

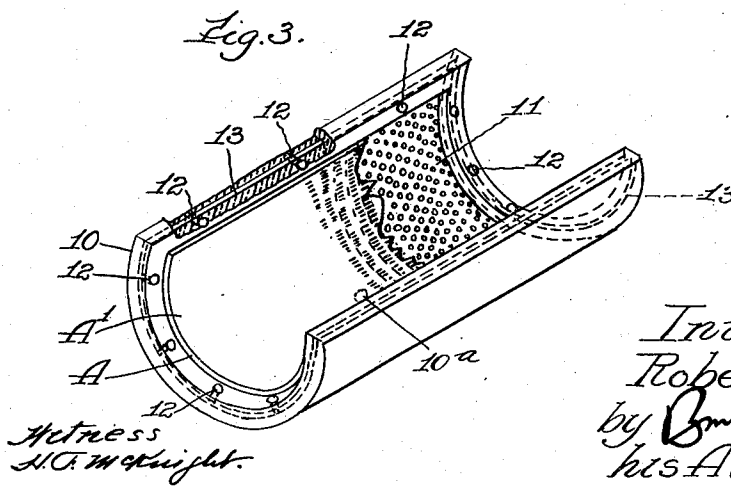
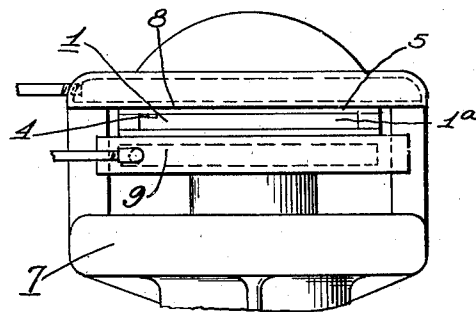
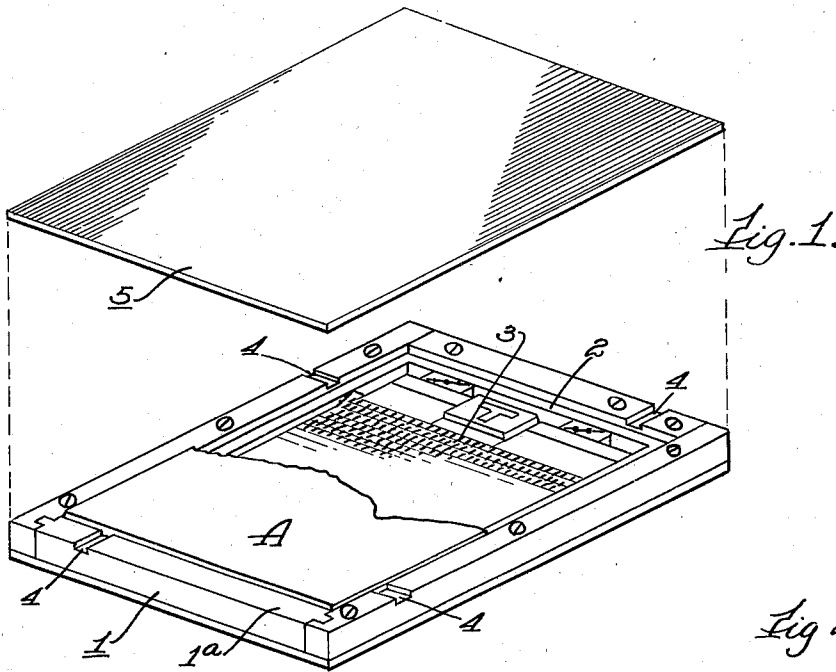
March 23, 1937.

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2,074,335

METHOD AND APPARATUS FOR PRODUCING ELECTROTYPE PLATES AND SHELLS

Original Filed June 13, 1931 3 Sheets-Sheet 1



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Original Filed June 13, 1931 3 Sheets-Sheet 2

Fig. 4.

