W. J. YEOELL.

PRINTING PLATE MATRIX AND METHOD OF MAKING THE SAME.

APPLICATION FILED DEC. 2, 1920.

1,379,434. **Patented May 24, 1921.**

2 SHEETS—SHEET 1.

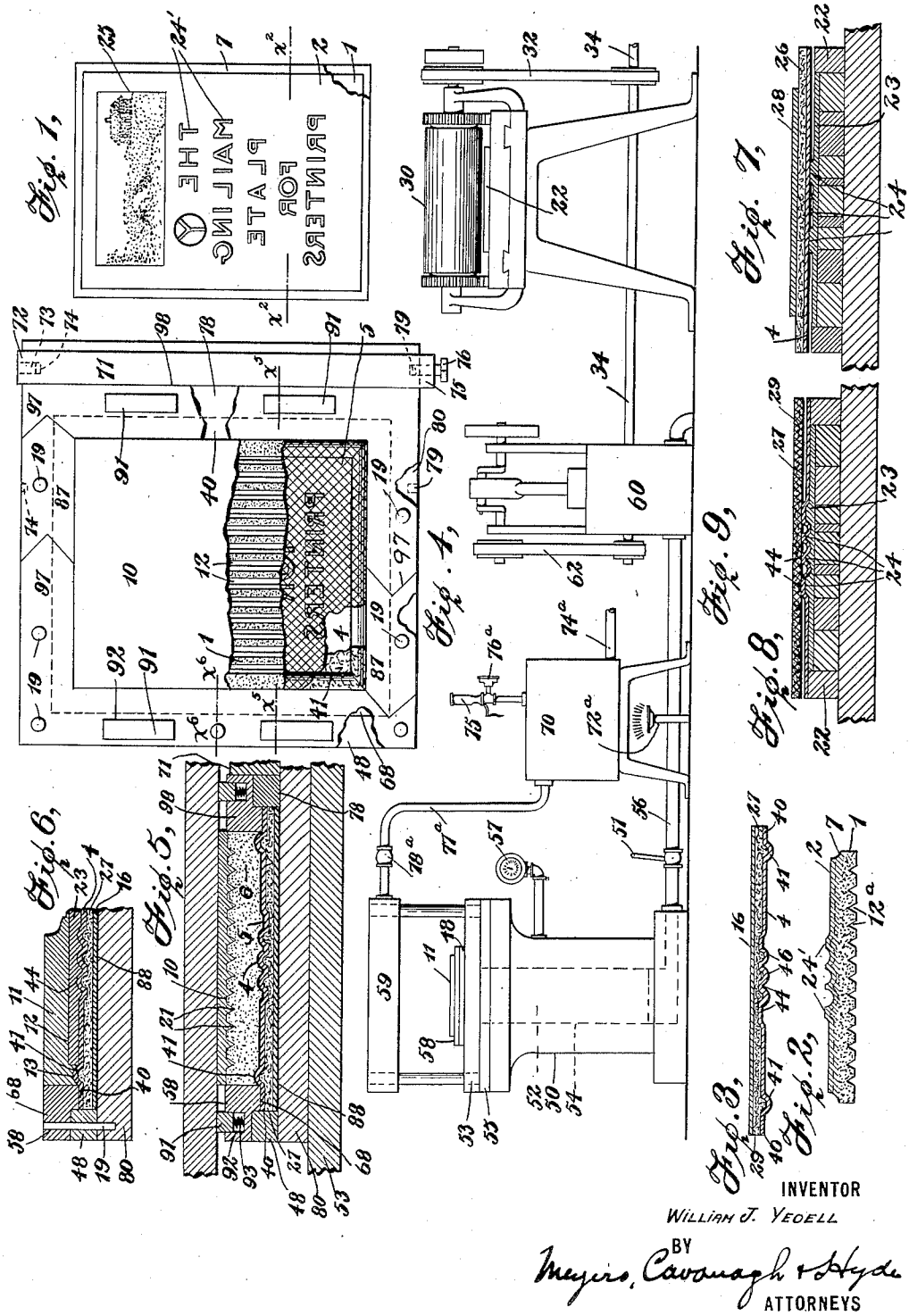


Fig. 1,

Fig. 4,

Fig. 5,

Fig. 6,

Fig. 7,

Fig. 8,

Fig. 9,

Fig. 12,

Fig. 13,

INVENTOR

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BY

Meyers, Cavanagh & Hyde

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2 SHEETS—SHEET 2.

