No. 807,072. PATENTED DEC. 12, 1905.

C. D. GRIMES, B. F. EILERMAN & T. A. LEGLER, Jr.

CASTING APPARATUS.

APPLICATION FILED AUG. 13, 1904.

3 SHEETS—SHEET 1.

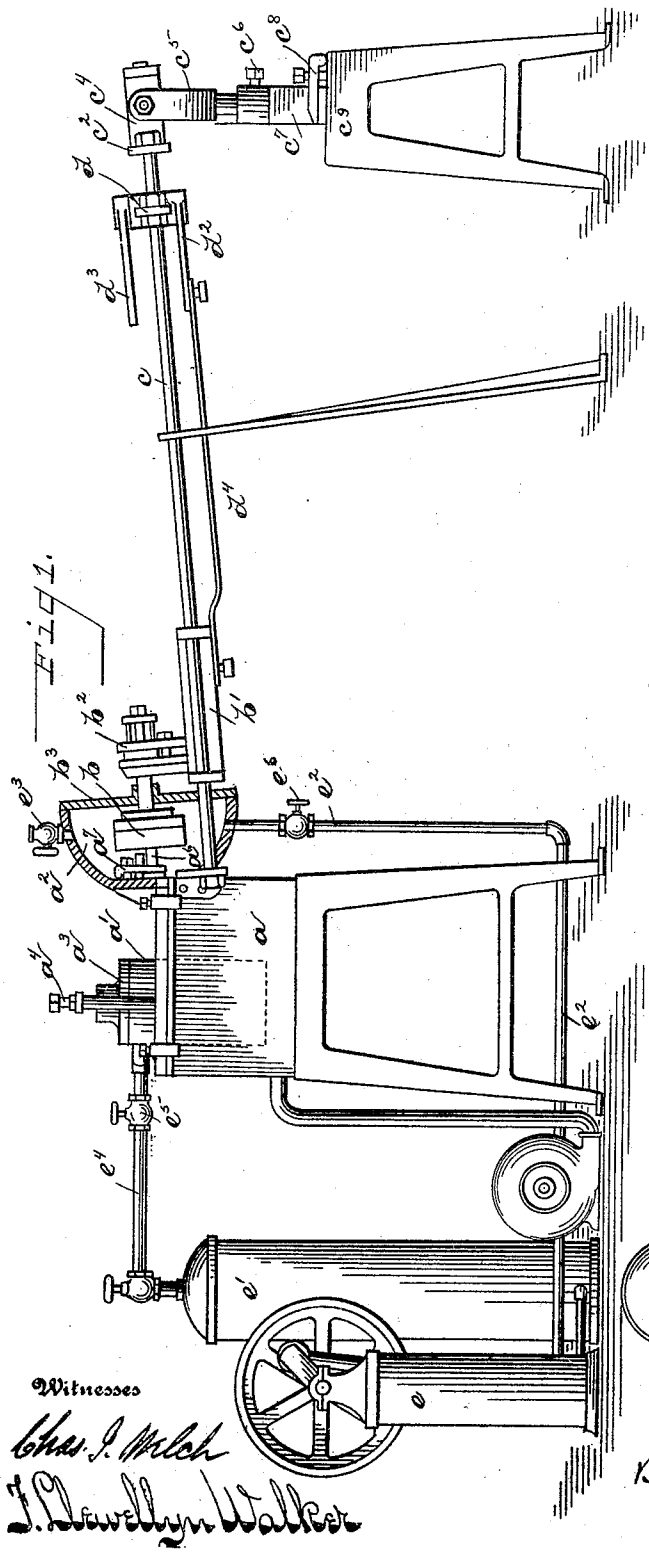

Fig. 1.

