Nov. 22, 1927. 1,649,876

J. J. WALSH

METHOD OF MAKING ELECTROTYPES

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Fig. 1.

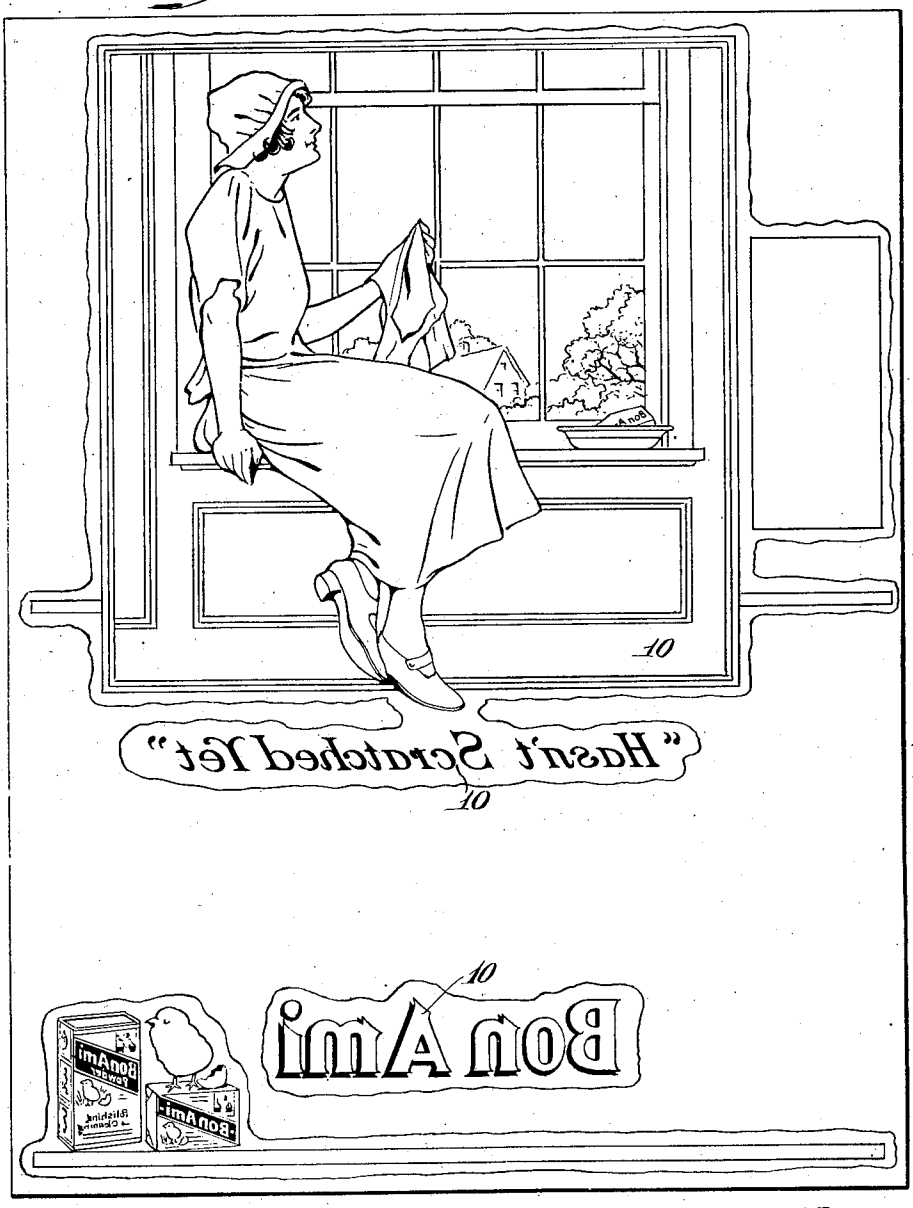
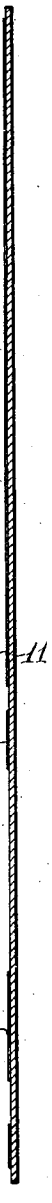


Fig. 2.



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Fig. 5.

