Aug. 20, 1935. F. T. POWERS 2,011,650

PROCESS FOR COOLING PHOTOMECHANICAL PRINTING PLATES

Filed Nov. 13, 1931 2 Sheets-Sheet 1

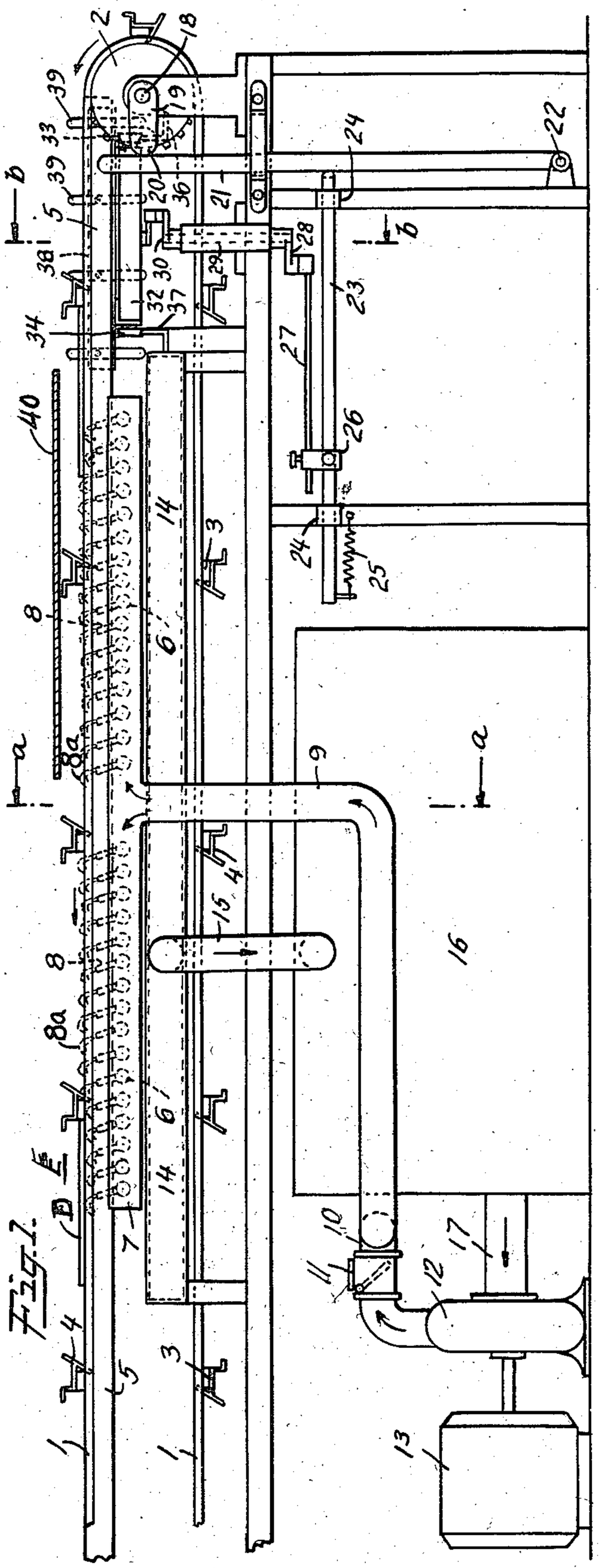

Fig. 1.

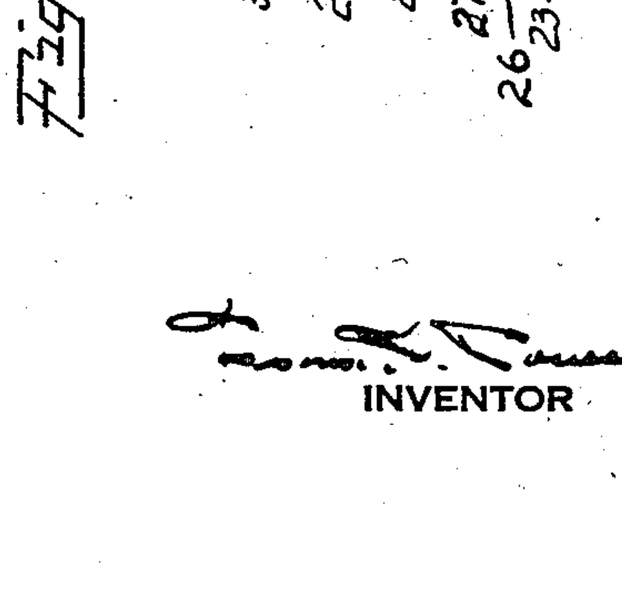

Fig. 4.

