(No Model.) 3 Sheets—Sheet 1.

H. AIKEN.

MOLD FOR INGOTS.

No. 416,706. Patented Dec. 10, 1889.

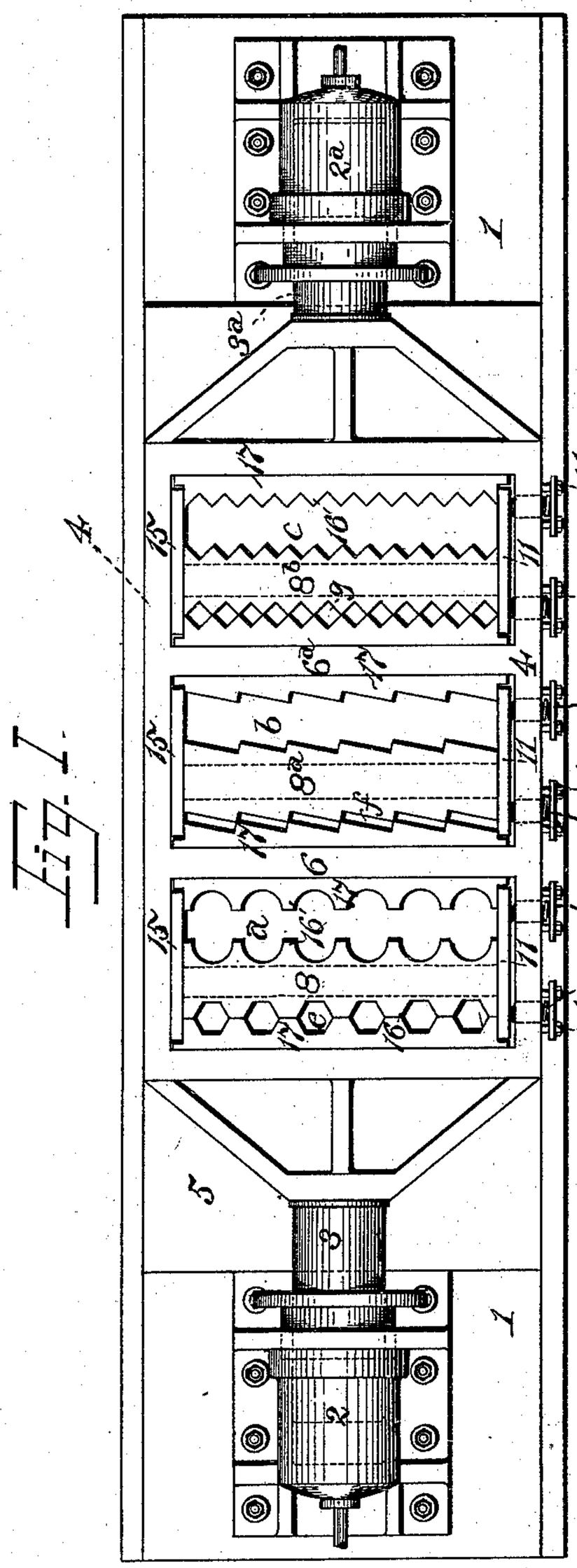

Fig. 1.