Fig. 17.

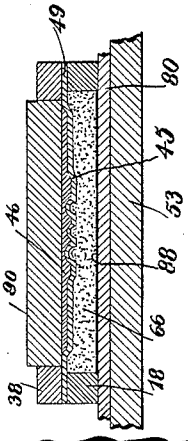


Fig. 12.

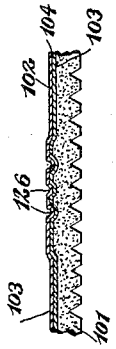


Fig. 10.



Fig. 11.



Fig. 13.

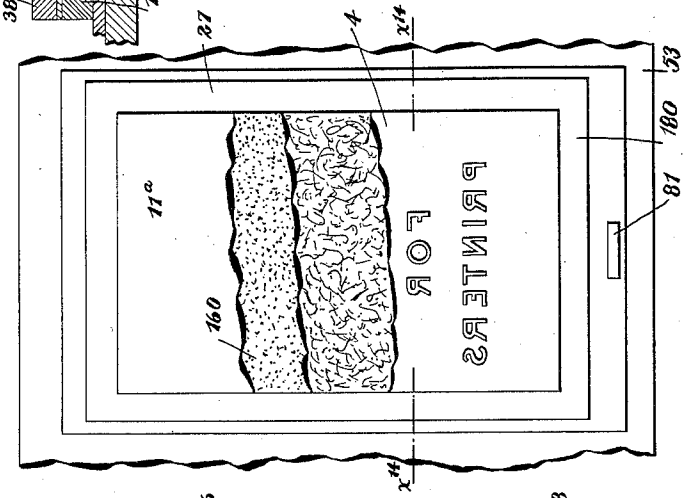


Fig. 14.

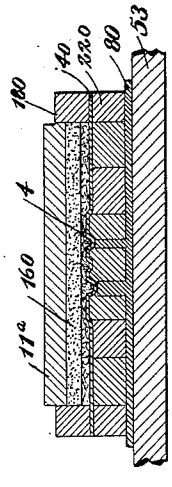


Fig. 15.

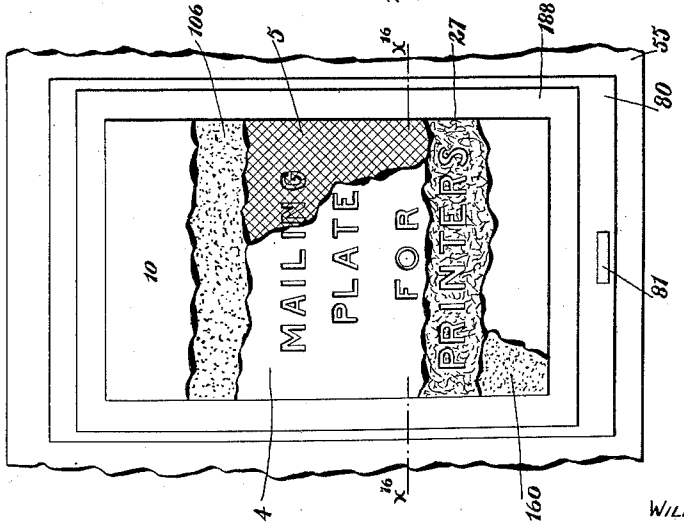
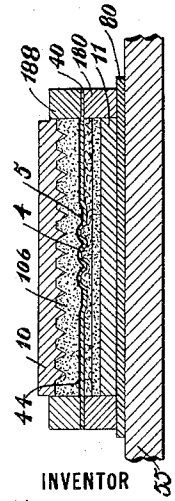


Fig. 16.



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PRINTING-PLATE MATRIX AND METHOD OF MAKING THE SAME.

1,379,434. Specification of Letters Patent. Patented May 24, 1921.

Original application filed August 12, 1913, Serial No. 784,456. Divided and this application filed December 2, 1920. Serial No. 427,833.

To all whom it may concern:

Be it known that I, WILLIAM J. YEOELL, a citizen of the United States, and resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Printing-Plate Matrices and Methods of Making the Same, of which the following is a specification.