INVENTOR

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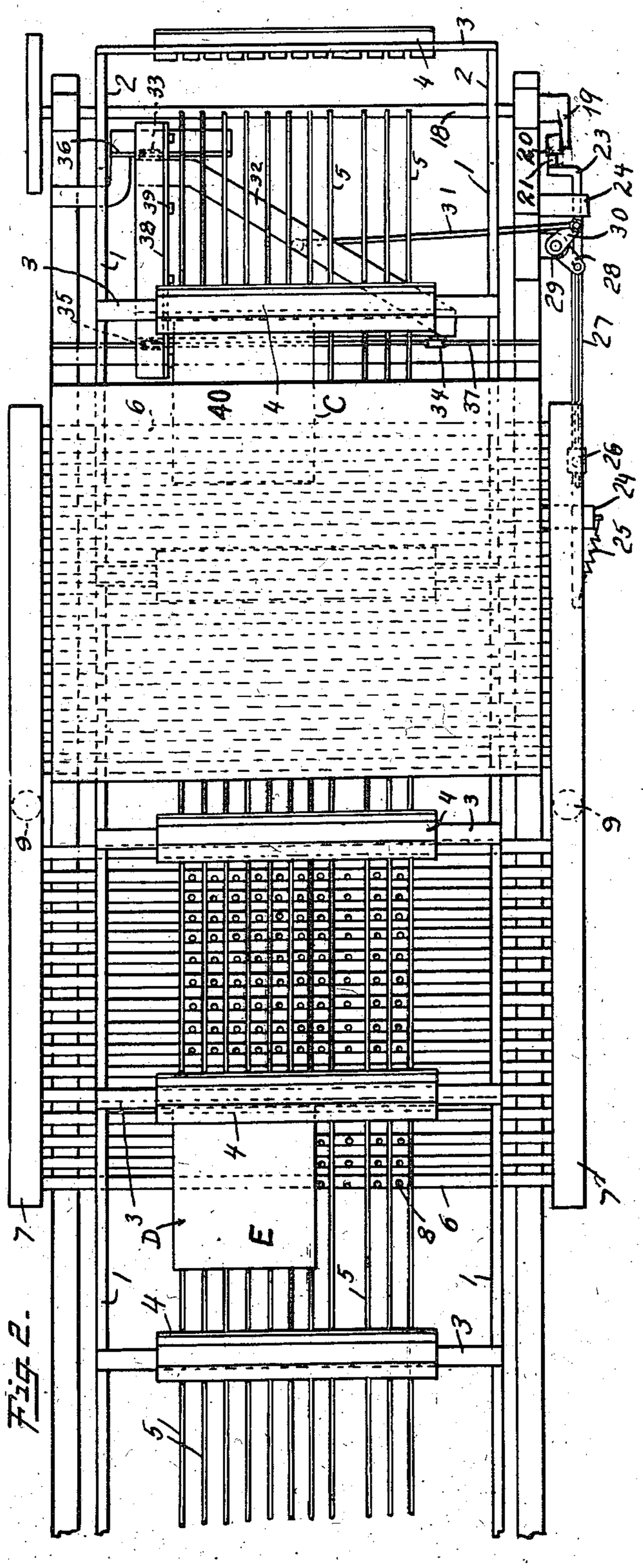

Fig 2.