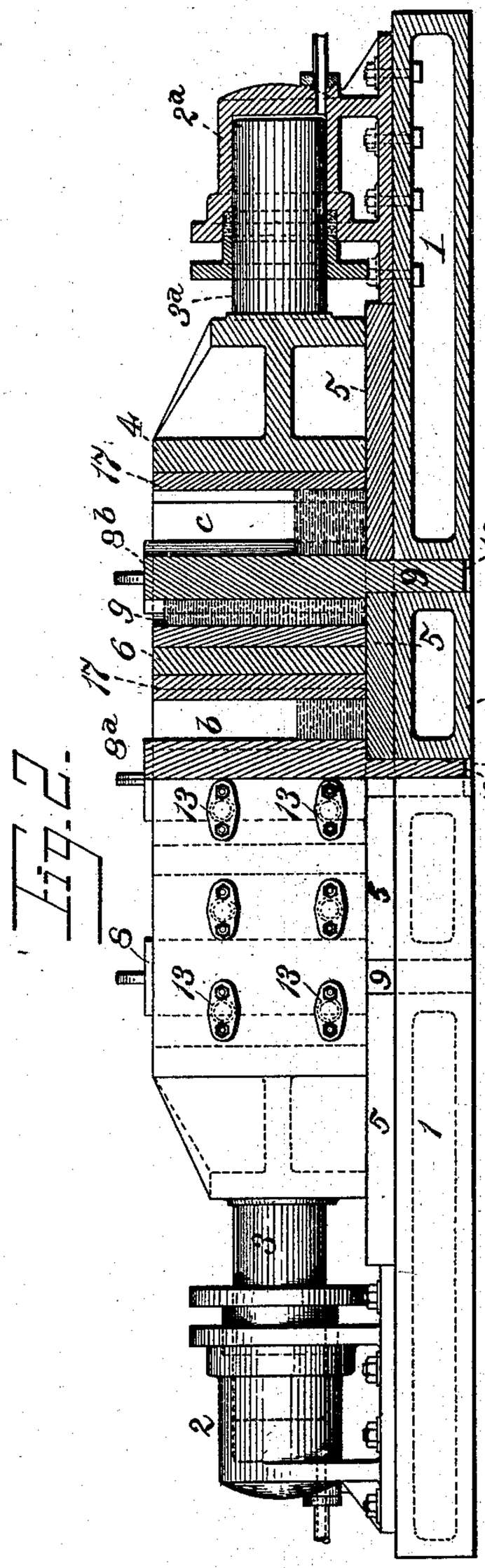

Fig. 2.

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Fig. 4.

