No. 644,918. Patented Mar. 6, 1900.

J. ILLINGWORTH.

INGOT CASTING MACHINE.

(Application filed June 3, 1899.)

(No Model.) 3 Sheets—Sheet 1.

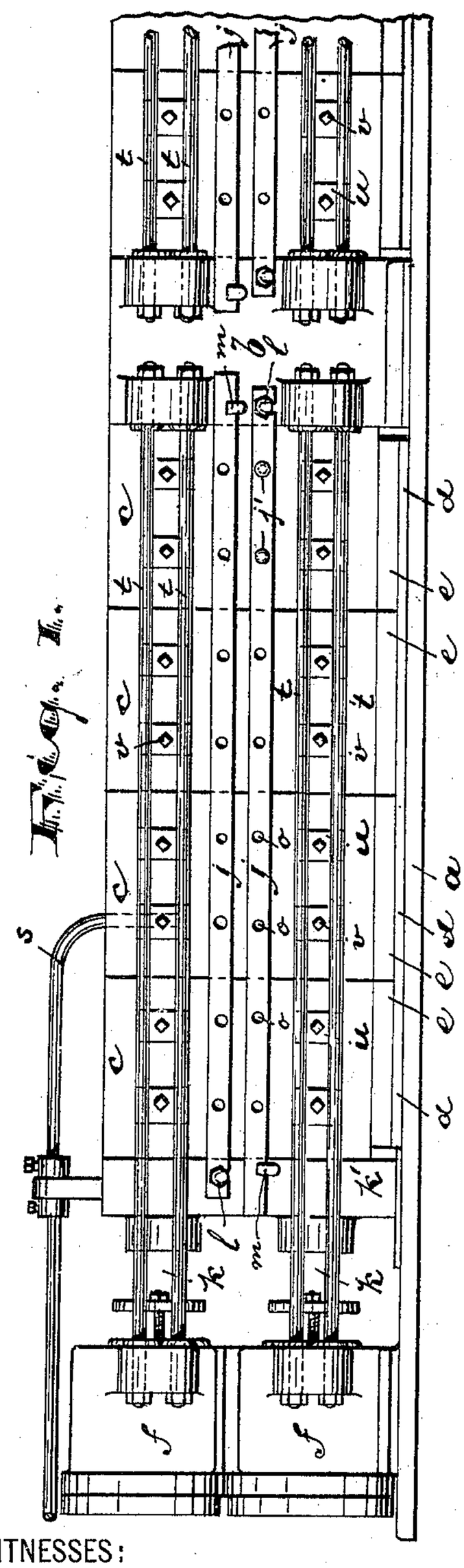

Fig. 1.