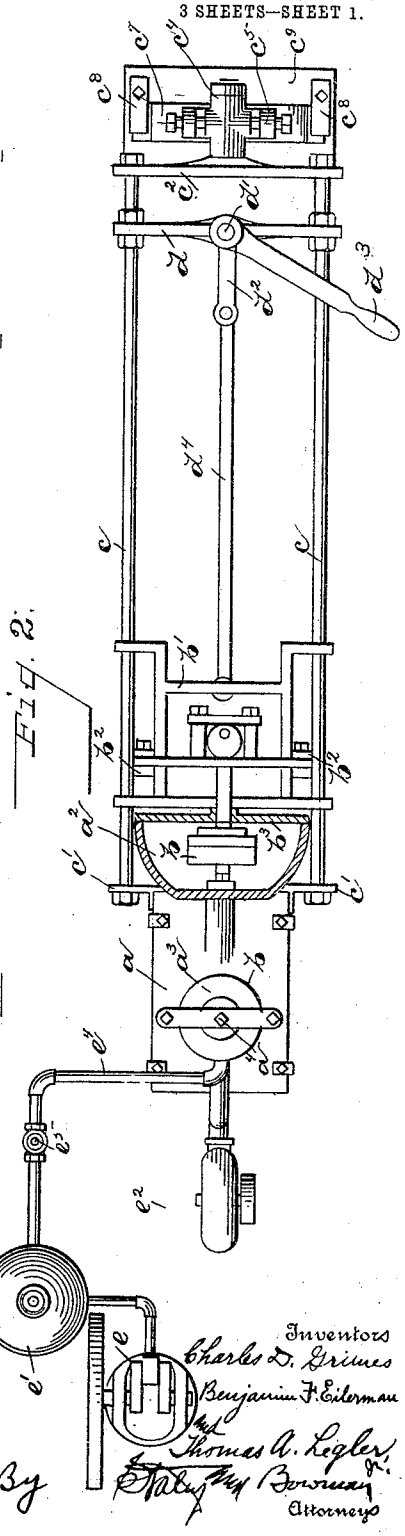

Fig. 2.

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Fig. 3

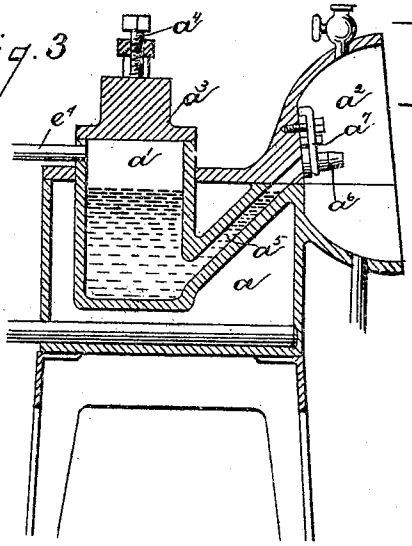


Fig. 4

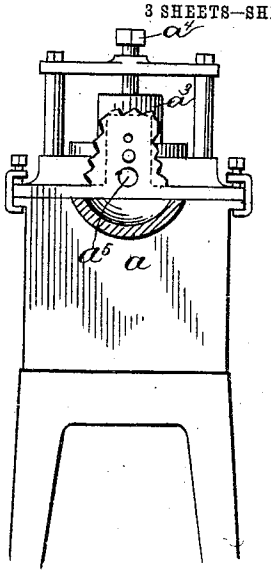


Fig. 6

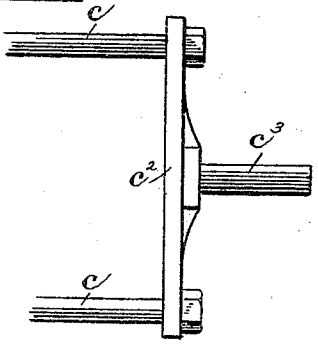
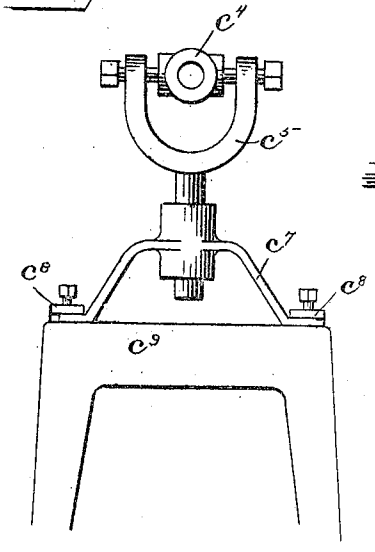


Fig. 5.



