

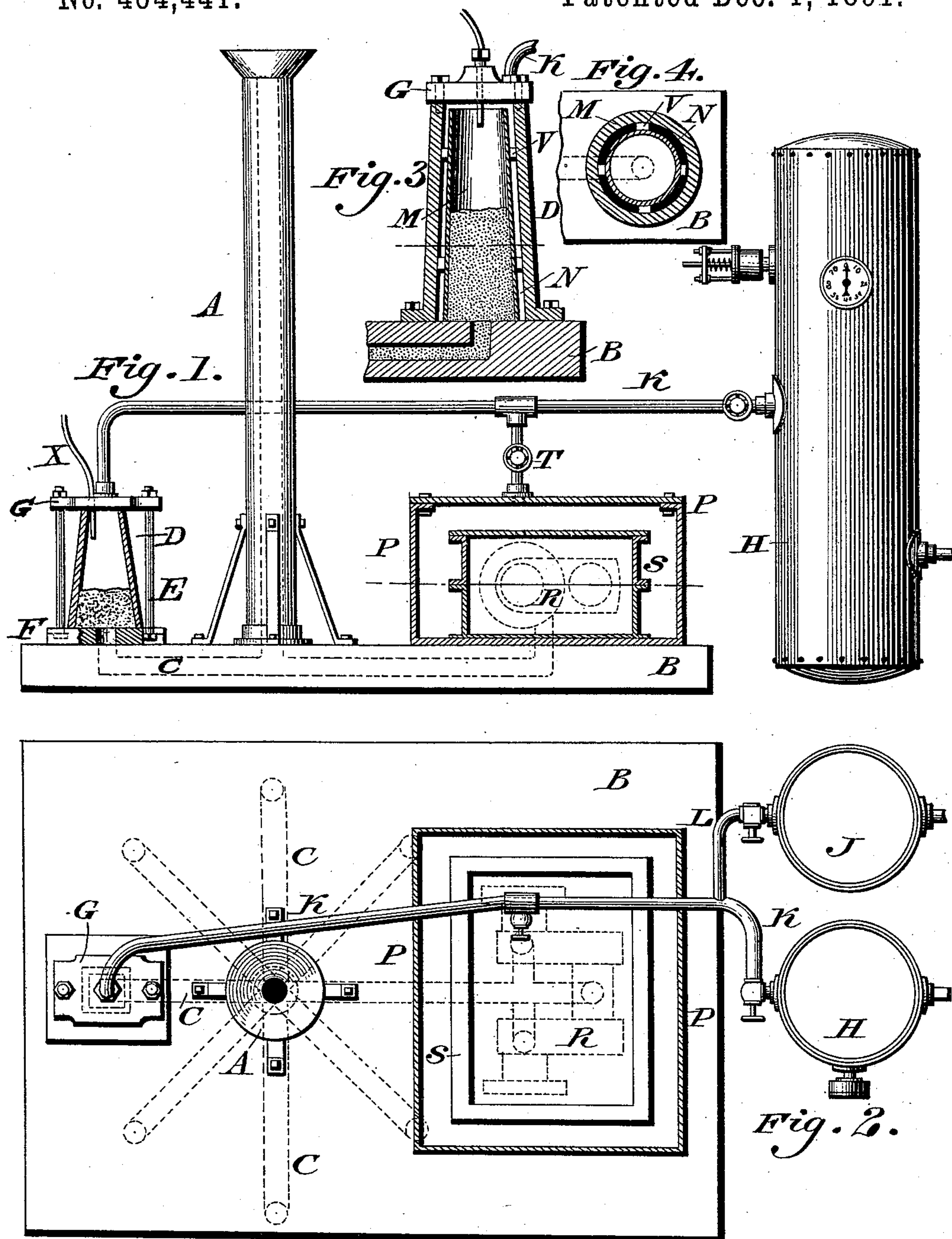
(No Model.)

S. C. ROCKMAN.

METHOD OF AND APPARATUS FOR COMPRESSING STEEL CASTINGS.

No. 464,441.

Patented Dec. 1, 1891.



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# UNITED STATES PATENT OFFICE.

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METHOD OF AND APPARATUS FOR COMPRESSING STEEL CASTINGS.

SPECIFICATION forming part of Letters Patent No. 464,441, dated December 1, 1891.

Application filed March 21, 1890. Serial No. 344,796. (No model.)

*To all whom it may concern:*

Be it known that I, SORENE C. ROCKMAN, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Methods of and Apparatus for Compressing Steel Castings, which improvement is fully set forth in the following specification and accompanying drawings.

My invention relates to improvements in method of and apparatus for compressing steel castings; and it consists, first, in subjecting the melted steel during its flow into the mold to a constant and uniform pressure and when the mold is filled to an increased pressure, as hereinafter described; second, of apparatus for compressing the melted steel in the mold; third, of the combination of parts herein described.

Figure 1 represents a partly side and partly sectional view in elevation of an apparatus for casting steel embodying my invention. Fig. 2 represents a plan view of the apparatus shown in Fig. 1, parts being in section. Fig. 3 represents a view of a mold for casting large ingots. Fig. 4 represents a section on line *x x*, Fig. 3.

Similar letters of reference indicate corresponding parts in the several figures.

Referring to the drawings, A designates a runner of any suitable height, firmly secured to a base B, the latter having therein the ducts C, leading from said runner into an opening in the base of the frame of the ingot-mold D.