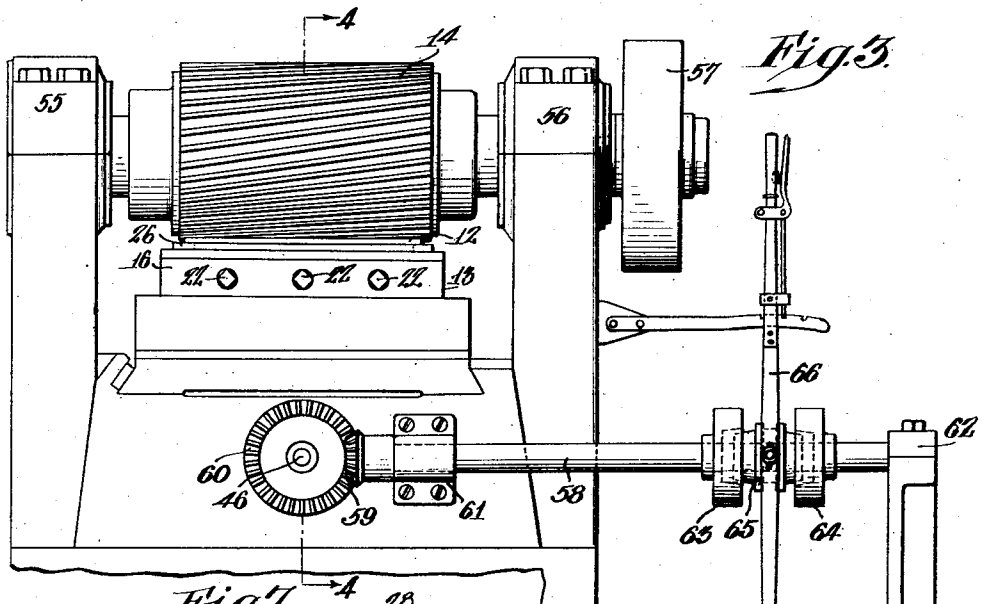


Fig. 7.

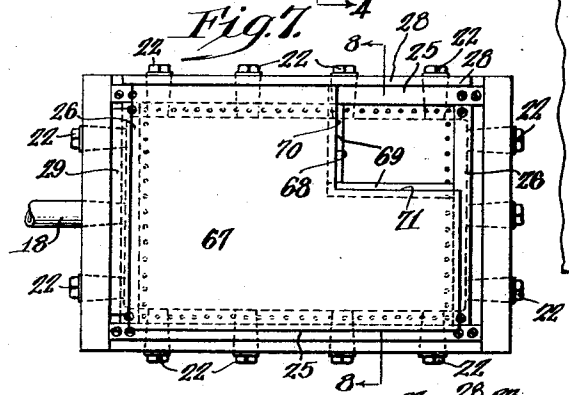


Fig. 6.

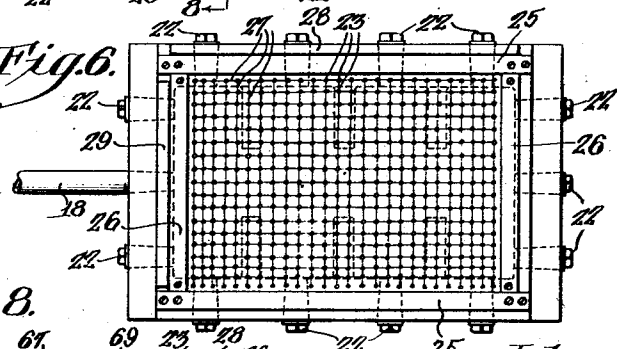
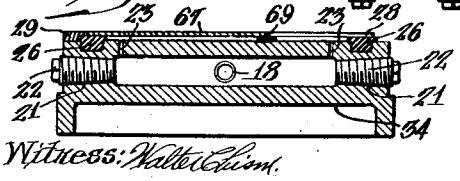


Fig. 8.



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METHOD OF MAKING ELECTROTYPES

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Fig. 4.