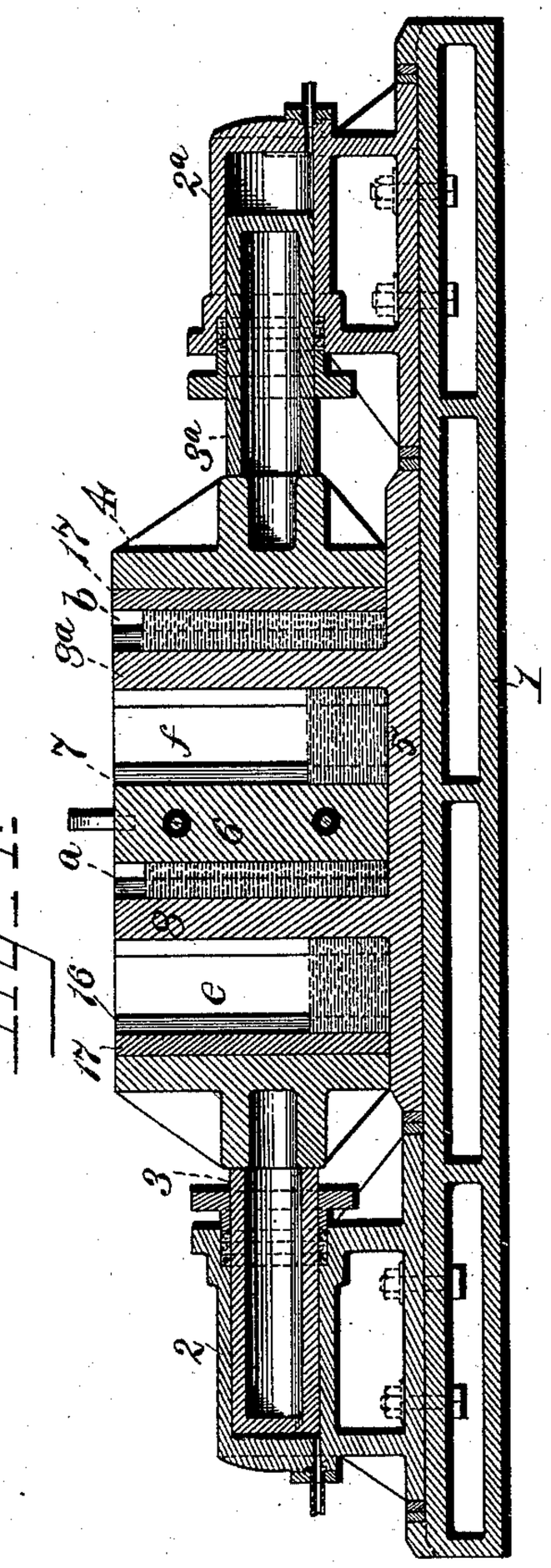

Fig. 1.

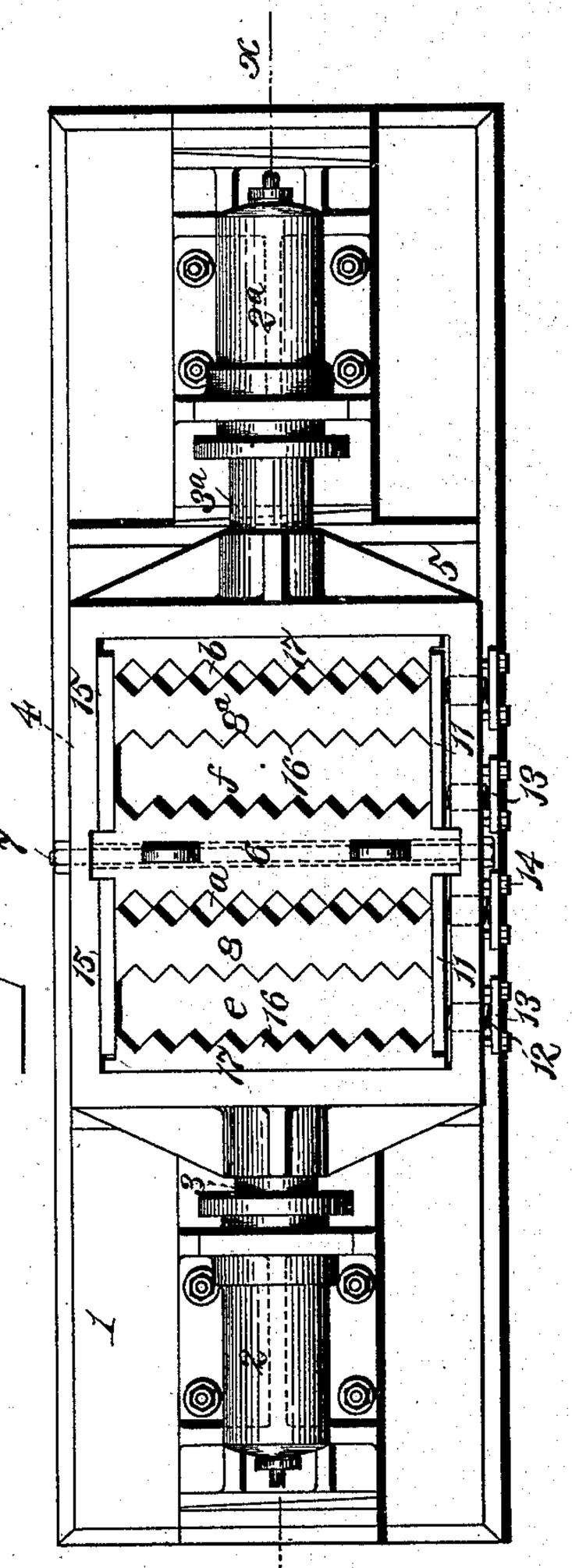

Fig. 5.

