

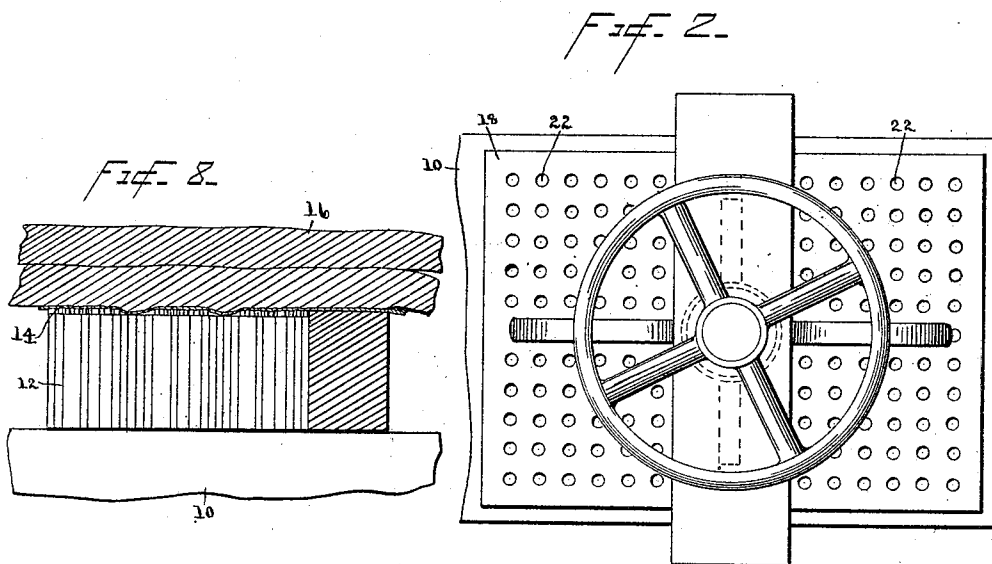
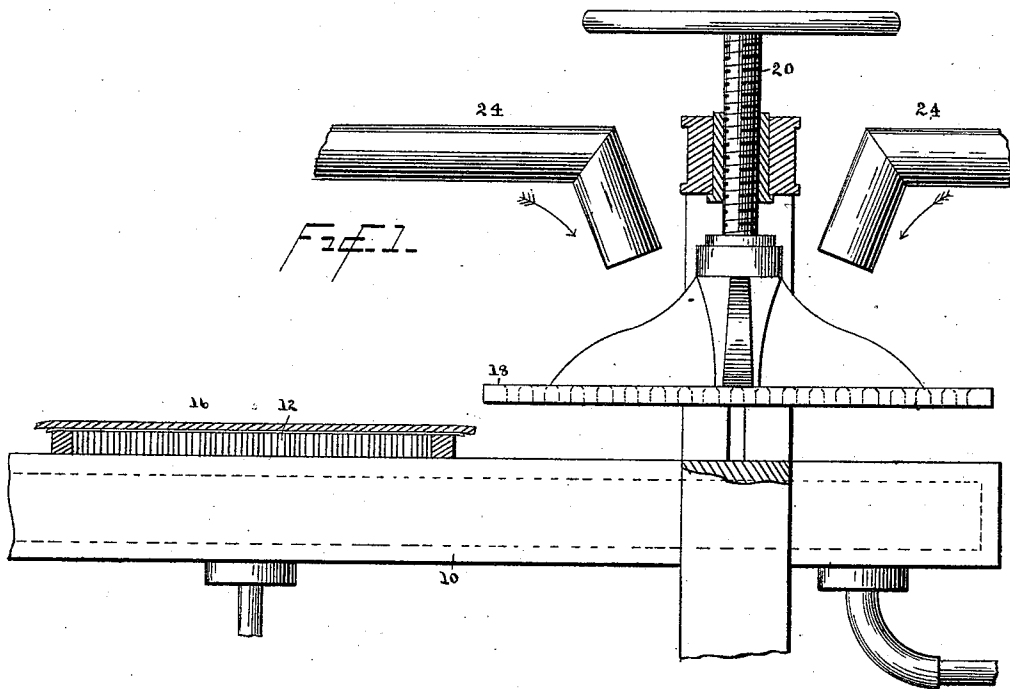
(No Model.)

3 Sheets—Sheet 1.

J. W. OSBORNE.
METHOD OF MAKING MATRICES.

No. 436,314.

