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Patented Oct. 30, 1900.

R. G. HOLBROOK & R. H. KING.
MACHINE FOR FORMING PLATES.

(Application filed June 4, 1900.)

(No Model.)

3 Sheets—Sheet 1.

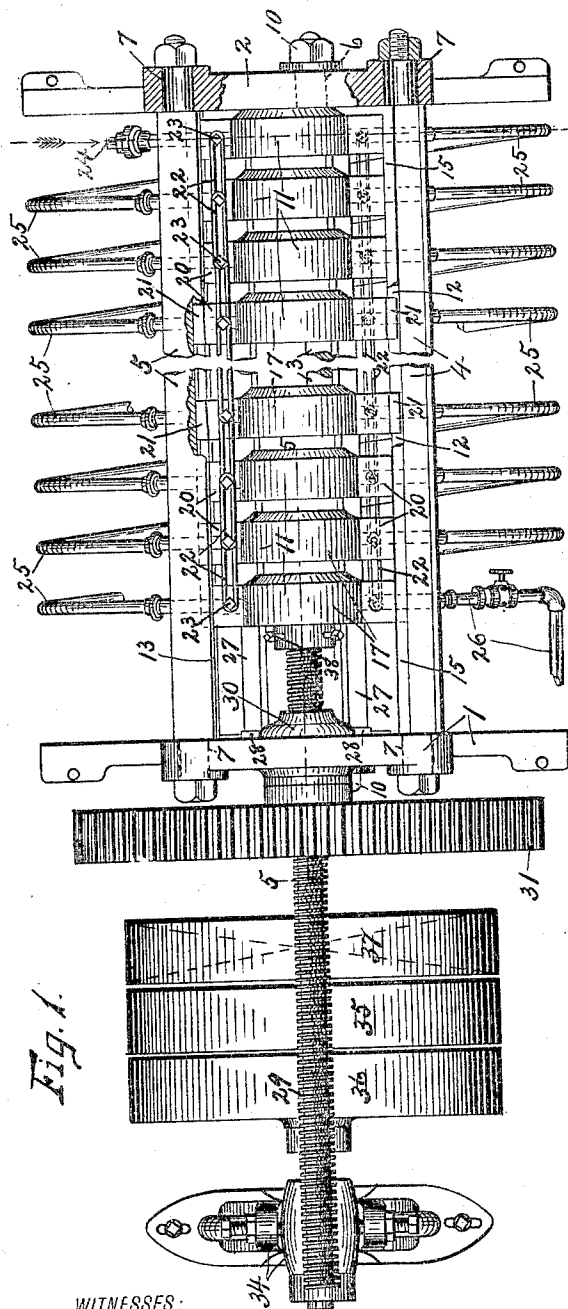


Fig. 1.

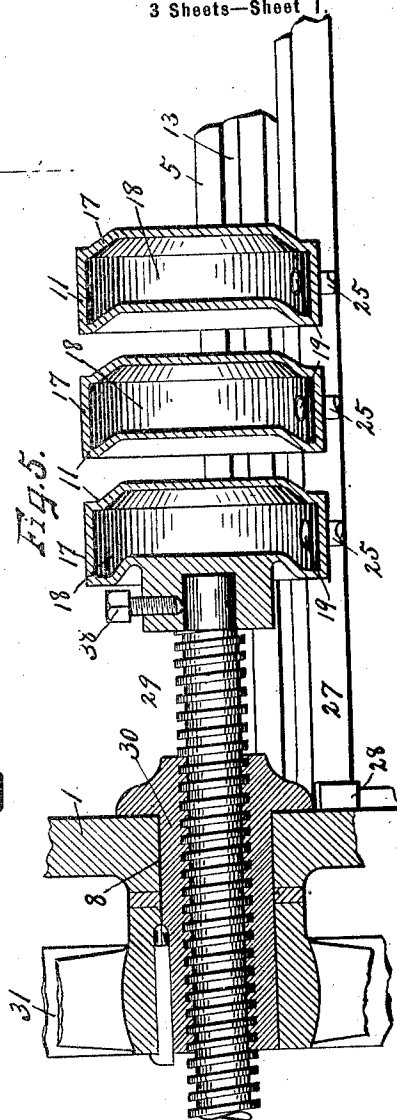


Fig. 5.