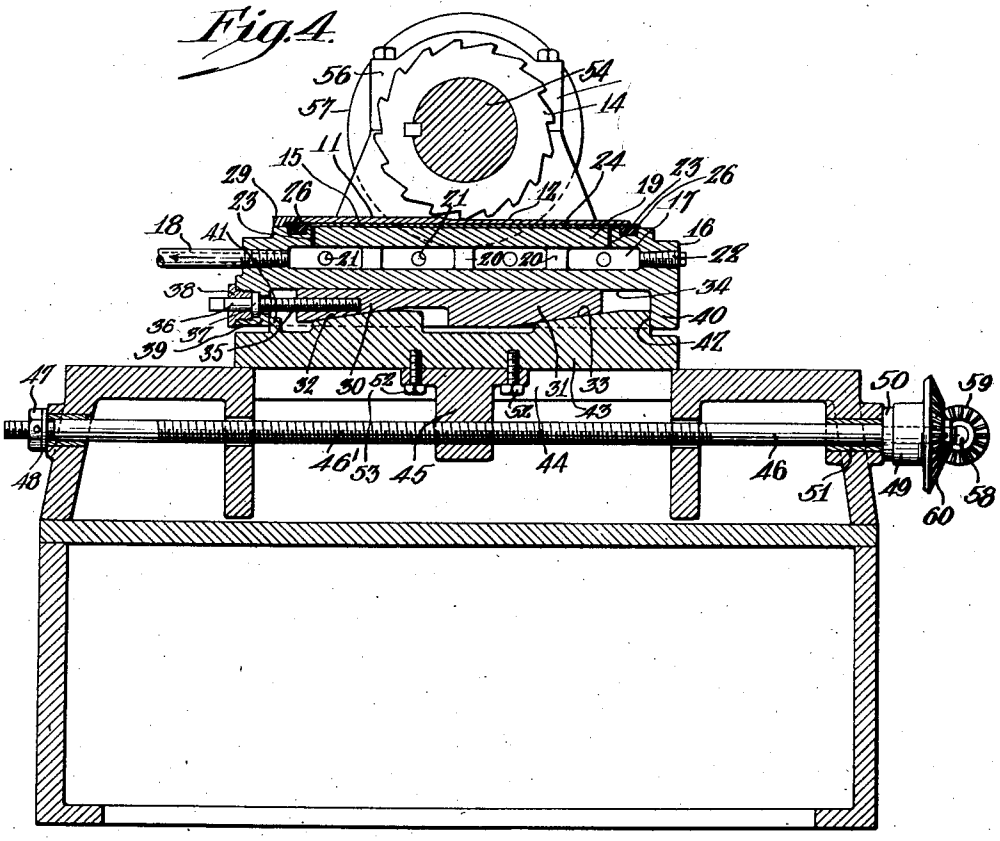
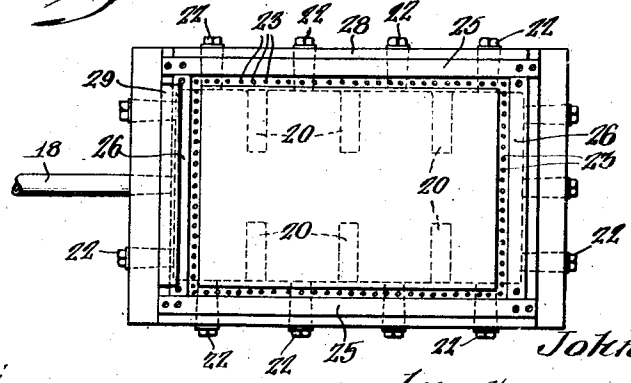


Fig. 5.



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METHOD OF MAKING ELECTROTYPES

Filed Nov. 7, 1924 4 Sheets-Sheet 4

Fig. 9

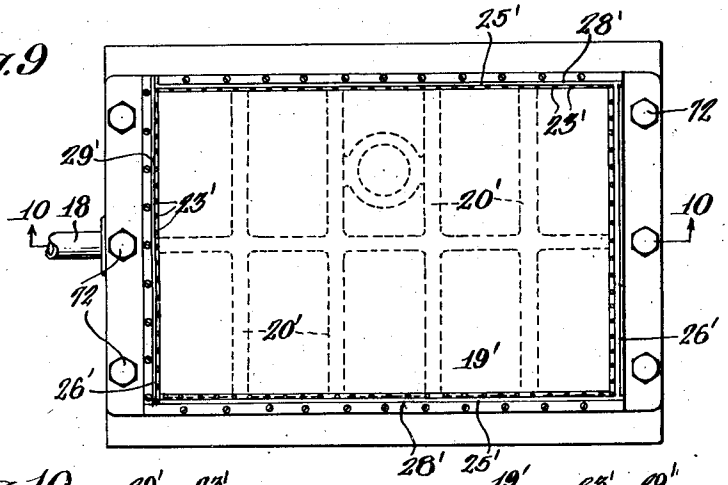


Fig. 10.