Patented Sept. 9, 1890.



Witnesses
Norris A. Clark
P. M. Furlong

Inventor

John W. Osborne



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Fig. 5.

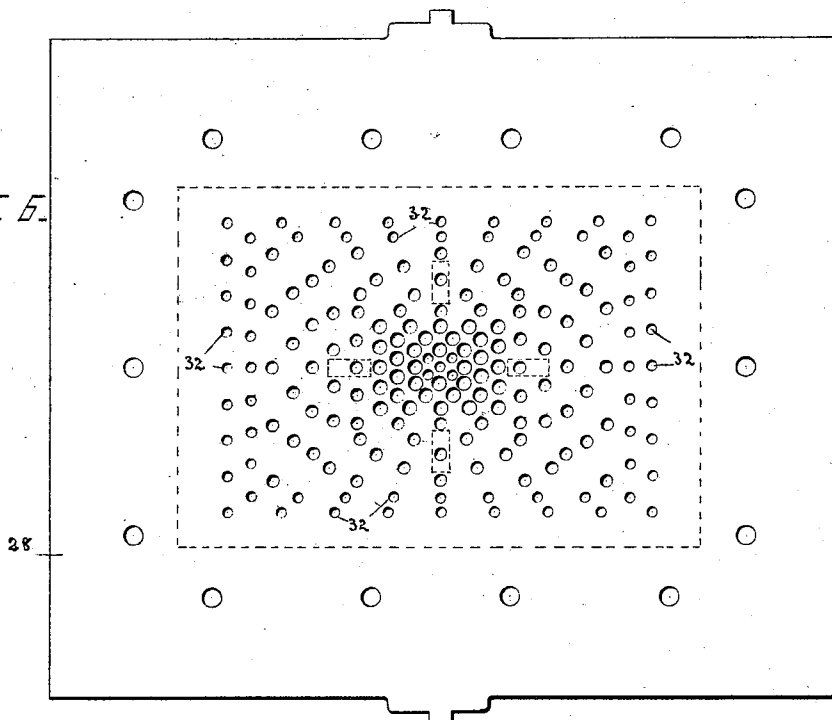
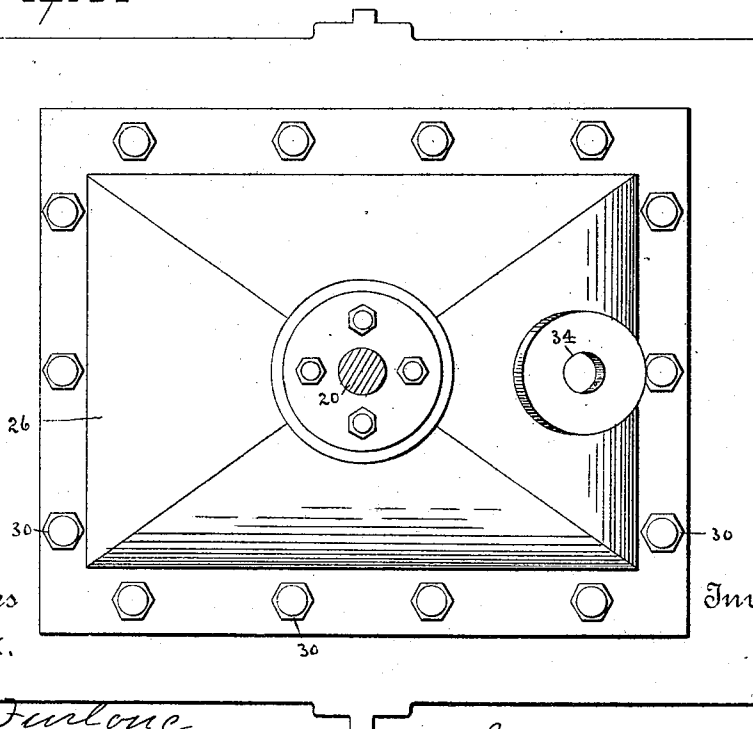


Fig. 3.



Witnesses
A. A. blank.

