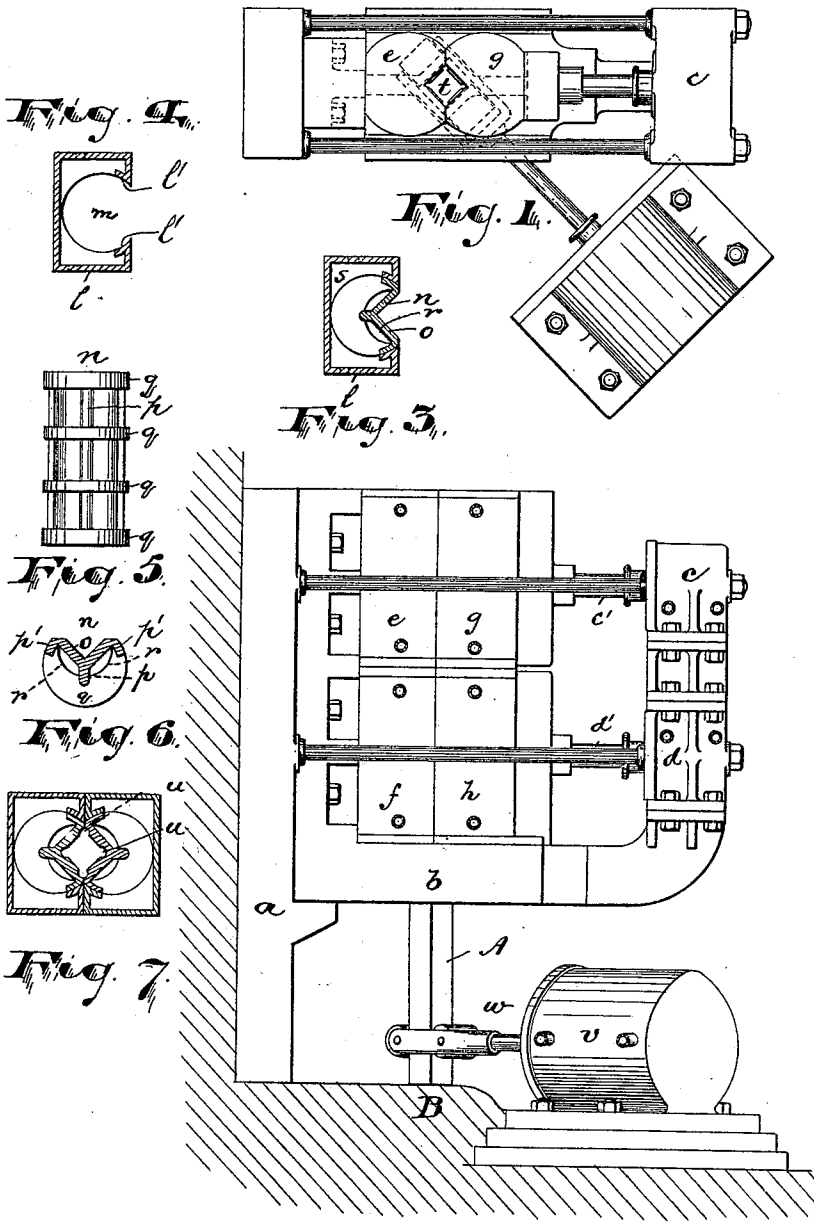


(No Model.)

J. ILLINGWORTH. INGOT MOLD.

No. 520,923.

Patented June 5, 1894.



Witnesses

Robert Sollberger
James Wayland

Fig. 2

Inventor,

John Illingworth,

By Drake & Co. Attys.

UNITED STATES PATENT OFFICE.

JOHN ILLINGWORTH, OF NEWARK, NEW JERSEY.

INGOT-MOLD.

SPECIFICATION forming part of Letters Patent No. 520,923, dated June 5, 1894.

Application filed December 4, 1893. Serial No. 492,705. (No model.)

To all whom it may concern:

Be it known that I, JOHN ILLINGWORTH, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Ingot-Molds; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to certain improvements in the machine illustrated and described in my former patent, dated April 26, 1892, and numbered 473,579.

The objects of the invention are to make a more perfect ingot, facilitate the operation of manufacture and to secure other advantages and results, some of which will be referred to hereinafter in connection with the description of the working parts.

The invention consists in the improved ingot-casting machine, and in the arrangements and combinations of parts, all substantially as will be hereinafter set forth and finally embraced in the clauses of the claims.

Referring to the accompanying drawings, in which like letters indicate corresponding parts in each of the views, Figure 1 is a plan and Fig. 2 a side elevation of the improved machine, and Figs. 3, 4, 5, 6 and 7 are detail views illustrating the construction of the sections of the matrix, Fig. 3 being a horizontal section of one of the upper sections, Fig. 4 a section of the outer casing thereof, Fig. 5 a back view of an inner member of one of the sections, Fig. 6 a section thereof, and Fig. 7 a horizontal section of the lower sections.

In said drawings, *a* indicates the frame of the machine providing a supporting arm, *b*, or bearings for the matrix sections and for certain hydraulic cylinders, *c* and *d*, all substantially as illustrated in the patent above referred to. The matrix sections are horizontally separable to allow the ingot to gravitate automatically, when opened, from the chamber therein. The sections *e* and *f*, are fixed in vertical line, one above the other, upon the frame or bed, *a*, of the machine by bolts or other suitable means admitting of re-

moval, and the sections *g*, *h*, corresponding therewith are in connection with the hydraulic pistons *c'*, *d'*, of the cylinders *c* and *d*, and are thus movable to and from the fixed sections, *e*, *f*, under the power exerted by said pistons. The hydraulic cylinders are provided with ducts and valves, in any usual arrangement, by which the water is brought to press the piston back or forth as may be required. The matrix sections are each provided with water jackets by which the molten metal is cooled more or less rapidly, the said jackets being also provided with pipes or ducts, by which the warm water is removed from and cold water conveyed to the chambers around said matrix sections.