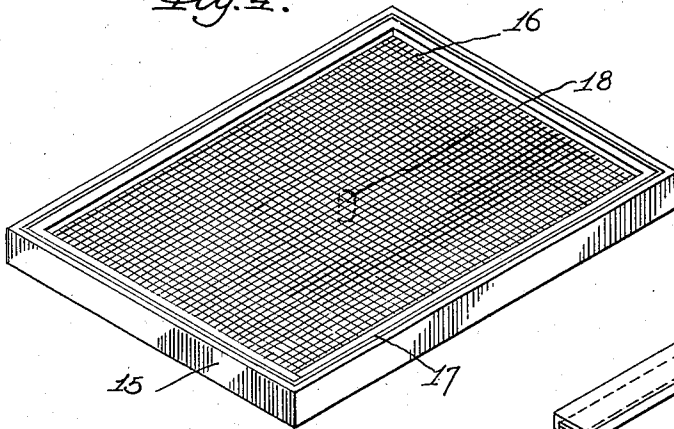


Fig. 5.

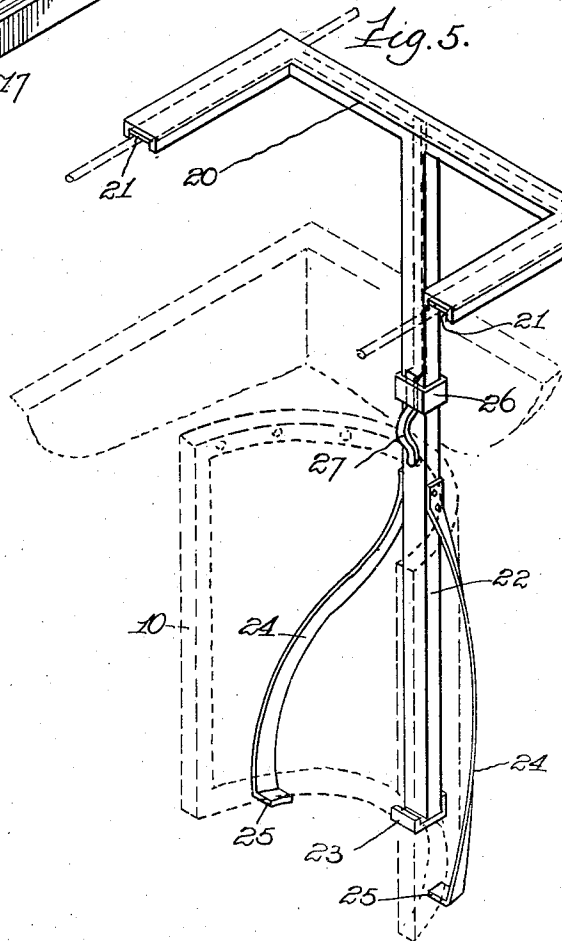
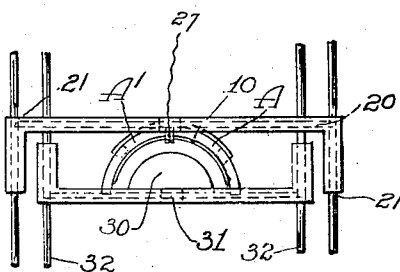


Fig. 6.



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METHOD AND APPARATUS FOR PRODUCING ELECTROTYPE PLATES AND SHELLS

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Fig. 7.

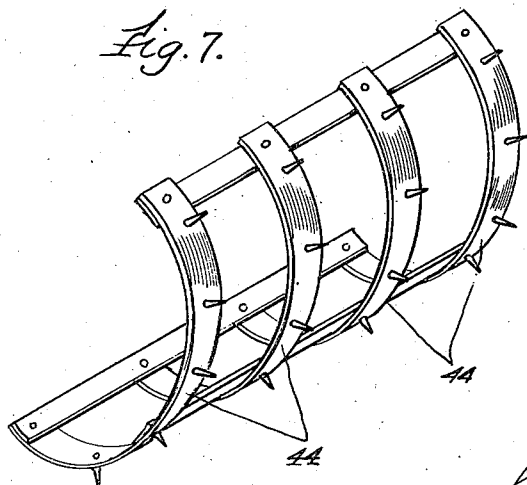


Fig. 8.