P. M. Furlong

Inventor

John W. Osborne

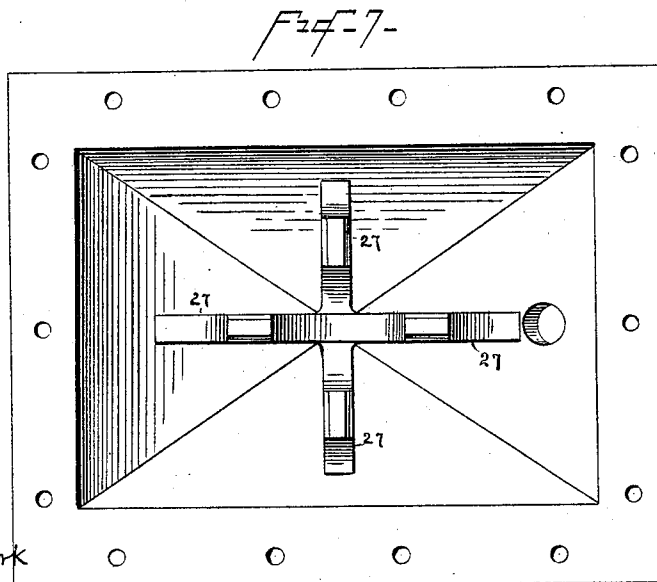
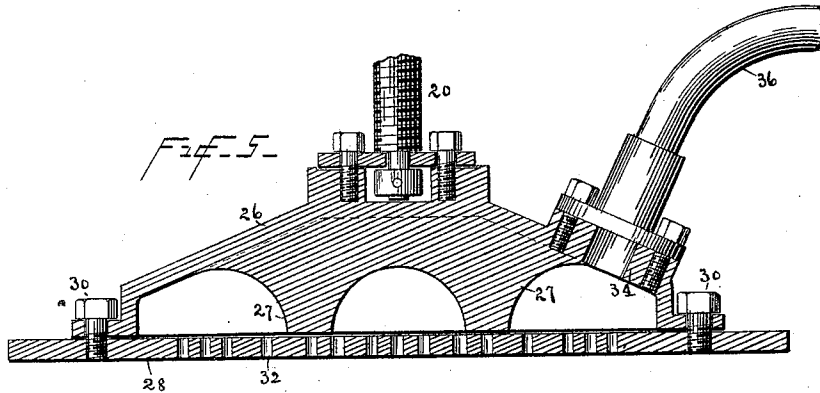
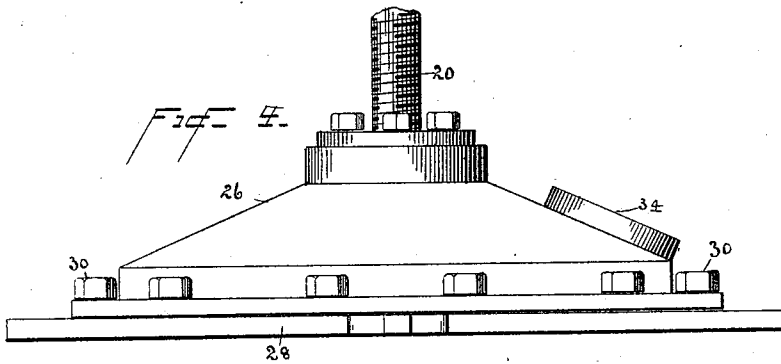
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3 Sheets—Sheet 3.

J. W. OSBORNE.
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Witnesses
Lewis A. Clark

P M Furlong

Inventor

John W. Osborne

UNITED STATES PATENT OFFICE.

JOHN W. OSBORNE, OF WASHINGTON, DISTRICT OF COLUMBIA.

METHOD OF MAKING MATRICES.

SPECIFICATION forming part of Letters Patent No. 436,314, dated September 9, 1890.

Application filed February 12, 1889. Serial No. 299,666. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. OSBORNE, a subject of the Queen of Great Britain, and a resident of Washington, in the District of Columbia, have invented a new and useful Improvement in the Method of Making Matrices, of which the following is a specification.

