press having pressure surfaces corresponding to the desired inner and outer surfaces of the final curved plate.

4. The process of forming a curved printing plate from a flat printing plate including heating a cylindrical surface to a temperature at which the plate would be non-resilient but below the melting point of the plate, applying the back of the flat plate to said heated cylindrical surface with an edge of the plate contacting a straight line element of the surface, exerting a bending force upon portions of the plate remote from the region of contact of the plate and cylindrical surface, while avoiding direct pressure on the outer face of the portions being bent, to effect a gradual progressive conformity of the plate with the heated surface as portions of the plate adjacent those in contact with the surface are progressively heated to said temperature, the bending force being so moderated that bending to the curvature of the surface takes place only at the portions of the plate progressively heated to a temperature at which they are non-resilient.

5. The process of forming a curved printing plate from a flat printing plate including heating a cylindrical surface to a temperature at which the plate would be non-resilient but below the melting point of the plate, applying the back of the flat plate to said heated cylindrical surface along a straight line element of the surface, exerting a bending force upon portions of the plate remote from the region of contact of the plate and cylindrical surface, while avoiding direct pressure on the outer face of the portions being bent, to effect a gradual progressive conformity of the plate with the heated surface as portions of the plate adjacent those in contact with the surface are progressively heated to said temperature, the bending force being so moderated that bending to the curvature of the surface takes place only at the portions of the plate progressively heated to a temperature at which they are non-resilient, and thereafter pressing the curved plate to accurate curvature.

6. The process of forming a curved printing plate from a flat printing plate including heating a cylindrical surface to a temperature at which the plate would be non-resilient but below the melting point of the plate, applying the back of the flat plate to said heated cylindrical surface along a straight line element of the surface, exerting a bending force upon portions of the plate remote from the region of contact of the plate and cylindrical surface, while avoiding direct pressure on the outer face of the portions being bent, to effect a gradual progressive conformity of the plate with the heated surface as portions of the plate adjacent those in contact with the surface are progressively heated to said temperature, the bending force being so moderated that bending to the curvature of the surface takes place only at the portions of the plate progressively heated to a temperature at which they are non-resilient, applying a paper backing to the curved plate, and pressing it to accurate curvature.

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