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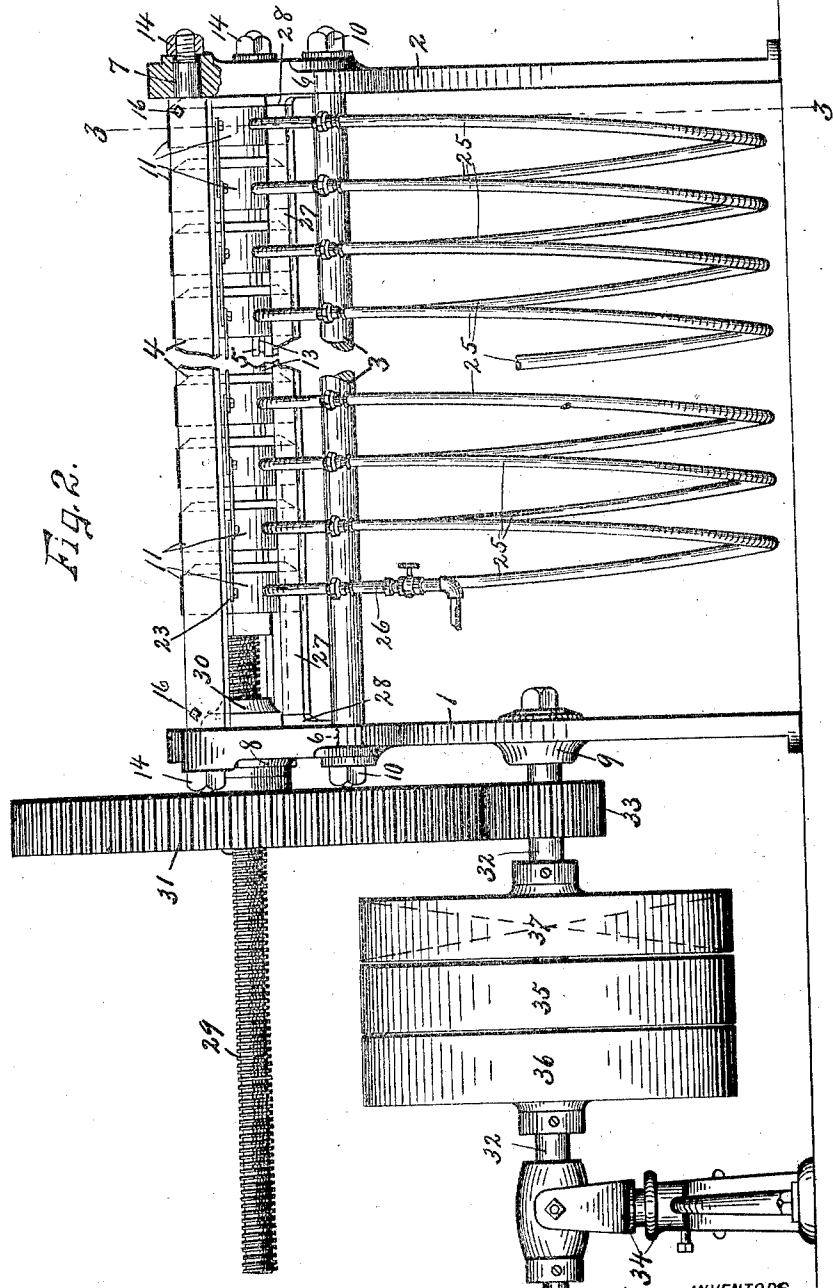


Fig. 2.