This invention is related to several which have for their object the production of a mold into or against which type-metal may be cast for the production of a stereotype-plate for printing purposes. One of these methods, which is now largely employed, is known as the "papier-maché" process, and my invention is designed especially to improve the method of making matrices in accordance with that art. In practicing the same it has hitherto been the custom to take a number of sheets of thin paper of good quality, well covered with a mixture of paste and whiting, and backed by one or more sheets of stronger paper pasted down upon the former, and to lay the whole (it being thoroughly soaked and softened with moisture) upon the upturned face of the page or pages of type to be reproduced, and then to beat, by strokes from a brush, this papier-maché layer into contact with all the interstices and convolutions of the raised letters, so as to fill every depression. When large forms are stereotyped, substantially the same result as that got by the brush is reached by causing a suitable roller to traverse the wet matrix, while some elastic material is interposed to stretch and indent the paper between the letters and spaces. The mold so taken has been dried hitherto in a way which gave rise to no distortion or shrinkage by bringing the type, held in a suitable chase and covered with the molded matrix, as described, under the platen or follower of a screw-press of simple construction. Between the platen and the wet paper on the type one or more thicknesses of woolen blanket or of a soft and open felt are placed, and the effect of the screw-pressure applied to this elastic stratum is to complete the work of the brush or roller by establishing the most perfect accommodation of the matrix to the form. The next operation is to dry the layer of paper without removing it from the form. This is accomplished by ap-

plying heat (generally steam heat) to the iron table on which the form rests and over which the platen is supported and controlled by its screw. As the heat from below passes through the mass of type and reaches the paper mold it heats the water in the paper to the boiling-point and forces it to escape and make its way through the blankets as steam. After a few minutes the platen-pressure may be removed, the form taken from the press, and the dry paper matrix lifted off in a condition ready for the casting operations of the stereotyper, which need not be considered in this specification. Although the paper matrix thus obtained is very satisfactory as far as its quality is concerned, the length of time required for its production is sometimes much longer than is desirable, and one of the objects of my invention is to shorten that time by hastening materially the drying process. It is often necessary in printing-offices to start printing at a precise hour of the day or night, as the case may be, and also to continue the setting of type up to the last moment before such start, so that a gain of four or five minutes in the time required for stereotyping would frequently have much value.

The drawings forming part of this specification illustrate certain forms of apparatus adapted for working my process, and are as follows:

Figure 1 represents in side elevation and partly in section a press like that generally used for making matrices, but modified for my process, and a form on its table ready to go under the platen. Fig. 2 is a plan view of the same without the form. Fig. 3 gives a plan view of a different kind of platen with an inclosed chamber. Fig. 4 is a side elevation of the same. Fig. 5 is a vertical longitudinal section of the same platen. Fig. 6 shows in plan the face-plate of the platen and the distribution of its perforations. Fig. 7 is an inverted plan of the platen with the face-plate removed, showing ribs within the hollow portion. Fig. 8 exhibits, on an enlarged scale in vertical section and elevation, a portion of a form with matrix and blankets ready to receive the platen-pressure. Fig. 9 illustrates in section a supplemental face-plate made use of to suit a small form.

The construction of presses used in making

papier-maché matrices is well known and is substantially represented in Figs. 1 and 2. On the bed 10, which is heated by a circulation of steam, the pages of type 12 are placed face up and properly locked in a chase. (See also Fig. 8.) Upon these the pasted-paper sheets 14 are beaten down by the brush, and are then covered with two or more thicknesses of blanket or open felt 16. The whole is then pushed beneath the platen 18, which is brought down upon the blankets by means of the screw 20. Under the old system the form remained in this position till the wet paper was dried by reason of the direct steady heat imparted to it from the steam-heated table. The temperature of the latter may be easily raised considerably above 212° Fahrenheit, and, as the mass of type is a good conductor, the drying was effected by boiling away the water contained in the several sheets of paper forming the matrix. The operation of drying in this way is prosecuted at a disadvantage, because the vapor from the water in the paper and paste has to overcome much resistance to get away and to force itself, in fact, through the blankets by virtue of its own elasticity, while its generation in the first instance is also much impeded by reason of the slow diffusion of water-vapor in an atmosphere like itself—a physical fact that is true of all gaseous bodies.

I overcome the difficulty of drying the matrix, in great part at least, and lessen the time required therefor by modifying the apparatus, as shown in Figs. 1 and 2. In those views of the press I use the platen 16 is perforated over the most of the surface by small round holes 22 at equal distances apart. These facilitate the drying of the paper under the influence of steady heat applied as already described, because the provision so made for the escape of the elastic steam shortens the journey the water has to make from the paper to the external air; but the time required may be still further lessened by directing currents of air from a fan or other blower down upon the upper surface of the platen, as from the tubes 24, which are connected with some source of air at low pressure. By such additional means the escaping vapor is swept away as fast as it is formed and its diffusion promoted.