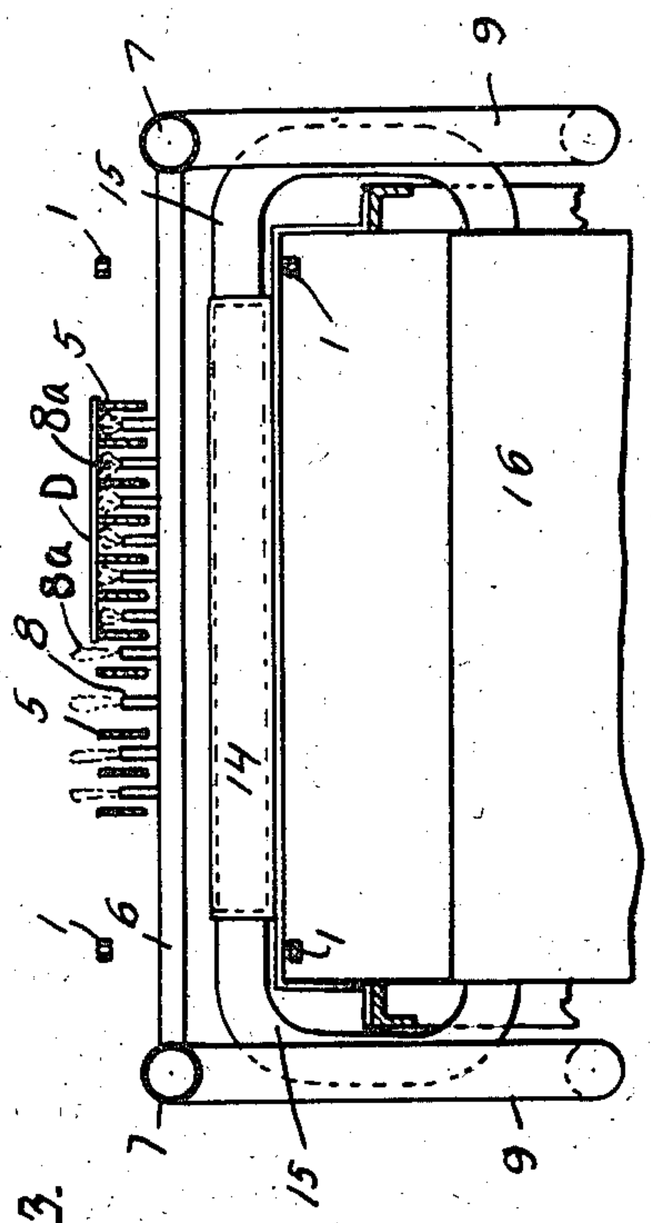

Fig 3.

Thomas T. Powers
INVENTOR

Patented Aug. 20, 1935 2,011,650

UNITED STATES PATENT OFFICE

2,011,650

PROCESS FOR COOLING PHOTOMECHANICAL PRINTING PLATES

Frank T. Powers, Douglaston, N. Y.

Application November 13, 1931, Serial No. 574,737

1 Claim. (Cl. 62—12)

My invention relates to the art of making printing plates by photomechanical processes, and particularly to an apparatus for cooling the plates after they have been heated to set or fuse the powdered resist usually applied between bites.

The object of my invention is to provide a means for cooling heated printing plates from the back by the application of water without danger of ever getting water on the front or printing side of the plate and to do so while the plate is travelling continuously through an automatic machine without being touched or handled.

Other objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claim.

The cooling of photo-engraved or linecut printing plates by automatic means has presented one of the most difficult problems in the creation of an entirely automatic powdering machine, capable of handling all types of plates, including half tones, line work, Ben-Day or ink-top, either on copper or zinc, of either standard thickness of 16 gauge or the extra heavy 14 gauge metal.

Ability to successfully meet all these conditions imposes many limitations upon the cooling apparatus. While the plate is hot, nothing may touch its top surface, since Ben-Day ink is soft and sticky when hot. The plates often become warped while being heated and so cannot be cooled by being passed over a flat wet surface or wet roller for cooling, since the warped plate will not come into contact throughout its entire area without bringing pressure to bear on its upper surface to depress the upwardly warped portions which in turn is prohibited by the stickiness of the Ben-Day ink.

