(No Model.)

E. B. MEATYARD.

APPARATUS FOR COMPRESSING CAST METAL.

No. 347,003. Patented Aug. 10, 1886.

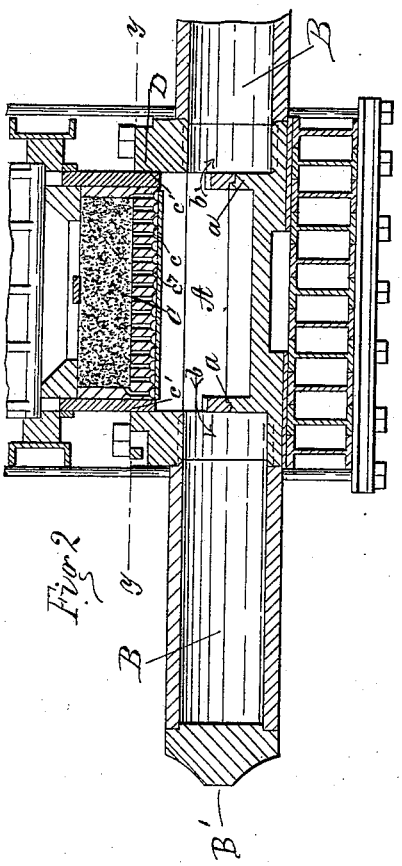

Fig. 2.

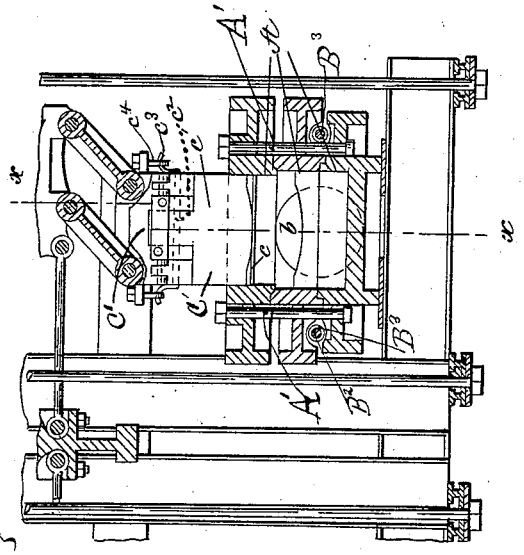

Fig. 1.

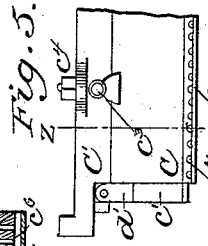

Fig. 5.

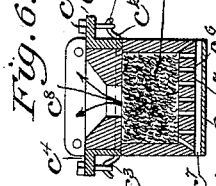

Fig. 6.

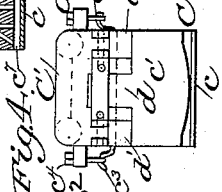

Fig. 4.

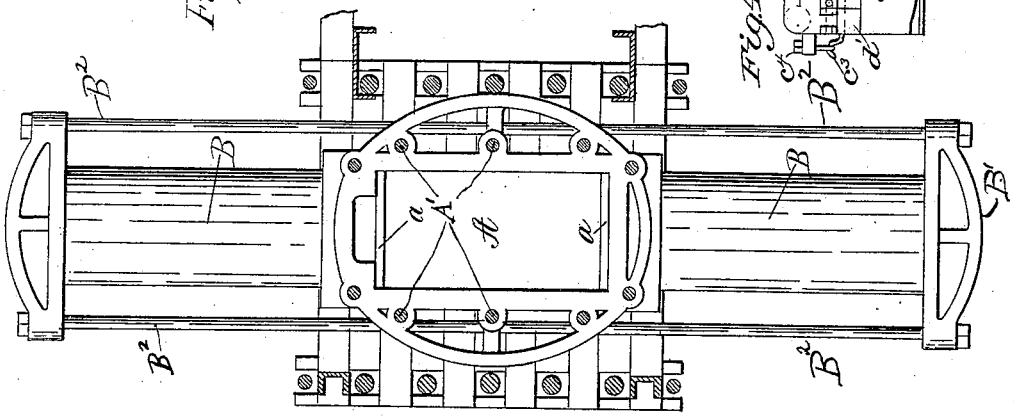

Fig. 3.

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UNITED STATES PATENT OFFICE.

EDWARD B. MEATYARD, OF LAKE GENEVA, WISCONSIN.

APPARATUS FOR COMPRESSING CAST METAL.

SPECIFICATION forming part of Letters Patent No. 347,003, dated August 10, 1886.

Application filed September 10, 1884. Serial No. 142,701. (No model.)

