P. BUNAU-VARILLA.

MACHINE FOR MOLDING PRINTING BLOCKS.

APPLICATION FILED NOV. 8, 1907.

912,228.

Patented Feb. 9, 1909.

3 SHEETS—SHEET 1.

Fig. 1.

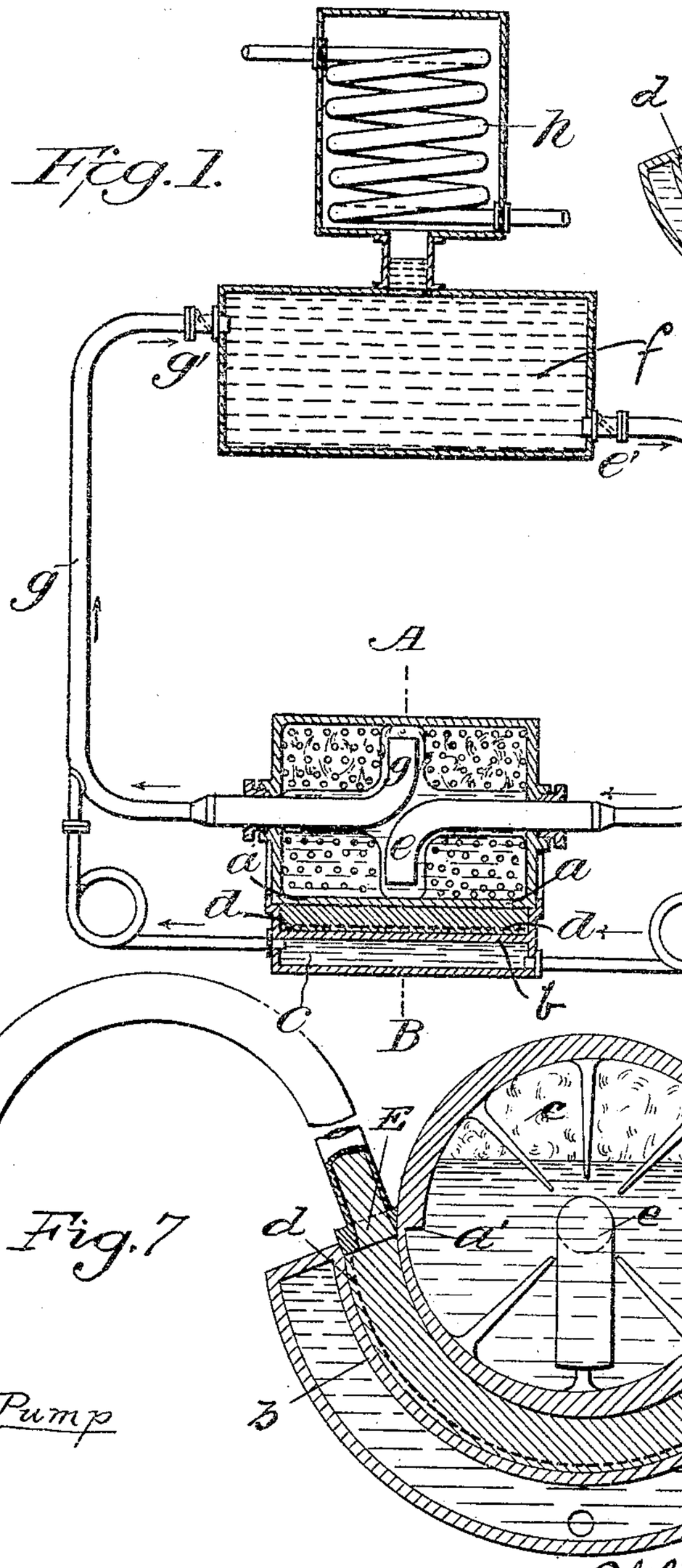

Fig. 2.