The difference in the total amount of heat to be absorbed or removed from a heated plate depends upon several factors. Among them are: the size of the plate, the thickness of the plate and the amount of metal which has been removed by etching the previous bites. The condition under which the greatest amount of heat must be removed from the plate is when the largest plate of the heaviest metal used is receiving its first powdering, which immediately follows the first "bite". The cooling apparatus must, therefore, have sufficient cooling capacity to cool such a plate from a temperature of approximately 500 deg. F. down to such a temperature that it may be held in the hands of the operator without discomfort. It must cool every square inch of the surface of a plate which has become warped and curved while heating, and no water may touch the top of the plate nor may any pressure be brought to bear on the top while the plate is hot. To meet all of these conditions I have invented an apparatus of which the following is a complete description, which, taken in conjunction with the drawings, will enable one skilled in the art to make and use it. The embodiment of my invention shown in the drawings is one which I prefer, but I do not wish to be understood as limiting my invention to this particular form since there are many variations which are suitable for reducing my invention to practice.

In the drawings, like symbols indicate the same or similar parts and arrows indicate the direction of motion or of rotation.

Fig. 1 is a side elevation, partly in section of my new apparatus. Fig. 2 is a plan view, Fig. 3 is a vertical section on the line *a—a*, and Fig. 4 is a vertical section on the line *b—b* of Fig. 1.

A pair of detachable link chains, **1**, in Fig. 2, mesh with two pairs of sprocket wheels, **2**, only one pair of which are shown in the drawings, the other pair being located at the opposite end of the apparatus not included in the drawings. Attached to the chains, **1**, are a plurality of pusher bars, **3**, to each of which is attached a shield, **4**, of special form as will be hereinafter described. The pusher bars, **3**, ride on and are supported by a series of grid bars, **5**, running lengthwise of the apparatus. These grid bars are so spaced that plates cut to a standard series of dimensions will slightly overlap the grid bars upon which it rests when properly centered thereon by the automatic plate centering device, described hereinafter. The standard series of sizes begins with plates 8 inches square and advanced by increments of two inches in each dimension up to fourteen inches for smaller plates and from eighteen inches to twenty-two inches for larger plates.

Immediately below the grid bars is provided a series of pipes, **6**, extending transversely of the grid bars and terminating at each end in longitudinal header pipes, **7**. Each of the transverse pipes, **6**, is provided with a plurality of short tubular nozzles, **8**, each located midway between the adjacent grid bars, **5**. At approximately the mid points of the header pipes, **7**, are connected pipes, **9**, which are brought together to join a common pipe, **10**, provided, with a check valve **11**, and connected with the discharge outlet of the pump, **12**, driven by the motor, **13**. Under the series of pipes, **6**, is suitably supported a pan, **14**, to the opposite sides of which are connected two pipes, **15**, leading to a reservoir, **16**, which is connected by a pipe, **17**, to the suction side or inlet of the pump **13**.

The automatic plate centering device referred to above is constructed as follows: Attached to one end of the shaft, **18**, of the sprocket wheels, **2**, is an arm, **19**, carrying a roller, **20**, which at each

revolution of the shaft 18, engages the lever, 21, having its fulcrum pin at 22. The lever, 21, engages the slide bar, 23, which slides in the guides, 24, against the tension of the spring, 25. Attached to the slide bar, 23, is a clamp, 26, which serves as a connecting member between the slide bar 23, and the connecting rod, 27, which engages the lower arm, 28, of an offset bell crank which oscillates in the sleeve bearing, 29. The upper arm, 30, of the bell crank is pivotally connected to one end of a rod 31, the other end of which is connected to a triangular travelling carriage, 32, provided with three wheels, 33, 34 and 35, which travel on suitable tracks, 36 and 37. Loosely pivoted to the vertical leg of the angle iron 38 forming one side of the frame of the triangular carriage, 32, are a plurality of fingers, 39, which are free to oscillate about their pivots, but which, by reason of the greater weight of the portion below the pivots tend to remain in a vertical position.

Suitable means not shown in the drawings are provided for driving the chains, 1, and suitable framework and supports not shown in complete detail in the drawings are provided to support and firmly hold all parts of the apparatus.