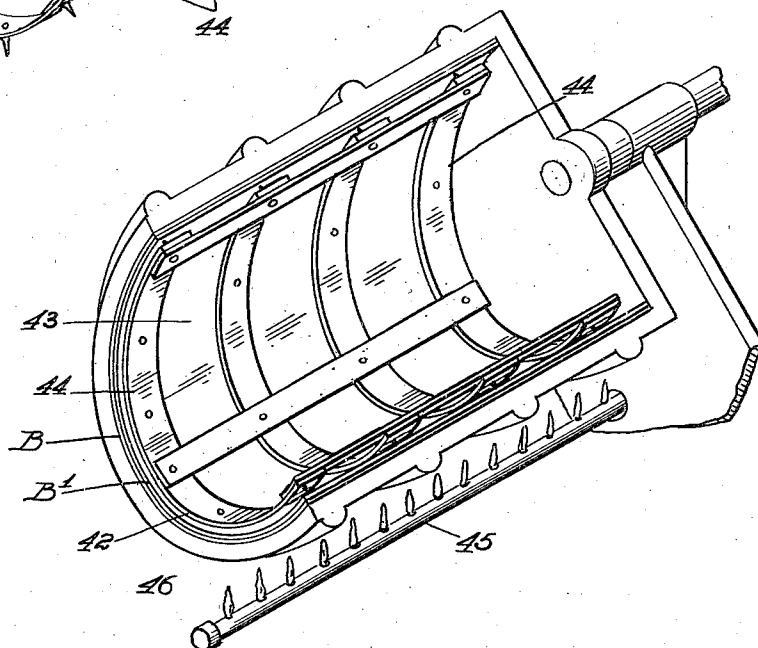
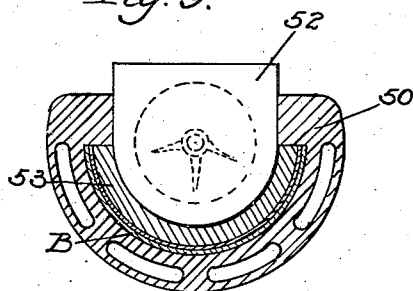


Fig. 9.



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UNITED STATES PATENT OFFICE

2,074,335

METHOD AND APPARATUS FOR PRODUCING
ELECTROTYPE PLATES AND SHELLSRobert L. Kelley, Sr., Chicago, Ill., assignor, by
mesne assignments, to Vulcan Proofing Com-
pany, Inc., a corporation of New YorkApplication June 13, 1931, Serial No. 544,171
Renewed May 28, 1936

5 Claims. (Cl. 204—6)

The purpose of this invention is to provide an improved method and means for producing electrotypes, particularly when the electrotype plates are to be employed in curved form, as on a rotary press. The invention therefore includes the formation of a matrix or mold of flexible material which can be bent into curved form before the deposition of the metal which forms the printing face, so that said material is initially deposited in the curved form closely approximating the final form in which it is to be used. Another object of the invention is to produce a mold which will retain its own form when the electrolytically deposited plate is stripped away from it, so that such mold may be used repeatedly for producing electrotypes in multiple. Another object is to provide a method by which a curved printing plate may be produced which reproduces the original more faithfully and with less distortion than printing plates now manufactured by other processes. The invention therefore consists in a succession of steps which constitute a process or method for producing the mold, and from it a printing plate, and in certain apparatus employed in the process including the mold itself, all as herein more fully described and illustrated in the drawings, and as indicated by the claims.

In the drawings:

Figure 1 is a perspective view of a molding pan employed in producing the rubber mold.

Figure 2 is a diagrammatic view of a hydraulic press in which the molding pan is secured during the molding operation.

Figure 3 is a somewhat diagrammatic perspective view of a cradle designed for supporting the flexible mold during the electrolytic deposit of metal thereon.

Figure 4 illustrates an alternative form of support for the mold in producing a flat printing plate or shell.

Figure 5 is a specially designed cathode hook for suspending the mold during deposition.

Figure 6 is a somewhat diagrammatic view of a special form of anode employed in producing curved electrotype plates in accordance with this invention.