To all whom it may concern:

Be it known that I, EDWARD B. MEATYARD, a citizen of the United States, and residing at Lake Geneva, in the county of Walworth and State of Wisconsin, have invented certain new and useful Improvements in Apparatus for Producing Dense and Homogeneous Steel Ingots, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 is a transverse sectional view of an apparatus embodying my invention; Fig. 2, a vertical sectional view on the line *x x* of Fig. 1; Fig. 3, a plan section on the line *y y* of Fig. 2; Fig. 4, an end elevation of the plunger and follower detached; Fig. 5, a side elevation of the same, and Fig. 6 a transverse sectional view on the line *z z* of Fig. 5.

Like letters refer to like parts in all the figures of the drawings.

My invention relates to apparatus for producing dense and homogeneous steel ingots, and more particularly to the construction of a mold in which the metal is to be impressed while in a liquid state, and of a plunger operating in conjunction with the said mold and with a suitable press to impress the metal in the mold, its object being to provide means whereby steel ingots of great density and homogeneity may be readily produced in a rapid manner.

I will now proceeed to describe a construction in which my invention is practically carried out in one form, and will then specifically point out in the claims the features which I deem to be new and desire to protect by Letters Patent.

In the drawings the molds are shown as consisting of a central mold or well, A, and one or more branch molds, B, communicating therewith, two being shown in the present instance, though more or less than that number may be employed. The central mold, A, is on a higher level than the branch molds, and is preferably formed of three superposed parts, as clearly shown in Figs. 1 and 2 of the drawings, being strongly constructed to resist the heavy bursting strain to which it is in practice submitted, while at the same time it may be taken apart to remove the metal contained within it, the parts being connected by vertical bolts A′, passing through the whole, substantially as shown in Figs. 1 and 3 of the drawings. The upper portion of this central mold is somewhat narrower transversely than the lower portion, and is of the same width as the plunger which operates therein, as clearly shown in Fig. 1 of the drawings. The metal in the central mold has a tendency to chill against the side walls of the mold, thereby producing a tough section near the walls, which would resist the advance of the plunger into the mold, and it is to provide against this resistance that I form the upper portion of the mold of a less width, whereby the plunger acts only against the central portion of the metal in the mold, and not against that portion near the sides thereof.

The side or branch molds, B, are shown in the present instance as plain hollow tubes, tapering slightly, their largest diameter being at their point of communication with the central mold, and having their outer ends closed by caps B′, connected by bolts B^2 passing through tubes or sleeves B^3, to hold the end caps and the branch molds in position. The branch molds being tapering, as hereinbefore pointed out, and not being permanently connected to the central mold, but only held against the same by means of the bolts B^2, the said molds may be readily detached and the ingots removed therefrom after pressing. The end walls, *a*, of the central mold extend upward, as shown in Figs. 1 and 2 of the drawings, leaving an overflow-orifice, *b*, communicating with the adjacent branch molds, whereby the metal upon being poured into the central mold will overflow into and fill the said molds. These end walls act as knives, in conjunction with knives attached to the plunger, as hereinafter pointed out, to practically sever the ingots in the branch molds from the metal in the central mold when the pressing is completed, either severing the same completely or leaving only a thin fin connecting them, which will break, by reason of the weight of the ingots and molds, upon loosening the bolts B^2.

In order to compress the metal, I employ a

plunger, C, fitting within the central well or mold, A, as hereinbefore pointed out, and operated by a press or other suitable means. In the present instance I have shown this plunger as operated by means of a press constructed substantially as set forth in an application filed by me October 15, 1884, Serial number 145,613, to which application reference is made for further description of the same.

To the follower proper, C′, of the press is attached the removable plunger C, provided with a cross-bar, c^2, having at its ends hooks c^3, which pass through eyebolts c^4 on the follower proper, so that by unscrewing the ends of these eyebolts the plunger may be detached. This plunger is made as hollow as is consistent with strength, the recess c^5 therein being filled with ground silicon or any other porous and at the same time refractory material. In the bottom face of the plunger are minute orifices c^6, communicating with the recess c^5, and with fine corrugations c^7 in the face of the plunger, the whole face being covered with asbestus cloth c, or any other porous refractory non-radiator of heat. By this means the face of the plunger is prevented from chilling the metal during the pressing, and the gas contained in the metal is permitted to escape through the grooves and apertures aforesaid and through the sand in the recess c^5, and it finally passes out through a well or opening, c^8, in the follower proper. Upon each side of the plunger is arranged a knife, c', operating in conjunction with the walls a, as hereinbefore pointed out, to sever the ingots in the side molds from the metal in the central well.

To permit rapid pouring of the metal, I have formed at one end of the central mold a gate or pouring-orifice, D, and the knife c', which is adjacent thereto, may be raised vertically, its shank d sliding in a suitable mortise or gain in the follower to take it out of the way of the metal while pouring. After pouring, the knife is lowered and two hinged pawls, d' on the follower are swung down to bear against the upper edge of its body to hold it in place during the pressing. The knives at each end of the plunger are constructed in this manner, so that the plunger may be used with either end thereof adjacent to the pouring-orifice D. The walls of the central mold may be lined, if desired, with any suitable refractory non-radiator of heat, to prevent too sudden heating of the walls in the central mold.