In use the apparatus functions as follows:

The pump is put into operation after making sure sufficient water is present in the tank. The head of water in the tank, 16, may be varied by maintaining the level of the water at the desired point, which is reflected in the height to which the water nozzles 8 discharge the jets of water, 8*a*. The higher the water level in the tank, 16, the higher the nozzles will discharge. The top of the trajectory of the water should be maintained at about ½ inch above the tops of the grid bars, 5, upon which the plate is pushed by the bars, 4. If the trajectory of the water jets is maintained at this height the plate may be warped or bent as much as half an inch and still be properly cooled while passing through the jets. The speed of the travel of the plate through the jets should be approximately equal to the horizontal component of the forward velocity of travel of the water in the jets. When this condition exists, there is no tendency for the water to travel around the edges of the plate and so reach the top side. If the plate travels faster than the horizontal component of the velocity of the jets at the top of their trajectory the front edge of the plate will tend to cut through the jets and water will reach the top of the front or advancing edge. If the water is travelling forward faster than the plate, there will be a tendency for the water to be thrown up on the rear edge of the plate and so wet the top. This is an important condition to maintain in connection with the operation of the cooler, and is one of the essential elements of its success and efficiency. The flow of the water from the jets having been properly adjusted, the hot plate to be cooled is placed on the cooler at the point C on the receiving table 40, and when one of the pusher bars 3 has just passed under the edge of the receiving table the plate is pushed off the edge of the receiving table, and drops on the grid bars 5 just in front of the next advancing pusher bar 3. At this instant the roller 20 on arm 19 contacts with the lever 21 which pushes the slide bar 23 and so by means of the rod 27 and the bell crank unit, 28, 29 and 30, the carriage 32 is moved over and the fingers 39 push the plate into correct position relative to the grid bars 5. This correct position is indicated in Fig. 4 which shows the plate D resting on the grid bars 5 with each side of the plate slightly overhanging a grid bar. In this position the jets of water, which are located midway between the grid bars 5 do not impinge upon either edge of the plate, since the plates are all of standard size, such that they will always cover a known number of grid bars. If a water jet is permitted to impinge directly on one of the side edges of a plate, the water may carry over or follow around the edge of the plate and so wet the top.

If the plate is warped or curled by the action of the heat during the burning in process which immediately precedes this cooling process in the making of printing plates, it will not lie flat upon the grid bars and in contact therewith. This fact, however, will not interfere with its becoming cooled by the impingement of the cool water from the jets against its under side, by reason of the height above the top of the grid bars to which the water in these jets is projected. This fact strongly differentiates this method of cooling plates from all other methods heretofore in use, in which it is necessary that the plate either be flat or nearly so in order to come in contact with the cooling medium, or else that the curved or warped plate be pressed against the cooling medium by pressure applied to the top or printing side of the plate,—an operation not permissible with plates having an ink top, such, for example, as plates prepared by the Ben-Day process.

The plate having been centered on the grid bars, the pusher bar, 4, pushes the plate along the top of the grid bars and into and through the numerous water jets, each of which continuously plays a stream of water against the under side of the plate, quickly reducing the temperature of the plate to a point where it is easily handled without discomfort by the operator. The plate having been pushed through the cooling zone is delivered to the point E where it is removed by the operator, or if the cooling device forms an integral part of an apparatus by which other than the cooling operation is performed, the plate is passed on to the succeeding step in the operation by the pusher bar, 3.

I am aware that cooling devices involving the use of a plurality of jets of water impinging upon the object to be cooled have been in use for a variety of purposes, and I do not broadly claim such a device. In my new cooling device I depend upon a particular arrangement of water jets and upon adjustment of the velocity and direction of the flow of the water emerging from the jets and upon coordinating the velocity of movement of the plate with the movement of the water in the jets to prevent any of the water reaching the top or printing surface of the plate where considerable damage might result.

Having described my invention and a preferred form of apparatus by means of which it may be put to practice, I will now state what I claim to be new and for which I pray that Letters Patent be granted.

I claim:

The process of cooling photomechanical printing plates, comprising projecting a plurality of upwardly inclined uniform jets of water having uniform trajectories, and conveying the plates through said jets of water at a level below the top of their trajectory, approximately in the horizontal direction of their flow, at a velocity substantially equal to the horizontal component of the velocity of flow of the water.

FRANK T. POWERS.