This invention relates to the art of printing, and the present case is directed to improvements in printing plate matrices and method of making the same, and is a division of my co-pending application, Serial No. 784,456, filed August 12, 1913.

My matrix is so constructed that it is particularly well adapted for molding printing plates embodying a plastic substance in the nature of a synthetic resin, such as a phenolic condensation product.

Molded printing plates and matrices having a phenolic condensation product as a constituent possess certain manifest advantages over other forms of these articles now in use. For example, the plastic phenolic condensation product may be readily and speedily molded to exact dimensions and under molding operation will accurately reproduce the finest details and characteristics of an original type form or of the matrix employed. Furthermore, after the phenolic condensation product, under the action of molding heat and pressure, has undergone chemical reaction and assumed its usual final, hard and substantially infusible form, it produces a structure of great strength and durability which is capable of resisting stresses, strains and shocks incident to handling, transportation, pressure operations and the like. In addition such an article is not affected by acids or other cleansing fluids generally used in printing offices for cleaning the printing equipment, and the article will have but a fraction of the weight of a similar article made of metal and may be therefore advantageously mailed because of the lower rate of postage required.

It is also my purpose to provide a matrix for printing plates comprising, in a unitary structure, a replication of original printing characters as widely different as type and half tone plates.

I also propose to provide a simple, efficient and economical method through the practice of which my matrices may be produced with a minimum expenditure of time, labor and cost.

With the above recited objects and others of a similar nature in view, my invention consists in the improved matrix and in the method of making the same set forth in and falling within the scope of the appended claims:

In the accompanying drawings:

Figure 1, is a plan view of a printing plate such as may be molded with my matrix.

Fig. 2, is a view of the plate in vertical section, on the line X^2—X^2, Fig. 1.

Fig. 3, is a cross sectional view of my preferred form of metal-faced matrix.

Fig. 4, is a plan view, with parts broken away, illustrating the assemblage of the plate and matrix, and coöperating appliances at the time of molding a plate.

Fig. 5, is a cross sectional view taken on the line X^5—X^5 of Fig. 4.

Fig. 6, is a fragmentary detail view, in vertical section, on the line X^6—X^6 of Fig. 4 and showing the final stage in the preparation of the plate-molding matrix.

Fig. 7, is a vertical sectional view taken through a type form and showing one of the preliminary steps of forming the matrix.

Fig. 8, is a view similar to Fig. 7 and showing another step in the formation of the matrix.

Fig. 9, is a view in front elevation showing conventionally a press and certain cooperative devices which may be used in producing my invention.

Fig. 10, is a vertical sectional view of a printing plate having a sheet metal surface formed by the adherence of the metal face of the matrix.

Fig. 11, is a sectional view showing the stripping of a plate.

Fig. 12, is a cross sectional view of a modified form of plate.

Fig. 13, is a plan view, partially broken away, and showing a modified arrangement for producing a matrix.

Fig. 14, is a cross sectional view taken on the line X^{14}—X^{14} of Fig. 13.

Fig. 15, is a plan view, partially broken

away, and showing a modified arrangement for producing a printing plate with the matrix of Figs. 13 and 14.

Fig. 16, is a cross sectional view taken on the line X^{16}—X^{16} of Fig. 15.

Fig. 17, is a cross sectional view showing a further modification in the manner of making a matrix.

Before entering into a detail description of my invention I will briefly state that my matrix is provided with a metal molding face formed by pressing or swaging a metal sheet against a body of type, half tone, etching, or a combination of these, thus producing in the metal face sheet characters complemental to the printing characters of the original type form. This metal face is backed up and the matrix finished as hereinafter described. I then use this metal-faced matrix for molding my printing plate which, in its preferred form as herein set forth, comprises a metal printing face backed by a body of a baked or hard and set phenolic condensation product. The printing plate may be made in a number of ways as by coating the molding face of the matrix with a suitable material having a metalliferous content, as example a paste containing a powdered zinc, and thereafter applying the phenolic condensation product in suitable commercial form either powder or sheet to the coated surface of the matrix and applying pressure and heat until the phenolic condensation product has been molded to the desired contour and shows a metal printing face incorporate therewith or formed thereon, the resultant printing face being in all respects a negative replica of the matrix.