In operation, the press being off, the pawls d' are swung up and the knife c' raised to permit the pouring of the metal into the central mold, from which it flows into the side molds through the orifices b. The three molds being filled, the knife is lowered, the pawl swung down, and the press operated to force the plunger downward in the central mold, thereby compressing the metal in all three of the molds. The knives c' and end walls, a, finally sever, or practically sever, the ingots, as hereinbefore pointed out, and they may be removed while still retaining enough central heat in their cores to regenerate the skin while being worked in the rolls or under the hammer.

In pressing steel ingots, unless adequate vents for the escape of the gases evolved are provided, these gases seek that portion of the metal which retains its heat and remains molten the longest, and are therefore compressed near the heart or core of the mass, the skin cooling or hardening first, and remain there in the completed ingot in spheroidal cells under a bursting strain proportionate to the amount of pressure used in compressing the ingot, thereby rendering the ingot faulty. By the use of my apparatus these objections are overcome. The gas in the ingots in the branch molds, instead of remaining in the cores, passes into the mass in the central mold, which, being the last poured, is the hottest, and being therefore kept in a molten condition by reason of this fact and of the asbestus facing of the plunger and refractory lining of the central mold, when such lining is employed, the light scoriæ and other impurities will remain on the surface of the same, the gases passing off through the orifices in the plunger, as hereinbefore described. The central mold is preferably arranged on a higher plane than the branch molds, in order that all the gases in the ingots shall flow up through the mass in the central mold, their tendency being to rise. Owing to this rising tendency of the gases, if the side molds are arranged above the central mold, the gases in the ingots will seek the higher points in these molds, instead of passing out through the central mold. For the same reason—*i. e.*, to facilitate the escape of the gases—the plunger acts from above and not from below, and is located above the highest surface of the metal in the several molds. After each operation the side molds are dropped down by unscrewing the bolts B^2, thereby breaking the small fins connecting the several ingots, which latter are then removed in time to save the molds from superheating. Subsequently the central mold, with the plunger and its knives, is removed and a new set substituted. By this means dense ingots of great purity and homogeneity are produced with great rapidity.

While the branch molds for pressing rail or other large ingots may be made as shown and described above, molds for pressing shafting of uniform diameter for the whole length may be in two halves.

It is obvious that various mechanical alterations and modifications may be made in the details of construction without departing from the principle of my invention, and I therefore do not wish to be understood as limiting myself strictly to the construction shown and described.

In an application filed by me August 1, 1885, Serial No. 173,285, I have shown and described, and also claimed, broadly, a plunger operating in the mold to compress the metal therein, and provided with a movable section to form a

pouring-orifice, and with knives to separate the ingots in the side molds. I therefore do not wish to be understood as claiming such a construction, broadly, in this my present application, the claim relating to these features being limited to the specific construction set forth, which differs from the specific construction shown and described in my other application.

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

1. The combination, with the central mold, and side or branch molds communicating with the same, of the vented plunger arranged to operate in the central mold, substantially as and for the purposes specified.

2. The combination, with the central mold, and side or branch molds communicating therewith, of the vented plunger arranged to operate in the central mold, and provided with an asbestus facing, substantially as and for the purposes specified.

3. The combination, with the central mold, and side or branch molds arranged on a lower level than and communicating with the central mold, of a vented plunger arranged to operate in the central mold above the highest surface of the metal therein, substantially as and for the purposes specified.

4. The combination, with the central mold, of branch molds communicating therewith, and having caps B′, and connecting-bolts B^2, arranged as described, to retain said caps and molds in position, substantially as and for the purposes specified.

5. The combination, with the branch molds, of a central mold narrowed transversely at its upper portion, and a plunger to fit the said narrowed portion, substantially as and for the purposes specified.

6. The combination, with a mold having a pouring-orifice arranged as described, of a plunger, the end of which adjacent to said orifice may be raised or lowered, substantially as and for the purposes specified.

7. The combination, with the mold having the pouring-orifice D arranged as described, of the plunger having knives c', provided with shanks d sliding in suitable mortises, and the hinged pawls d', to hold the knives in position when lowered, substantially as and for the purposes specified.

8. The combination, with the mold, of the hollow plunger filled with refractory sand, and having in its face minute orifices communicating with the central recess, substantially as and for the purposes specified.

9. The combination, with the follower having the central well, c^8, of the plunger secured thereto, and having the central recess filled with refractory sand, the orifices c^6, corrugations c^7, and asbestus-cloth facing c, substantially as and for the purposes specified.

10. The combination, with the follower having perforated lugs on each side, of the plunger having hooks c^3, and secured to the follower by eyebolts c^4, substantially as and for the purposes specified.

EDWARD B. MEATYARD.

Witnesses:
W. C. CORLIES,
A. M. BEST.