

G. WEBB.
Ingot-Mold.

No. 223,566.

Patented Jan. 13, 1880.

FIG. 1.

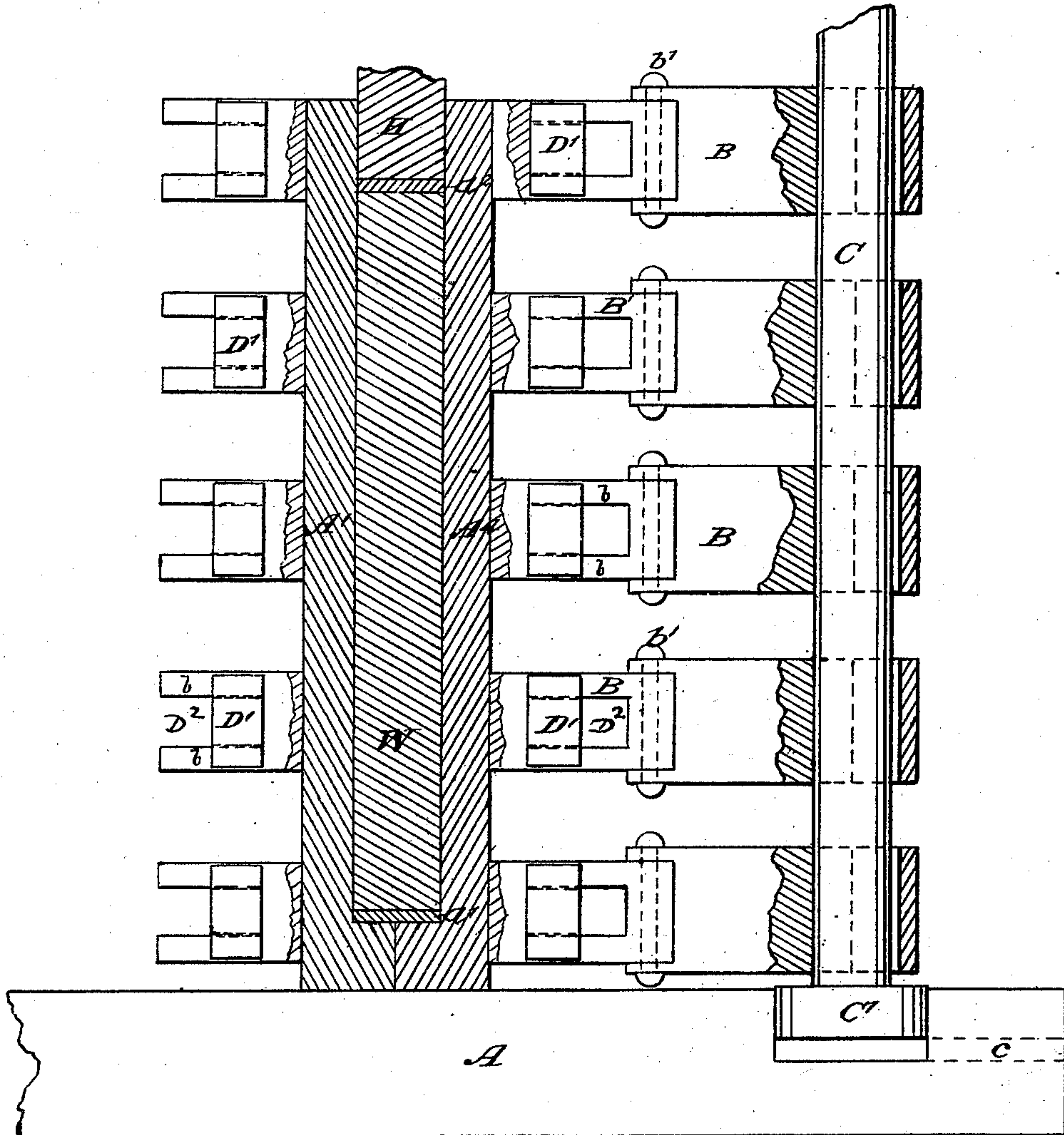


FIG. 4.