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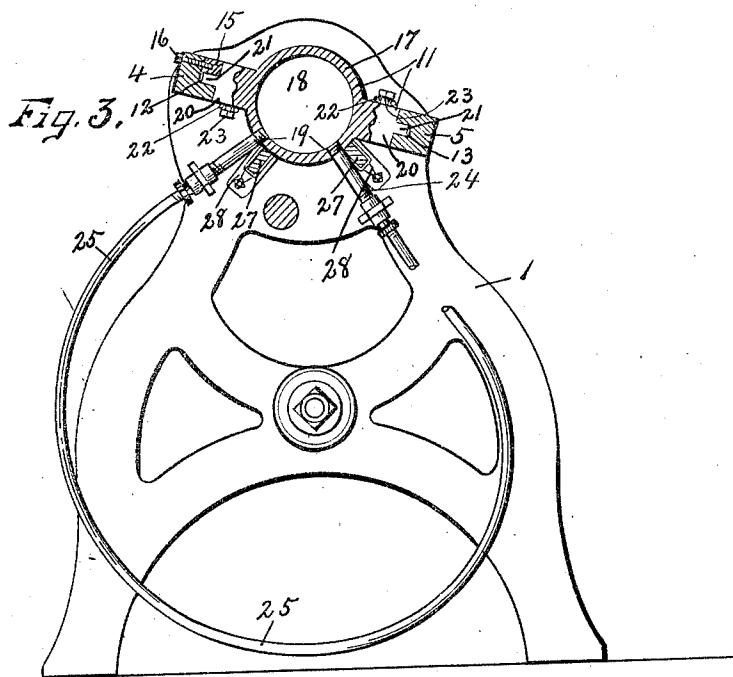
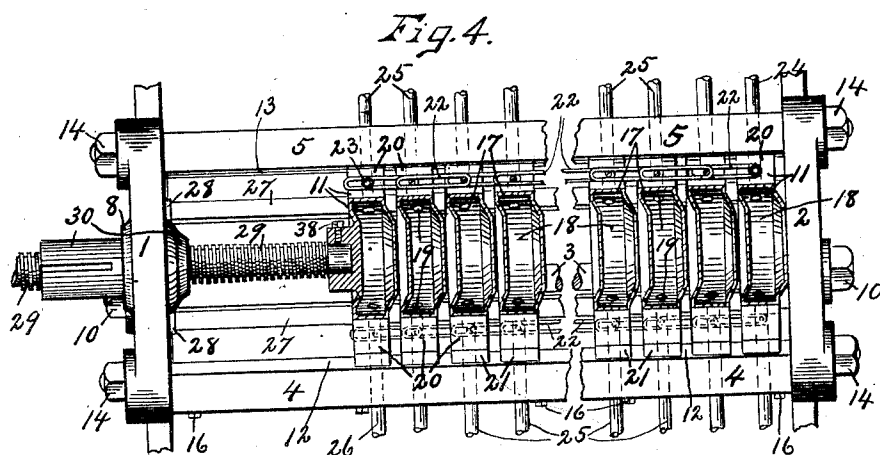
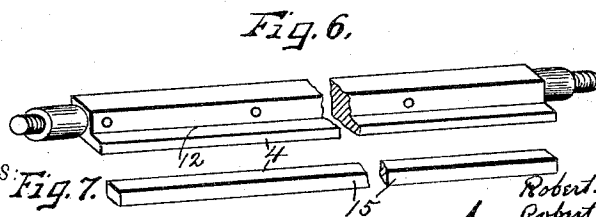
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Fig. 7.

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UNITED STATES PATENT OFFICE.

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MACHINE FOR FORMING PLATES.

SPECIFICATION forming part of Letters Patent No. 660,638, dated October 30, 1900.

Application filed June 4, 1900. Serial No. 18,987. (No model.)

To all whom it may concern:

Be it known that we, ROBERT G. HOLBROOK and ROBERT H. KING, of Oswego, in the county of Oswego, in the State of New York, have invented new and useful Improvements in Machines for Forming Plates, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

Our invention relates to improvements in machines for forming plates, and is particularly applicable for use in the formation of wood or pulp plates, the object of this invention being speedily and simultaneously to compress, form, and dry a large number of such plates which have been previously moistened by the use of the least possible mechanism; and to this end the invention consists in the construction, combination, and arrangement of the component parts of a machine for the desired purpose, as hereinafter fully described, and pointed out in the claims.

In describing this invention reference is had to the accompanying drawings, forming a part of this specification, in which like numerals indicate corresponding parts in all of the views.

Figures 1 and 2 are respectively a top plan and a side elevation, partly broken away, of our invention. Fig. 3 is a sectional view taken on line 3 3 of Fig. 2, showing particularly the guide-rails, the heating-chambers of one of the dies, and the conduits leading to and from said chamber. Fig. 4 is a top plan similar to Fig. 1, the driving mechanism being omitted and the dies being shown in section and as moved toward each other. Fig. 5 is an enlarged sectional view taken on line 5 5 of Fig. 1. Figs. 6 and 7 are isometric views of one of the detached guide-rails and the removable section thereof.

The supporting-frame of our invention may be of any desired form, size, or construction, but preferably consists of separated upright standards 1 2, a tie-bar 3, and guide-rails 4 5. The standards 1 2 are usually provided with apertures 6 7 for receiving the opposite ends of the tie-bar 3 and the guide-rails 4 5. One of the standards, as 1, is formed with suitable bearings 8 9 for receiving revoluble portions of a suitable driving mechanism, hereinafter described.