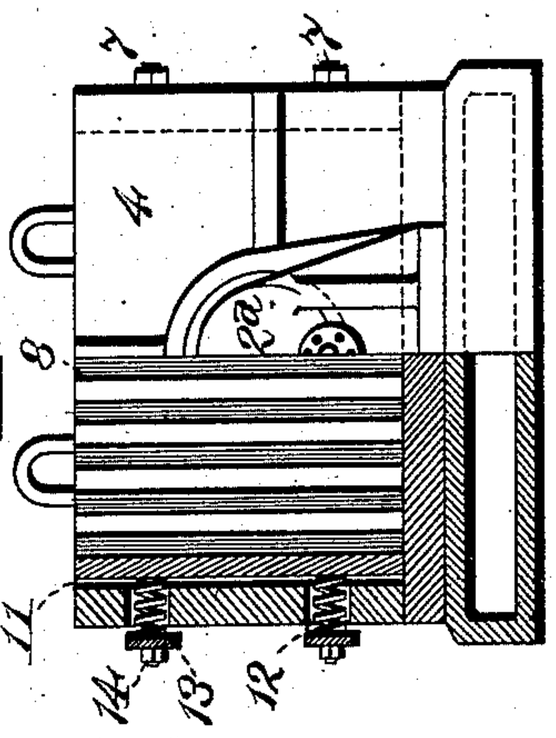

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Fig. 5.

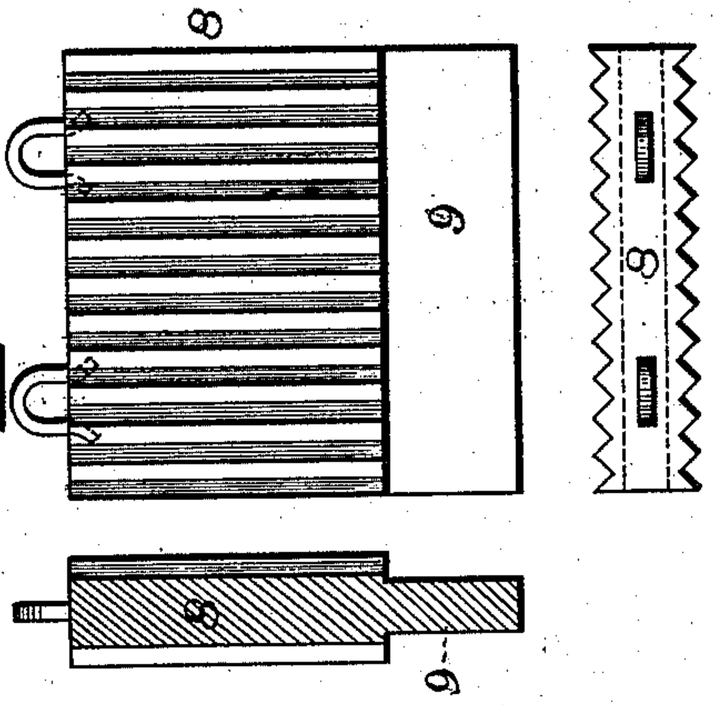


Fig. 6.