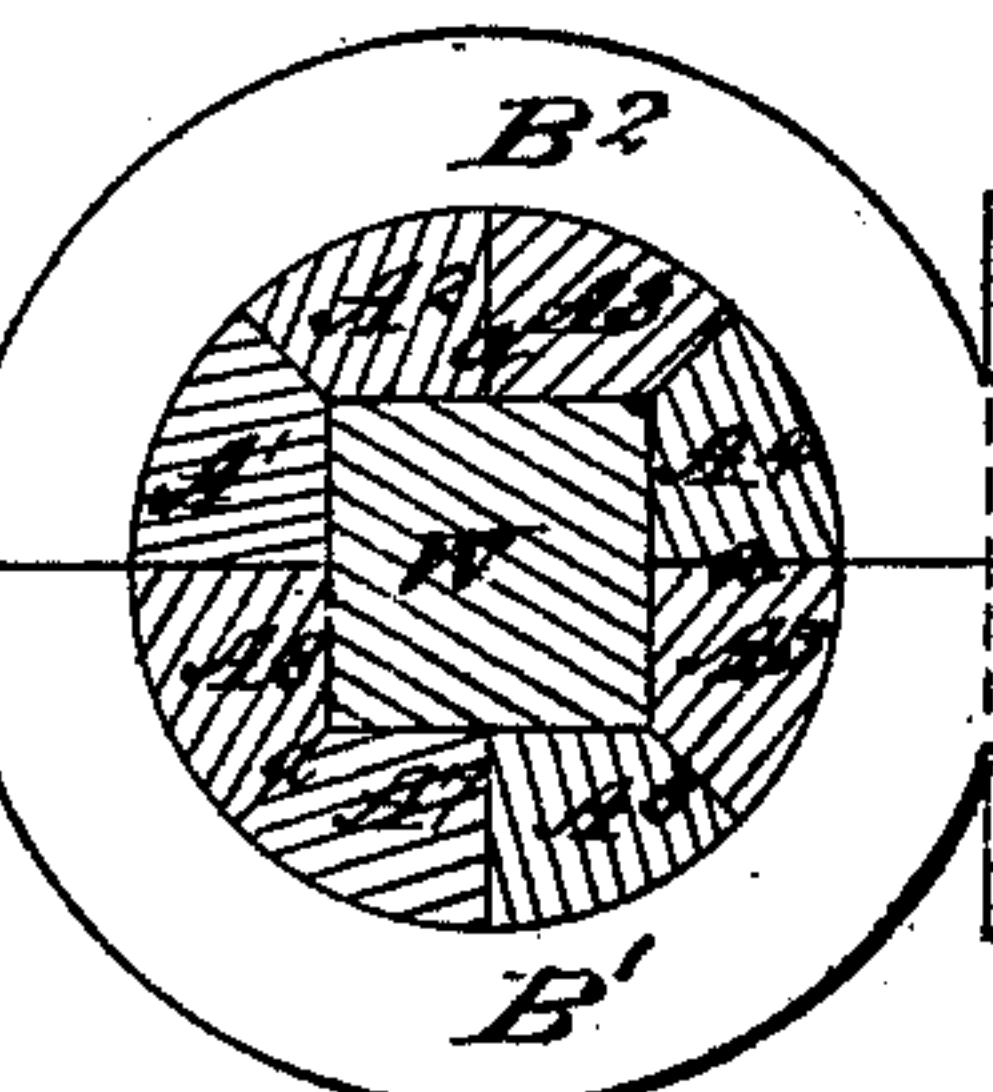
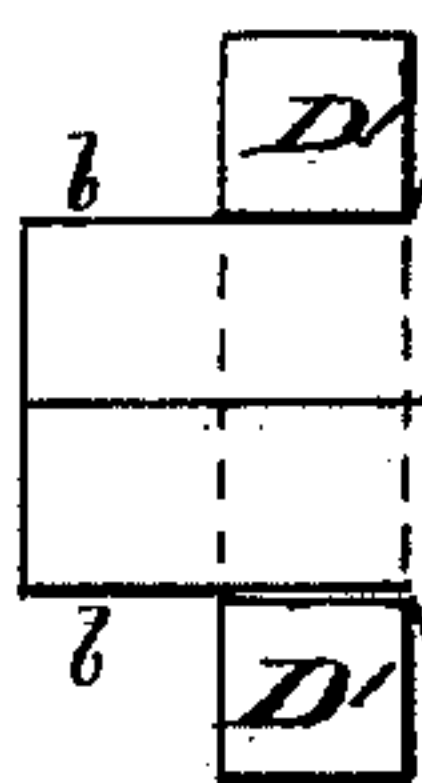
