

G. WEBB.
Apparatus for Forming Molten Metal into Ingot, &c.
No. 223,561. Patented Jan. 13, 1880.

FIG. 2.

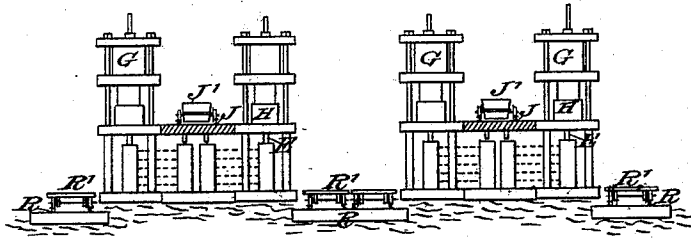
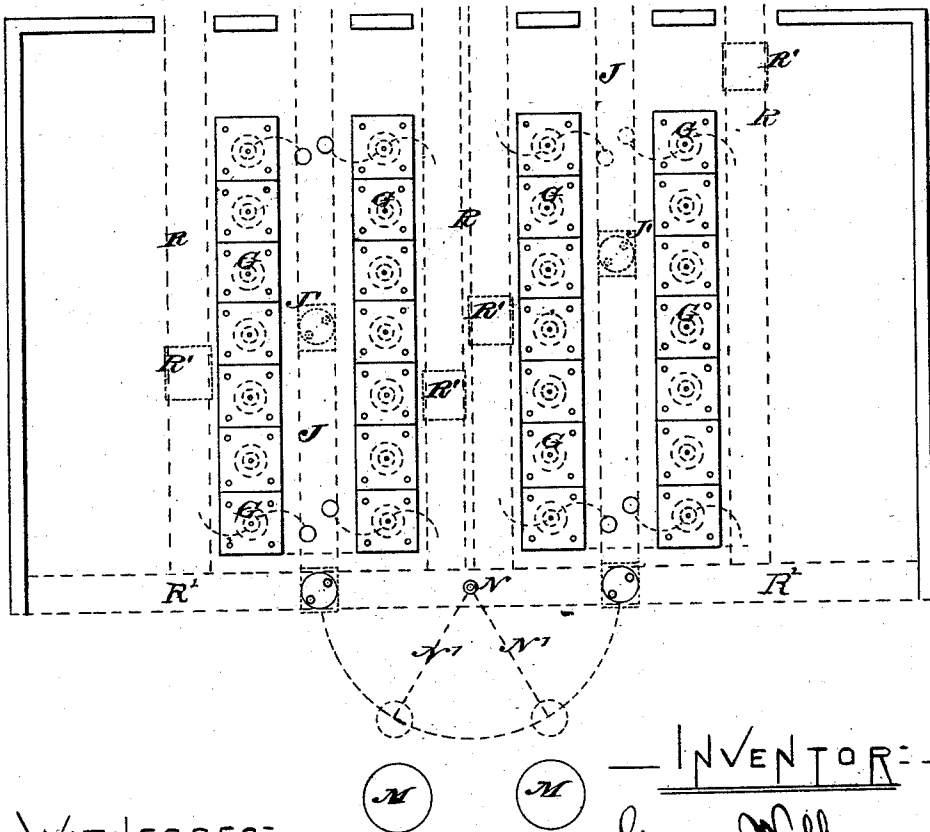


FIG. 1.



WITNESSES:
W. Colborne Brooks
E. B. Bolton

INVENTOR:
George Webb
John Atkins
J. S. Eaton

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FIG. 3.