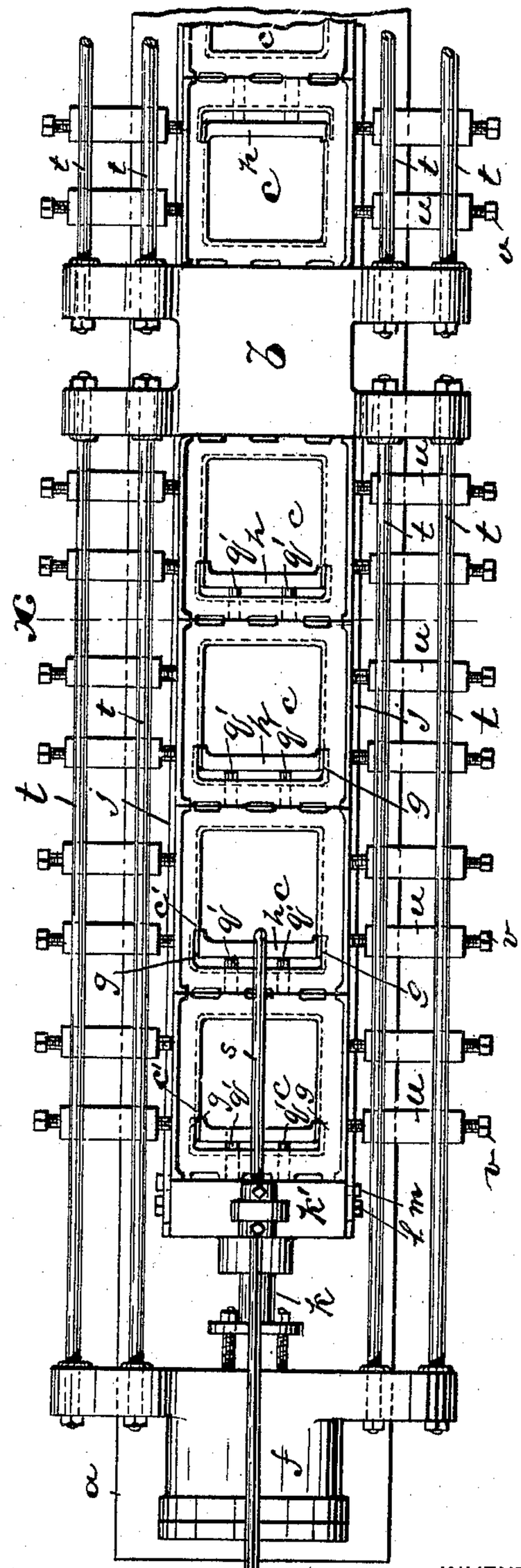

Fig. 2.

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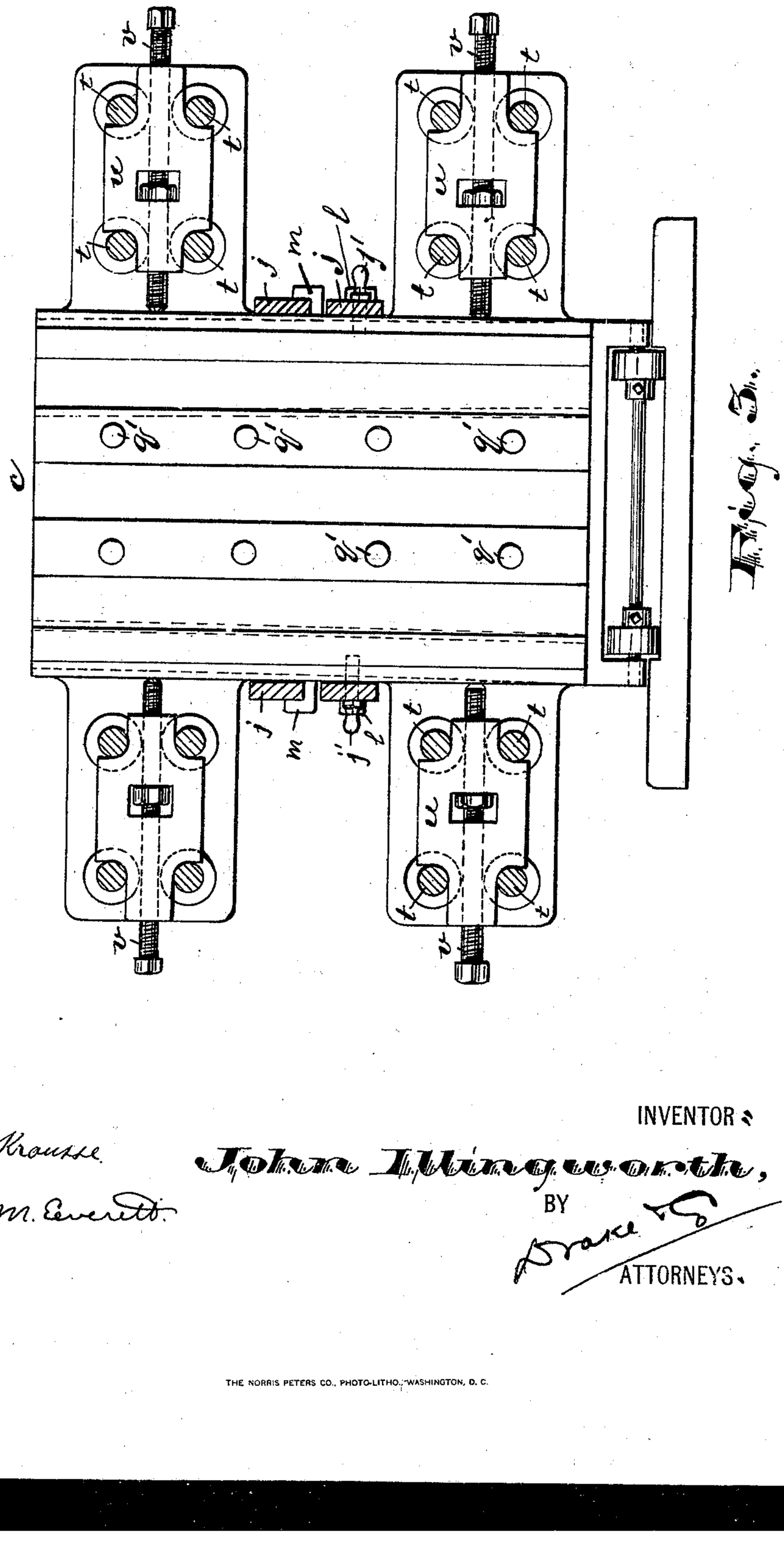