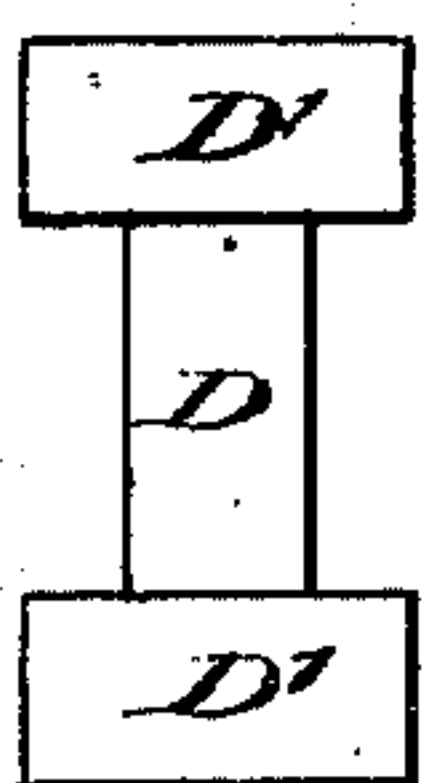
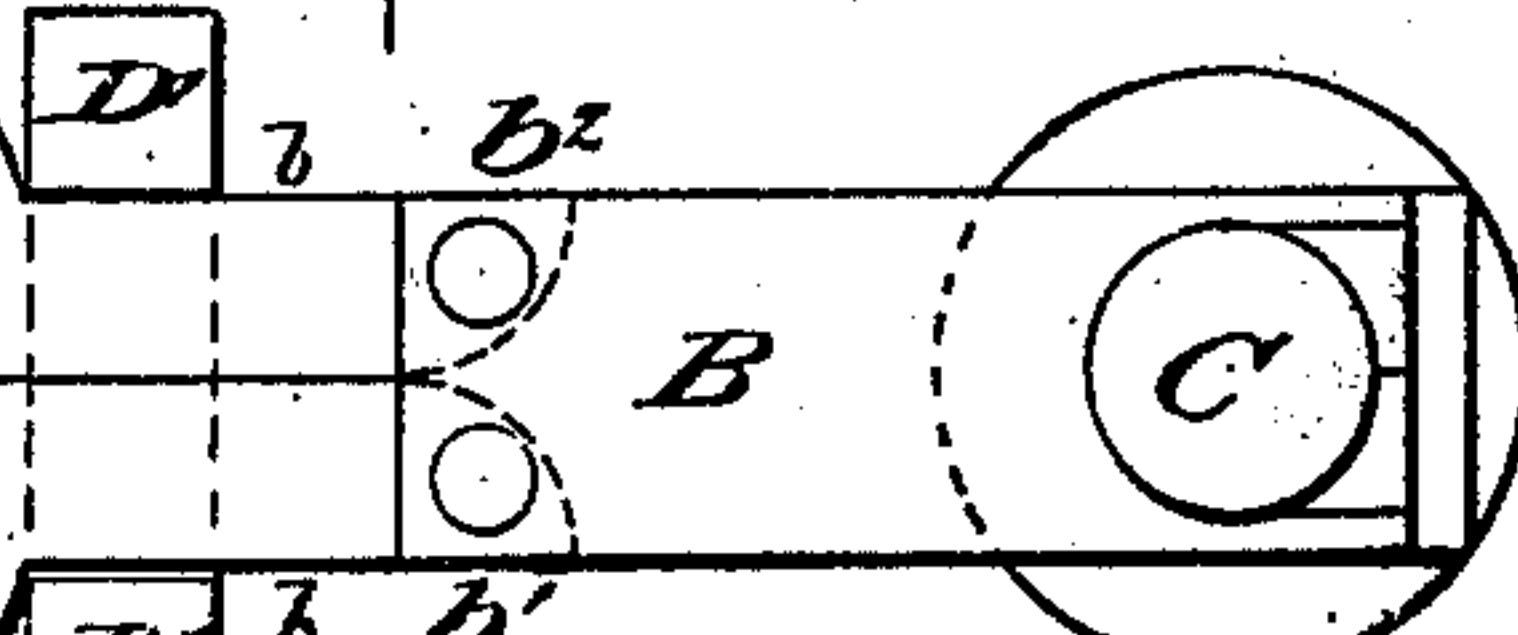