Figure 7 represents in perspective a yielding form of retainer for securing the deposited shell in position in a holder for tinning.

Figure 8 is a diagrammatic view showing the shell in a position for the tinning process.

Figure 9 is also diagrammatic and shows the shell in a casting box for the addition of backing metal.

Heretofore it has been standard practice in electrotyping to set up the original material consisting entirely of type matter or engravings, or partly of type and partly of "cuts" in a chase which secures it in flat form, and then to produce an impression in wax by covering the printing face of the original with a quantity of wax and applying enormous pressure thereto. The wax is then separated from the original matter and "black-leaded" or dusted with graphite which gives it an electrically conductive surface. Upon immersion of the wax impression in an acid plating bath, and the application of electric current, a thin layer of copper or other suitable metal is deposited electrolytically on the wax. The plating, when stripped from the wax, reproduces the impression which was made in the wax by the original, and this plating, when suitably filled with additional metal and backed up for use in a printing press, constitutes substantially a replica of the type and cuts which made up the original.

The wax impression process is reasonably satisfactory for producing a flat printing plate, but the separation of the wax from the deposited plate of metal involves breaking up the wax form so that it cannot be used again; and any attempt to curve the electrotype plate by bending it after it has been formed results in a considerable stretching of the printing face, involving distortion to some extent, because the stretching does not occur uniformly throughout the plate. In some instances this stretching amounts to as much as $\frac{3}{8}$ of an inch in a plate 19 inches long. A similar process is sometimes employed in which the impression is molded in lead instead of in wax.

The present invention substitutes for the wax a relatively thin sheet of rubber or like synthetic material which is molded to form an impression of the original printing face. The rubber or composition is placed in a molding pan, 1, which contains the chase, 2, and its type or printing plates, 3, preferably so arranged that the original of the printing face forms the bottom of the pan. The pan is strongly constructed of metal, and its side walls near the top may be provided with overflow vents, 4. One of said sides, 1^a, is made removable to facilitate separation of the molded rubber from the original. A cover, 5, is placed on the pan after it has been substantially filled with the rubber composition, and the covered pan is then fitted into a suitable hydraulic press, 7, having jaws or pressure plates, 8 and 9, arranged to be heated by steam or electricity, so that heat may

be applied to the material in the pan, 1, while the cover is held in place under suitable pressure.

The rubber or other composition is such that after the molding and vulcanization which results from the application of heat in this manner, the material will stand relatively high temperatures without melting and without modification of its form, and when removed from the press the molded sheet of rubber composition embodies in one surface a faithful impression of the printing face of the original type and plates, 3. For use in the plating bath of the electrotyping process the rubber must be substantially acid-proof, and to avoid chemical interaction with the metal deposited upon it, it should be clear of free sulphur. By reason of the vulcanization the impression of the type face and plates forming the bottom of the molding pan is unusually durable as formed in the rubber, so that the sheet may be handled without danger of altering or breaking this impression.

Preferably, the face of the type or engravings which form the bottom of the molding pan is separated from the rubber during the molding operation by any suitable smooth, thin and continuous material, such as the commercial nitrocellulose composition known as cellophane; this results in an extremely smooth impression in the rubber matrix when formed. A similar result may be secured by employing a sheet of rubber or synthetic composition having one face treated with a thin coating of sodium silicate or glycerine, or with a mixture of graphite, sodium silicate and glycerine, or with collodion or other cellulose solution, and placing the rubber or other material with the treated face against the type or engraving from which the impression is to be taken. If cellophane is employed, it separates from the rubber as soon as the molding operation is completed; but the other materials mentioned simply have the effect of giving the rubber mold an extremely smooth surface. It is also desirable to spray the entire form at the bottom of the molding pan with a solution of soap and water, or sugar and water, preferably pre-heating the molding pan sufficiently to cause it to evaporate the moisture readily from the solution, leaving a film on the type face or engraving which acts as a parting material or releaser to prevent the rubber from sticking to the metal after the molding operation.