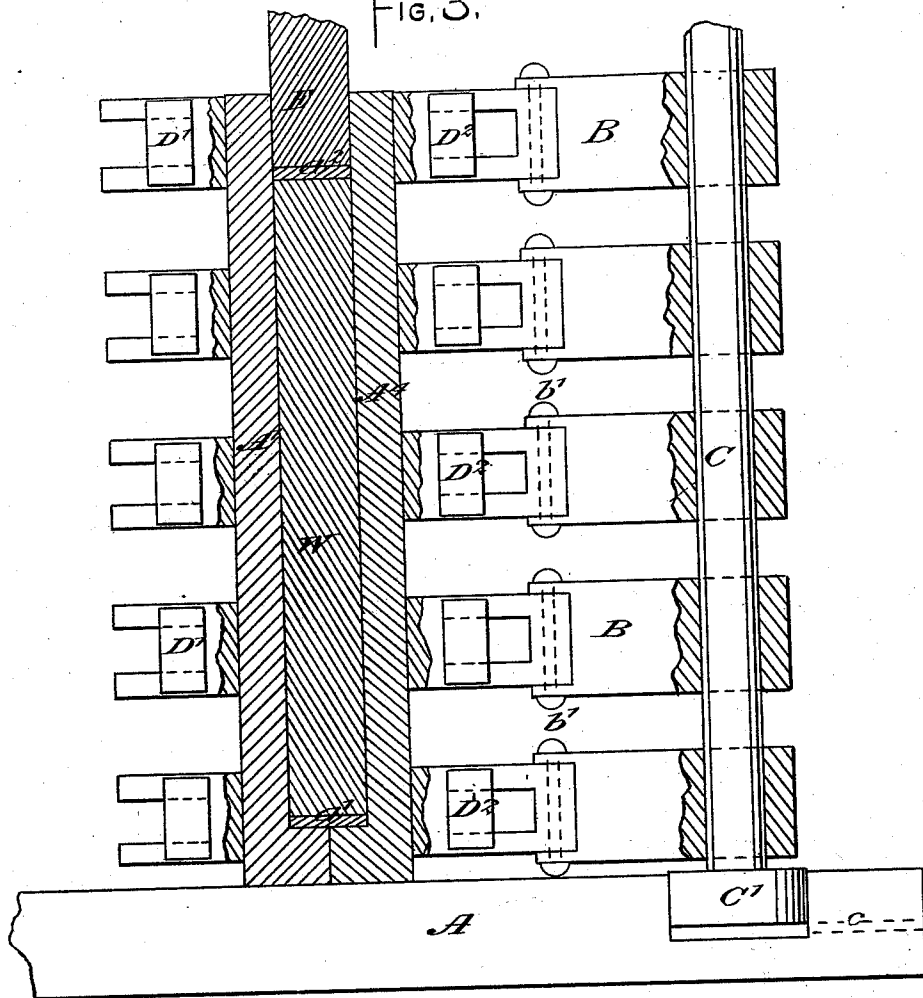
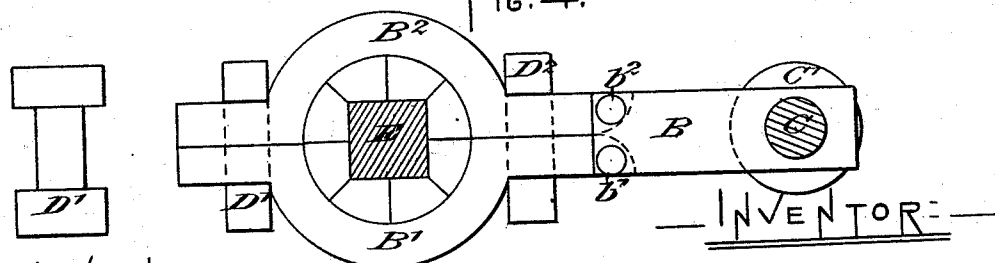


FIG. 4.