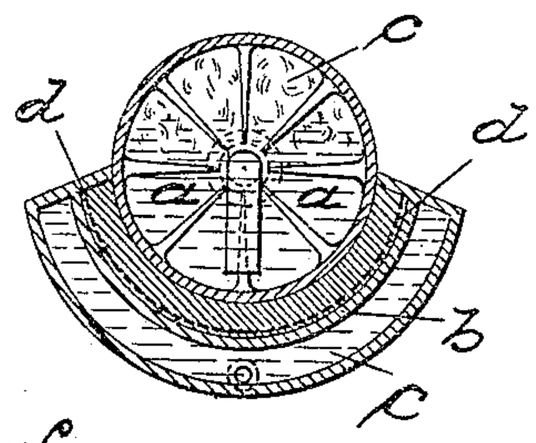

Fig. 7

Witnesses

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3 SHEETS—SHEET 2.

Fig. 3.

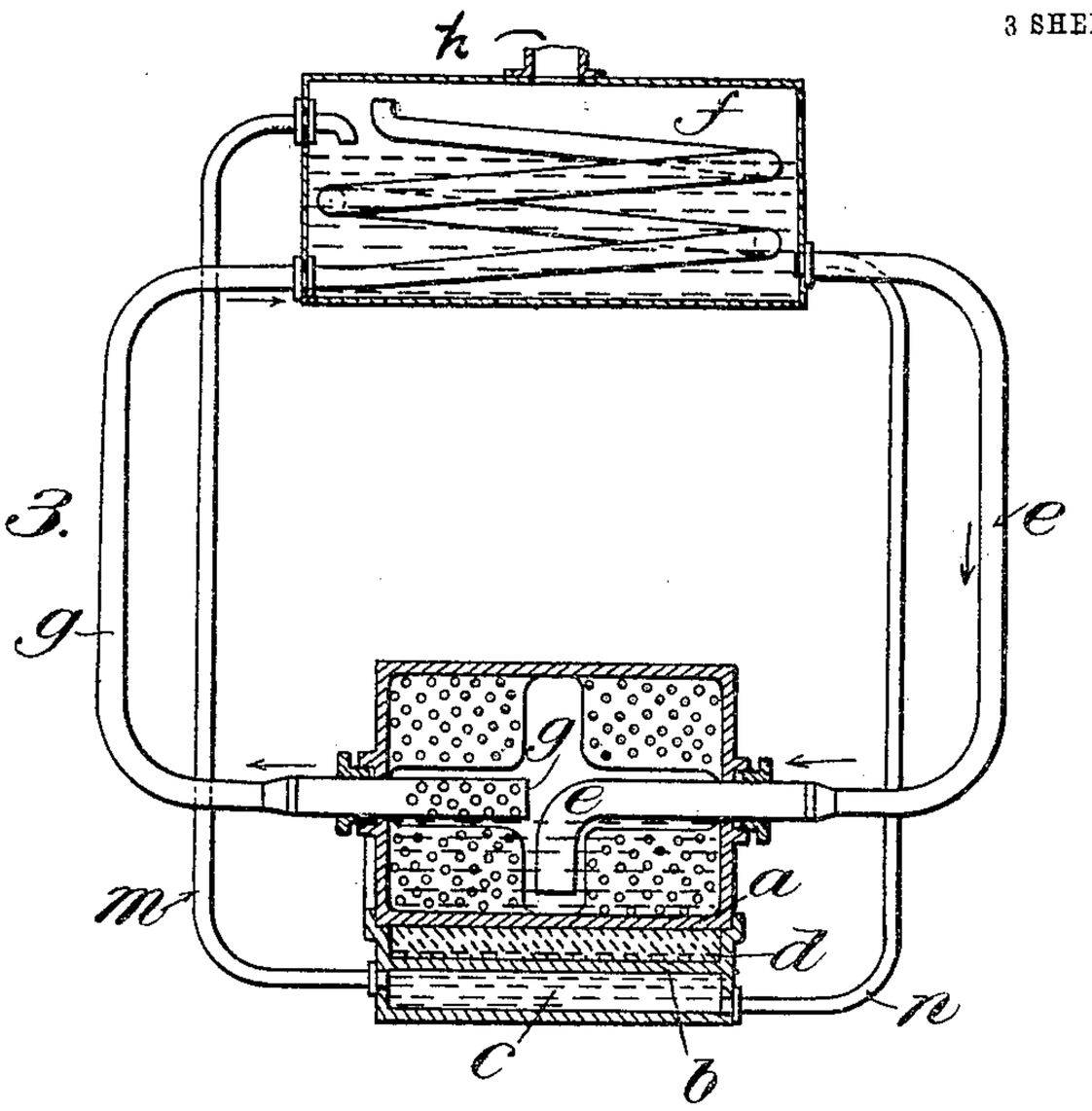
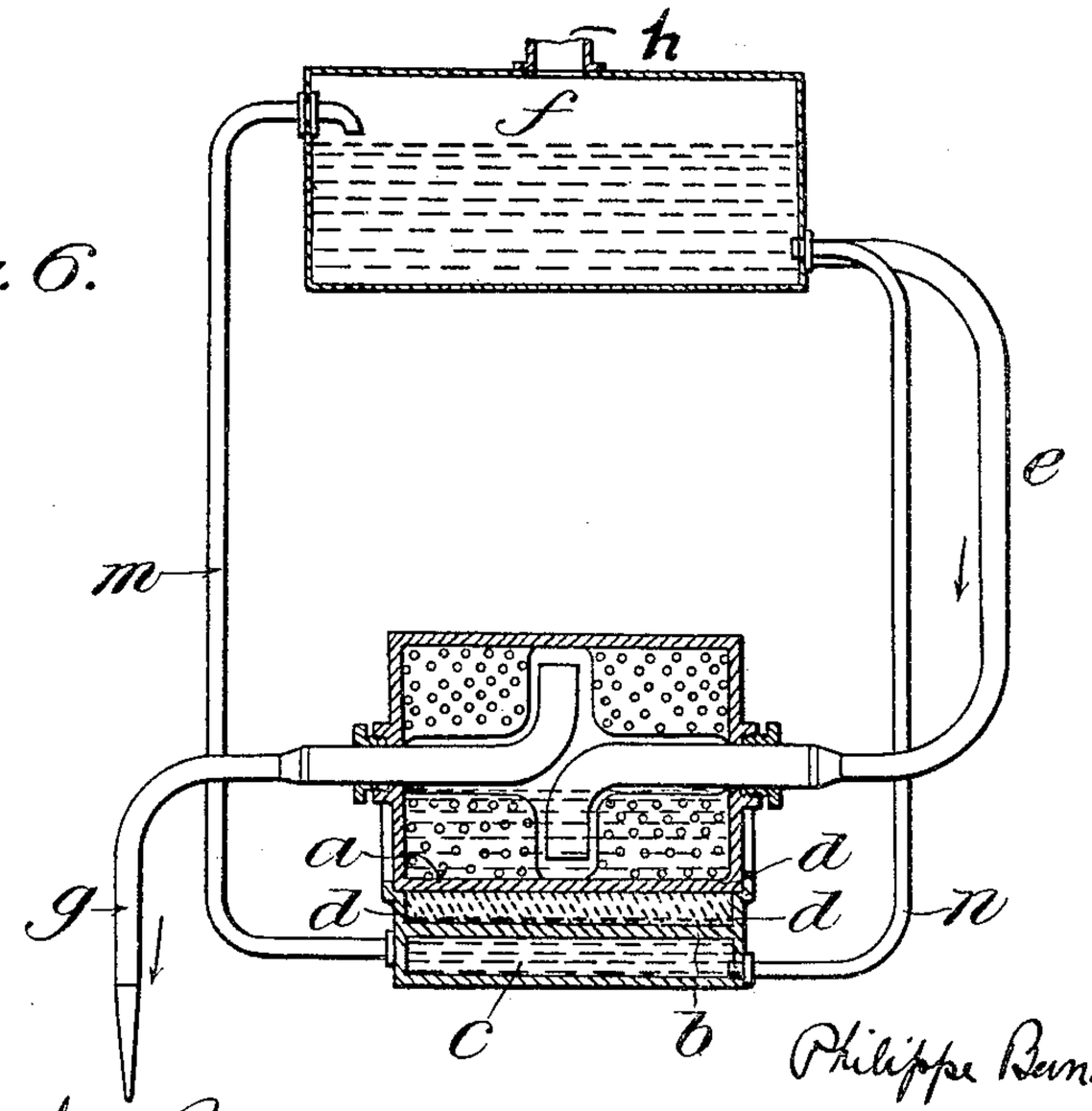