In Figs. 3, 4, 5, 6, and 7 apparatus is shown which puts the practice of my method into still more practical shape. These figures represent different views of a peculiarly-constructed platen, which, substituted for that of an ordinary drying-press, accomplishes all that the old platen accomplished as far as the efficient and positive application of pressure is concerned, and much more in other respects. This platen consists of a hollow box of metal made (as here designed) in two parts and bolted together. The upper part 26, with which the screw 20 is connected, may be described as a rectangular bell-shaped vessel, strengthened by ribs 27 inside, while the

lower part 28, which forms the face of the platen, is a plate screwed to the flange on 26 by the tap-bolts 30. The face-plate 28 is perforated with numerous holes 32, and the completed structure has at 34 an opening through which the flexible tube 36 connects the chamber within the closed box with an air-pump or other suitable blower. The hose 36 may have either a current of air sent through it to the platen or an exhaust in the latter may be maintained by continuously drawing the air out in the contrary direction through the same tube. Each of these methods of using the apparatus shown will shorten very materially the time required to dry the matrix; but the former adapts itself well to other improvements on the established practice and will be first considered.

When the type 12 with its coverings is in place under a platen like that described and subjected to the necessary pressure, the matrix would dry spontaneously without heat, if sufficient time were allowed. This is, in fact, (using the old platen,) the recognized course which should be followed when a paper mold from a wood-cut is required. Whatever the time may be in such a case (and it will vary greatly according to the size of the form) it will be much shortened if ordinary dry air be blown into the platen through the tube 36. This result is due to the fact that the evaporation of water (or any other fluid) is very much more rapid at any given temperature when it takes place into an atmosphere differing from itself in constitution than when the water is enveloped in its own vapor. When air is blown into the hollow platen, the holes 32 being closed only by the porous blanket 16, the air under very little pressure permeates the blankets and finds its way rapidly to their edges. In doing so it constantly renews over the wet matrix a foreign atmosphere for the water-vapor to diffuse into, according to the well-known law, and sweeps away all such water-vapor as it is formed. Under such circumstances the cold-paper process may be well applied to wood-cuts without injuring them and without excessive loss of time, for the rate of evaporation will depend essentially upon the quantity of air at low pressure which passes over the matrix, and that is thoroughly under control. As will be seen from an examination of Figs. 5 and 6, the face-plate 28 is abundantly supplied with holes through which the air escapes into the porous blankets, and through them till it reaches the moist paper, where it is necessarily deflected toward the edges of the form. In this way the continuous movement of a stratum of air upon and parallel to the back of the matrix is maintained till all its moisture is removed, the currents through the plate reaching all parts of the same. If, now, the table on which the masses of type rest is made hot by steam under pressure, the heat passing through the type-metal will boil the water in the matrix and drive it off in the form of steam, which,

as before, is instantly taken up and removed by the air-currents, with a great acceleration in the rate of drying as the result. In the method which is now common the steam so
 5 formed is allowed to accumulate and force its way, and the dissipation of the water is therefore much slower. To still further hasten the drying of the matrix while it is under the platen-pressure, I heat the air which is blown
 10 through the tube 36, and so gain the maximum of rapidity. To whatever extent the injected air may be heated, its avidity for moisture will be increased, so that air which in cold weather would be regarded as very damp and
 15 unfitted for drying purposes may, by simply raising it in any way to a summer warmth, become relatively and for all practical purposes exceedingly dry; but when the hot air used in my process at low pressure is raised
 20 to 212° or above that temperature, and is driven at the same time rapidly over the wet surface of the matrix, already made hot from below, the best possible conditions for drying are established.

25 The blankets used in my method should be such as not to impede the transit of the air too much, and this can be easily prevented by using suitable woven or felted material, for the lower the pressure is on the air blown
 30 into the hollow platen the greater its avidity will be for water in the gaseous form, according to a well-known physical law.

The means best adapted for heating air and so rendering it serviceable for my purpose
 35 need not be discussed in this specification, as they are very well understood; but when the circumstances are especially favorable for reaching a high temperature, (say 300° or upward,) it will be sometimes found advantageous
 40 ous to depend upon the hot blast alone, and either not to heat the form at all or to do so slightly, and sufficient only to prevent condensation of water on the face of the type.