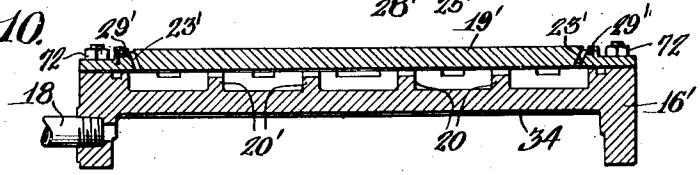


Fig. 11.

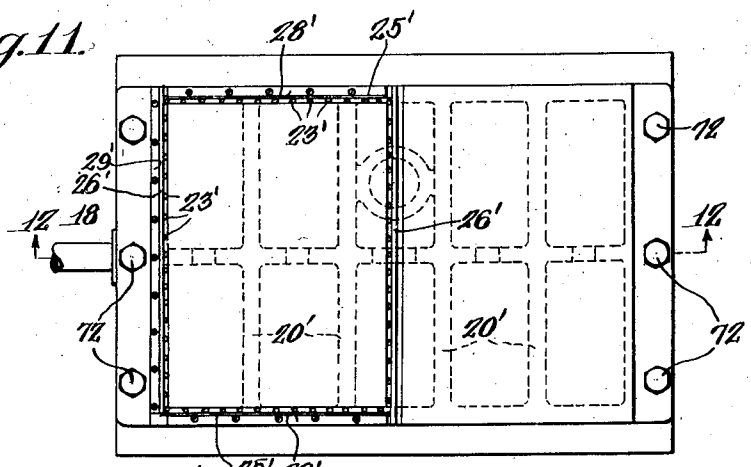
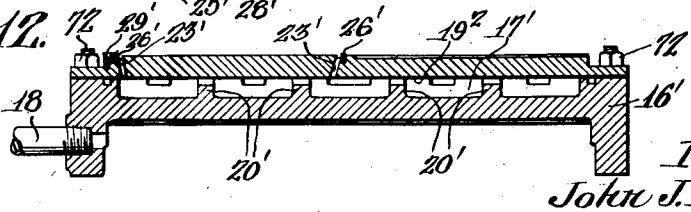


Fig. 12.



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Patented Nov. 22, 1927

1,649,876

UNITED STATES PATENT OFFICE.

JOHN J. WALSH, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO ROYAL ELECTROTYPE COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

METHOD OF MAKING ELECTROTYPES.

Application filed November 7, 1924. Serial No. 748,413.

My invention relates to the art of production of electrotypes for use in printing.

In general practice lead moulded electrotypes require for their production a copper original engraving which is almost universally .063 thickness.

The main purpose of my invention is to provide copper-backed duplicate originals in the form of master electrotypes from which electrotypes may be made in quantity and to the best advantage.

A further purpose is to duplicate engravings and photo-engravings, cuts of any kind and also type metal, separately or together in such form as to be equally as effective and harder than original engravings for the production of electrotypes.

A further purpose is to back an electrotype surface by hard material in rigid and uninterrupted engagement therewith and to utilize the stiff hard plate so produced for the production of electrotypes, making the thickness of the plate equal to the thickness of backed electrotypes so that where it does not include the entire printing surface it may be used along with other cuts to complete the printing surface.

A further purpose is to finish the back of an electrotyped plate to the required thickness, whether the electrotype be intended as a master or as a printing electrotype, while the back is held by a suction chuck.

Figure 1 is a front face view of an electrotyped plate, which may be either printing or master, to the making of which my invention may be applied.

Figure 2 is a section corresponding to line 2—2 of Figure 1 and showing a master plate.

Figure 3 is an end elevation of one form of machine capable of finishing plates by my invention.