In the construction embraced in my former patent, the lower chamber was somewhat larger than the upper chamber formed between the sections, and the lower chamber served merely as a cooling chamber and not, in any sense, as a matrix or mold chamber, it being larger, than the upper chamber horizontally so that the ingot gravitated therethrough without obstruction and thus the lower sections were not necessarily separable.

In my improved construction, the lower sections are separable and are, preferably, smaller in the diameter in the line of separation, so that, when the ingot, formed in the upper chamber, is lowered into the lower chamber and the movable lower section is forced to its closed position, there will not only be a direct contact of the said sections with the semi-hardened ingot, but also a compression serving, in connection with the other features of the invention, in preventing any tendency to "pipe." The actual contact of the separable, lower, water jacketed sections serves to facilitate the cooling of the ingot.

The sections *e*, *f*, and *g*, *h*, are each V-shaped in cross section and so avoid wall lines in the matrix parallel with the line of separation tending to bind the metal in the chamber, as will be understood.

The water jacketed sections are furthermore, of peculiar construction in that the parts are interchangeable, and are strengthened to enable them to compress the ingot as hereinafter more fully described.

The peculiarities of construction are illustrated more clearly in the detail figures, Figs.

3 to 7, where l indicates an outer casing, which is open at one side to receive the matrix portion and at the opposite ends is provided with recesses m , into which the end ribs of the said matrix portion, n , are closely fitted so as to make impervious joints, or joints sufficiently impervious for the purpose. Said matrix portion, n , has the V-shaped part, o , in which the ingot is formed and at the back is longitudinally ribbed, as at p , at the longitudinal angle. It is also provided with longitudinal flanges p' , at the opposite longitudinal edges, which are formed to engage corresponding flanges, l' , on the casing. To strengthen the matrix portion still further, whereby they are better fitted to resist the compressing operation effectively, it is provided with a series of transverse ribs, q , of which the end ribs fit the recesses m as above described and the intermediate ribs bear against the inner wall of the casing. The said intermediate ribs are arched as shown clearly in Figs. 6 and 7. The arch being integral with said V-shaped portion at the edges and at the intermediate angle. Openings, r , are formed under the arches between them and the oppositely inclined sides of the V-shaped portion, which allow a free flow of cooling liquid therethrough.

The matrix portions of the lower sections f and h , are formed in the ingot chamber, t , as shown in Fig. 7, where the angles are shown to be cored out or cut away, as at u, v , so that there will be no bearing of the cooling surfaces upon the corners of the ingot. Thus said corners are not cooled with undue rapidity. The ingot is broken, as it is lowered from time to time, by the hydraulic cylinder and piston v, w , in the manner described heretofore.

In operating the invention, the parts being as shown in Fig. 2, the ingot, A , where it projects below the arm, b , is broken or severed by means of the hydraulic piston, a charge of liquid metal having been poured in at the top of the mold to replace that lowered in the mold in bringing the downwardly projecting ingot portion to the position shown. The pistons c', d' , are next drawn back with their sections g and h , the mold or matrix chambers, t , being thus opened so that the ingot is again allowed to gravitate, the gravitation being free and quick because of the peculiar relation of the mold walls to the ingot. The downward movement of the ingot being stopped by the floor or bearing B , the mold or matrix sections are again closed together, the metal is poured again and the operations repeated. When the poured metal cools sufficiently to sustain itself, and is lowered into the lower chamber, the action of the sections f, h , is to rapidly cool the ingot and to com-

press the same thus avoiding the tendency of the metal to "pipe" to a large extent as above indicated.

Having thus described the invention, what I claim as new is—

1. In an ingot mold or matrix, the mold or matrix section consisting of the outer case and an inner matrix portion consisting of a V-shaped part provided with a longitudinal rib at the back angle and transverse ribs, substantially as set forth.

2. In an ingot machine the combination with the bed or frame having a support for the mold sections, of said sections, the sections g, h , of which are separable from the sections e, f , said sections forming mold or matrix chambers, t , the upper one of which is larger than the lower one, and the lower sections serving to compress the ingot substantially as set forth.

3. In an ingot machine, the combination with the frame or bed, the arm b , cylinders c, d , piston rods c', d' , and severing device, of separable mold or matrix sections, the lower ones of which are recessed at the angles, as at u , substantially as and for the purposes set forth.

4. In an ingot machine, the mold section comprising a casing, l , and a separable matrix portion having the V-shaped part, o , and at the back of said V-shaped part, the ribs, q , the intermediate ribs being arched over the back walls of said V-shaped portion, and being integral with said V-shaped portions at the back angle and near the edges, an opening r , being formed admitting a free flow of cooling liquid therethrough, substantially as set forth.

5. In an ingot machine, the combination with the casing open at one side to receive the matrix portion, and at the ends to receive end ribs, of said matrix portion V-shaped in plan and having said end ribs, and having intermediate arches which serve to strengthen the V-shaped portion and are open to allow a flow of liquid therethrough, substantially as set forth.

6. The combination with the casings of an ingot machine of matrix portions which are V-shaped in plan and have on the insides at the longitudinal angles thereof, ribs, p , and at various points in their lengths having transverse arches, q , serving to strengthen said V-shaped matrix portions, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 25th day of November, 1893.

JOHN ILLINGWORTH.

Witnesses:

CHARLES H. PELL,
DILLON BEEBE.