In connection with the foregoing it may be
 45 said that a very important advantage which my invention secures, independently of the saving in time, is the reduction to a minimum of the injury done the type upon which the matrix is molded. This injury is well known
 50 and need not be discussed at length. It is generally regarded as inseparable from the papier-maché process. It is due to the effect of frequent heatings and coolings in altering the length of the type locked in the chase,
 55 and to the conjoined results of high temperature and pressure applied to the faces of the same. At present the only way of hastening the drying of the matrix when it is *in situ* on the type, and forced into contact therewith
 60 by the screw and platen, is to raise the temperature. This expands and softens the type metal, and cannot be safely carried beyond a certain limit, probably about 300° Fahrenheit; but in following my invention the operator may
 65 warm the type only high enough to prevent condensation of evaporated water upon it to an injurious extent, and then apply a hot

blast far above that named, indeed, of any temperature that will not scorch the blankets. The effect of the latter is to remove the water
 70 from the matrix with great rapidity, but in doing so it cannot raise the temperature of the type above 212° Fahrenheit till all the water in the matrix is gone. As soon as that is accomplished the work is done and the
 75 form should be removed from the drying-press before the hot air has affected its temperature, which is then low. As a consequence the injury to type will be found small in amount.

As has been hereinbefore stated, this process may be successfully worked whether the air be forced through the tube 36 into the platen or drawn from the latter through the
 80 same tube. In the latter case the effect produced is identical in kind—that is, the exhaust in the platen draws the air through the perforations 32 in the face-plate, and to supply the deficiency the external air is forced
 85 by atmospheric pressure to enter the pervious blankets at their edges and move in currents converging toward the middle of the plate. In doing this the air, as before, presents to the back of the matrix, whether the same
 90 be heated or not, a constantly-changing stratum of dry air into which the vapor of water can readily diffuse, to be then immediately removed by the exhaust blower or pump. This method has, moreover, the advantage that the
 95 reduction of atmospheric pressure over the wet matrix promotes very efficiently the generation of water-vapor, causing the water to boil, in fact, at a temperature very much below the usual boiling-point if the attenuation be considerable. In gaining this advantage, how-
 100 ever, that of using very hot air has to be in part sacrificed, as it would not be easy, though of course quite feasible, to give the air entering at the edges of the form a temperature much
 105 above that of the warm room in which the work is carried on.

In Fig. 6 the perforations in the face-plate, through which the air is blown (or drawn) into the blankets, is shown. These perforations may be managed so as to give practi-
 115 cally the same rate of evaporation from all parts of the matrix at once. It is evident that if the holes were equally distributed this end would not be gained, for there would be a reaction toward the center of the form from
 120 all sides, and a consequent stagnation of the air there. Accordingly, as shown in the drawings, I increase the closeness and size of the holes about that region, and thereby increase the quantity of air passing through them,
 125 whereby the reaction of air-pressure from the edges is overcome and radial currents established. Were the plate perforated about the center only, then the corresponding part of the matrix under that region would dry first,
 130 and there would be loss of time waiting for the edges, which would lag behind in consequence of the relatively moist atmosphere reaching them. It will be seen that this evil

is counteracted by the sparse distribution of smaller holes about the outer edges of the form. It is plain that if the plate 28 were perforated over its whole surface it would have to be removed and another one substituted for it if a paper-maché matrix from a small form were required, as the blankets would not close all the holes. In many cases this trouble can be avoided by employing the loose supplemental face-plate shown in Fig. 9. This is the same size as the other, and is pierced with holes 32 to suit the form required. It is provided with a depression at the back, which covers all the holes in the attached face-plate 28, and has also the projections 38 standing up at intervals. These are level with the edges. When in use, this plate is simply laid upon the blankets with the side containing the depression upward, and the platen is then brought down upon the whole.

All that has been said relative to the distribution and size of the holes and the use of supplemental face-plates applies equally well to those cases in which the lateral flow of air over the matrix is determined by an exhaust, as by a plenum within the hollow platen.