Figure 4 is a section of Figure 3 taken upon line 4—4 thereof.

Figures 5 and 6 are top plan views of different forms of clutch face that may be used in the machine of Figures 2 and 3.

Figures 7 and 8 are a reduced scale top plan view and a section thereof upon line 8—8 of a cover construction which may be used when smaller electroplates, printing or master, are being cut.

Figures 9 and 11 are top plan views of slightly modified chucks for full sized and small sized electrotypes, respectively.

Figures 10 and 12 are sections of Figures 9 and 11 upon lines 10—10 and 12—12, respectively.

In the drawings similar numerals indicate like parts.

Reproduction of electrotypes from other electrotpyes where lead molding (for color work, for example) is required has been unsatisfactory because of the soft character of the backing of the initial electrotypes, soft spots in the backing, the distortion of the picture caused by the pressure incident to lead molding and the consequent impossibility of making successive electrotypes which are exact duplicates. Electrotypes from electrotypes have therefore been limited to such as electrotyped type matter, and composite matter in which the distortion will not be noticed and in which no registration is required. The initial plate has usually been made by wax process or has contained a wax process plate.

The backing with harder metal of a plate having a positive printing surface such as an electrotype has hitherto proved to be difficult if not impracticable because of the injury to the printing surface which has been entailed in the finishing of the backing to give uniform and proper thickness to the finished plate.

I have discovered a way by which an electrotype plate can be backed reliably and can be surfaced to thickness without injuring the printing face.

Though the best results are obtained by lead molded electrotype work, as in the case of all electrotyping where the lead sheet can be used, my invention is applicable to electrotypes which have been made by wax molding processes also and offers special advantages with these for some classes of work.

Because of the prior inability to make successful duplicates of master electrotypes or other copies the making of a large order for electrotyped work to be used about the country has generally required the production of an original engraving or photo-engraving for each locality in which the elec-

trotypes are to be used in order that electrotypes may be made from it, or the supply from one locality of all of the electrotypes intended to be used.

By my method master electrotypes can be furnished which are exact duplicates of the original engravings or cuts of any character or type or of a combination of these and which are capable of standing the same pressures and treatment as that to which original engravings may be subjected and very much more severe pressures and treatment than that to which the other cuts and type metal could be subjected.

In carrying out my invention I make an impression in lead or in wax and hang this impression in the electrotyping bath to coat it as in the case of an electrotype, making the wax surface conductive in the case of a wax mold as in all wax molded electrotyping work. However, instead of stopping the electrolytic deposit at the usual thickness of approximately seven thousandths of an inch and backing up the copper shell thus made with electrotype metal to the printing thickness required, I deposit a thickness of metal, preferably copper, such that there shall be room to take a finish cut from the back and leave a final thickness equal to the standard thickness of an engraved plate, that is sixty-three thousandths of an inch. I find that seventy-three thousandths of an inch at the low spots is ample thickness to allow for this finish cut. The cut may be nickel-faced and is very hard.

It must be remembered that I am dealing with positive printing surfaces which are peculiarly subject to injury by reason of pressure against them and that I must therefore take special care to prevent the injury to the face in finishing the back, which injury to the face has been the controlling difficulty in prior efforts to produce such a plate.

In the plate seen in Figures 1, 2 and 3 the printing surface is shown at 10, the back of the plate is deposited at 11 and the level 12 shows the depth to which the back of the plate must be removed to produce the finished thickness desired.

Where the master plate finished is that of an engraving or cut and is intended to take the place of the engraving or cut in a complete plate made up in part of other electrotypes, it is very desirable that the master plate produced by my process shall have the same thickness as that of other engravings and this has led me to standardize the thickness of my finished plate as engraving thickness, notwithstanding that the greater part of my invention is independent of this.

In cutting off the surplus metal from the back of the plate I utilize a planer 13, intended, except for its chuck, to be typical of such machines suitable for cutting the metal, preferably copper, of which the back of the plate is composed. Because the milling cutter does more rapid work and gets more uniform pressure upon the plate cut than diamond point and other ordinary planer tools, I have preferred to illustrate the cutter 14 as a milling cutter though I have successfully tried other tools.