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Fig. 4.

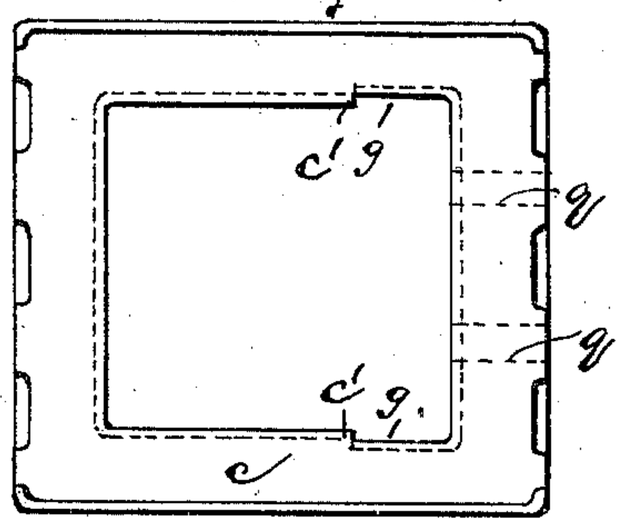


Fig. 5.

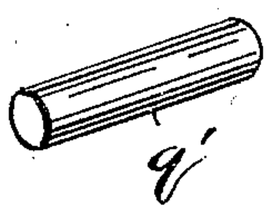
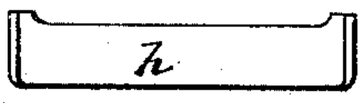


Fig. 6.