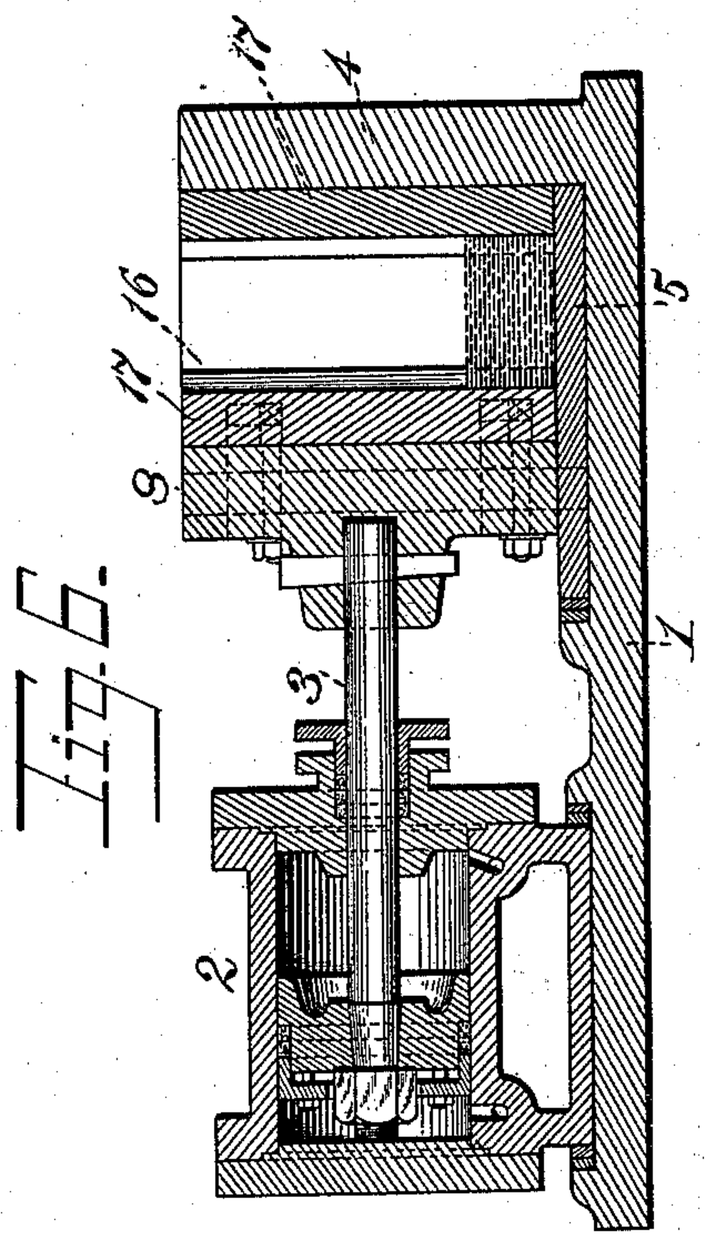


Fig. 8.