The plate is held face downwardly upon the surface 15 of a vacuum chuck 16 and is protected from direct contact with the chuck face by a coating of relatively soft protective metal or celluloid for which I have found a zinc sheet sixteen thousandths of an inch thick well suited. The chuck 16 is hollow at 17 to provide a vacuum compartment from which the air is exhausted through pipe 18. For structural reasons the roof 19 of this vacuum compartment is supported at intervals by ribs 20. Core openings 21 are shown as plugged at 22. Openings 23 pass through roof 19 communicating with the chuck face. In Figures 4 and 5 these openings are shown as in generally rectangular arrangement, near the outer border of the largest electrotype to be handled. The comparatively free leakage of air inevitable along the surface of the chuck between it and the zinc sheet 24 permits placing these openings beneath the zinc sheet if desired or they may be, as shown in these figures, just beyond its edge.

About these openings, along the sides and ends, I place sealing strips 25, 26 which come together at the edges to form a complete surrounding seal. They are preferably imbedded in the material of the top chuck as best seen in Figure 4. The distance which they extend above the plate is exaggerated in the figure. They are intended, at the desired sealing compression, to extend above approximately the thickness of the zinc sheet, whose thickness is also exaggerated in this figure.

The zinc sheet preferably but not necessarily stops short of the line of openings 23 so as to leave them as freely open as possible.

I find that it is not essential that the vacuum openings 23 shall be interspersed throughout the surface of the plate, as a good vacuum is maintained between the zinc and the surface of the chuck on the one side and the zinc and the electrotype on the other with the form of chuck shown in Figure 4. I have also illustrated, in Figure 6 a form of chuck in which small openings 23′ are spaced close together all over the plate and in which those openings are for diagrammatic purposes joined by lines 27 to indicate air passage between the openings. In fact, even with the normal planer finish of a surface such as that of the chuck the air passes out freely from beneath the zinc sheet so as to give good vacuum conditions through-

out between the chuck and the zinc, and the spaces between the printing surfaces of the electrotype, including the spaces provided by the mesh of the engraving used, permit thorough evacuation of the air from between the electrotype and the zinc. The printing or master electrotype is thus held down firmly and evenly throughout its entire area by the vacuum. The lines 27, so far as any such passages are needed, are therefore satisfied by the normal variations due to the tool in the usual good planer finish. The master electrotype is fully and uniformly supported by the continuous plane surfaces beneath it.

In order to support the electrotype against movement in its own planes to the left (chiefly) and away from the observer in Figure 4, due to the components of the cutting pressure of milling cutter 14, I provide stop strips 28, 29 engaged by the end and side respectively of the electrotype, which stops may over-lie parts of the rubber sealing strips as in Figure 4.

Vertical adjustment of the vacuum chuck is effected in any suitable manner for which I show double wedges 30, 31 bearing against surfaces 32 and 33 and sliding above against the lower surface 34 of the vacuum chuck. The wedges are fed in or withdrawn by a screw 35 turned by spindle 36 and having a collar 37 pressing against a plug 38. The depending flanges 39, 40 upon the chuck engage with guide surfaces 41 and 42 upon the table 43 to maintain the chuck against movement in the directions of wedge travel.

The table is moved longitudinally along bed guides 44 by nut 45 engaged by screw 46′ of a shaft 46 which is held against longitudinal movement by any suitable means, shown as a nut 47 and washer 48 at one end and by a gear hub 49 and collar 50 at the other end. The frame is bushed at 51 to receive the shaft.

The nut is attached to the table by bolts 52 and travels in a slot 53.

The milling cutter shown is mounted upon a shaft 54, in bearings 55 and 56 and is rotated by belt-driven pulley 57. The longitudinal feed screw 46 is rotated by means of shaft 58 geared at 59 to the gear 60 upon shaft 46. This shaft is 61, 62. The feed screw is driven in either direction at will by oppositely rotating pulleys 63, 64 engaged at will with the shaft by clutch 65. The clutch is thrown into engagement with either by lever 66 latched in any of its three positions.

