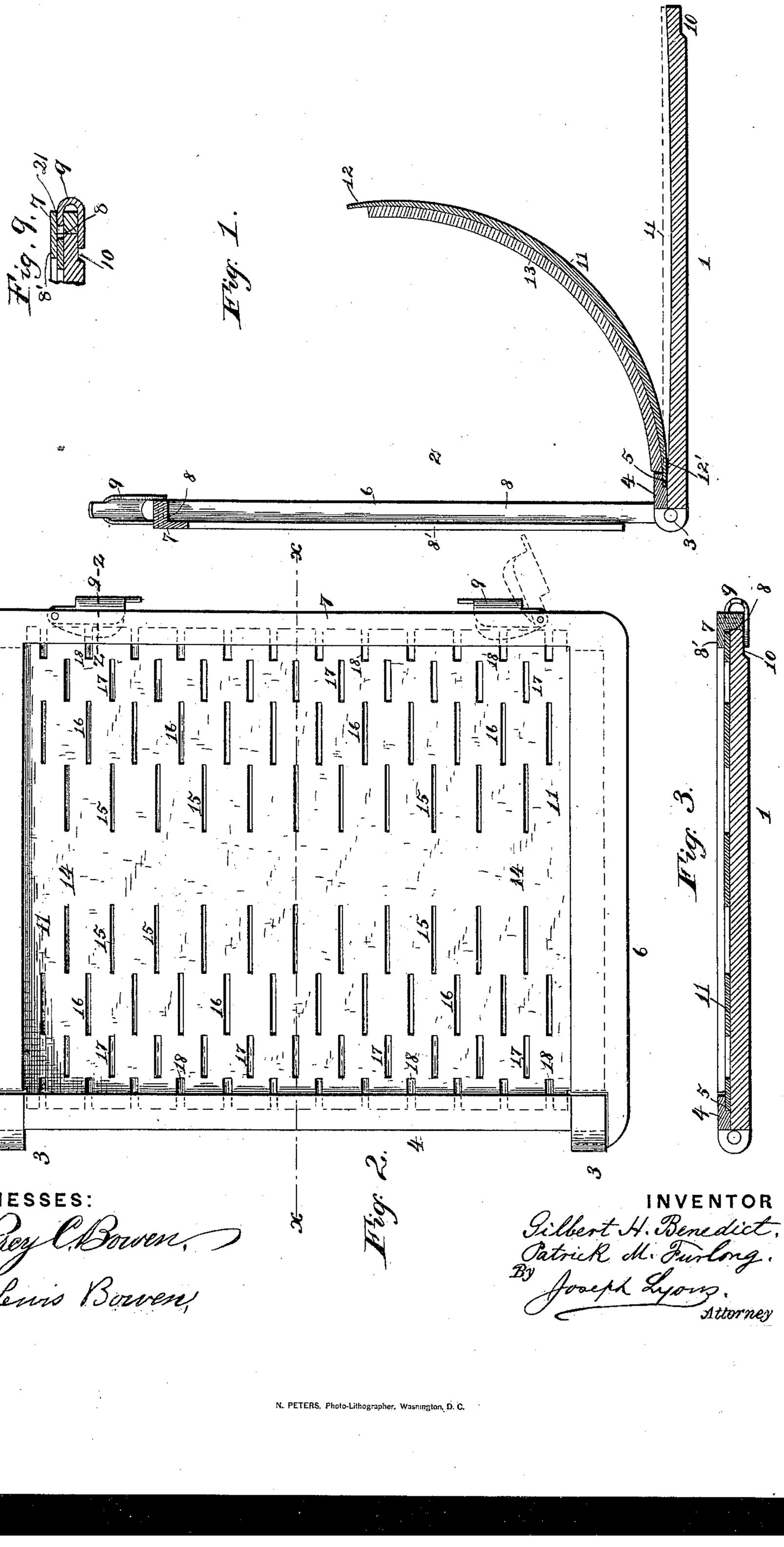
(No Model.) 2 Sheets—Sheet 1.