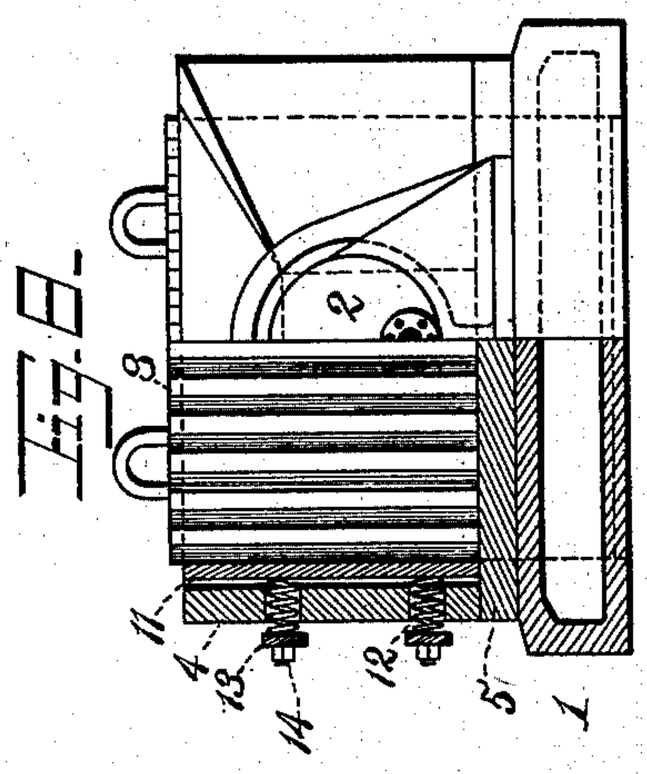
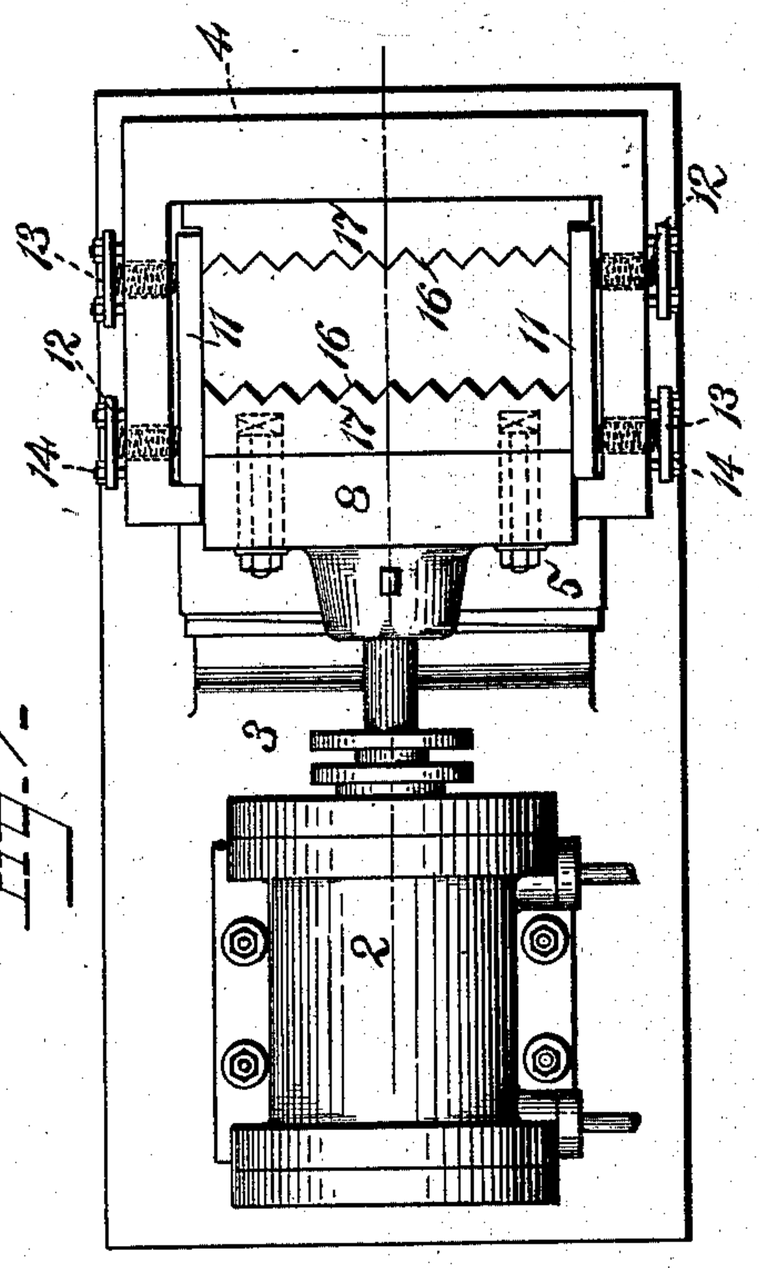


Fig. 7.



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UNITED STATES PATENT OFFICE.

HENRY AIKEN, OF HOMESTEAD, PENNSYLVANIA.

MOLD FOR INGOTS.

SPECIFICATION forming part of Letters Patent No. 416,706, dated December 10, 1889.

Application filed May 2, 1889. Serial No. 309,362. (No model.)

To all whom it may concern:

Be it known that I, HENRY AIKEN, a citizen of the United States, residing at Homestead, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Molds for Ingots, of which improvement the following is a specification.

In an application, Serial No. 301,073, filed February 25, 1889, I have described and claimed a method of manufacturing ingots, billets, &c., said method consisting, generally stated, in partially filling a mold with molten metal and then displacing the metal while in a fluid state laterally and upwardly for the purpose of increasing its vertical depth and diminishing its cross-sectional area; and as a further or additional step in said method the metal shaped as above stated is divided into a series of sections.