Where the electrotype to be planed is smaller than the full plate in length or width or in both I provide for holding of the reduced plate in the same chuck, showing one structure by which this can be taken care of in Figures 7 and 8. Here the same vacuum chuck is used and the zinc is placed over the same large part of the surface of the plate as in the other figures or may be cut to leave space for the electrotype. A cover plate 67 is used, fitting over and sealing with the strips 25 and 26 but cut away at 68 to provide sufficient space for the electrotype which is to be planed.

The cover plate 67 rests against the stops 28, 29 and takes the thrust in these two directions. About the edge of the cut away portion I place straight or angular sealing strips 69 which may lie merely upon the chuck between it and the cover plate or between it at the edges and the zinc the rest of the way and the cover plate and also extending into the opening 68 to lie between the surface of the chuck, or chuck and zinc, and the electrotype.

However, the seal may be made against the cover plate so as to seal off and protect from leakage the entire portion of the chuck covered by the cover plate with separate sealing protection for the electrotype.

Where the zinc sheet is interrupted at the opening a separate small zinc sheet will be used here.

The electrotype to be planed in the second form seals against the remaining exposed portions 70, 71 of the sealing strips 25, 26 on the outer sides and along its inner edges seals against strips 69 comprising the separate straight or angular strips as preferred, which lie betwen the chuck and the electrotype or, as to part of the distance, between the zinc and the electrotype. The electrotype is stopped against the exposed edges of the cover plate.

In the forms shown in Figures 9–12 the chuck 16′ is hollow at 17′ and the roof 19′ or 19^2 is supported by ribs 20′. This roof comprises a wholly removable clutch face or top which is replaceable by other tops for special service, such as holding plates of lesser size than standard. Two different tops are shown, that of Figures 9 and 10 for full sized plates and that of Figures 11 and 12 for smaller plates. In each case the top is secured to the base of the chuck by screws 72 and the stop strips 28′ and 29′ are secured by screws to the tops about an end and a side of the operative clutch face.

In each the operative face is outlined by sealing gasket strips 25′, 26′ which are set into the metal of the top, and openings 23′ connect the effective face of the chuck with the vacuum space 17′ within the chuck. The only difference between the form of Figures 9 and 10 and that of Figures 11 and 12 lies in the extent of surface which is outlined by the sealing strips.

The stop strips extend throughout all of one side and end of each, in part unnecessarily in Figures 11 and 12. In Figure 9 substantially the entire surface is a clutch

surface, while in Figure 11 approximately half of the surface is used as a clutch, adapted for a smaller electrotype plate. This substitution of special tops permits the use of tops of special shape to accommodate odd or unusual sizes or contours.

In operation, in making a master electrotype the wax or lead impression is backed electrolytically to form an integral mass sufficiently thicker than the intended finished plate to allow for one or more finished cuts. The plate is then placed face down upon the zinc sheet of the chuck and the air is exhausted from the vacuum chamber of the chuck withdrawing the air from the space between the chuck face and the zinc and also from the space between the electrotype and the zinc sheet. The interstices in the face of the chuck due to its finish cut and between the printing surfaces of the plate permit sufficiently free flow of air for the purpose so that a good vacuum can be obtained and maintained.

The electrotype is placed initially against the stop surfaces so that these take the thrust in the direction of cutter feed relative to the chuck and also in the direction of lateral strain due to the angle at which the cutters operate.

The stops at the side and end are thus effective in holding the plate against all movement parallel to its face.

The plate is then cut to the required thickness, for which I prefer normal engraving thickness, namely .063 inches. During this cutting operation the outer edges of the plate seal against the gaskets in or upon the chuck to prevent leakage of air from the outside and the plate is held firmly to the chuck by the unbalanced pressure of the outside air, i. e., by the difference between the pressure of the air outside and that remaining between the plate and chuck.

Where the backed electrotype plate is smaller than standard and a cover plate is used (Figures 7 and 8) the cover plate seals all of the face of the chuck except the portion corresponding substantially with the size of the smaller plate to be planed and which smaller surface is exposed by the hole in the cover plate. The electrotype plate bears against the edges of the cover plate and the latter bears against the stops, thus taking the thrust of the cut parallel with the face of the chuck.

The electrotype seals against that portion of the normal chuck gasket which is exposed by the cut (part of a side and part of an end). The remainder of the perimeter of the electrotype must be sealed from leakage separately and may be sealed to advantage against the same straight or angular sealing strips as seal the corresponding edges of the opening in the cover plate.