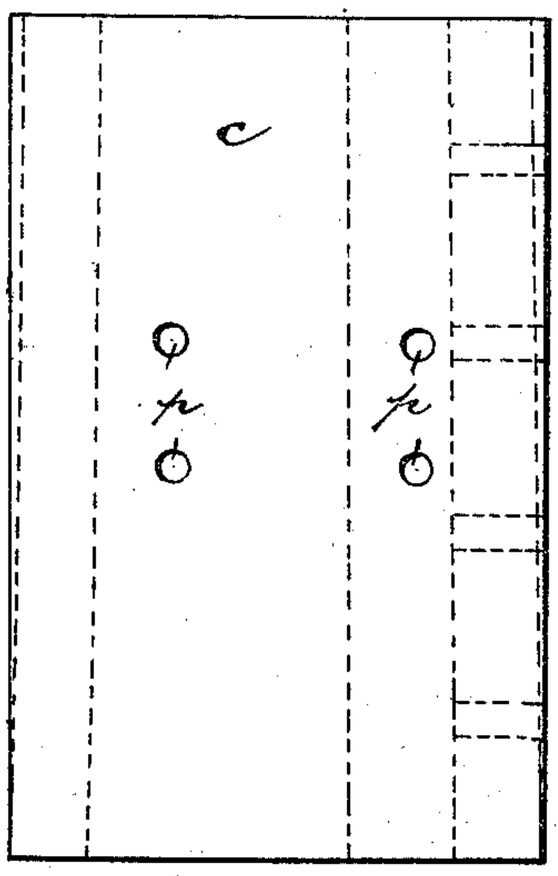


Fig. 7.

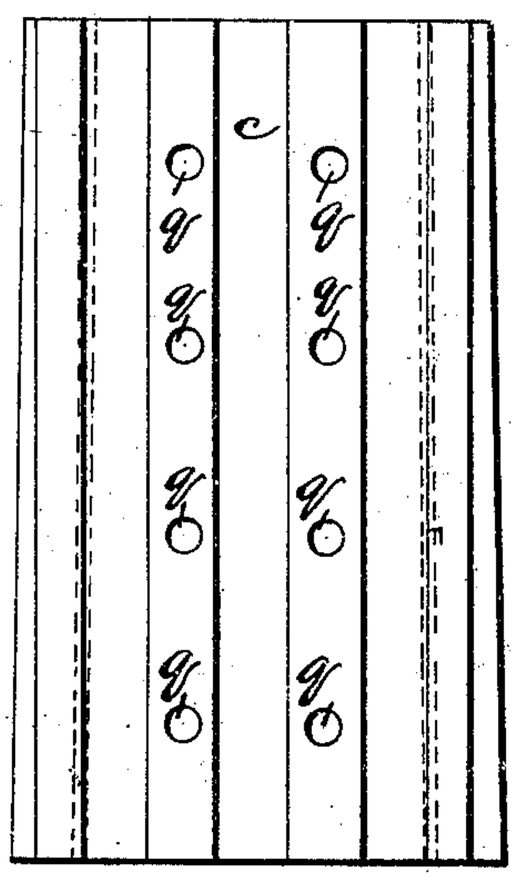


Fig. 8.

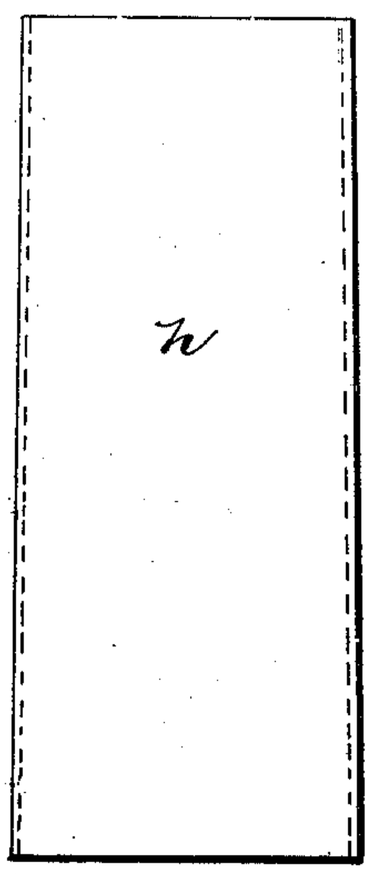


Fig. 9.

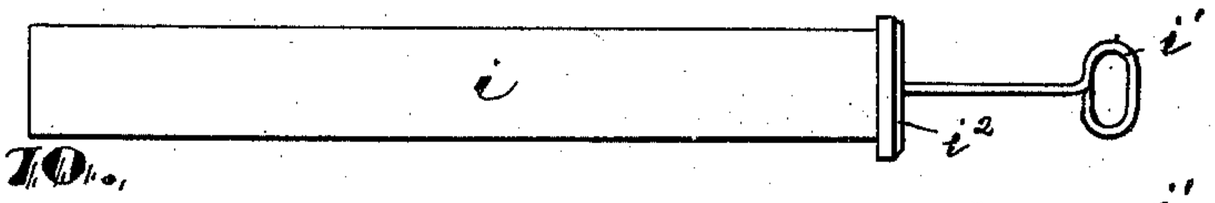


Fig. 10.