The frame E of the said mold is formed of a base F and a cover-plate G, which inclose the ends of the mold D and are firmly secured by bolts having their ends inserted in openings in said base and plate, having nuts thereon.

H and J represent, respectively, low and high pressure compressed air or steam receivers having the pipes K and L leading therefrom, the pipe K leading into the top of the mold D and the pipe L into the pipe K. Each of the pipes K and L is provided with a stop-cock, so that the air or steam supply can be shut off from either receiver, as desired.

For casting large ingots, the mold D is formed with an inner yielding or flexible shell M, as shown in Fig. 3, the latter having a surrounding space N, communicating with the

air or steam supply, the said shell being kept in place by the clay plugs V, located between the shell and outer casing of the mold.

P designates an air-tight box having an opening in its base for the entrance of a duct C to the interior of a sand mold R in the flask S in said box. A pipe T, connected with the pipe K, leads into the box P, and the flask S, which is of the usual construction, has an opening leading into the top of the interior of the sand mold. Any number of ducts may be made in the base leading from the runner A and molds connected therewith, if desired.

To ascertain the height in the mold that is necessary to be filled with metal, a small pipe X is passed through the cover-plate, so that its lower end is at the desired height in the mold. During the filling a current of air or steam will pass out through the pipe; but when the metal has reached the desired height the opening in the lower end of the pipe will be closed, so the supply to the runner can then be stopped.

The operation is as follows: The cock of the receiver J being closed and that of the receiver H opened, the melted metal is poured into the runner A at the top thereof, and, descending, enters a duct C, and from thence passes into the bottom of a mold. The air or steam pressure is regulated according to the pressure of the weight of metal in the runner above that in the mold, so that the pressure on the upper and lower sides of the mass in the mold will be substantially equal, the escape of extra air or steam by the valve V preventing the excess of the air or steam-pressure. The air or steam bears uniformly on the upper face of the metal as it enters the mold, so that the metal is under constant compression the entire time while entering and forming in the mold. When the mold is filled, the air or steam supply from the low-pressure receiver H is shut off, and the cock of the high-pressure receiver J opened, so that a much greater pressure is constantly exerted upon the metal while cooling and solidifying, making a sound and close-grained metal casting free from honeycomb, cavities, pipings, or blow-holes.

In the mold shown in Fig. 3, the air or steam passing into the mold enters also the



space N and presses equally upon all sides of the thin and yielding shell M, containing the melted metal as well as upon the top of the metal, thus making a perfect compressed ingot or casting.

In the process herein described when employing a runner of ordinary size, the pressure of air or steam from the low-pressure receiver during the filling of the mold will be about thirty-six pounds to the inch, and when filled the amount of pressure from the high-pressure receiver employed will be about seven hundred to one thousand pounds to the inch.

In the use of the sand mold R the cocks of the pipes K and T are opened and that of the pipe L closed, so that the air or steam from the pipe K and the receiver H enters the mold through the opening in its top at the same time that the metal enters the bottom of the mold, so that the pressure is constantly exerted during the filling of the mold. When the mold is filled, the low-pressure receiver is shut off and the high-pressure receiver is connected with the interior of the mold. The sand mold may be employed at the same time as the ingot-mold, or a number of either ingot or sand molds be operated either separately or conjointly, as desired, however, for the sake of clearness, a single ingot-mold and a single sand mold being shown in the drawings. The runner A is made considerably longer or higher than the mold, so that great air or steam pressure is necessary on the metal in the mold to balance the weight of the metal in the runner above the mold, thus obtaining a heavy pressure on the metal in the mold for compressing the same.

In making castings where no after pressure is required when the mold is filled, I make a cover with a conical opening and a small aperture or outlet. When the mold is now filled, the steel chills in the aperture, and thereby closes the mold, the metal in the runner above the mold serving to compress the metal in the mold.

The base, to which the runner is secured and which contains the ducts leading to the molds, may be above the latter, if so desired, instead of under, as shown. The molds may be cast either separately or a number com-

bined, which latter is preferable for small ingots.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The method of casting steel, consisting in, first, subjecting the molten metal to a constant pressure of air or steam while passing into the mold, and, second, in subjecting the mold when filled to a highly-increased air or steam pressure, substantially as described.

2. The method of compressing steel castings, consisting in subjecting the molten metal to a constant pressure of air or steam while passing into the mold, said pressure being equal to the pressure of a descending column of the molten metal, and, second, in subjecting the metal when the mold is filled to a highly-increased air or steam pressure, substantially as described.

3. The method of casting steel, consisting in subjecting the molten metal to a constant and uniform pressure of air or steam while passing into the mold, and, second, in subjecting the mold when filled to a highly-increased air or steam pressure on the top and the sides thereof, substantially as described.

4. An apparatus for compressing steel castings, consisting of a vertical runner, a mold, a duct leading from the lower end of the runner into the lower end of the mold, a high and a lower pressure air or steam receiver, a pipe leading from one of said receivers to the top of the mold, and a pipe leading from the other receiver into said first-mentioned pipe and valves, as described, in said pipes, said parts being combined substantially as described.

5. In an apparatus for the purpose named, a runner with a base, a mold on said base, a duct in said base leading from the lower end of said runner to said mold, a low-pressure air or steam receiver connected by a pipe with the upper part of said mold, and a high-pressure air or steam receiver with pipe leading into the said mold, said parts being combined substantially as described.

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Witnesses:

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