Reference will first be made to Figs. 1 to 9 inclusive of the drawings in order that an understanding of the preferred form of my invention may be had.

The complete printing plate which may be made with my matrix, is illustrated in Figs. 1 and 2 and embraces a body or base 1 of a non-metallic material such as a phenolic condensation product having a metallic face 2 which in the present instance contains a reproduction of letters, shown at 24′ and of a half tone as shown at 25, thus constituting a printing surface.

My preferred form of matrix is best shown in Fig. 3, and as illustrated comprises a metal sheet 4 having type forming depressions or intaglios 44 formed therein and separated by the convexly rounded interstitial webs or elevations 46.

The metal sheet 4 is also preferably formed adjacent its marginal edges 40 with the marginal beads 41. The metal sheet 4, as thus formed constitutes the molding face of the matrix and is backed with a layer of fibrous material, such as blotting paper, as shown at 27. This fibrous material is impregnated with a shellac or varnish as indicated at 29, and the exposed face of this sheet 27 is coated and leveled with a layer of hard and plastic material, such as plaster of Paris or the like, as shown at 16.

In making this metal-faced matrix I proceed as will best be understood by reference to Figs. 7 and 8. I provide a type form 22 carrying the original printing element to be reproduced, such as a printing plate 23. This original printing plate may be made up, for example, of letter characters 24 which will ultimately be reproduced in the letters 24′ of the molded printing plate shown in Fig. 1, and the original plate may also contain a half-tone which will ultimately be reproduced in the half-tone printing surface section 25 of said molded printing plate. Upon the original form thus constituted I place the metal sheet 4 which is to be manipulated to form the molding face of the matrix. This sheet 4 may be in the nature of a thin layer of steel, brass, zinc, or other suitable metal which is capable of being rolled or forced into the interstices of the original to be reproduced. Upon the metal plate 4 I then place a blanket of felt or other suitable material as shown at 26, and back this with a sheet of harder material such as a smooth, calendar cardboard indicated at 28. Parts thus assembled as shown in Fig. 7 are then passed through a suitable roll press, such as shown at 30 in Fig. 9, with the result that the metal sheet 4 will be rolled or pressed into the original plate 23. The roller press 30 in the present instance is actuated by a belt 32 from a shaft 34 driven by suitable source of power (not shown).

The matrix thus partially produced is now ready for the next step in its formation. This step consists in sharpening the definition of the intaglios or depressions of the matrix, as it is upon the clearness of these that the printable quality of the molded plate to a great measure depends. To effect this sharpening of the intaglios or type-forming depressions of the matrix face I remove the felt blanket 26 and the cardboard 28, and substitute therefor the fibrous sheet or blanket 27, impregnated with a sharpening medium such as varnish or shellac, as shown at 29, and as heretofore mentioned. The metal matrix sheet 4 is of course still upon the original type form. The parts, assembled as shown in Fig. 8, are now passed through the roller press 30 with the result that the sheet or blanket 27 will draw the thin sheet of metal 4 more closely over and into intimate relation with the corners of the printing characters of the original plate, thus reproducing faithfully all of the details and printing characteristics of the original plate 23. In addition to producing every salient characteristic of the original plate the matrix face will be found to have

convexly rounded webs 46 in place of the usual square spaces between type characters, so that there will be no crevices in the matrix to catch and tear material molded thereagainst, and this matrix face will furthermore lend itself to the ready coating with metalliferous paste or the like which may be used for making the metal face of the molded printing plate.

Following this second passage of the metal matrix face 4 through the roll press it will be found that the fibrous sheet or blanket 27 has been rolled or pressed into the back of the metal sheet, and this fibrous sheet 27 is permitted to remain to constitute a support for the metal face 4 and a constituent part of the complete matrix. I prefer to then apply to the exposed face of the fibrous sheet 27 a layer of plastic material shown at 16, which may be composed of plaster of Paris for example, and which may be leveled and hardened to form a coating or back face for the complete matrix.