The tie-bar 3 is interposed between the standards 1 2. Its opposite ends are secured to said standards and are preferably provided with reduced threaded portions passed through apertures 6 of the standards 1 2 and engaged by suitable clamping means, as nuts 10. The shoulders formed by reducing the ends of the tie-bar 3 engage the inner faces of the standards 1 2 and, together with the clamping-nuts 10, form convenient means of firmly securing the standards to the tie-bar.

The guide-rails 4 5 are supported by the standards 1 2, preferably on the opposite sides of the tie-bar, and are arranged substantially parallel with each other and with said tie-bar, and are each provided with a lengthwise groove 12 13, also arranged parallel with each other, which serve to receive and guide portions of the movable dies 11, presently described. These guide-rails also serve as tie-bars for uniting the standards and are each provided with reduced threaded ends passed through the apertures 7 in the standards 1 2 and are engaged by suitable clamping means, as nuts 14. It is thus apparent that the standards 1 2, the tie-bar 3, and the guide-rails 4 5 form when assembled a rigid supporting-frame for the remaining parts of our invention.

It is sometimes desirable to remove one of the dies without disturbing the remaining dies, and for this purpose we provide one of the guide-rails, as 4, with a removable section 15, which forms one of the walls of the groove 12 and is detachably secured to the main portion of the guide-rail 4 by suitable clamping means, as threaded bolts 16, passed through apertures in said main portion and engage with threaded apertures formed in the removable section 15.

Although the above-described guide-rails for the movable dies are particularly simple, durable, and efficient, it will be understood that the same may be otherwise formed and supported and that either one or both may be provided with a removable section, if desired, without departing from the spirit of this invention.

The movable dies 11, previously referred to, are supported one in advance of the other upon the guide-rails 4 5, having portions thereof arranged within the grooves 12 13, and are

movable lengthwise of the said rails a limited distance toward and away from each other for permitting the insertion between the dies of the wood or pulp blanks and for compressing the same to the desired form corresponding to the contour of the adjacent faces of the dies. These dies are all substantially the same size and general contour, are usually formed concavo-convex in cross-section, and are so relatively arranged that the concave face of one die is adjacent to the convex face of the adjacent die, said concave and convex faces being of substantially the same contour and dimensions in order that one may fit closely within the other as the dies are moved toward each other. Each of these dies 11 preferably consists of a substantially-cylindrical shell 17, having a heating-chamber 18, branch passages 19, leading to and from the chamber 18 to the exterior of the shell, and oppositely-arranged arms 20, having tongues 21, arranged in the grooves 12 13, said tongues being elongated lengthwise of the grooves for holding the shell in a substantially-upright position and guiding the dies in their movement along the guide-rails.

Any desired means may be employed for limiting the movement of the dies away from each other in order that said dies may be normally separated a substantially-uniform distance from each other for permitting the insertion of a number of wood or pulp blanks between the adjacent faces of the dies. This means preferably consists of a plurality of series of links 22, the links of one series being adapted to engage suitable shoulders, as bolts 23, secured to the top face of the arms on one side of the shell 17, and the links of the other series being arranged to engage similar shoulders, as bolts 23, secured to the lower face of the arms at the opposite side of the shell 17.

The chamber 18 may be heated in any desired manner for heating the walls of the shell 17, and thereby drying the previously-moistened wood or pulp, as plates, while said plates are being compressed and formed by the dies. We preferably use steam for this purpose and connect the several chambers with each other in such manner that the steam is admitted to the chamber of one of the end dies by a suitable conduit 24, is successively conducted to the chambers of the remaining dies by means of flexible conduits 25, and may be discharged from the chamber of the other end die by a conduit 26.

Each of the chambers 18 is provided with branch passages for receiving, respectively, the conduits 24, 25, and 26, the conduits 24 26 communicating, respectively, with the chambers of the opposite end dies for conducting the steam to and from said dies and the conduit 25 being arranged in the form of a loop and each having its opposite ends communicating with the chambers of the adjacent dies, thereby connecting the several chambers with each other and forming a con-

tinuous passage for the steam from the inlet-conduit 24 through the several conduits 25 and chambers 18 to the outlet-conduit 26.

When placing the wood or pulp blanks in position between the several dies, it is essential that some means be provided for centering said blanks with the dies. This means, as shown in the drawings, consists of separated substantially-parallel bars 27, arranged beneath the dies in planes substantially parallel with the guide-rails 4 5 and equidistant on opposite sides of a vertical plane through the center of the dies and each preferably supported in suitable brackets 28, secured to the inner faces of the standards 1 2. These bars are formed substantially flat, and in cross-section are arranged substantially radial with the cylindrical shell of the dies, with their upper faces disposed in close proximity to the lower faces of said shells.