FIG. 2.



INVENTOR:

WITNESSES:

Charles C. Stetson
E. B. Bolton

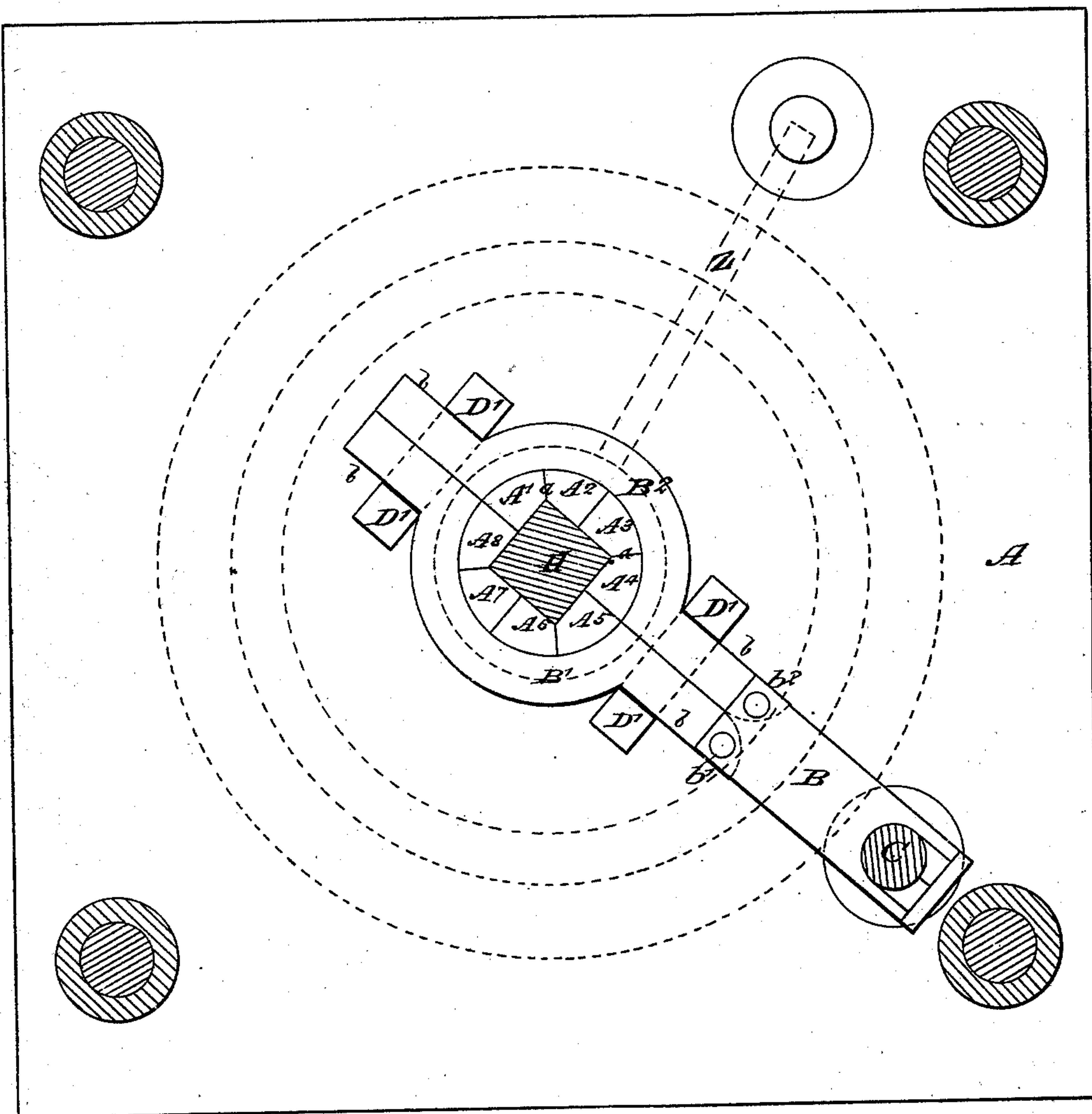
George Webb
by his Attorney
Thomas L. Stetson

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FIG. 3.



— WITNESSES: —

Charles C. Stetson
E. B. Bolton

— INVENTOR: —

George Webb
by his attorney
E. B. Bolton

UNITED STATES PATENT OFFICE.

GEORGE WEBB, OF JOHNSTOWN, PENNSYLVANIA.