The rubber composition is such as to provide sufficient resilience to permit the molded sheet to stretch and return to its original shape, so that in stripping the molded sheet from the type face whose impression has been formed in it, the rubber may be freed from the various indentations and conformations of the type face by temporary stretching or local deformation, but without any actual breakage in the rubber surface.

Upon removal from the molding pan the sheet of rubber composition carrying the impression of the type face, and hereinafter called the "mold", is placed in a depositing frame in which it is to be supported in the electroplating bath. If the printing plate is to be used on a rotary press, and therefore is required to be curved to conform to the cylinder, the mold is placed in a curved frame or cradle such as that shown at 10 in Figure 3. This cradle is preferably composed of hard rubber or similar composition, and its concave surface is formed of screen cloth, 11, or other reticulated material, spaced away slightly from the con-

cave wall of the cradle itself. An air vent, 10^a, extending through the cradle, is connected with any suitable source of suction for creating a partial vacuum to pull the flexible rubber mold sheet, A, smoothly against the screen, 11, to give the desired concave form preparatory to deposition of the metal upon it. The edges of the mold are sealed to the cradle or frame, 10, by the use of wax or putty to form an air-tight chamber under the mold to permit this action of the suction. It will be understood, of course, that the mold sheet is placed with its impression surface, A¹, exposed inwardly,—that is, in concave form, as seen in Figure 3.

When the mold, A, has thus been secured in place, its exposed surface is thoroughly cleaned with alcohol or other suitable agent; then, preferably, the mold is warmed so that when its impression face is treated with a releaser such as a soap or sugar solution, or an emulsion of albumin, the liquid will be readily evaporated from the surface. Pulverized dry mica is also effective as a releaser. When the mold is thus prepared the cradle, 10, is placed in a blackleading machine designed for applying a thin coating of graphite to the entire exposed concave surface. Metallic conductor buttons, 12, disposed in the frame or cradle, 10, are exposed adjacent the edges of the rubber mold, A, for contact with the graphite layer, and said buttons, 12, are electrically connected by a continuous conductor 13, which may be embedded in the cradle, 10, as indicated in dotted outline to insure proper distribution of the electric current to the entire area, A¹, of the mold, A, when the frame, 10, is placed in the plating bath. After the graphite has been applied by the blackleading machine the frame, 10, is washed on the outer or back surface and around its edges with water to remove any excess of graphite and thereby render the frame non-conductive everywhere except on the surface where collection of metal is desired.

If the printing plate is to be employed on a flat bed, the mold, A, is secured in a flat frame instead of in a curved frame, as shown in Figure 3, and the process is otherwise the same. Such a flat frame is shown in perspective at 15 in Figure 4, with a flat screen cloth support, 16, for the rubber mold sheet. If desired, a continuous inset bead or rim, 17, of metal may be substituted for the contact buttons, 12, of Figure 3, for distributing the current to the blacklead surface of the mold. The screen, 16, is depressed somewhat below the surface of the frame, 15, and said conductor, 17, to facilitate putting the edges of the mold, and a suction vent is indicated at 18 for drawing the mold flatly onto the reticulated support, 16.

When the frame, such as that shown at 10, is fully prepared with the mold secured to it, and properly blacklead, the frame is lowered into the plating bath in which it is supported preferably by a specially formed cathode bar of the type illustrated in Figure 6. The main portion of the bar is T-shaped, comprising a cross member, 20, notched or grooved near its ends at 21 to rest upon suitable conductor rails associated with the plating tank, and having a vertical portion, 22, formed with a hook, 23, at its lower end to support one end of the cradle or frame, 10. A pair of diverging legs, 24, rigidly attached to the portion, 22, of the T-shaped bar are formed with hooked lower ends at 25; this form of cathode provides a substantially rigid

support for the frame or cradle, 10, which, being composed of relatively light non-metallic material would otherwise have less stability in the constantly agitated plating bath than the copper or lead "cases" which are commonly employed to support a wax mold. Above the junction of the legs, 24, with the part, 22, a slip ring, 26, is carried on the latter part to cooperate with a spring clip, 27, which emerges from the insulated surface of the part, 22, for engagement with one of the contact buttons, 12, of the frame, 10, or the metallic molding, 17, of the frame, 15, for transmitting the current to the graphite surface of the mold. It will be understood that the T-shaped cathode bar is composed principally of conducting material, but that its surface for the most part is encased in the insulating material, and, of course, if desired, the lower end portion of the part, 22, as well as the diverging legs, 24, may be of non-conductive material. The provision of the connected contacts, 12, or the continuous conductor, 17, eliminates any need of leading the current to several points on the mold by separate leads from the cathode connection,—the single clip contact, 27, being quite sufficient to supply the necessary current.