WITNESSES:

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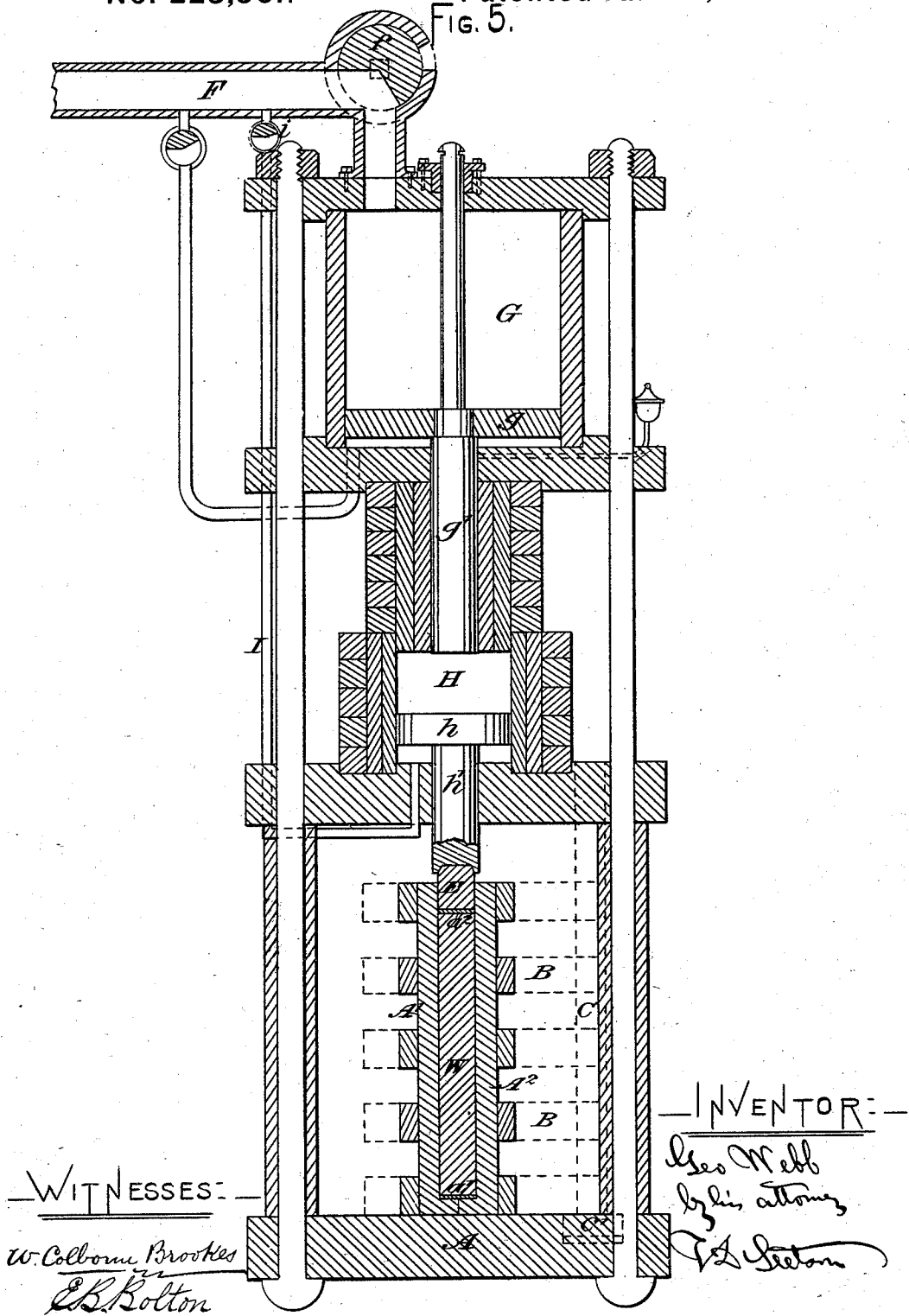
George Webb
by his attorney
Thomas D. Latham