The invention described herein relates to the construction of apparatus whereby the above-recited steps of the method may be easily and quickly carried out.

In the accompanying drawings, forming a part of this specification, Figure 1 is a top plan view of my improved apparatus. Fig. 2 is a view, partly in side elevation and partly in section, of the same. Fig. 3 is a view, similar to Fig. 1, of a modified form or construction of my apparatus. Fig. 4 is a sectional elevation of the same, the section being taken in the plane of the line $x\ x$, Fig. 3. Fig. 5 is a view, partly in end elevation and partly in section, of the apparatus shown in Fig. 3. Figs. 6, 7, and 8 are views, similar to Figs. 4, 3, and 5, of a form of apparatus employed in the manufacture of a single series of ingots; and in Fig. 9 the dam or abutment is shown in plan, side elevation, and section.

At the ends of a suitable bed or foundation 1, preferably formed of a single casting, are secured the fluid-pressure cylinders 2 2^a, provided with pistons 3 3^a, which are connected to or bear against the ends of a rectangular frame 4. This frame 4 rests upon a plate or series of plates 5, arranged upon the bed 1 between the fluid-pressure cylinders 2 2^a, as shown in Figs. 2, 4, &c., said plate or series of plates 5 extending along the bed a sufficient distance to permit of the movement of the frame. One, two, or more transverse partitions 6 are arranged within the frame 4, said partitions being formed integral with the sides of the frame, as shown in Fig. 1, or fitting, as regards their edges, in grooves formed in the sides of the frame, as shown in Fig. 3, bolts 7 being employed in the latter construction to hold the sides of the frame against the edges of the partition.

Between the ends of the frame and the partitions 6 next adjacent to such and between adjacent partitions 6, when two or more are employed, is arranged a dam or abutment 8, stationary with relation to the frame and the partition or partitions moving with the frame. This dam or abutment 8 is formed with a tenon 9, adapted to fit in a socket 10, formed in the bed or foundation 1, as shown in Figs. 2 and 9; or, if desired, the dam or abutment may be formed integral with the plate 5, as shown in Fig. 4.

In order to permit of the expansion of the dams or abutments when heated by the molten metal and at the same time prevent the escape of the metal around edges, yielding lining-plates 11 are placed along one of the sides of the frame 4, said plates being held against the edges of the dams or abutments by springs 12, passing the sides of the frame, each of said springs bearing at one end against the plates 11 and at the opposite end against a tension-plate 13, which is adjustably held in position by bolts 14, as shown. These plates 11 are readily removable from the frame, and can therefore be replaced in case of injury by contact with the molten metal. The opposite side of the frame is protected by removable plates 15, which may be held in operative position in the same manner as the plates 11, if desired, as shown in Fig. 7; but by making the springs 12 sufficiently strong a proper adjustment of the several parts of the apparatus can be secured by means of the plates 11 alone.

In casting ingots, referring to Figs. 1 and 2, the frame 4 is shifted by a proper adjustment of the controlling-valves of the cylinders 2 2^a to the right, thereby moving the left-hand end of the frame and the partitions 6 and 6^a into proximity to the dams or abutments 8, 8^a, and 8^b, respectively, and moving the partitions 6 6^a and right-hand end of the frame 4 away from said dams or abutments, thus opening the matrices $a\ b\ c$ and closing or contracting the matrices $e\ f\ g$, which have previously been partially filled with molten metal. The

cross-sectional area of the metal in the matrices *e f g* is diminished and the depth of metal increased by this movement of the frame and partitions, as shown at *g* in Fig. 2, the metal nearly filling the matrices thus reduced in dimensions. Molten metal is now teemed into the enlarged matrices *a b c* and the frame 4 shifted to the left, thus closing said matrices and causing the metal therein to rise to a height proportionate to the amount of metal poured therein. The movement of the frame to the left opens the matrices *e f g*, so that the ingots can be removed therefrom and a fresh charge of molten metal teemed therein.