When a curved shell is to be formed by the employment of a mold supported on a curved frame, such as 10, a specially formed anode should be provided to insure uniform deposition of the metal. Such an anode is shown in Figure 6 as comprising a body of metal in the form of a half cylinder, 30, which is suspended from a conductor rod, 31, extending to suitable conductor rails, 32, at opposite sides of the tank, in such manner that the convex surface of the half cylinder is disposed opposite the concave graphited surface of the mold, and in substantially coaxial relation thereto, so that the radial distance from any portion of the anode surface to the mold is substantially equal over the entire area of the mold. Upon closing the circuit so that the electric current flows through the plating bath from the anode, 30, toward the cathode member, the metal of the anode will be transferred, in a well understood manner, to the graphited surface, A¹, of the mold, A, and depending upon the time during which this deposit continues a metallic shell of greater or less thickness will be formed whose surface adjacent the impression surface, A¹, of the mold will be substantially a replica of the original surface which formed at the bottom of the molding pan, 1.

When a comparatively thick shell is formed, it may be removed from the mold before the additional metal, which serves as a backing, is cast into it, but if the shell is quite thin it may be left in the mold until after the backing is applied. For example, if the deposited shell is of chromium, say, .0002 inch thick, it may be dipped in a zinc or tin solution for building up a metal backing instead of employing acid and soldering tin. The rubber mold will be left in place on the thin chromium shell during this operation for keeping the printing face covered, and also tending to preserve the proper shape of the shell.

In most instances, however, particularly when the shell is thick enough to stand removal of the mold, the concave surface of the shell is covered with a thin layer of tin to provide a suitable bond with other backing metal. The shell, shown at B in Figure 8, is placed in a tinning oven of any suitable design, its concave surface, B¹, being first cleaned with acid and then overlaid with sheets of tinfoil, 42. The tinfoil is temporarily

and sufficiently held in place as by means of the spring holder frame, 43, consisting of several parallel arcuate bars or straps, 44, of spring metal, yieldingly forced into the shell, B, so as to pinch the edges of the tinfoil sheets adjacent the edges of the shell, as shown. By the application of heat in the oven the tin melts and unites with the concave back of the shell. Preferably, the shell is supported in the oven for rotation substantially about the axis of its cylindrical form, and heat is applied along the line as by a gas burner indicated at 45. The shell is turned slowly to a half revolution in the direction indicated by the arrow, 46, so that the tin is melted only adjacent the line of the gas flame and solidifies promptly as this portion of the shell is shifted away from the source of heat. The shell may then be placed in a casting box, such as that conventionally indicated at 50 in Figure 9, which includes a concave surface, 51, against which the convex printing face of the shell, B, is supported. Preferably, heat is applied to this part of the casting box to bring the temperature of the shell, B, to equal the temperature of the metal which is to be applied as a backing so as to prevent excessive shrinkage from tending to separate the backing from the shell, or to distort the shell itself. The casting box includes a suitable core member, 52, which limits the thickness of the backing metal, 53, as required.

When the casting operation is completed and the plate comprising the shell, B, with its backing, 53, is removed from the casting box, it may be finished up in a suitable boring machine arranged for taking a rough cut and a finishing cut, and if necessary, the curvature may be finally rectified by the "bumping" process, or by means of a hand hammer. The plate is then ready for printing service on a press.