Fig. 6.



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3 SHEETS—SHEET 3.

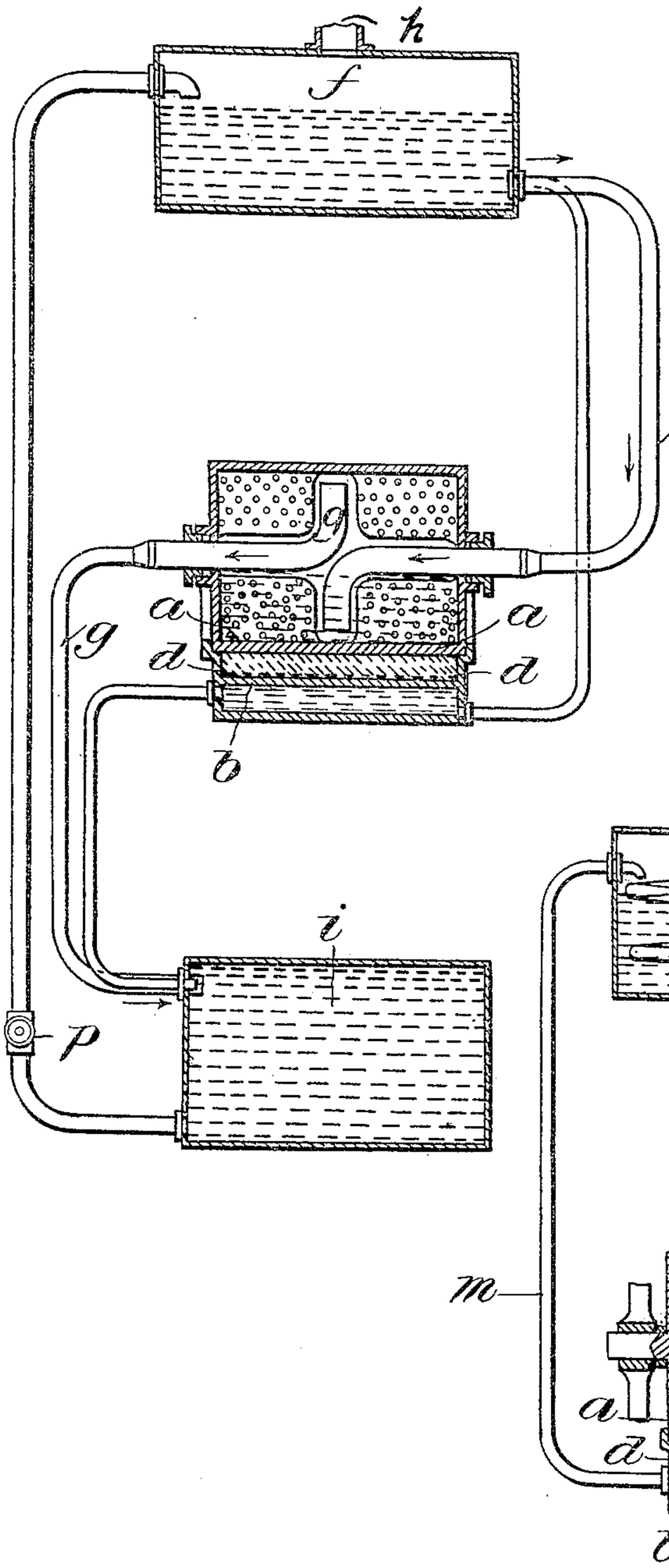
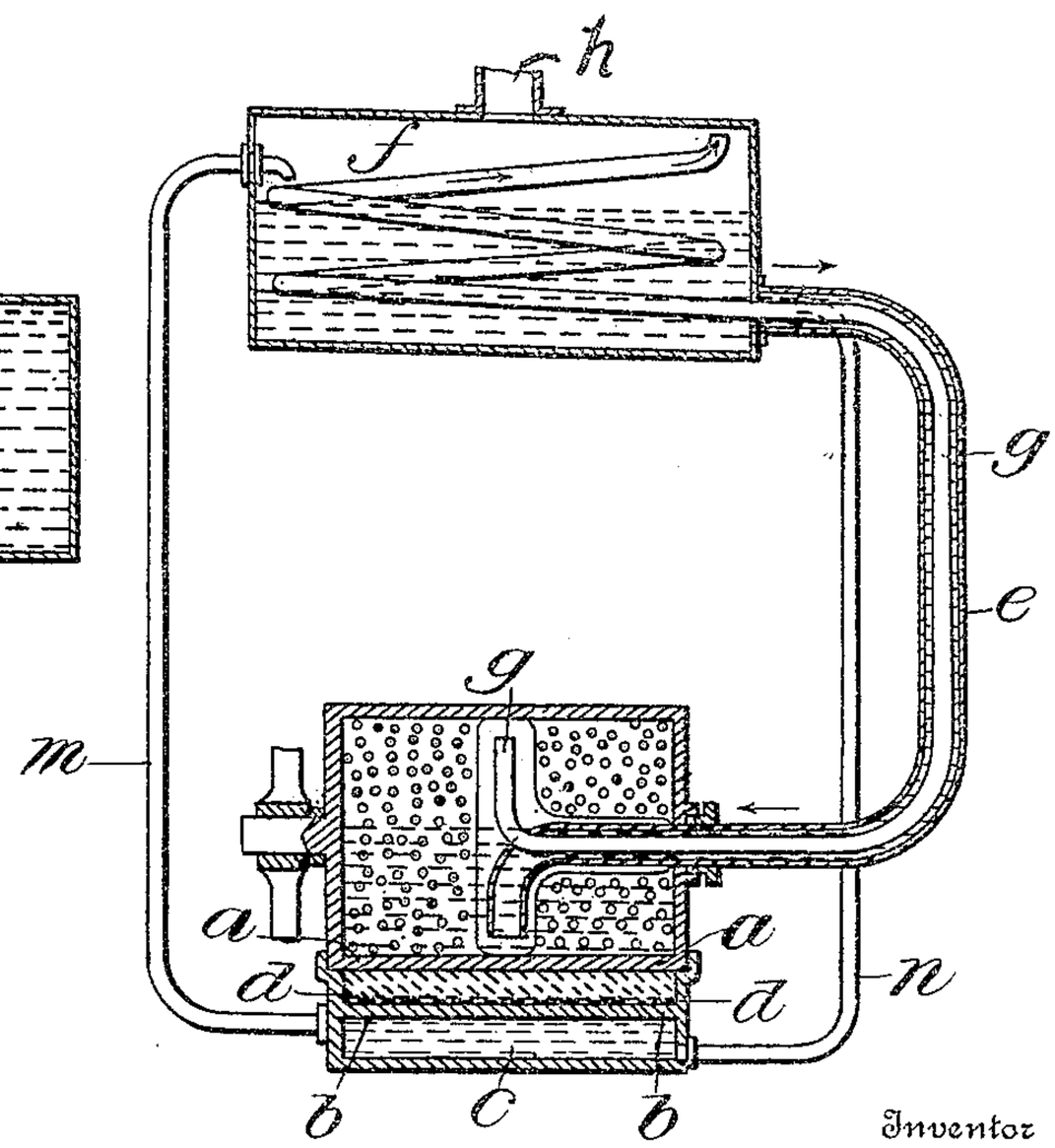


Fig. 5.