For the purpose of hardening, leveling and finishing the matrix after it has been coated with the plastic material 16, by the means of a knife or brush, I may employ the apparatus shown in Figs. 4, 5 and 6. This apparatus, which is in the nature of a molding box, comprises a base plate 80, preferably of copper, carrying two rectangular frames, one imposed upon the other, and each formed of an L-shaped normally stationary section and an L-shaped shiftable section reversely positioned relative to the companion stationary section, together with short, removable connecting strips dovetailed with and connecting the companion sections of each frame. The stationary section of the lower frame is shown at 48, the shiftable section at 78, and the dovetailed connecting strip at 77. The stationary section of the upper frame is shown at 58, the shiftable section thereof at 98 and the connecting strip at 87, the dovetailed joints being indicated by the numerals 97. The upper frame is undercut to receive the lower frame, and to provide the depending shoulder 68 as shown in Figs. 5 and 6. Dowel pins 19 secure the stationary frame sections 48 and 58 to each other and to the base 80, and similar dowel pins also connect the shiftable sections of the upper and lower frames, as well as their dovetailed connecting strips to each other and to the base. When the box is to be used for a double column matrix, for example, it will appear as shown in Fig. 4 with the dovetailed connecting strips in use and forming parts of the frame. But when a single column article is to be accommodated, for example, the dowel pins of the shiftable frame sections and the connecting strips are pulled out, such connecting strips removed, and the frame narrowed by moving the shiftable sections toward their companion stationary sections until the companion frame sections are in contact, when a relatively narrow frame will be provided as will be readily understood. The dowel pins may then be replaced in the shiftable sections to hold the latter against movement. A movable abutment bar 71, preferably of steel, is provided, and has at its upper end an overhang 72 with a pin 73 adapted to enter a selected hole 74, of a series of holes arranged along the adjacent edge of the base 80. The lower end of the bar has a similar overhang 75 with a set-screw 76 which can be selectively set in any one of a corresponding series of holes 79 along the bottom edge of the base 80. The abutment bar 71 affords a rigid support against outward lateral displacement of the shiftable frame members, and is operated in an obvious manner, by loosening the set-screw, shifting the bar from one set of holes to another, and then again tightening the set-screw.

The upper frame member is provided with a series of abutment blocks 91 working in sockets 92 and tensioned by the springs 93 which normally thrust the upper portions of the blocks above the top face of the frame. The purpose of these blocks will be hereinafter described.

In leveling and finishing the matrix, the latter along with the original plate 23 is placed with the plastic back 16 of the matrix in contact with the waxed surface 88 of the base plate 80, the wax being employed to prevent the adherence of the plastic to the plate. In this position the original plate 23 is uppermost, as shown in Fig. 6. The frames of the molding box are adjusted and fastened so that the lower frame will confine the matrix against lateral movement while the upper frame, through the shoulder 68 will rest upon and clamp the matrix against vertical movement. A plunger or pressure block 11 is then applied, with the recess 12 of the plunger receiving the original plate 23 and the concave flange 13 of such plunger resting upon the matrix face adjacent the marginal edge portion thereof. The parts thus assembled, as indicated in Fig. 6, are now ready for the action of a press. Any suitable press may be used, and in Fig. 9 I have shown one apparatus, comprising a hydraulic press 50 having a piston 52 working in a cylinder 54 connected by a conduit 56 with a pump 60 driven by the belt 62 running to the shaft 34. The press is preferably provided with a suitable pressure indicator 57 and a controller 51, and I also provide suitable means for heating the press, such for example as a steam boiler 70 heated by the gas burner 72a. The boiler is provided with a water inlet 74a, a safety valve 75, a pressure gage 76a and a conduit 77a, for leading steam to the hollow head 59 of the press 50, this conduit

having a controlling valve 78ª. The numeral 53 designates the bed platen of the press while 55 is a table which may be conveniently located adjacent to and in front of the press. The matrix assembled in the molding box as before described is placed upon the platen of the press and the controller 51 operated to admit hydraulic pressure from the pump 60 through the conduit 56 to the cylinder 54, which forces the piston 52 and the platen 53 upward until the plunger 11 of the molding box contacts with the press head 59 and is forced downward into the upper mold frame until the latter contacts with the press head thereby limiting the extent to which the plunger can compress the matrix, the buffer or abutment bocks 91 being depressed into their sockets by contact with the press head. The pressure of the concave flange of the plunger 11 against the metal face of the matrix will produce a standardizing marginal bead 41 upon the latter, as the fiber sheet 27 at the back of the matrix face tends to force the metal of the latter upward into the groove 13 of the plunger head, under the pressure exerted. This marginal bead will always occupy the same position regardless of the extent of the characters 44, so that when the printing plate material is forced against the matrix bead in the operation of molding the printing plate, as illustrated in Fig. 5, the plate will be given a concave marginal depression which serves as a guide to the operator in trimming the plate to the exact width desired and to form the marginal edges of the plate as shown at 7 in Fig. 1.