G. H. BENEDICT & P. M. FURLONG.

MATRIX PLATE FOR CURVED ELECTROTYPES.

No. 401,729. Patented Apr. 23, 1889.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

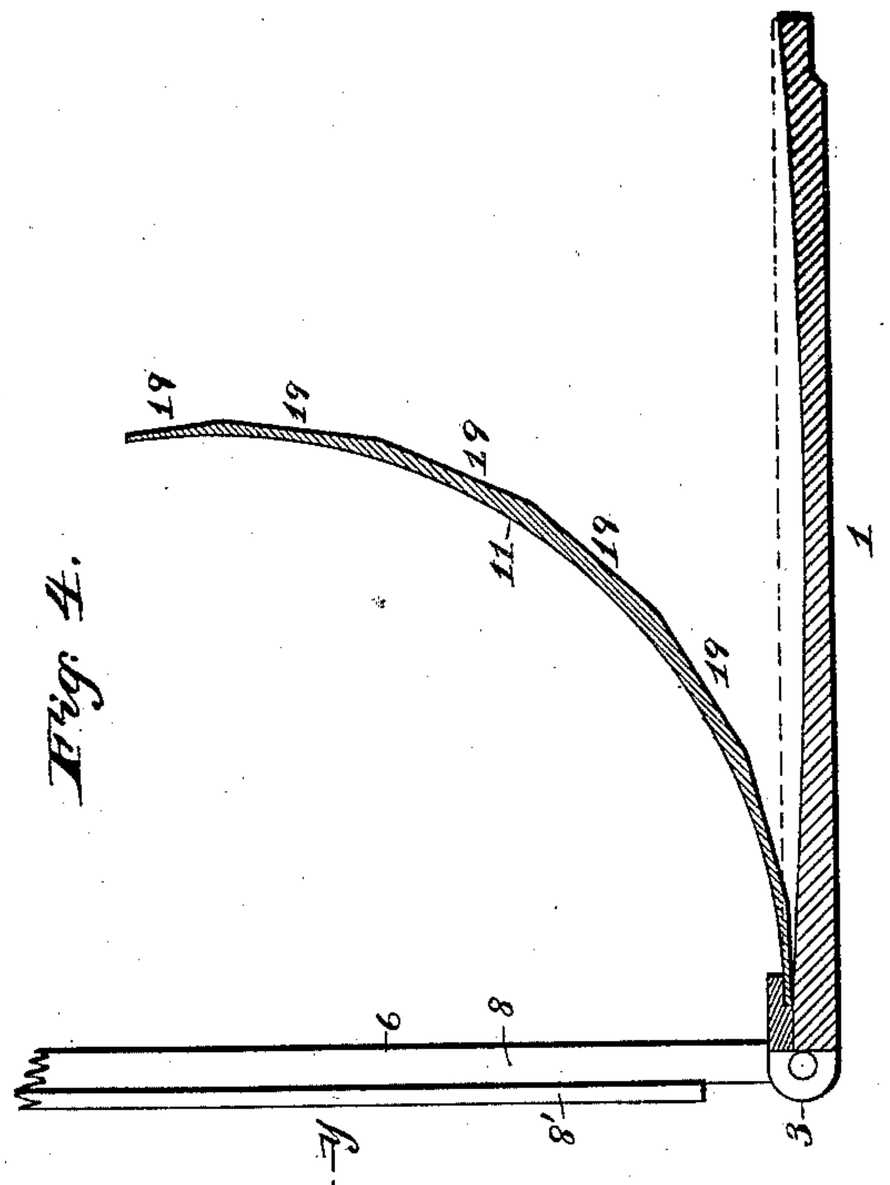

Fig. 5.