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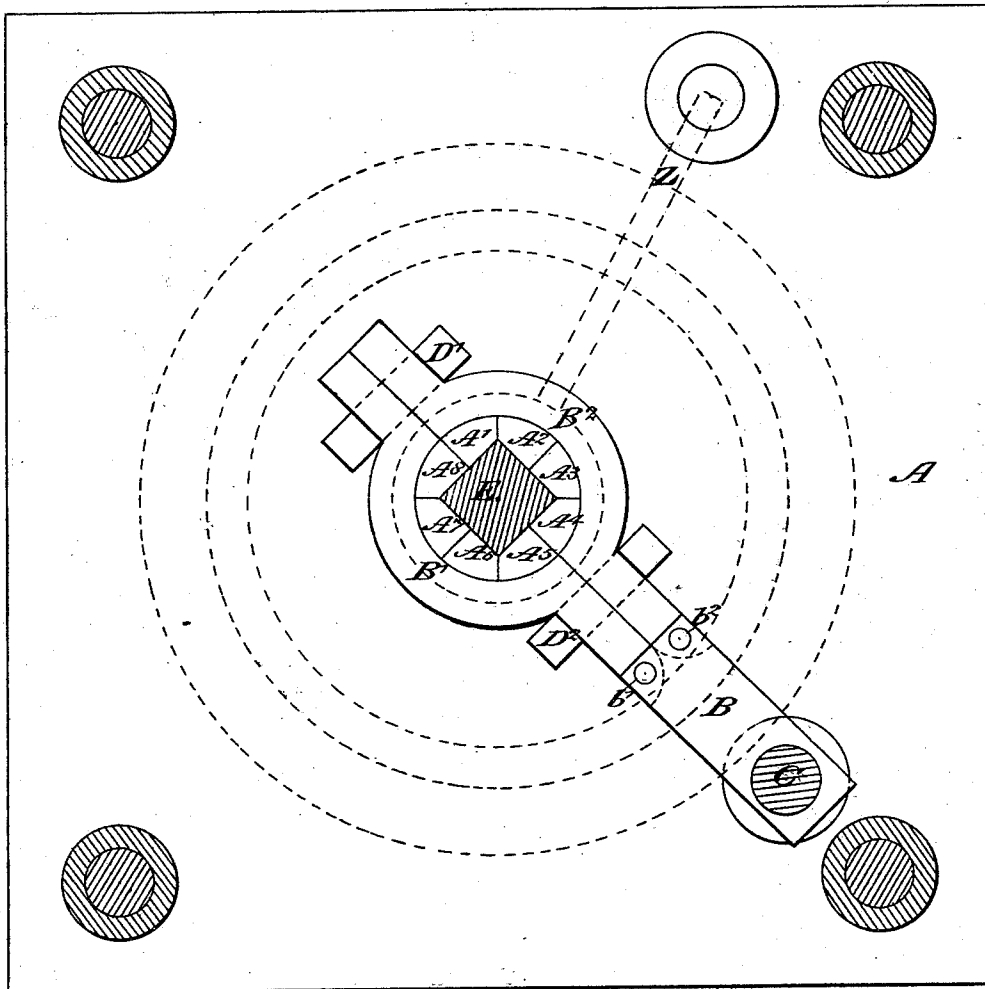
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FIG. 5.



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FIG. 6.