The matrix may be subjected to a suitable degree of temperature and pressure for desired length of time to produce the necessary leveling and baking or finishing of such matrix. For example with the steam pressure of about 100 to 150 pounds in the boiler I can secure temperatures of from 200° F., and upward on the press 50, while a corresponding hydraulic pressure of say from 500 pounds to 2500 pounds in the cylinder 54 will give satisfactory results, the time required to bake the consolidated material varying from 2 to 15 minutes, in correspondence with the degrees of pressure and heat attained. When the matrix has been properly baked and leveled the piston is lowered, the base plate 80 withdrawn with the frame members and the matrix, and after these parts have been placed on the table in front of the press the plunger 11 and the original plate 23 are removed to expose the molding face of the matrix 4.

When it is desired to make the molded printing plate shown in Fig. 1 the metal molding face of the matrix is provided with an additional coating or layer of metallic material. For example the matrix face may be coated with a metalliferous paste as indicated at 5, by brushing or other means of application, and then a body of the phenolic condensation product, either in powder or sheet form is filled in to near the upper level of the upper frame of the molding box. Instead of using the plunger 11 in making the plate, I substitute therefor a plunger 10 which comprises a block or plate of metal having a series of spaced V-shaped ribs 21 formed in its under surface. This plate is laid in position as shown in Fig. 5 with the V-shaped ribs projecting into the soft phenolic condensation product which at this time is in its plastic or non-reacted state. The molding box with the parts thus assembled as shown in Fig. 5 is again placed upon the lower platen or bed of the press and the latter is closed to exert the necessary pressure, while at the same time heat is applied for a desired period and at a pre-determined temperature so that simultaneously with the molding of the plate the phenolic condensation material of the latter will undergo the well-known reaction to assume a hard and set form. As in the operation of making the matrix, the baking of the printing plate can be accomplished in a period varying from 5 minutes, or even less, to about 15 minutes, according to the conditions of heat and pressure found desirable for different materials, a pressure of from 500 to 2500 pounds in the press, and a steam heating pressure of from 100 to 150 pounds being satisfactory in general, with a corresponding temperature ranging from 200° F. upward. The action of heat and pressure in the molding operation will cause the metalliferous paste to assume a smooth, hard and homogeneous or sheet-like form and to intimately incorporate or unite with the phenolic condensation product forming the body of the plate, and at the same time the molding face of the matrix, even to the finest detail, will be accurately and faithfully reversely duplicated or reproduced to form the printing face of the plate as shown in Fig. 1 for example. Incidentally the V-shaped ribs 21 of the plunger 10 resting against the back of the plate will produce in the latter V-shaped grooves 12ª, as shown in Fig. 2, which will make the plate lighter than if the rear surface were continuous, and this interruption of the surface also permits the plate to be more readily leveled or brought to the desired contour.

After the printing plate has been properly molded and baked or hardened and set the press may be opened, and the base plate 80 with the assembled parts removed. Subsequently, the plate may be cleared from the matrix, trimmed and made ready for use, in the printing press.

It will be noted that the construction of

the molding box is such that the plate may be readily removed from the matrix, without disturbing the latter, this being accomplished by simply dismantling or opening the upper frame while permitting the lower frame of the molding box to remain in position and confining the matrix. Thus any number of plates may be made without taking the matrix from the molding box.

If, in exceptional instances, the metallic matrix face 4 should adhere to the metal face 2 of the molded printing plate, the operator can readily strip off this face 4 as indicated in Fig. 11, thus clearing the metal surface 2 for printing purposes.

In some instances, however, it may be desirable to leave the sheet metal face 4 permanently in place upon the printing plate 1, this providing a sheet metal printing surface, as is shown in Fig. 10, but under ordinary circumstances I prefer to form the metallic printing face of the molded plate as heretofore described.