In the foregoing it has been shown that the substitution of a foreign atmosphere of dry or warm air for that more or less fully charged with moisture, which is in contact with the damp matrix, is effected within the substance of the blankets and after the same have been compressed by the pressure of the platen. It is important, therefore, to employ blankets or their equivalent—such as mats of fiber or of twisted horse-hair—which are sufficiently elastic, not only on account of the capacity possessed by such material to follow the damp sheet of stratified paper into the interstices of the form and keep it there, (which is an essential part of my process,) but also to enable it to maintain under the mechanical platen-pressure that perviousness which is requisite to admit of the transit of considerable quantities of air through its interstices without an undue increase of pneumatic pressure. The conditions which affect this matter are many and variable, the size of the form being one of the chief; but it is evident that the perviousness of the elastic stratum can be increased or decreased by proper selection of the substance employed, and by modifying the manner in which it is woven or felted or the number of layers laid one upon the other. It is also easy to effect changes in this regard to suit particular cases by the interposition of non-elastic substances pervious to air, such as pieces of wire-gauze or of thin closely-perforated sheets. By the judicious employment of such it is possible to use large-sized holes in the face-plate 28 without thereby releasing the necessary mechanical pressure on any part of the form or forcing the blanket up into such openings.

From the foregoing it will be seen that many changes in the form and construction of the apparatus described may be made without

departing from the principles involved in my method or affecting its nature essentially; also, that my invention retains all the advantages possessed by the old process as it is still commonly practiced, this being especially true of the flat and undistorted condition of the matrix after it is dried, for the contractive force which buckles and strains a heavy sheet of paper or card-board while it is being rapidly and therefore unequally dried is exceedingly great, and can only be resisted by an opposing force which is sufficient, if need be, to rupture the fibers of the paper. The pressure exerted by the screw and platen on the papier-maché sheet is enough for this purpose; but it should not be relaxed till the drying is completed.

The apparatus shown and described in this specification I do not now claim, as it is intended to make it the subject of another application for patent.

What I claim is—

1. The improvement in the art of making papier-maché matrices, which consists in beating or otherwise forcing the wet sheet of stratified paper into the interstices of the form, then pressing and holding it in intimate contact therewith by the mechanical pressure of a platen, and then drying the matrix while so held by passing a current of air over the matrix, substantially as described.

2. The improvement in the art of making papier-maché matrices, which consists in beating or otherwise forcing the wet sheet of stratified paper into the interstices of the form, then pressing and holding it in intimate contact therewith by the mechanical pressure of a platen, then heating said form from its under side, and then drying the matrix while so held and heated by passing a current of air over the matrix, substantially as described.

3. The improvement in the art of making papier-maché matrices, which consists in beating or otherwise forcing the wet sheet of stratified paper into the interstices of the form, then pressing and holding it in intimate contact therewith by the mechanical pressure of a platen, then heating said form from its under side, and then drying the matrix while so held on the heated form by passing a current of heated air over the matrix, substantially as described.

4. The improvement in the art of making papier-maché matrices, which consists in beating or otherwise forcing the wet sheet of stratified paper into the interstices of the form, then pressing and holding it in intimate contact therewith by the mechanical pressure of a platen, then heating said form from its under side, and then drying the matrix while so held on the heated form by currents of hot air blown down against its upper surface, substantially as described.

5. The improvement in the art of making papier-maché matrices, which consists in beating or otherwise forcing the wet sheet of stratified paper into the interstices of the form, then

pressing and holding it in intimate contact therewith by the mechanical pressure of a platen, and then drying the matrix by currents of air urged against the same in quantities gradually decreasing from the center toward its edges, substantially as described.

6. The improvement in the art of making papier-maché matrices, which consists in beating or otherwise forcing the wet sheet of stratified paper into the interstices of the form, then pressing and holding it in intimate contact therewith by the mechanical pressure of a platen, and then drying the matrix while so held by deflected currents of air impelled along its upper surface, substantially as described.

7. The improvement in the art of making papier-maché matrices, which consists in beating or otherwise forcing the wet sheet of stratified paper into the interstices of the form, then pressing and holding it in intimate contact therewith by the elastic pressure of a pervious elastic stratum compressed thereon by the pressure of a platen, and then drying the ma-

trix while so held and pressed by passing dry air through said stratum, substantially as described.

8. The improvement in the art of making papier-maché matrices, which consists in beating or otherwise forcing the wet sheet of stratified paper into the interstices of the form, then pressing and holding it in intimate contact therewith by the elastic pressure of a pervious elastic stratum compressed thereon by the pressure of a platen, then heating the form from its under side to about 212° Fahrenheit, and then forcing against and along the upper surface of the matrix so held and heated and through the compressed elastic stratum a current of air heated to above 212° Fahrenheit, whereby the water in the matrix is speedily evaporated and removed, substantially as described.

JOHN W. OSBORNE.

Witnesses:

J. G. BRADFORD,
THOMAS W. SORAN.