Fig. 4.



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UNITED STATES PATENT OFFICE.

PHILIPPE BUNAU-VARILLA, OF PARIS, FRANCE.

MACHINE FOR MOLDING PRINTING-BLOCKS.

No. 912,228. Specification of Letters Patent. Patented Feb. 9, 1909.

Application filed November 8, 1907. Serial No. 401,354.

To all whom it may concern:

Be it known that I, PHILIPPE BUNAU-VARILLA, a citizen of the French Republic, residing at Paris, France, (postal address 53 Avenue d'Jéna, Paris, France,) have invented certain new and useful Improvements in Machines for Molding Printing-Blocks, of which the following is a full, clear, and exact description.

The present invention relates to improvements in machines for molding printing plates or blocks and especially machines known as autoplates, junior autoplates, citoplates, casting boxes, etc.

The object of the invention is to provide a machine of this type by which a methodical, regular and practically automatic cooling of the walls of the mold proper may be attained, and at the same time reducing to a minimum the labor and the water consumption involved, supplying a constant volume of cooling fluid to the mold at a substantially uniform temperature and consequently producing better and more uniform plates or blocks, and particularly removing any possibility of the formation of blow-holes during the molding operation.

Briefly stated, the invention consists in providing an apparatus for conveying water at very nearly the boiling point to the surface of the walls of the mold adjacent the metal to be cooled gradually or in such quantities as to be immediately nearly or entirely vaporized, and conveying the steam or vapor back to the source of supply which is heated thereby and, if desired, is constantly replenished by the condensation of the steam from the mold. It is the heat absorbed from the metal in changing the boiling water to steam that cools the plate without too rapidly chilling the same.

The description of the said improvements is given with respect to the annexed drawing in which:—

Figure 1 is a diagrammatic longitudinal section of the mold fitted with cooling means according to the present invention. Fig. 2 is a cross section upon line A—B of Fig. 1. Figs. 3, 4, 5 and 6 are modifications of the device represented by Figs. 1 and 2. Fig. 7 is a section on the line A—B, Fig. 1, drawn to a larger scale and showing pump P and a modified construction of the cylinder.

The part of the autoplane in which the molten metal is delivered under pressure from the pump P is inclosed on top by a cylindrical convex wall *a* and below by a cylindrical concave wall *b* each combined with a chamber *c* for the circulation of the cooling liquid. The wall *a* and the corresponding chamber *c* form a hollow cylinder revoluble on a fixed horizontal axis. The wall *b* and the corresponding chamber *c* form a segment of a hollow cylinder mounted so as to be capable of being lowered before the rotation of the cylinder before mentioned. The bottom of the mold receives the matrix or imprint *d* forming the mold proper; the sides are closed and the liquid metal is injected by the aid of the pump P suitably connected by piping.

According to the invention the cooling of each of the chambers *c*, *c* is obtained in the following manner: A pipe *e* places the bottom of each of the chambers *c* in communication with a water reservoir *f* arranged above and near the mold; another pipe *g* places the top of the said chambers in communication with the same reservoir. The pipes *e* and *g* enter the chamber *c* of the upper hollow cylinder through stuffing boxes, and are provided with non-return valves e^1 and g^1. The water from the reservoir led by the pipe *e* into contact with the hot wall of the mold is rapidly vaporized and the steam produced escapes by the pipe *g*. The resulting vacuum is immediately filled by a fresh supply of water coming from the reservoir *f*. The circulation of water and steam which is established between the reservoir *f* and the chamber *c* and between this chamber and the reservoir causes a rapid rise in the temperature of the water which is brought to ebullition, that is to 100° C. It is this water which serves for the cooling of the mold with which it is brought continually in contact. The exchange of heat between this water and the mold causes the cooling of the molded plate or block neither too slowly nor too quickly and the inconveniences before-mentioned are avoided. Moreover as the cooling of the upper and lower walls of the mold takes place under identical conditions, the plate or block is submitted on both sides to similar cooling actions and consequently it is rendered perfectly homogeneous. Another advantage of this manner of cooling is that the walls of the mold may be made thinner and a more rapid transfer of the heat thereby secured. The cylindrical chamber revolving around the