The means for moving the several dies toward and away from each other preferably consists of a non-revoluble screw 29, extending through the bearing 8 of the standard 1, a threaded sleeve 30, journaled in the bearing 8, a gear 31, keyed to the sleeve 30, and a revoluble shaft 32, having one end journaled in the bearing 9 and provided with a pinion 33 and its other end journaled in a suitable hanger 34 and provided with a tight pulley 35 and loose pulleys 36 37, arranged at the opposite sides of the tight pulley 35. The screw 29 is fixed at one end to one of the dies, as the adjacent end die, by suitable fastening means, as a set-screw 38. The opposite end of the screw is passed through the revoluble sleeve 30 beyond the outer face of the gear 31 and is engaged by threads of said revoluble sleeve for moving the screw endwise, and thereby forcing the dies 11 toward and away from each other. The gear 31 is keyed or otherwise secured to the outer end of the sleeve 30 and meshes with the pinion 33 on the shaft 32, which in turn is driven by the tight pulley 35. The belt (not illustrated) is shifted from either of the loose pulleys 36 37. When either of the belts (not illustrated) is shifted from either of the pulleys 36 37, one of the belts referred to, as the one driving the loose pulley 36, is a straight belt and may be shifted to the tight pulley 35 for rotating the shaft 32 in one direction, and the belt normally driving the pulley 37 is a cross-belt, as is indicated by the dotted lines in Fig. 2, which may be shifted to said tight pulley 35 for driving the shaft 32 in the opposite direction.

In the operation of our invention the dies 11 are normally separated to their extreme limit, regulated by links 22. The wood or pulp blanks are then inserted between the adjacent faces of the several dies and are supported upon and centered by the bars 27. The gear 31 is then rotated by the pinion 33, thereby rotating the sleeve 30 and moving the screw and the dies endwise toward each other for compressing the blanks between said dies and forming the same of substantially the

same contour as the adjacent faces of the dies. During this operation steam is admitted through the inlet-conduit 24 to the chamber in the adjacent end die 11, is discharged from said die into the adjacent conduit 25, which conducts the steam to the chamber of the next adjacent die, and in like manner the steam passes through the chambers of all of the dies successively, thereby heating the walls of the several dies uniformly for the purpose of drying the several plates before being released. After successively passing through the chambers of all of the dies the steam is discharged through the conduit 26, which may be connected to a suitable drip. (Not illustrated.) When the plates between the several dies are sufficiently dry, the sleeve 30 is rotated in the opposite direction, thereby separating the dies from each other, whereupon the plates may be readily removed and the operation repeated.

The operation of our invention will now be readily understood upon reference to the foregoing description and the accompanying drawings, and while the described construction, combination, and arrangement of the component parts of this device are particularly simple and efficient in operation it will be understood that considerable change may be made in the construction without departing from the spirit of this invention, and therefore we do not limit ourselves to the precise construction shown and described.

We claim—

1. In a machine for forming plates, the combination of a supporting-frame having a guide-rail composed of separable sections, one being removable from the other, and a plurality of dies movable lengthwise of the guide-rail and having portions thereof interposed between said sections.

2. In a machine for forming plates, the combination of a supporting-frame having oppositely-arranged grooves, one of the walls of one of the grooves being removable, and a plurality of dies supported by the walls of the grooves and movable lengthwise thereof.

3. In a machine for forming plates, the combination of parallel guide-rails having lengthwise grooves one of the guide-rails having a removable section forming one of the walls of its lengthwise groove, and a plurality of dies movable lengthwise of the guide-rails and having portions thereof projecting into said grooves.

4. In a machine for forming plates, the combination of a supporting-frame, dies mounted on the frame and each provided with a heating-chamber, one of said dies being movable toward and away from the other, and a flexible conduit connecting said chambers.

5. A machine for forming plates, comprising a supporting-frame, dies mounted on the frame and each provided with a heating-chamber, an inlet-conduit connected to one of the chambers, an outlet-conduit connected to the

other chamber, and a flexible conduit connecting said chambers with each other.

6. A machine for forming plates, comprising a supporting-frame having separated guide-rails, a plurality of dies mounted on said guide-rails one in advance of the other and movable lengthwise thereof, each of said dies being provided with a heating-chamber and branch inlet and outlet passages, an inlet-conduit connected to the inlet-passage of one of the end dies, an outlet-conduit connected to the outlet-passage of the other end die, and a plurality of flexible conduits connecting the chambers of said dies with each other.