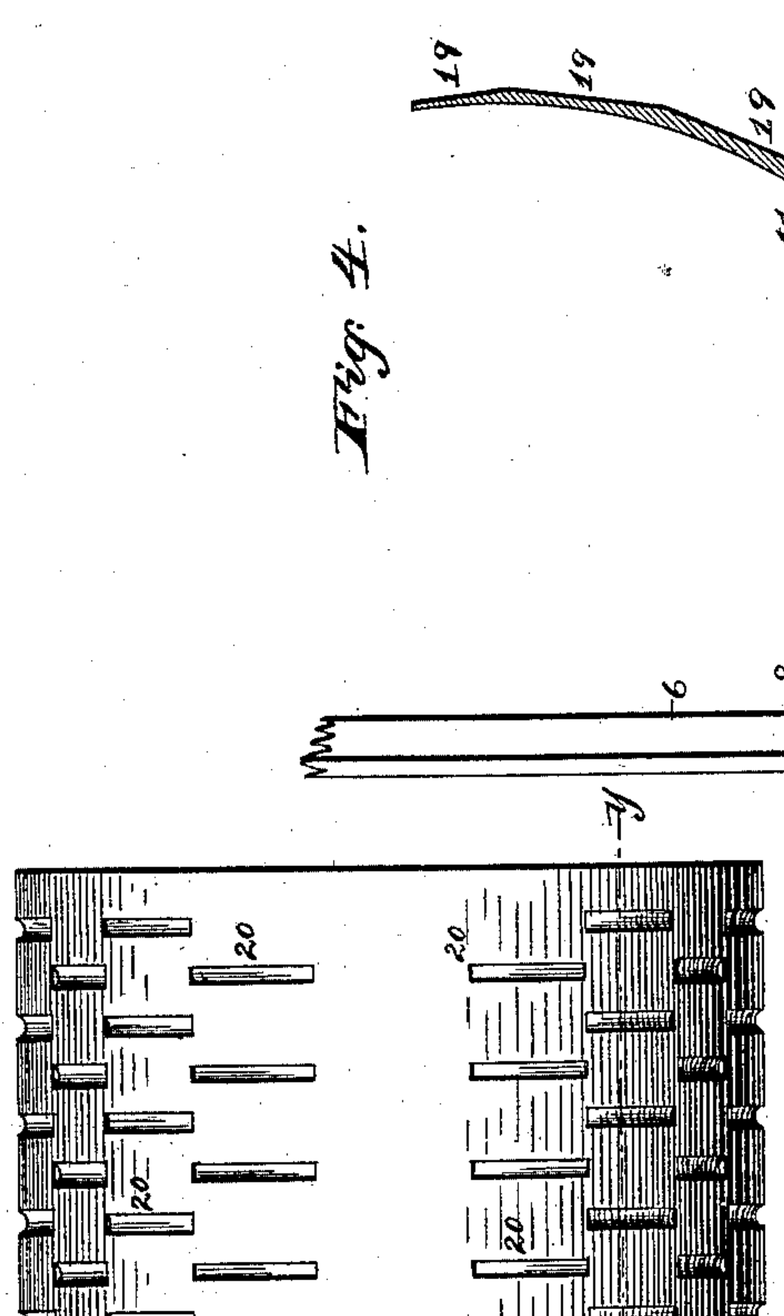

Fig. 6.

Fig. 7.

Fig. 8.

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UNITED STATES PATENT OFFICE.

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MATRIX-PLATE FOR CURVED ELECTROTYPES.

SPECIFICATION forming part of Letters Patent No. 401,729, dated April 23, 1889.

Application filed January 26, 1889. Serial No. 297,625. (No model.)

To all whom it may concern:

Be it known that we, GILBERT H. BENEDICT, a citizen of the United States, residing at Ellenville, Ulster county, State of New York, and PATRICK M. FURLONG, a citizen of the United States, residing at Albany, Albany county, State of New York, have invented certain new and useful Improvements in Matrix-Plates for the Production of Curved Electrotype-Plates, of which the following is a description.

Our invention relates to improvements in devices used in the production of curved electrotype-plates the curvatures of which must conform to that of the surface of the printing-cylinders in cylinder-presses, upon which these plates, when produced, are mounted in a manner well understood by those skilled in the art of printing.