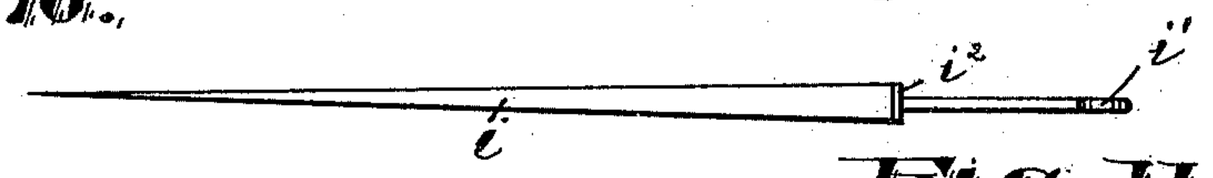


Fig. 11.

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UNITED STATES PATENT OFFICE.

JOHN ILLINGWORTH, OF NEWARK, NEW JERSEY.

INGOT-CASTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 644,918, dated March 6, 1900.

Application filed June 3, 1899. Serial No. 719,332. (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-Casting Machines; 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 the letters of reference marked thereon, which form a part of this specification.

This invention relates to certain improvements in that class of ingot-casting machines represented by the one described in my prior patent, No. 594,157, dated November 23, 1897, the objects of the present improvements being to secure a mold better adapted for the production of heavy castings, to reduce the cost of constructing the molds, and to avoid the necessity for planing the sections of the mold to bring them into proper alinement, to enable the molds whether made solid or in sections to be drawn apart or away from one another at any point in the series, and to secure other advantages and results, some of which may 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 of the same, all substantially as will be hereinafter set forth and finally embraced in the clauses of the claim.

Referring to the accompanying drawings, in which like letters of reference indicate corresponding parts in each of the several views, Figure 1 is a side elevation of the improved ingot-casting machine. Fig. 2 is a plan of the same. Fig. 3 is a sectional view taken at line *x*, Fig. 2. Fig. 4 is a plan in detail of one of the molds of the series. Fig. 5 is a perspective view in detail of one of the pressure-pins hereinafter described. Fig. 6 is an end view or plan of a loose pressure-plate adapted to be inserted in the mold, especially when the mold is of a solid construction, and to operate in connection with said pins. Fig. 7 is a side elevation of the mold-section shown in Fig. 4, and Fig. 8 is a rear elevation. Fig. 9 is an elevation of the pressure-plate shown in Fig. 6. Figs. 10 and 11 are views in detail of certain wedges, the functions of which will be hereinafter described.

In said drawings, *a* indicates a suitable bed-plate upon which the several operating parts are supported. Said bed-plate is provided with a heavy vertical standard or abutment *b*, at the opposite sides of which are series of molds *c c c*. Beneath said mold-sections and on said bed-plate are tracks or ways *d d*, on which are arranged cars or trucks *e e* about the length and width in plan of a pair of mold-sections, or if the mold be of the solid construction of the length and width in plan of said solid mold, each car supporting a mold.

In the present construction instead of making the bodies of the molds in halves or sections, as heretofore, I prefer to employ in each a solid structure, as shown in Figs. 2 and 4. The molds of this construction are arranged on the cars or trucks in series and are separable from one another.