INGOT-MOLD.

SPECIFICATION forming part of Letters Patent No. 223,566, dated January 13, 1880.

Application filed June 26, 1879.

To all whom it may concern:

Be it known that I, GEORGE WEBB, of Johnstown, Cambria county, in the State of Pennsylvania, have invented certain new and
5 useful Improvements relating to Ingot-Molds and their Appurtenances, of which the following is a specification.

In the manufacture of steel it has long been common to cast the fluid metal in the form of
10 thick bars of rectangular section, denominated "ingots," which are afterward subjected to hammering or rolling. The molds for this purpose are usually of cast-iron. I have improved the molds and the means for holding and oper-
15 ating them.

My improvements are intended more especially to be used in combination with means for subjecting the material of the ingot to compression while in a fluid state. I employ a pe-
20 culiar combined hydraulic press.

The accompanying drawings form a part of this specification, and represent what I consider the best means of carrying out the invention.

25 Figure 1 is an elevation, partly in section. Fig. 2 is a plan view of the sectional mold and the accompanying parts. Fig. 3 is a corresponding plan view, showing the same with a dotted outline, giving the relative position of
30 the big cylinder of the hydraulic press, which, it will be understood, is above. The figure also shows, in section, the stout holding-down bolts by which the top and bottom of the machine are held directly together to allow the
35 intense pressure required. Fig. 4 represents one of the locking devices detached.

Similar letters of reference indicate like parts in all the figures.

40 A' A², &c., are the sections of a mold, adapted, when applied together, to present a smooth and cylindrical exterior and a smooth cavity of uniform rectangular section on the interior. This cavity receives the melted steel and forms the ingot. The surfaces which abut together
45 at the junctions of the several sections are marked *a*. They are carefully and accurately fitted together, and, instead of being left absolutely smooth, are left with fine scores across their surfaces, such as result from filing with

a coarse file. These scores may be actually 50 produced by filing; but I prefer that they shall be produced by machinery with a motion analogous to planing. The result is a junction of the surfaces sufficiently tight to prevent the passage, or even the entrance to any consider- 55 able extent, of the melted metal into the joint; but the fine scores in the surfaces *a* allow any gases which are emitted from the melted steel to escape. The multiplicity of sections and of joints presents these vents for the gases at 60 such closely-distributed points as tend greatly to prevent the accumulation of gas to induce blow-holes or flaws.

The sections, being very strongly bound together by means to be described below, are, in 65 the use of the invention, filled with melted steel and moved into a position where the contents are subjected to a great pressure, preferably by a peculiar compound hydraulic press, which will form the subject of another application for 70 patent. The pressure thus induced serves, with the freedom for the escape of gas due to my construction of mold, to insure absolutely uniform and sound metal in the ingots. Such ingots make superior steel.

75 The sections A' A², &c., are held together by massive clamps B' B², which are supplied in sufficient numbers, and arranged to embrace the mold at short distances apart along its length. The parts of each clamp are hung by 80 pivots *b'* *b*² to a swinging arm or jib, B, which is keyed or otherwise firmly fixed on a turning mast, C, which is supported in a suitable guide at the top, (not represented,) and is formed at the bottom in a foot, C', which fits tightly in 85 a corresponding cylindrically-bored recess in a bed-casting, A. Provision is made by a passage, *c*, connected to a suitable pumping-engine or other means of controlling water, 90 for permitting water or oil under pressure to act on the whole under face of the enlarged foot C', and to raise the mast C and its connections bodily when desired.

It will be understood that on sufficiently 95 raising the parts by the pressure of water under the foot C' the ingot-mold and its connections are allowed to swing clear of the bed, and may then be swung around, turning on the line

of the mast C as an axis of motion. This is done to allow the ingot-mold and its contents to be taken away and a new mold supplied. On swinging the ingot-mold into the correct position under the press, it is allowed to sink and rest firmly upon the bed A by simply letting out the water from under C'.

The clamps B' B² are very strong, and fit tightly to the exterior of the sections A' A². They are locked by the application of stout locking-pieces or gibs D D', which apply on slightly-inclined faces b, as represented, so that the center part or body, D, is received in narrow slots D², and the ends or heads D' take strong hold, respectively, on the outer faces of the clamps. The locking-piece farthest from the hinges or pivots b' b² may, after loosening it with a heavy hammer, be removed by simply moving it bodily outward beyond the end of the clamps. The other locking-piece—that nearest the pivots b' b²—is inserted in a horizontal position by being thrust endwise through the rectangular hole, D², represented, which is large enough to admit it, and is locked by being turned partly around and moving it bodily by a heavy hammer or otherwise toward the ingot-mold.