WITNESSES:—

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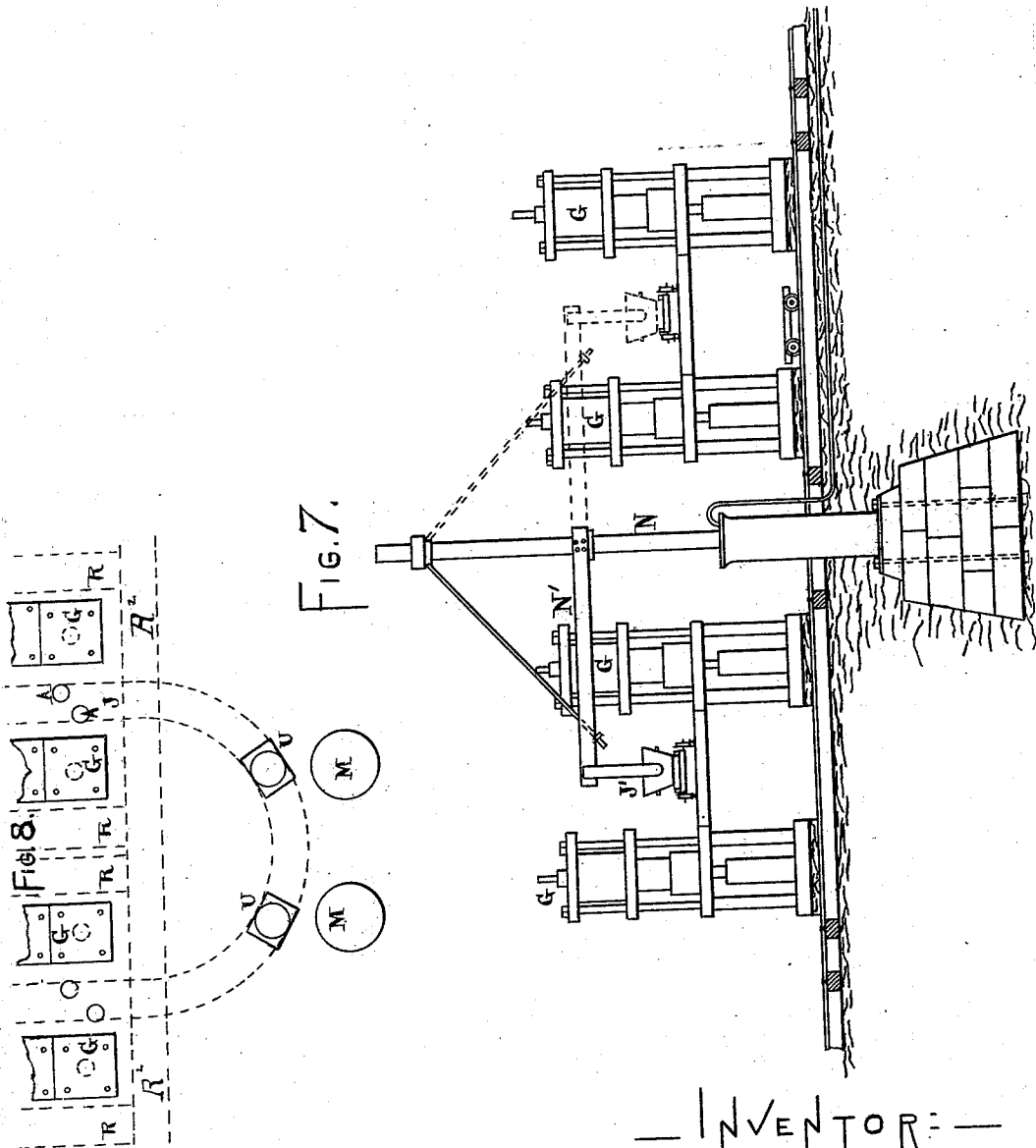
INVENTOR:—

George Webb
by his attorney *T. A. Selton*

G. WEBB.
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— WITNESSES: —
W. Colborne Brooks
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— INVENTOR: —
George Webb,
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UNITED STATES PATENT OFFICE.

GEORGE WEBB, OF JOHNSTOWN, PENNSYLVANIA.

APPARATUS FOR FORMING MOLTEN METAL INTO INGOTS, &c.

SPECIFICATION forming part of Letters Patent No. 223,561, dated January 13, 1880.

Application filed July 25, 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 useful Improvements relating to Apparatus for Forming Molten Metal into Ingots or other Castings, of which the following is a specification.

I subject the melted steel to strong compression, which is rapidly applied and maintained until the metal has set. I have devised a system for conveniently and effectively operating on quantities made in the large way in modern practice.

My invention is intended to overcome the difficulties and to adapt the work to successful and economical manufacture on a large scale, with repetitions rapidly conducted and continued indefinitely.