The chambers within the molds are each at the sides or ends toward the hydraulic cylinder *f* laterally enlarged, the recesses *g* being one-half an inch, more or less, in depth on opposite sides. Into the mold-chamber of each mold, extending from one recess into the opposite recess, is arranged a movable pressure-plate *h*, which is permitted to slide therein backward and forward one-half an inch, more or less, so that after the casting operation is effected and when the ingot becomes more or less solid, sufficiently so to sustain its own weight, this pressure-plate is moved back and a wedge is inserted between the ingot and the plate *h*, and when thus slipped into position the full length or nearly the full length of the ingot the pressure-plate *h* is again forced toward the ingot by hydraulic pressure and the ingot is compressed and consolidated to cure any piping or the formation of a chamber in the center of the ingot due to the contraction of the metal by cooling.

At the sides or ends of the molds toward the hydraulic cylinder *f* and piston *k* the said molds are perforated, as shown at *q* in Fig. 8, to receive the pressure-pins *q'*, Figs. 2, 3, and 5. Said pins *q'* are longer than the thickness of the end walls of the mold, so as to project either from the mold into the chamber there-

of or from the outside of said mold, and at their inner ends said pins q' bear endwise against the outer side of the pressure-plate. Thus when the molds are pressed together in the series by the hydraulic piston or pistons k the pressure-plates h will be forced at their opposite edges against the shoulders c' c', Fig. 4, and the mold-chamber will be prepared to receive the molten metal. When the piston k and plate k' thereof are drawn backward or toward the hydraulic cylinder f, carrying with them certain of the molds, as hereinafter described, the pins q' of the last-drawn mold from the piston-plate will be free to permit the plate h in said mold to be pushed back from the ingot and the wedge i to be inserted in the opening thus formed.

The wedge i may have at its large end a handle i' to facilitate handling, the shoulders i^2 at the base of the handle being ample in size to receive the blows of a mallet should I wish to drive the wedge between the ingot and pressure-plate.

To enable the operator to more perfectly and easily control the separation of any one of the molds from the next in the series, especially when the said molds are of the solid construction, I have provided at each side of the molds a pair of binding or coupling bars j j, which extend the full length of a series. One of these bars on each side is fastened permanently or rigidly to the piston-plate k', as at l, and the other bar is permanently or securely fastened upon the stud b. The opposite ends of the said bars are supported one on the abutment b and the other on the piston-plate and are free to slide on the supports m m. The said bars are each provided with coupling means, by means of which the said bars may be secured to the molds. I prefer to employ in this connection pins j', Fig. 3, which fit into holes o, Fig. 1, in the rods j, and also enter corresponding holes p, Fig. 7, formed in the sides of the molds. Thus when I desire to separate any two of the molds of a series I pin one of the bars j to the mold to be drawn away from the one next toward the abutment, the other end of said bar being fastened to the piston or piston-plate k. The second bar j, fixed or fastened to the abutment b, is pinned to the said other mold or the mold to remain stationary. The hydraulic devices are then operated to draw the plate k' and the molds coupled thereto away from the mold to remain stationary, which being accomplished the pins q' of said stationary mold are free to release the pressure-plate therein, so that the latter may be forced away from the ingot to permit the insertion of the wedge. After such insertion the hydraulic device is again operated to press the molds together. The moving mold section or sections approaching the stationary section engages the outwardly-projecting pins q' thereof and forces them inward against the pressure-plate h. The latter being thus pressed presses the wedge against the more or less plastic or semifluid ingot, so that the metal thereof is compressed and any piping therein closed.

To facilitate the separation of the pressure-plate from the ingot should said plate be hard to move in its mold, I may employ a hook s or series of such hooks loosely attached to the piston k or piston-plate k' and adapted to be caught upon the pressure-plate h. When thus arranged and the hydraulic devices are operated to separate the molds, the pressure-plate will at the same time be drawn back from the ingot to allow the insertion of the wedge, as will be understood.

To hold the molds in alinement in the series, I provide at opposite sides of said series rods t t t t, preferably four in a set, which lie parallel with one another and are secured at opposite ends upon the abutment b and hydraulic cylinder f. Supported by and between said rods are blocks u, apertured to receive the rods, as illustrated in Fig. 3. Said blocks are provided with threaded holes, in which are screws v, which bear upon the molds and hold them in proper vertical position and alinement and permit of the movement hereinbefore described.