In Fig. 12 I have illustrated a modified form of printing plate wherein the body portion 101 of non-conductive material, wholly, or chiefly, is provided with a metallic printing surface 102 formed by the electrodeposition of zinc 103 upon one or both sides of a metal foil 104, indicated in the drawings by black line. The zinc layers are shown of exaggerated thickness for the sake of clearness. The zinc 103 may be, and preferably is deposited upon the foil 104 prior to the application of the latter to the form, the sheet thus provided having the advantages of softness and ductility when employed for plates of large size, a printing surface composed thereof presenting the printing qualities of the original form of type and it also possesses the concave interstitial web portions 126.

The several steps employed in the production of my improved matrix may be modified to suit various conditions. For example, referring to Figs. 13 and 14, I have shown an arrangement for baking the matrix especially useful when it is desired to furnish the matrix face 4, with a backing 160 of compressed and baked powder or sheet material of substantial thickness. In this instance I may first make a matrix by imposing a mold frame 180 upon the margins 40 of the matrix molding face 4 which in Fig. 14 is shown in contact with the body of type 240 locked in the chase 220, the metal face 4 being backed by the fibrous blanket 27 as before described. I then fill the space within the confines of the walls of the frame 180 with a phenolic condensation product backing material 160 of powder or sheet form and place a suitable plunger 11^a above the same. The parts thus assembled are placed in the press and there compressed to consolidate the backing material 160 and preferably bake the same, as heretofore described with respect to the strengthening material 16.

The plate 80 with the assembled parts thereon may then be removed from the press, using the handle 81, and then rearranged as shown in Figs. 15 and 16 with the frame 180 reversed and imposed upon the base plate 80, containing plunger 11^a, backing 160, blanket 27 and metal matrix face 4 in the order named, with the margins 40 of the matrix face extended over the frame 180 and the intaglios 44 presented upwardly. Thereupon the upper section 188 of the mold frame, is superimposed upon the margins 40 of the matrix face sheet 4, the latter then provided with a coating 5 of metalliferous paste, as already described, and the plate blank material 106, in powdered or sheet form, is introduced into the cavity of the mold frame member 188, the plunger 10 placed in position, and the parts thus assembled are again compressed in the press 50 to mold and set the plates after which the parts may be dismantled and the now molded printing plate removed as heretofore described. Of course the plate blank material is molded and set under heat and pressure as has been heretofore mentioned.

In Fig. 17 I have shown still a further modification in preparing a matrix for the printing plate. In this instance the numeral 45 indicates a metal sheet forming the molding face of the matrix, while 46 indicates the original form or plate imposed upon the metal sheet 45. Within the mold frame 18, resting upon the base plate 80, is placed a bed or body of backing powder, the wax 88 preventing the adherence of the powder to the plate 80. The metal sheet 45 carrying the original form or plate 46 is placed in contact with the backing powder, with the marginal edges 49 clamped between the frame 18 and the frame 38. A plunger block 90 is now inserted within the frame 38 and the parts thus assembled are subjected to heat and pressure, as through the agency of the press shown in Fig. 9, to complete the formation of the matrix. When the matrix is thus backed, it is only necessary to remove the plunger 90 and the original form or plate 46, when the intaglio side of the matrix will be exposed within the frame 38 in position ready to be coated with the metalliferous paste and to receive the plastic phenolic condensation product for the formation of the body of the printing plate 1.

In connection with my invention it will be noted that I have provided a pressed-up or molded matrix comprising in a unitary structure a replication of original printing characters as widely different as type and

half-tone plates, an achievement, which, so far as I am aware, has not been attained heretofore in matrices for molding printing plates for the reason that the original half-tone surface presents interstices of but slight depth between its "dots" over extended areas, while type and line cuts, on the contrary, present large areas of considerable depth between the lines making up their printing characters and it has been practically impossible to press up a unitary matrix from these diverse surfaces for the reason that the pressure requisite to force the material into the type original must be applied differently from that used in forcing the material of the matrix into the half-tone original.

By putting the metal matrix face through the operations with the use of the blankets as herein described I am enabled to secure with equal pressure, in the matrix face, a duplication of both half-tone and type or line characters, and then I can produce from this matrix, with equal pressure, a molded printing plate embodying in a unitary structure both line and dot surfaces, and of equal thickness throughout their extent.