Prior to our present invention we have produced curved electrotype-plates to be used in cylinder-presses, in the following manner: A rectangular plate, of uniform thickness, made of sheet-steel, hard rolled brass, or other highly-elastic metal, was bent to set to the arc of a circle whose radius was slightly larger than the radius of the cylinder of the press upon which the electrotype-plate was intended to be used. This plate was then unbent and clamped to a rigid flat bed-plate in such manner that its original curved set was not affected, so that when released from the clamp it would again assume its original curvature. The curved elastic plate, thus flattened out upon a rigid support, was then used as the support upon which the molding material was poured in a layer of uniform thickness, and after this material had attained the desired hardness, and its surface had been well impregnated with graphite or other suitable conductor of electricity, an impression of the type or other relief-printing form was produced upon the molding material. This furnished a matrix, which was then shaved, trimmed, built up, and otherwise prepared to receive an additional treatment with graphite. The elastic plate was then released from the clamp, and it again assumed the original curvature, thereby bending the matrix which it supported to the curvature of the cylinder of the printing-press, or nearly so. From this matrix electrotype-plates were made by inserting the same into a depositing-bath in proper relation to a convex anode, as is well understood by those skilled in the art. In the process thus briefly described great difficulties were experienced, the principal difficulty consisting in the fact that when the curved plate was clamped upon the flat rigid bed-plate it would buckle near the middle, and sometimes in other places, to such extent that the molding material could not receive and retain a clear and sharply-defined impression of the printing-form. This buckling we found to become the more serious the smaller the radius of curvature and the greater the width of the elastic plate was, and our process, which otherwise yielded excellent results, had to be confined to the production of electrotype-plates for printing-cylinders of comparatively large diameter. Even within that limited range a great number of the newly-prepared elastic plates had to be discarded, and others, which at first seemed to be unexceptional, would after repeated use begin to buckle.

It is the object of our present invention to overcome this buckling of the curved elastic matrix-plates, and we have discovered that this may be accomplished to perfection by reducing the mass of the matrix-plate from the middle line of the curvature toward the two edges, either continuously or in graduated steps. Thus constructed the set curvature of the matrix-plates may be much greater—*i. e.*, the radius of curvature may be much smaller than has heretofore been found practicable—and whatever that curvature may be no buckling can be found in the plate when flattened out to receive the molding material, while its elasticity is not impaired in the least by the reduction of its mass from the middle toward the edges in the direction of the curvature.

With certain forms of the matrix-plate the clamp-frame is specially constructed, and this particular construction of the clamp-frame forms another feature of our invention, all of which will more fully appear from the following detailed description with reference to the accompanying drawings, in which we illustrate, in—

Figure 1, a cross-section of one form of our improved elastic matrix-plate, with the ma-

trix material thereon, in position in the clamping-frame when the lid of the latter has been raised; Fig. 2, a plan view of another form of our improved matrix-plate flattened out in the clamp-frame; Fig. 3, a cross-section on line *x x*, Fig. 2. Fig. 4 is a cross-section of another form of our matrix-plate inserted in the clamp-frame, with the lid of the latter raised. Fig. 5 is a plan view of still another form of our improved matrix-plate. Fig. 6 is a view of a section on line *y y*, Fig. 5. Figs. 7 and 8 are like views of modifications thereof. Fig. 9 is a sectional view on line *z z* of Fig. 2.

Like numerals of reference indicate like parts in all the figures of drawings.

Referring now more particularly to Figs. 1, 2, and 3, the clamp-frame is there shown composed of the bed-plate 1, which has the general quadrangular shape indicated by the whole clamp in Fig. 2, and of the open frame 2, hinged to one edge of the bed-plate, as indicated at 3 3. A bar, 4, provided with an offset on its under side and extending between the hinges 3 3, is secured to the bed-plate, so that a recess or groove, 5, is formed near the rear edge of the bed-plate for the insertion of one edge of the curved matrix-plate, as will hereinafter more fully appear.