7. In a machine for forming plates, the combination of a supporting-frame, a plurality of hollow dies mounted on the frame one in advance of the other and movable toward and away from each other, and a plurality of flexible conduits each having its opposite ends communicating with the interior of adjacent dies.

8. In a machine for forming plates, the combination of a supporting-frame having parallel guide-rails provided with lengthwise grooves, one of the guide-rails having a removable section forming one of the walls of the groove, a plurality of hollow dies supported one in advance of the other in said grooves and movable toward and away from each other, flexible conduits connecting the internal chambers of adjacent dies, and additional conduits communicating with the internal chambers of the end dies.

9. In a machine for forming plates, the combination of a supporting-frame, a plurality of dies mounted on the frame and movable toward and away from each other, means for moving one of the dies, and additional means connecting the remaining dies to said one of the dies for transmitting motion thereto and for limiting the separation of the dies one from the other as said one of the dies is moved away from the remaining dies.

10. In a machine for forming plates, the combination of a supporting-frame, a plurality of dies mounted on the frame and movable toward and away from each other, means connected to one of the end dies for moving the same, and links connecting the several dies with each other for moving the other dies and limiting their separation one from the other as said end die is moved away from the remaining dies.

11. In a machine for forming plates, the combination of a supporting-frame having separated substantially-parallel guide-rails provided with lengthwise grooves, one of the guide-rails having a removable section forming one of the walls of the groove, a plurality of dies supported one in advance of the other in said grooves and movable toward and away from each other, means for actuating one of the dies, and links connecting the several dies with each other for transmitting motion to the

other dies and limiting their separation one from the other as said end die is moved away from the other dies.

12. In a machine for forming plates, the combination of a supporting-frame having separated substantially-parallel guide-rails provided with lengthwise grooves, one of the guide-rails having a removable section forming one of the walls of the groove, a plurality of hollow dies supported one in advance of the other in said grooves and movable toward and away from each other, means for actuating one of the end dies, links connecting the several dies with each other for transmitting motion to the other dies and limiting their separation one from the other as said end die is moved away from the remaining dies, flexible conduits connecting the internal chambers of adjacent dies, and additional conduits communicating with the internal chambers of the end dies.

13. In a machine for forming plates, the combination of a supporting-frame, a plurality of hollow dies mounted on the frame and movable toward and away from each other, flexible conduits connecting the internal chambers of the dies with each other, a screw fixed to one of the dies, a threaded revoluble sleeve journaled on the frame and engaged with the screw, and means for revolving the sleeve.

14. In a machine for forming plates, the combination of a supporting-frame, a plurality of dies mounted on the frame and movable toward and away from each other, a screw fixed to one of the end dies, links connecting the remaining dies with each other and with said end die, a threaded sleeve journaled in the frame and engaged with the screw, a gear fixed to the sleeve, and means for revolving the gear in opposite directions.

15. A machine for forming plates, comprising a supporting-frame having parallel guide-rails provided with lengthwise grooves, one

of the rails having a removable section forming one of the walls of the groove, hollow dies guided in said grooves and movable toward and away from each other, an inlet-conduit communicating with the interior of one of the end dies, an outlet-conduit communicating with the interior of the other end die, flexible conduits having their opposite ends communicating with the interiors of adjacent dies for forming a continuous helical conduit through the dies from one end die to the other, a screw secured to one of the end dies, links connecting the remaining dies with each other and with the die to which the screw is secured, a revoluble threaded sleeve journaled on the frame and engaged with the screw, and means for rotating the sleeve in opposite directions.

16. In a machine for forming plates, the combination of a supporting-frame, dies mounted on the frame and movable toward and away from each other, centering-bars supporting the plates in alinement with the dies, and means for moving the dies in opposite directions.

17. In a machine for forming plates, the combination of a supporting-frame, hollow dies mounted on the frame and movable toward and away from each other, separated substantially-parallel bars supported beneath the dies and arranged in planes substantially equidistant on opposite sides of a vertical plane through the centers of the dies, for centering the plates with the dies, means connected to one of the dies for moving the same in opposite directions, and links connecting the remaining dies to each other and to said one of the dies.

In witness whereof we have hereunto set our hands this 31st day of May, 1900.

ROBERT G. HOLBROOK.
ROBERT H. KING.

Witnesses:

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