I employ gas-discharging sectional ingot-molds, which are or may be used repeatedly without any preparation beyond a thin wash. The molds are rapidly filled with liquid metal. They are in long narrow sections strongly united. Provision exists for the escape of gases from all the joints. A great pressure is applied and maintained on the limpid metal immediately after it is poured, and all the movements may be effected easily at the right periods. Large charges may be disposed of with rapidity, and the charges may succeed each other indefinitely.

I employ hydraulic pressure in a form of mechanism very powerfully working and adapted for treating a single ingot at a time by one press. I can use a number of presses together.

Hydraulic presses and accompanying mechanism for receiving and holding the ingot-molds are arranged in lines with railway-tracks between. Suitable cars, moved by hand or otherwise, on one track carry large ladles of melted steel and supply two molds at once. Ready means move each mold into place and give it pressure. Cars on another track carry the ingot-molds with their contents away, and bring empty molds to be placed in position and receive the melted material. Each series or row of presses should be of sufficient length to allow an ingot-mold to be filled while another place in the series is being supplied with a fresh mold and another place is having the

filled mold taken away with its contents sufficiently cooled to retain its condition, and each press holds the metal under strong pressure until it has slowly cooled to the required consistency.

I will proceed to describe more in detail this, which I consider the best, mode of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a plan view representing the general arrangement of the parts. Fig. 2 is a cross-section through the entire arrangement. Fig. 3 is a vertical section through one of the ingot-molds and the associated parts on a larger scale. Fig. 4 is a plan of the same. Fig. 5 is a vertical section of the press with an ingot-mold in position. Fig. 6 is a horizontal section on a larger scale. Fig. 7 is an end elevation of the several straight railways with the crane which carries the ladles thereto. The crane with its load is raised and lowered as required by the ordinary hydraulic power. Fig. 8 is a plan view of a modification, in which a semicircular railway with two lifts takes the place of the crane indicated in Figs. 1 and 7.

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

A' A², &c., are the sections of an ingot-mold of cast-iron, adapted, when applied together, to present a smooth and cylindrical exterior and a smooth cavity of uniform rectangular section on the interior, which cavity receives the melted steel and forms the ingot. The surfaces of the ingot-mold A' A², which abut together, are marked *a*. They are accurately fitted together, but instead of being absolutely smooth are left with fine scores running across their surfaces, such as result from filing with a coarse file.

The sections A' A², &c., are held together by clamps B' B², which are provided in sufficient numbers, and with peculiar locking pieces or gibs D' D², and embrace the ingot-mold at short distances apart along its length.

On sufficiently raising the mast C and the connected clamps and ingot-molds and their contents, the whole may be swung around clear of the bed to allow the ingot-mold to be moved into the proper position to receive its charge of melted steel, and to be moved back into the

central position under the press to receive the compressive strain.

Z is a second gib, employed in each press to aid in removing the filled molds after the compression and in introducing empty ones.

The peculiarities of the ingot-molds and their immediate attachments are made the subject of a separate application for Letters Patent.

I employ a press which is compound, using, in effect, two hydraulic presses, one of which receives the steam, water, or other fluid from a boiler, accumulator, or other source, and by the motion of its plunger induces a greater pressure in another mass of fluid, which acts in a second cylinder to apply a still greater pressure on the plunger of the second press. This latter plunger acts on the steel in the ingot.

The peculiarities of my compound hydraulic press are made the subject-matter of a separate application for Letters Patent.

When the pressure has been maintained for a sufficient time the steam or other fluid under pressure is shut off from the cylinder G, and the fluid above the piston *g* is allowed to escape by any suitable device. (Not represented.) Then both the pistons *g h* and their connections are raised and the ingot is relieved from pressure.

To remove the mold with the solidified ingot, the locking-pieces D² D' are removed, the clamps B' B² thrown open, and the sectional mold A' A² and its contents will be seized by properly-shaped tongs, (not represented,) which are adapted for the purpose, and may hang from a traveler moving on a straight or curved or a swinging overhead way. Z represents a mast or upright shaft for a swinging way for this purpose. The sectional mold A' A² and its contents, are thus brought to and deposited on a car, R', on a track, R, which track is located on the opposite side of the press from where the melted metal was poured into the mold.