If desired, the metal molding face of the matrix may, upon occasion be stripped from the backing 27, and the exposed impressed face of the latter may be used as a matrix as its formed or impressed surface will be found to be smooth and sharp, owing to the continuous metallic face sheet with which it has been impressed.

At times it will be found advantageous to form more than a single sheet metal molding face, and this may be readily done either by rolling a plurality of metal sheets between the type form and blankets, as heretofore described, or the extra metal faces may be formed at a later stage either by forcing a sheet of metal into the intaglios of a matrix face 4, or by impressing a blank metal sheet into the impressed surface of a blanket 27, from which a molded metal face sheet 4, has been removed.

In making such additional molding face sheets or replicas the appliances shown in Figs. 7 and 8 may be used to work up the sheet metal gradually.

What I claim is:

1. A matrix for making printing plates comprising a sheet metal molding face, a fibrous blanket treated with a shellac substance applied to the back of the sheet metal molding face, and a layer of hard cementitious material applied to the back of the blanket, said blanket and hard cementitious layer forming a backing for the sheet metal molding face.

2. A matrix for making printing plates comprising a sheet metal face, a blanket of fibrous material secured thereto, and a backing of phenolic condensation product consolidated with said blanket and sheet metal face to form a unitary structure having a non-metallic body with a metal molding face.

3. A matrix for making printing plates comprising a metallic molding face and a backing including a cementitious material which under chemical reaction will assume a hard infusible form.

4. A matrix comprising a metallic molding face having type-forming depressions and non-type forming elevations therein and a backing therefor including a hard infusible phenolic condensation body.

5. A matrix for making printing plates comprising a metallic molding face having a backing composed of fibrous material and a synthetic resin product.

6. A matrix for making printing plates comprising a metallic facing sheet having a molding face formed with type-forming depressions and swelled or curved non-type forming elevations surrounding the type forming depressions, and a backing for the facing sheet composed of fibrous material and a synthetic resin product.

7. A matrix for making printing plates comprising a sheet-metal molding face having a backing permanently united thereto comprising fibrous material and a synthetic resin product.

8. A matrix for making printing plates comprising a sheet-metal molding face and a backing including a cementitious material united thereto in integral formation by a process involving chemical reaction of said cementitious material.

9. A mold comprising a sheet-metal molding face having type-forming depressions and non-type forming elevations therein, and a backing therefor including a hard infusible phenolic condensation body united in integral formation with said sheet-metal molding face.

10. In the herein described method of forming a matrix for printing plates from a composite sheet of metal and a plastic material which is capable of chemical reaction to assume a hard and set form, the step which consists in subjecting said sheet to heat while against the type body or the like to form type-forming depressions and non-type forming elevations on the metal section of the sheet and to cause the plastic material to assume a hard, set condition.

11. In the herein described method of forming a matrix for printing plates from a composite sheet, including a facing sheet and a plastic material capable of chemical reaction to assume a hard and set form under heat, the step which consists in subjecting said sheet to heat against the type body or the like to form type-forming depressions

and non-type forming elevations in the facing sheet and to cause the plastic material to assume a hard, set condition and to constitute a backing for the facing sheet.

12. The herein described method of making a printing plate matrix which comprises rolling a thin metallic sheet in contact with a type body to reproduce in the face of said sheet printing intaglio characters complemental to the relief characters of the type body and with rounded interstitial web portions between the characters, applying a blanket of fibrous material to the back of the metallic sheet, applying a layer of cementitious material to the back of the fibrous sheet and then subjecting the parts thus assembled to heat and pressure to unite such parts in a unitary structure and to harden and set the cementitious backing layer.

13. A composite sheet including a metallic facing layer, and a support therefor, comprising a layer of phenolic condensation product.

14. A composite sheet for use in the printing art comprising fiber substance, metallic material and a hard synthetic resin product.

15. A composite sheet including a fiber body, metallic material and a phenolic condensation product.

16. A composite sheet including a sheet-metal facing and a supporting layer therefor, comprising a phenolic condensation product.

Signed at Philadelphia in the county of Philadelphia and State of Pennsylvania this 2nd day of November A. D. 1920.

WILLIAM J. YEOELL.