horizontal axis instead of having a uniform thickness may be shaped in the interior so that its thickness is smaller near the entrance of the molten metal and greater on the other side in order to lessen the loss of heat of the metal during its travel along the exterior of the surface of the half cylindrical chamber and to avoid bubbles due to a too early refrigeration during such travel. This method of cooling offers above all the principal advantage that during the period of injection into the mold the metal is brought into contact with relatively hot walls (100° C.) This prevents sudden chilling of the metal, which at the moment is in small quantity, and the resulting partial solidification, and production of blow-holes in the plate or block when the operation is complete. In addition to the reduction of the thickness of the walls of the mold, the effect of the cooling can be increased by means of radial or other ribs arranged within the chamber *c*. These ribs would be perforated to allow the release of steam-bubbles; in any case they would increase the rigidity of the cylinder. In order to avoid the loss of the steam which passes through the pipe *g* to the reservoir *f*, the latter may be put in communication with a condensing reservoir *h* above it in which cold water or air would circulate by means of suitably arranged coils. It is to be understood that the details of carrying out this cooling system are absolutely optional and that the drawing merely shows in a diagrammatic manner the arrangement of the molding machine, of which the working, molding and withdrawal are effected as before. This system is applied not only to the autoplate proper, selected as example in the diagram for the explanation of the working but also to all machines for molding plates or blocks, such as ordinary casting boxes, citoplates, junior autoplates, etc. by substituting for the cooling by a current of water of varying temperature, exclusively employed up to the present, the cooling by transformation into steam of a very small fraction of a practically constant mass of water which is naturally maintained at a fixed temperature which is that of boiling water.

In the diagrammatic drawing annexed hereto, Fig. 3, an equivalent modification would be to make the upper end of the pipe *g* deliver steam and hot water into the atmosphere of the reservoir *f* after having formed it as a spiral within the reservoir in order that it may first give up a portion of its heat to the water in this reservoir. The lower extremity of the pipe *g* may also be left simply horizontal within the cylinder formed by the wall *a* and the corresponding chamber *c*. The vertical elbow which terminates the lower extremity of the pipe *g* in this case is suppressed, care being taken to pierce with holes the upper face in order to assist the escape of the steam. On the other hand, as in Fig. 4 for example, one may provide for both the entrance of boiling water and the escape of the steam at one side of the cylinder formed by the chamber *c* and the wall *a*. For this purpose it will suffice to introduce within the pipe *e* another pipe of smaller dimensions which passes into the chamber through the lower elbow of *e* at the height of the axis of rotation of the cylinder and continues beyond as the extremity of the pipe *g* does in the diagram. This pipe would be angled upward as indicated in the diagram or would rest horizontal as shown in Fig. 3. The steam would issue by this pipe escaping either into or above the water of the reservoir *f*; and the water itself would travel from the reservoir towards the chamber by the pipe *e* between the interior walls of this pipe and the outer walls of the steam-escape pipe fulfilling the functions of *g*.