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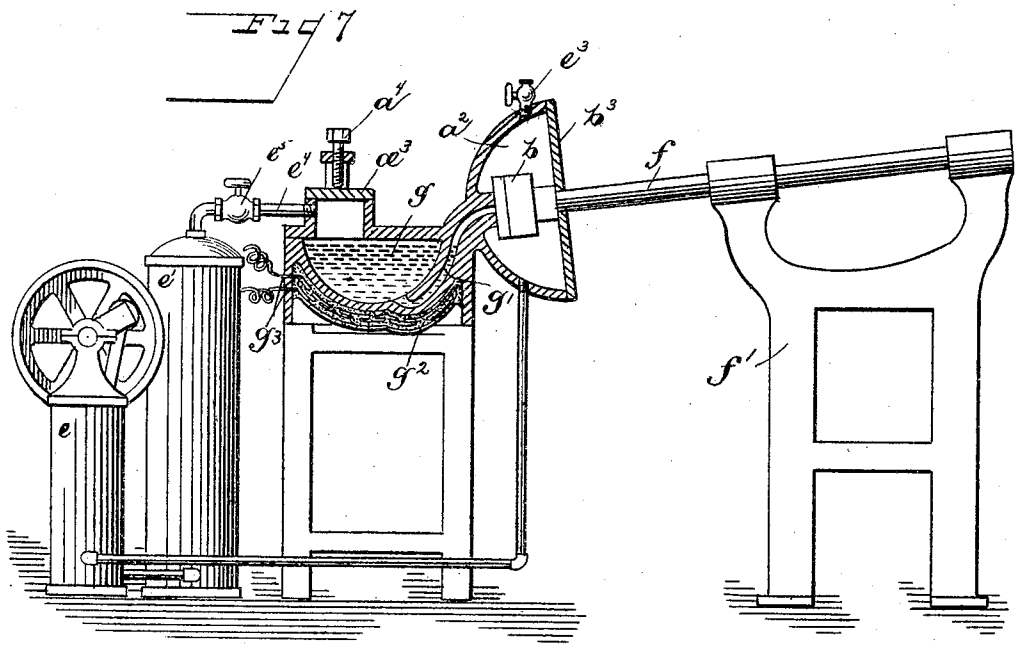
3 SHEETS—SHEET 3.

Fig 7



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UNITED STATES PATENT OFFICE.

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CASTING APPARATUS.

No. 807,072. Specification of Letters Patent. Patented Dec. 12, 1905.

Application filed August 13, 1904. Serial No. 220,645.

To all whom it may concern:

Be it known that we, CHARLES D. GRIMES, BENJAMIN F. EILERMAN, and THOMAS A. LEGLER, Jr., citizens of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Casting Apparatus, of which the following is a specification.

Our invention relates to the art of making castings from molten metal, and especially relates to the means and mechanism employed.

The object of our invention is to provide simple and efficient means whereby castings from molten metal may be cheaply and rapidly made by a person unskilled in the molding art.

A further object is to provide means whereby castings may be produced having a smooth even surface and whereby the casting will be solid throughout, containing a minimum amount of air-bubbles.

A further object is to provide means whereby castings having very thin webs or flanges or other projections of small dimensions may be successfully made by forcing the molten metal into such parts of the mold under pressure or by means other than gravity or the weight of the molten metal. This feature will be found especially advantageous in casting light alloys, such as contain a high per cent. of aluminium, antimony, or tin.

With the above primary and other incidental objects in view our invention consists of the parts, constructions, and modes of operation or their equivalents hereinafter described, and set forth in the claims.

In the drawings, Figure 1 is a side elevation, partly in section, of the apparatus employed in making the castings. Fig. 2 is a plan view, partly in section, of same. Fig. 3 is a sectional view showing the metal reservoir or pot and vacuum-chamber. Fig. 4 is an end elevation, partly broken away, of devices shown in Fig. 3. Fig. 5 is a front elevation of the swivel support for the supporting-shafts. Fig. 6 is a detail of the connection of the supporting-shafts. Fig. 7 shows a modified form of apparatus.

Like parts are indicated by similar characters of reference throughout the several views.

In the said drawings, a is a casing adapted to contain the means for heating the metal in the pot a', which is supported within the casing a. The casing a is extended at one side to form the walls of a vacuum-chamber a^2.

b is a separable die or mold removably secured to a carriage b' by means of clamps b^2. The carriage b' is slidably mounted on parallel supporting-shafts c c. One end of each of said shafts is supported in ears c', extending from the casing a. The opposite ends of the shafts c c are connected by a cross-bar c^2, having at its middle and extending at right angles thereto a trunnion c^3. (See Fig. 6.) The trunnion c^3 has a bearing in the swivel-block c^4, which has pivotal connections at right angles to said trunnion with the bifurcated member c^5. This bifurcated member c^5 is adjustably secured by means of a set-screw c^6, Fig. 1, in the stand c^7, which stand is in turn removably secured by clamps c^8 to the table c^9. Adjacent to the cross-bar c^2, connecting the shafts c c and supported thereby, is a second cross-bar d, having at its middle a bearing for a vertical shaft d', carrying at its lower end a crank-arm d^2 and at its upper end a handle d^3. A link d^4 connects the crank-arm d^2 and the carriage b'. By means of the handle d^3 and its connections with the carriage b' the carriage is moved upon the shafts c c and the die is withdrawn from the vacuum-chamber a^2 for the ejection of the finished casting.