The hydraulic cylinder and piston may be of any usual construction.

In operating the machine above described I prefer to begin casting in the molds next to the abutment b, which are filled with molten steel or metal, which is allowed to cool until in a condition to sustain its own weight, after which the molds thus filled are coupled to the abutment b and the other molds of the series are secured to the piston and drawn thereby away from the filled molds, the hydraulic devices being operated in any manner to accomplish such a result. The wedges are then inserted between the plastic ingots and the plates h, the large ends being uppermost, and the molds are again forced together, the moving molds next to the filled molds engaging the pins q' of said filled molds and the latter pressing the plates h against the wedges, so that the latter compress the ingots, the compression being greater toward the top of the ingots.

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

1. The improved ingot-casting machine herein described, comprising a bed, a series of molds supported thereon and each having within the mold-chamber ingot-compressing means, means extending from said compressing means outside of said mold-chamber and into engagement with the next mold of the series, means for coupling a portion of said molds together and means for moving said coupled molds back and forth on said bed and for operating the compression means of the molds, substantially as set forth.

2. The improved ingot-mold herein described, comprising a bed, a series of molds movable on said bed, an abutment at one end of said series, and a hydraulic cylinder and

piston at the opposite end, coupling-strips arranged at the opposite sides of and parallel with the series of molds, and removable fastening-pins passed through said strips into the molds, substantially as set forth.

3. The combination with a bed, a series of molds each having a pressure-plate therein, a stud at one end and at the other end of said series a hydraulic cylinder and piston, of coupling-strips *j*, and pins *j'*, located at the sides of the molds for coupling any one mold of the series to the piston, whereby said mold may be released from the next mold in the series and the pressure-plate therein released to permit the insertion of a wedge, substantially as set forth.

4. The combination with a bed, of a series of perforated molds, each having within the mold-chamber thereof a pressure-plate and in the perforations thereof pins adapted to engage said pressure-plate and extending out from one mold to engage the next mold in the series, and means for moving said molds back and forth on said bed to permit the operation of said plates and pins, substantially as set forth.

5. The combination with a bed, stud and hydraulic mold-operating devices of a series of perforated molds, each having pressure-plates and pins therein, coupling devices in connection with the hydraulic operating devices and means for separably connecting the hydraulic devices with the molds, substantially as set forth.

6. In an ingot-casting machine, the mold having a perforated side or end with movable pins in the perforations thereof and a pressure-plate within said mold extending vertically to the mouth of said mold whereby a wedge may be inserted between said plate and ingot, the said pins being arranged below said mouth and extending from the outside of the mold into engagement with the plate, substantially as set forth.

7. In an ingot-casting machine, the combination with the mold having a pressure-plate therein movable independent of the mold and adapted to be operated from the outside of said mold to secure a compression of the plastic ingot therein, of a hydraulic piston and coöperating means for operating the said pressure-plate, and a separable wedge adapted to be inserted within the mold, between the said pressure-plate and the ingot, substantially as set forth.

8. In an ingot-casting machine, the combination with a series of molds and means for moving said molds back and forth in the direction of the series, of rods or bars *t*, *t*, arranged at opposite sides of said molds and carrying adjustable blocks *u*, *u*, and screws *v*, arranged in said blocks and adapted to engage the sides of the molds, substantially as set forth.

9. In an ingot-casting machine, the combination with a track or way having an abutment and hydraulic devices at opposite ends; of a series of carriages or trucks, a series of molds thereon, and horizontal rods *t*, arranged at opposite sides of said series of molds and having a series of blocks supported thereon, said blocks being each provided with screws *v*, serving as guides or stays in holding the molds in position on the carriages as said molds are moved on their carriages and otherwise operated.

In testimony that I claim the foregoing I have hereunto set my hand this 19th day of May, 1899.

JOHN ILLINGWORTH.

Witnesses:
CHARLES H. PELL,
C. B. PITNEY.