The apparatus thus far described is adapted for the production of comparatively large ingots, the walls of the ends of the frame, partitions, and dams or abutments being made plain.

In order to adapt the apparatus to the production of small ingots or billets, a series of projections 16 are formed on the faces of the end walls of the frame and on the faces of the partitions and dams or abutments, the projections on adjacent faces being arranged in line with each other and extending into the matrices such a distance that when the matrix is closed, as hereinbefore stated, said projections will come into contact with each other—as, for example, when the frame 4 is shifted to the left the projections 16 on the partition 6, extending into the matrix *a*, will come into contact with the corresponding projections 16 on the dam or abutment 8, thus dividing the metal in said matrix into a series of sections or small ingots or billets.

The walls of the recesses formed by the projections 16 may be varied in shape and arrangement in accordance with the cross-sectional shape of the ingot or billet desired—as, for example, the walls formed by the projections extending into the matrix *e* are constructed to form hexagonal billets or ingots, while in matrices *b* and *f* the ingots are given a rectangular slab-like shape in cross-section. These projections 16 may be formed integral with the dams or abutments 8, and also with the partition 6, (shown in Figs. 3 and 4,) as these parts are made removable and can be readily renewed; but as regards the end walls of the frame and the partitions 6, formed integral therewith, as shown in Figs. 1 and 2, it is preferred to provide removable lining or facing plates 17, having the projections 16 formed thereon, as shown, thus preserving the parts of the apparatus not readily renewable from injury by the molten metal.

The apparatus shown in Figs. 3, 4, and 5 is constructed to form a double series of ingot-sections, while in the construction of apparatus shown in Figs. 6, 7, and 8 only a single series of ingot-sections are formed. In this form of apparatus it is preferred to form the frame 4 integral with the bed or foundation 1, the dam or abutment 8 being movable back and forth in the frame by the piston 3 of the cylinder 2.

It will be observed that the partitions 6 and dams or abutments divide the frame into a series of matrices or molds, each matrix or mold having a wall movable toward or from the opposite wall—as, for example, the end walls of the frame in Figs. 1 to 4 form the movable walls of the matrices or molds at the ends of the frame, the partitions 6 forming the movable walls of the intermediate matrices or molds, the abutments or dams 8 forming in both cases the stationary wall, except in the form of apparatus shown in Figs. 6, 7, and 8, where the dam or abutment is the movable member.

If desired, the abutments or dam may be made movable in the form of apparatus shown in Figs. 1 to 4—as, for example, by connecting the plate 5, having the abutments formed integral therewith, as shown in Figs. 3 and 4, to the pistons 3 3^a, the frame 4 being held stationary.

I claim herein as my invention—

1. In an apparatus for casting ingots, a mold having one of the side walls movable with reference to increasing and diminishing the cross-sectional area of the mold, substantially as set forth.

2. In an apparatus for casting ingots, a mold having one of the side walls movable toward and away from the opposite side wall, the movable and its opposing wall having a series of projections extending into the matrix of the mold, substantially as set forth.

3. In an apparatus for casting ingots, the combination of the movable frame provided with one or more transverse partitions and two or more transversely-arranged dams or abutments, substantially as set forth.

4. In an apparatus for casting ingots, the combination of a frame and a transversely-arranged abutment or dam, one of said members being movable with relation to the other, substantially as set forth.

5. In an apparatus for casting ingots, the combination of a movable frame provided with one or more transverse partitions and two or more transversely-arranged dams or abutments, the adjacent faces of the frame partitions and abutments or dams having projections formed thereon, substantially as set forth.

6. In an apparatus for casting ingots, the combination of a movable frame provided with one or more transverse partitions, two or more transversely-arranged dams or abutments, and yielding lining-plates bearing against the edges of the dams or abutments, substantially as set forth.

In testimony whereof I have hereunto set my hand.

HENRY AIKEN.

Witnesses:

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DARWIN S. WOLCOTT.