The metal-pot a' is provided with a lid a^3, which is secured on the pot by a set-screw a^4 in such manner as to hermetically seal said pot. The pot a' is further provided with an inclined conduit a^5, having its discharge-orifice above the metal-level of the pot. A spout a^6 is removably secured to the orifice of the conduit a^5 by a clamp a^7 and forms the connection between the conduit a^5 and the separable metal-die b. Secured to and movable with the die b is a plate b^3, which forms one side of the vacuum-chamber a^2 and is adapted when in place to form an air-tight joint with the walls of said chamber.

Referring to Figs. 1 and 2, e is an air-compressor of any convenient form, and e' is a compressed-air reservoir. An intake-pipe e^2 of the compressor, provided with a regulating-valve e^6, is connected with the vacuum-chamber a^2, and in the opposite side of said vacuum-chamber is an inlet air-cock e^3. The object of this connection of the air-compressor with the vacuum-chamber is twofold: First, the passage of air through the vacuum-chamber while

the air-cock e^3 is open tends to cool the metal-die b after each successive operation; second, when the air-cock e^3 is shut off preparatory to casting at the time the reservoir e' has been filled almost to its capacity and the compressor is continued in operation the air is exhausted from the chamber a^2, and when the metal is forced into the die, as hereinafter described, it is not necessary that it should overcome the resistance of air in the die; but instead it flows freely into all remote parts of the die, which is practically a vacuum, thus permitting the casting of very thin and small parts and avoiding the danger of air-bubbles. The flow of molten metal into the die is induced by pressure of air on top of the molten metal in the pot a', the compressed air being conducted from the reservoir e' to the pot a' at a point above the metal-line through the pipe e^4, in which is placed a regulating-valve e^5.

In Fig. 7 there is shown a modification in which the die b is supported in a simple manner at the end of a shaft f, mounted in a stand f'. In this modified form the metal-pot is shown bowl-shaped, as at g, and the inclined spout is curved, as at g'. Arranged about the bottom of the bowl g is a thick layer of fire-clay g^2, in which are embedded wires g^3, affording means for electrically heating the metal within the pot.

By the above arrangement it will be seen that our apparatus is extremely simple. The use of valves between the melting-pot and mold is entirely dispensed with. This is important, because in machines of this character where valves are employed which come in contact with the hot metal they soon become useless either from the heat of the metal or from the accumulation of metal thereon. The air-pressure is put directly on the melting-pot, which connects directly with the mold without the aid of valves, and thus insures proper delivery of the metal at all times. The vacuum-chamber aids in insuring the proper delivery of the metal to all parts of the mold.

Having thus described our invention, we claim—

1. In a casting apparatus as described, a closed melting-pot, a die connecting with said melting-pot by means of an unobstructed conduit leading from the lower part of said melting-pot to a point above the level of the metal within said pot, a pressure-chamber connected to said melting-pot, a vacuum-chamber surrounding said die, a pump between said vacuum and pressure chambers, and a valved opening between the atmosphere and the said vacuum-chamber, substantially as and for the purpose specified.

2. In a casting apparatus as described, a melting-pot, a die removably secured to a reciprocating carriage, means for reciprocating said carriage, a vacuum-chamber surrounding said die, a pump having its supply-pipe connected with said vacuum-chamber, an air-reservoir into which said pump discharges, a valved connection from said reservoir to said melting-pot, an unobstructed conduit leading from said pot to said die, and a valved atmospheric opening from said vacuum-chamber, which opening forms the atmospheric supply to said pump, whereby the air for said pressure-reservoir is drawn through said vacuum-chamber when said valve is opened, and drawn from said chamber when said valve is closed, substantially as and for the purpose specified.

3. In a casting-machine as described, a melting-pot, a die removably secured to a reciprocating carriage, parallel supporting-shafts for said carriage, means for reciprocating said carriage, a stationary support for one end of said shafts, and an adjustable swiveled support for the other end of said shafts, and pneumatic means for forcing the molten metal from the pot to the die, substantially as and for the purpose specified.

4. In a casting apparatus, a closed metal-pot, a die, a conduit leading from said melting-pot to said die, a vacuum-chamber around said die, a valved atmospheric opening leading to said chamber, an air-compressor and an air-reservoir, and connection from said chamber to said compressor, and from said compressor to said reservoir, and a valved connection from said reservoir to said melting-pot, said valved atmospheric opening being adapted to form the atmospheric air-supply for said compressor through said chamber when said valve is opened, and to cause said chamber to be exhausted by said compressor when said valve is closed, substantially as and for the purpose specified.

In testimony whereof we have hereunto set our hands this 5th day of July, A. D. 1904.

CHARLES D. GRIMES.
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Witnesses:
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