Another modification, Fig. 5, would consist in making the steam-escape pipe *g* open not into the reservoir *f* above or below the water-level, but into an annexed reservoir placed below the axis of rotation of the cylindrical chamber. The boiling water carried by the steam would fall by gravity into this intermediate reservoir. The steam in order to reach this low reservoir would not have to push back the column of water in order to escape, as is the case when it ascends to the condenser *h*, and the pressure within the cylindrical chamber would remain exactly equal to that of the atmosphere. This cylindrical chamber would thus remain constantly filled to the level of the upper extremity of the part of the tube *g* which is bent upwards in the cylindrical chamber. The quantities of steam and boiling water passed out would be constantly and automatically replaced by the arrival of the boiling water which would take place by the tube *e* coming from the upper reservoir *f*. The water falling into the lower reservoir together with that furnished by the condensed steam would be continually forced into the upper reservoir *f* by the pump P and the circulation of boiling water within the cylindrical chamber thus perfectly provided.

As a modification of the method just described, the lower reservoir might be suppressed, Fig. 6, and the escape pipe *g* throttled so that the escaping steam and hot water is reduced to a slight thread which would be allowed to fall into the drain. The water from the upper reservoir would then be heated gradually by the tube *e* owing to the thermosiphonic effect and the slight circulation of water into the cylindrical chamber would moreover insure the presence of

the necessary quantity of boiling water of which only the steam would escape with very little water by the tube *g* curved downwards after its exit from the cylindrical chamber. In this case, in view of the smallness of the stream of water carried off with the steam the loss of water would be so slight that it might be neglected.

Lastly it is not necessary to connect the pipes *m* and *n* with *g* and *e* as shown in Figs. 3–6 nor *b* to the pipes *g* and *e*, Fig. 1. These pipes which insure the circulation of the boiling water and release of the steam for the cooling of the wall *b* can be connected directly to the reservoir *f* and receive similar arrangements to those of the pipes *g* and *e*. These pipes to *b* may be arranged in like manner as *e* and *g*. The pipe which takes away the steam may be curved downwards and permitted to discharge the steam and a very small quantity of water into a drain.

I claim as my invention:

1. In a machine of the character described, the combination of a revoluble hollow cylinder, means for holding an autoplate adjacent to the exterior surface thereof, a tank for containing cooling fluid, a pipe for conveying the cooling fluid to said hollow cylinder, a pipe connected with the upper part of said cylinder for conveying the steam generated in said cylinder back to said tank, and check valves in said pipes for preventing the return of the fluids.

2. The combination in a machine of the character described, a hollow cylindrical chamber, a concave member adjacent thereto forming a space between its concave surface and the exterior wall of the cylinder, a tank adapted to contain a cooling fluid, means for conveying the cooling fluid to the lower part of said cylinder, and means connected with the upper part of said cylinder for removing the steam generated therein.

3. The combination in a machine of the character described, a hollow cylinder, means for holding an autoplate adjacent to its exterior surface, radiating partitions projecting inwardly from the interior surface of said cylinder, a tank containing a cooling fluid, means for conveying the fluid to said cylinder, and means whereby the steam generated in said cylinder is returned to said tank.

4. The combination in a machine of the character described, a hollow cylindrical chamber, a concave member adjacent thereto forming a space between its concave surface and the exterior wall of the cylinder, a tank for containing a cooling fluid, means for conveying the cooling fluid to said cylinder, means for removing the steam generated therein, and a condenser whereby the steam is condensed and returned to said tank.

5. In a machine of the character described, separate water chambers forming separable sides of the mold, a reservoir containing a supply of water for said chambers, and a circulation system of piping connecting said reservoir and water chambers whereby the water in the said reservoir is heated exclusively by the steam and hot water generated in said water chambers by the flow of molten metal to the mold, substantially as described.

6. In a machine of the character described, separate water chambers forming separable sides of the mold, a reservoir containing a supply of water for said chambers and arranged above the same, and a circulation system of piping connecting said reservoir and water chambers whereby the water in the said reservoir is heated exclusively by the steam and hot water generated in said water chambers by the flow of molten metal to the mold, substantially as described.

7. In a machine of the character described, a water chamber forming a wall of the mold, the wall of said water chamber being of less thickness at the point at which the metal enters the mold, for the purpose described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses.

PHILIPPE BUNAU-VARILLA.

Witnesses:
LEON FRANEKEN,
H. C. COXE.