The hinged open frame 2 consists of two side bars, 6 6, and a front bar, 7, which are either joined together or which may all be made in one piece of L-iron and of such size that the depending flanges 8 of the L will just pass over the edges of the bed-plate. Two clasps, 9 9, pivoted to the front bar, 7, are adapted to secure the open frame to the bed-plate when the former is turned down upon the latter, as shown in Figs. 2 and 3, the under side of the front edge of the bed-plate being formed with offsets 10, as shown, to allow the lower jaws of the clasps to pass under said edge, and in the depending flange 8 of the front bar, 7, of the frame are formed corresponding slots, 21, to receive the upper jaws of the clasps, as shown in Fig. 9.

It will now be understood that if a rectangular plate of any kind having the size of the bed-plate, as limited by the rear end of recess 5, be placed in position upon said bed-plate, with one edge inserted into said recess, and the open frame be then turned down and clasped, said rectangular plate will be securely clamped in position upon the bed-plate. In this position there will be a guard of uniform height all around the clamped plate formed on three sides by the upper flanges, 8′, of the L-irons, and on the fourth (the rear) side by the bar 4, extending between the hinges 3 3.

In Fig. 1 one form of our matrix-plate is shown at 11. It is made of sheet steel, brass, or other like elastic metal, and is bent to set to the arc of a radius which is somewhat larger than the radius of the cylinder upon which the electrotype-plate is to be used. As shown in the drawings, the matrix-plate 11 is not of uniform thickness, but is reduced in thickness from the middle line of curvature toward the edges 12 12′ in such manner that when the plate is flattened out upon the bed-plate, as indicated in dotted lines, its upper surface represents a true plane, while the under surface is slightly convex. To accommodate the bed-plate to this convexity, a gentle concavity is formed in its upper surface, as is shown somewhat exaggerated in the drawings. Thus the mass of the matrix-plate is gradually and continuously reduced from the middle line of curvature toward the edges in the direction of the curvature; and by this construction the main object of our invention is accomplished. In use the rear edge, 12′, of the matrix-plate is inserted into the recess 5, as shown in Fig. 1, and the hinged open frame is turned down upon the bed-plate, whereby the flanges 8′ of the former engage and press down the edges of the matrix-plate, and the latter is flattened out upon the bed-plate, as shown in dotted lines in Fig. 1, and, in connection with another form of our matrix-plate, in Figs. 2 and 3. The clasps 9 9 are then turned to engage the under side of the front edge of the bed-plate, and in this condition the matrix-plate is ready to receive the molding material 13.

By the unbending of the matrix-plate (without disturbing its permanent set) and by the clamping of its edges in the clamp-frame a new distribution of the mass of the plate takes place, and when the matrix-plate is of uniform thickness, as heretofore, this new distribution of mass gives rise to buckles, which destroy the usefulness of the plate, as hereinbefore explained; but when the mass of the plate is originally reduced toward its edges, in accordance with our invention, the new distribution of mass accompanying the unbending of the plate takes place without perceptible buckling and the matrix-plate rests upon the bed-plate in intimate contact at all points, so that the subsequent preparation of the matrix is accomplished without flaws. When clamped in position, the flanges 8′ of the open frame form a guard of uniform height around the edges of the matrix-plate, so that the frame constitutes at the same time a molding-clamp and a molding-pan, and in this molding-pan the molding material 13 is poured and is allowed to set to the required hardness or consistency. The surface of the molding or matrix material is then impregnated with graphite, the impression with the type or other relief form is made, and then an additional treatment with graphite is ordinarily resorted to, whereby the matrix-surface becomes highly polished and in condition to receive the galvano-plastic deposit of copper or other metal. The object of the use of a curved elastic matrix-plate, however, is to curve the matrix to conform to the surface of the cylinder of the printing-press, and this curvature is produced before the matrix is inserted into the electro-depositing bath. This is done by unclamp-

ing the matrix-plate, as shown in Fig. 1, when, by its own elasticity, it will curve back to its original form and will bend the plastic matrix to the same curvature, as shown. This statement should be modified in so far as the curvature of the concave exposed surface of the matrix, being concentric with the concave surface of the matrix-plate, will be curved upon a slightly smaller radius than the matrix-plate, so as to conform exactly to the surface of the cylinder of the press. The matrix is then removed from the elastic matrix-plate and the electrotype-plates are produced in any ordinary or improved manner, well understood by those skilled in the art.