After release from the clamps B' B² the sections of the mold may be held together by slight bands, (not represented,) which bands are afterward to be removed when the car and its load have been hauled away a convenient distance.

The fresh mold is to be held together by the same small bands and brought in by the same route and appliances by which the filled molds are removed, and thus delivered to the clamps B' B².

The ingot on being liberated from the sectional mold is ready to be further treated by rolling or hammering, either at the same or a subsequent heat, to induce the desired form of a steel rail or other article, while the sections A' A² of the mold may be treated with water and partially or entirely cooled, ready to be returned to the position for use, fresh sets of sectional molds being used in the interim.

A mast, N, with an arm, N', and provisions for being raised and lowered, is favorably located for presenting the ladle at will to either of the converters M M, to receive the charge

of melted steel, and also for transferring it to either of the cars J' on the two tracks J.

A car, J', moves on each of the tracks J, carrying a ladle, which is at each return filled from one of the converters M, and as each car is moved step by step along its track it is stopped at the proper points, and tapped at two places to supply the proper quantity to each ingot-mold, which latter is, by the lifting and turning of the proper mast C C', presented in the proper position to receive it, and on being filled is promptly returned to its position under the press, and its contents subjected to the required pressure and held so.

A car, R', moves back and forward on each of the tracks R, bringing fresh ingot-molds and placing them in position, returning loaded with the filled molds previously allowed to cool under pressure to a point below that at which pipings form, to be taken care of at a distant point. (Not represented.)

It is theoretically possible to move the ladle and its supporting-car J' to a greater distance than above provided at each interval between the pourings, and to so arrange and turn the several masts C C' that four ingot-molds instead of two shall be presented at once, and receive their supply of melted steel simultaneously. In such case two molds will be swung outward from the tier of presses and their accompanying mechanisms on the right side of the car J', and two will be swung out on the left side of the same car; but I esteem it preferable on the whole to attempt to fill but two ingot-molds at a time, swinging one from the right and one from the left, and then rapidly shifting the position of the ladle to the next pair of presses, and so on.

R² is a cross-track, which may, by the use of ordinary turn-tables, or by such with lifts at the junction, serve to transfer any car from one to another of the main tracks J and R.

Instead of Bessemer converters, I can use open hearths, crucibles, or any suitable mode of producing the melted steel.

I prefer for steel rails to make the ingots about seven inches square, and of a length from four to six feet—sufficient to serve for only one rail, with a minimum wastage at the ends.

I believe it practicable in many cases to transfer metal from the open hearth or other metal-supply M to the ladle by a simple spout made in the usual manner with a non-conducting lining of fire-brick or the like. Such spout may be heated before pouring a charge, if required. With some means of supplying the melted metal, and especially when a Bessemer converter is used for each metal-supply source M, there is a great change of level of the supply-point as the ladle is filled. In such case simple means may be provided for correspondingly changing the inclination of the spout.

I claim as my invention—

1. The combination of a molten-metal supply with a press, a ladle, and a ladle-carrier,

arranged to move the ladle between the supply and the press, a mold, and an independent or separate gib, adapted to hold the mold in two different positions for pouring and pressing, and to transfer it from one position to the other, substantially as shown and described.

2. The combination and arrangement of three lines of railway, J R R, two lines of presses, *g g'*, and a source of molten metal, M, as and for the purposes herein specified.

3. The combination and arrangement of duplicate sets of apparatus, each set composed of three lines of railway, J R R, and two lines

of presses, *g g'*, with one or more sources of molten-metal supply, M, and with means, N N', for transferring the ladle from the metal-supply to either set of apparatus, as herein specified.

In testimony whereof I have hereunto set my hand this 25th day of June, 1879, in the presence of two subscribing witnesses.

GEO. WEBB.

Witnesses:

A. MONTGOMERY,
DAVID MCABEE.