The formation of the mold from rubber or synthetic material of similar qualities, provides an impression surface which is both tough and elastic, and thus permits of its repeated use in making any desired number of shells, each of which will be a duplicate of the original type or plate matter and thus accomplishes a considerable reduction in the expense as compared with the use of wax or lead molds where duplicate plates are wanted. It will also be appreciated that the strength and durability of the rubber mold renders it possible to ship the mold itself instead of shipping zinc or copper etchings to various points at which duplicate printings are to be made. Furthermore, a mold of this character may be preserved and filed as a record and can be used over even after long periods of time. Therefore, in my claims the term "rubber", if used alone, is intended to embrace equivalent materials having the qualities herein indicated.

It will be recognized that for some classes of work a paper matrix may be produced substantially by the foregoing process instead of making the matrix of rubber or other elastic material. The paper matrix will be sufficiently flexible so that it may be curved previous to the deposit of a shell in the formation of an electrotpe; but in general it is found that the rubber or material of this character, since it is rendered somewhat fluid by the application of heat will reproduce the original printing face more faithfully than it can be reproduced in paper material by the application of pressure, even though the paper stock may be moistened and softened with water or steam in preparation for the impression.

It may also be noted that if the rubber or composition mold be composed of a material adapted to withstand considerable heat, say, 600 to 700 degrees F., it may be employed for the formation of stereotype plates which are cast from molten type metal, and will produce a plate of finer quality than has been possible heretofore by the process employing a paper matrix. The rubber mold or matrix reproduces with almost perfect fidelity the extremely fine lines of half-tones, as well as all type faces.

One of the most important advantages of employing rubber or similar composition as the material of the mold is that it can be made to take the type face impression without the application of the enormous pressure which is required in making the mold of wax or the even greater pressure required for making a lead mold. With the latter materials the type face is frequently distorted by the pressure, so that a second impression cannot be taken, and in some cases the type is even broken down and the entire form must be reset before a successful impression can be made.

I claim:

1. A flexible and elastic matrix of vulcanized rubber to serve as a mold for electrodeposition, bearing in one face the reversed impression of a desired printing face with the bottom areas of said impression lying substantially in a common plane, said matrix, due to its elasticity, being adapted to have electrolytic deposits made upon its said face repeatedly and stripped therefrom without injury to the matrix or to the electrotype shells thus formed.

2. A matrix for producing a curved electrotype which consists in a flexible mat of vulcanized rubber supported to form a segment of a cylindrical surface, the concave side of said mat having a reversed impression of the desired printing face and being adapted to receive an electrolytic metallic deposit to serve as a final printing plate, the flexibility of the rubber mat permitting it to be stripped off from the electrotype thus formed without distortion of said metallic member or permanent injury to the mat.

3. The method of producing a curved electrotype which consists in providing a mold with a substantially flat bottom having the desired printing face formed therein, placing on said mold bottom a quantity of rubber and applying heat and pressure thereto to form in one surface of the rubber a reversed impression of said printing face, vulcanizing the rubber mat thus formed but leaving it flexible and elastic and removing it from the mold, placing the mat on a curved support and electrolytically depositing a suitable metal upon the said reversed impression of the rubber, and thereafter stripping the rubber from the metallic printing plate thus formed.

4. The method of producing a curved electrotype which consists in providing a mold with a substantially flat bottom having the desired printing face formed therein, placing in the mold a quantity of flexible and elastic material, and applying moderate pressure thereto to form a reversed impression of the printing face in one surface of said material, treating said material to render it tenuous but leaving it in the form of a flexible and elastic mat, and removing it from the mold, placing the mat on a curved support, and electrolytically depositing a metallic shell upon the said reversed impression, and thereafter stripping the flexible material from the shell and backing the latter with metal to form a printing plate.

5. The method of producing a curved printing plate which consists in providing a molding pan having its bottom surface formed with the desired printing face, placing in said pan a quantity of rubber gum or like synthetic material, and applying heat and pressure thereto for molding said material into a flexible and elastic matrix bearing the impression of the printing face in one surface, removing such flexible matrix and supporting it on a curved form with the said impression presented in a concave surface, depositing thereon a layer of metal to form a convex printing face and then separating said metallic layer from the matrix and backing up said layer with additional metal.

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