In Figs. 2 and 3 the matrix-plates are shown constructed, in accordance with our invention, in a different manner. Instead of reducing the mass of the plate toward the edges by a gradual reduction of thickness, as in the form shown in Fig. 1, we here achieve the same object by a series of slots cut into the plate, which is now made of uniform thickness.

By reference to Fig. 2 it will be seen that at about the middle line of the matrix-plate a strip, 14, of moderate width, is left intact, and that on each side of that central strip or belt there is a series of evenly-spaced narrow slots, 15 15, which extend in the direction of the curvature toward the edges of the plate. Another series of similar slots, 16 16, is produced on each side of the slots 15 15. These slots 16 16 are slightly wider than the slots 15 15 and are nearer to the edges of the matrix-plate, and additional series of slots, 17 17, 18 18, &c., increasing in width and preferably decreasing in length, are continued to the edges of the plate, and the slots of the last series extend out through the edges of the plate, as shown in Fig. 2, whereby these edges become discontinuous and comb-like. By this construction the mass of the matrix-plate becomes reduced step by step toward the edges in the direction of the curvature and the buckling of the plate is completely overcome. This construction is in some respects preferable to that shown in Fig. 1. In the first place, it is much easier to make, and consequently cheaper; and in the second place the molding material flowing into and filling the slots in the plate adheres better to the latter, so that when the plate is released from the clamp-frame after the matrix material has been applied the latter cannot peel off, as is sometimes the case when the matrix-plate presents an unbroken surface.

In Fig. 4 a modification of the form of matrix-plate shown in Fig. 1 is illustrated. In this construction the reduction of the mass of the plate is accomplished by cutting, planing, or grinding a series of facets, 19 19, on the under or convex side of the plate.

In Figs. 5 and 6 a modification of the construction shown in Figs. 2 and 3 is illustrated. In this case, in place of the slots 15 16, &c., a series of grooves, 20 20, is formed in the under side of the matrix-plate, these grooves being grouped in series and graduated in length, width, or depth, or in all these respects, to produce a step-by-step diminution of the mass of the plate toward the edges, the same as the slots in the construction shown in Figs. 2 and 3. The grooves may have any desired form—*i. e.*, they may be curved, as shown in Figs. 5 and 6, rectangular, as shown in Fig. 7, or V-shaped, as shown in Fig. 8; or they may be shaped to any other convenient form.

Having now fully described our invention, we claim and desire to secure by Letters Patent—

1. An apparatus for producing curved matrices for electrotype-plates, consisting, essentially, of a curved elastic matrix-plate having its mass reduced from the middle toward the edges in the direction of the curvature, and a clamping-frame for flattening the matrix-plate, provided with guards for the retention of the matrix material, substantially as described.

2. An elastic matrix-plate for the production of electrotype-plates for cylinder-presses, having a set curvature corresponding to the curvature of the printing-cylinder of the press, and having its mass reduced from the middle line to the edges in the direction of the curvature, substantially as described.

3. A matrix-support for the production of electrotype-plates for cylinder-presses, consisting of a plate of spring metal bent to a definite set curvature and having its mass gradually reduced from the middle toward the edges in the direction of the curvature, whereby the matrix-plate may be flattened out without buckling to receive the matrix material and to recurve to its original shape when released, substantially as described.

4. A matrix-support for the production of curved electrotype-plates for cylinder-presses, consisting of a plate of spring metal bent to a definite set curvature and having its mass reduced step by step from the middle toward the edges in the direction of the curvature, substantially as described.

5. A matrix-support for the production of curved electrotype-plates for cylinder-presses, consisting of a plate of spring metal having parallel series of slots from near the middle to the edges in the direction of the curvature, substantially as described.

6. A matrix-support for the production of curved electrotype-plates, consisting of a plate of spring metal having its mass reduced from the middle toward the edges in the direction of curvature by a series of perforations, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

GILBERT H. BENEDICT.
PATRICK M. FURLONG.

Witnesses:
ALBERT BAKER,
H. J. MCGOWAN.