The components of the thrust of the cutting tool parallel to the faces of the electrotype and chuck may be transmitted to the cover plate or directly to the stops according to whether the cut is made adjacent the stops or with a portion of the cover plate intervening between.

With the removable tops for the chuck shown in Figures 9–12 a separate top is provided for smaller plates, the operation with the special top resembling that of Figures 5 and 6 and being clear from the foregoing description.

All that I have said about chucking the electrotype with its face down by suction (i. e., by the unbalanced air pressure above pressing the plate against the chuck) and the cutting of the back of the plate while the electrotype is thus held applies with equal force to what I have termed herein as "master" electrotypes intended to act as originals in the production of other electrotypes with backings of the harder metal such as copper and to printing electrotypes with their backings of electrotype metal or other soft metal, suiting this invention to the routine surfacing of electrotypes in ordinary work as well as to the making of master electrotypes.

It will be sufficiently obvious that the type of metal used for the backing will determine the character of cutting tool most suitable for cutting the metal from the back to bring the plate to the required thickness.

The master electrotypes described correspond absolutely with the engravings or other matter from which they have been produced and make it possible to combine them with cuts or other electrotypes and to reproduce with the same fidelity as from engravings.

It will be obvious that my method has made it possible to duplicate in lead molding for any number of printing electrotypes matter which must be wax molded initially or which will stand a single lead mold impression only, with perfect registration securing good results from typed matter and from composite plates; and that I can duplicate these as well as engraved originals in the form of master electrotypes which duplicate originals can be distributed to electrotypers throughout the country for the production from each of as many electrotypes as may be desired with agreement of the reproductions from the different duplicate originals sufficiently not only for the reproductions from the same originals to register for color work but for the reproductions from different originals to so register.

It will be obvious that in view of my invention others skilled in the art will be able to secure all or a part of the advantage of my invention without using the same form of the invention and it is therefore my intention to include herein all modifications and

changes which come within the reasonable spirit and scope of my invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. The method of making a duplicate original of a positive plate, which consists in making an electrotype of the plate, backing it electrolytically with hard metal to an excessive thickness as compared with the normal unbacked electrotype and surfacing the backing parallel with the face.

2. The method of forming a duplicate original, which consists in backing an electrotype electrolytically to a thickness sufficient to give it stiffness and body and surfacing the back of the electrotype while holding it by vacuum means against movement lateral to its surface and mechanically against movement parallel to its surface.

3. The method of forming a plurality of duplicate electrotypes from a single copy, which consists in making an electrotype of the material to be copied, backing it electrolytically to form a firm plate, cutting away the back to make the backing of the plate parallel with the face thereof and making a plurality of lead process electrotypes from the duplicate original thus formed.

4. The method of making duplicates capable of accurate registration from an original incapable of successive electrotyping without distortion, which consists in making a single electrotyping impression, forming an electrotype thereof, continuing the deposition of metal upon the back of the electrotype until it is thick and strong, planing off the back of the electrotype as formed parallel with the face and making a plurality of lead process electrotypes from the electrotype thus formed.

5. The process of surfacing the back of an electrotype, which consists in supporting the face of the electrotype upon a sheet of soft metal resting upon a flat surface, evacuating the air pressure from between the supporting surface and the soft metal plate and from between the soft metal plate and electrotype, supporting the edges of the electrotype in the direction of thrust against sliding movement of the electrotype parallel with the supporting surface and cutting the back of the electrotype while so held.

6. The method of making lead process electrotypes from copy incapable of standing the pressures of lead process, which consists in making a wax electrotype from the subject matter in question, depositing many times the usual thickness of metal electrolytically upon the back of the electrotype so as to make a thick, firm electrotype, surfacing the back of the electrotype parallel with the face while holding the face to a flat surface by suction, thus producing a master electrotype, and making lead process plates from the master electrotype in the usual way.

7. The method of making a duplicate original adapted to serve the purpose of an original positive plate which consists in making an electrotype of the original, backing it excessively by hard metal to form a firm hard plate and surfacing the back of the plate parallel with its face to sufficient thickness for it to be capable of use in making lead process plates in the usual way.

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