The exteriors of the clamps B' B² are slightly tapered to allow these locking-pieces being driven home to engage them together very tightly.

I apply a piece of thick rolled-iron plate, a', in the bottom of the rectangular cavity for the ingot W before the ingot metal is run in, and I apply a similar plate, a², on the top of the molten metal immediately the filling is completed. A piece of cast-iron or steel, H, made only a little smaller than the cavity in the sectional mold, is applied in the position shown, and the upper end of it is made to receive the force of the plunger of the press. (Not represented.)

The bottom plate, a', receives the force of the dense stream of falling metal, which is otherwise liable to cut and injure the metal of the mold. The top plate, a², should fit quite tightly, and aids in preventing the molten metal from gushing up around the set H and escaping when the intense pressure is applied.

After release from the clamps B' B², the sections of the mold are held together by slight bands, (not represented,) which bands may be applied previous to presenting the mold under the press to be filled, and are removed at a subsequent period when the ingot-mold and its contents have been taken out of the clamps and removed to a convenient distance.

The bands may be stout wires or strips of hoop-iron secured by any suitable tie.

All the several parts are made with reference to easy and quick operation. I esteem it essential that the heavy pressure induced by my hydraulic press shall be applied to the metal before it commences to set, even on the outside.

The principal blow-holes and honey-comb places are in the interior of an ingot, within an inch or less from the surface. By applying the intense pressure before the exterior of the ingot has thickened, the gas is delivered immediately out through the just sufficiently open joints induced by my striated or file-roughened surfaces a.

A matter to which I attach much importance remains to be described. I have discovered that the presence of the mineral known as "dolomite" tends, by some means, the theory of which is but imperfectly conjectured, to prevent the formation of gas or to facilitate the exodus thereof, so as to avoid pipings in the ingot. I burn the dolomite, which is an impure limestone, and, having produced therefrom a lime containing magnesia, treat the same with water to form a thin paste analogous to ordinary whitewash, but thicker. This wash is applied by a brush or otherwise over the whole inner surface of each section of the ingot-mold. I also similarly coat one or both the striated surfaces forming the joints.

I propose to provide a tank filled with a thin solution of the dolomite-wash, and, by cooling the ingot-molds in this tank, prepare a good foundation for the subsequent coatings.

I propose to make this dolomite coating the subject of a separate application for patent.

Modifications may be made in many of the details. It is practicable to employ the clamps more thickly crowded together, so that six instead of five may be used in an ingot-mold of the size shown; or it is possible to dispense with one or more of the clamps shown; but I prefer about the number represented. It is only essential that there be sufficient to hold the sections A' A², &c., strongly and tightly together, and that they be easy of manipulation, to allow the removal of the ingot and replacing of the same molds or of different ones in position to have the contents again compressed.

In Fig. 3, Z represents another jib, adapted to transfer the ingot-molds to and from a railroad or other suitable provision on the opposite side of the press from that at which the melted steel is received.

I claim as my invention—

1. In combination with an ingot-mold formed of sections A' A², &c., the clamps B' B², mounted on a mast, C C', adapted for vertical lifting and horizontal swinging, as herein specified.

2. The locking-pieces D D', adapted to fit in corresponding recesses in the clamps B' B², in combination with such clamps and their supporting means, C, and with the sectional ingot-mold A' A², &c., as herein specified.

3. The thin plates of wrought metal, a' a², at the top and bottom, respectively, of the ingot-mold, in combination with sections A' A², each constituting a portion of the side and of the bottom of the mold, formed in one, and with

the separate set or top piece, H, all substantially as and adapted to serve the purposes herein specified.

4. In combination with a press provided
5 with a jib having clamps, as described, for moving and holding the molds for filling and compressing, another jib, Z, turning on a center near the other side of the press, for introducing the empty and removing the filled
10 molds, as herein specified.

In testimony whereof I have hereunto set my hand this 22d day of May, 1879, in the presence of two subscribing witnesses.

GEO. WEBB.

Witnesses:

A. MONTGOMERY,
J. W. REES.