F. T. KITCHEN.

CASTING APPARATUS.

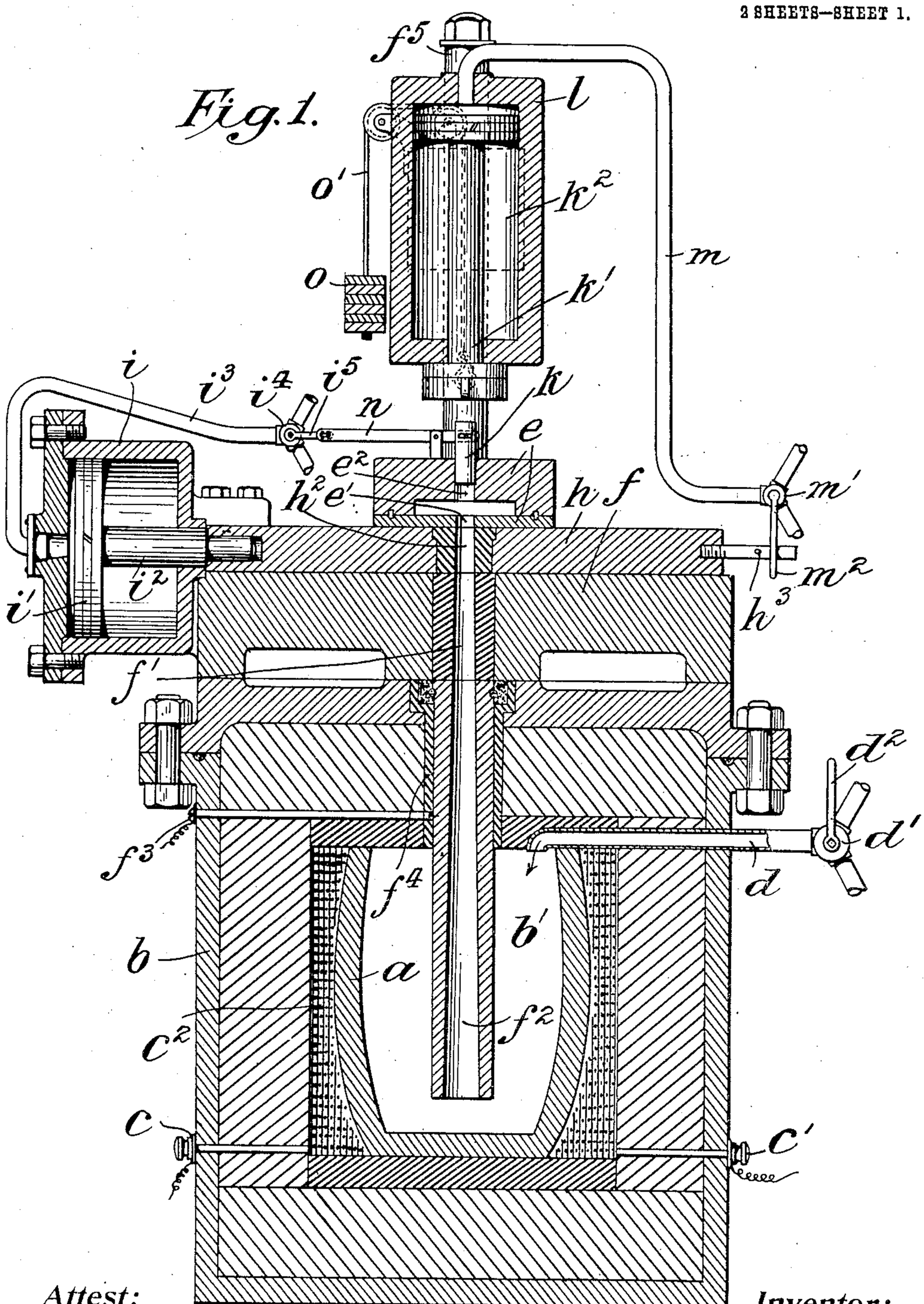
APPLICATION FILED JUNE 16, 1908.

969,539.

Patented Sept. 6, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



Attest:
Ella J. Krueger
Thomas A. Price.

Inventor:
Frederick T. Kitchen
by Redding, Greeley & Austin,
Attys.

F. T. KITCHEN.

CASTING APPARATUS.

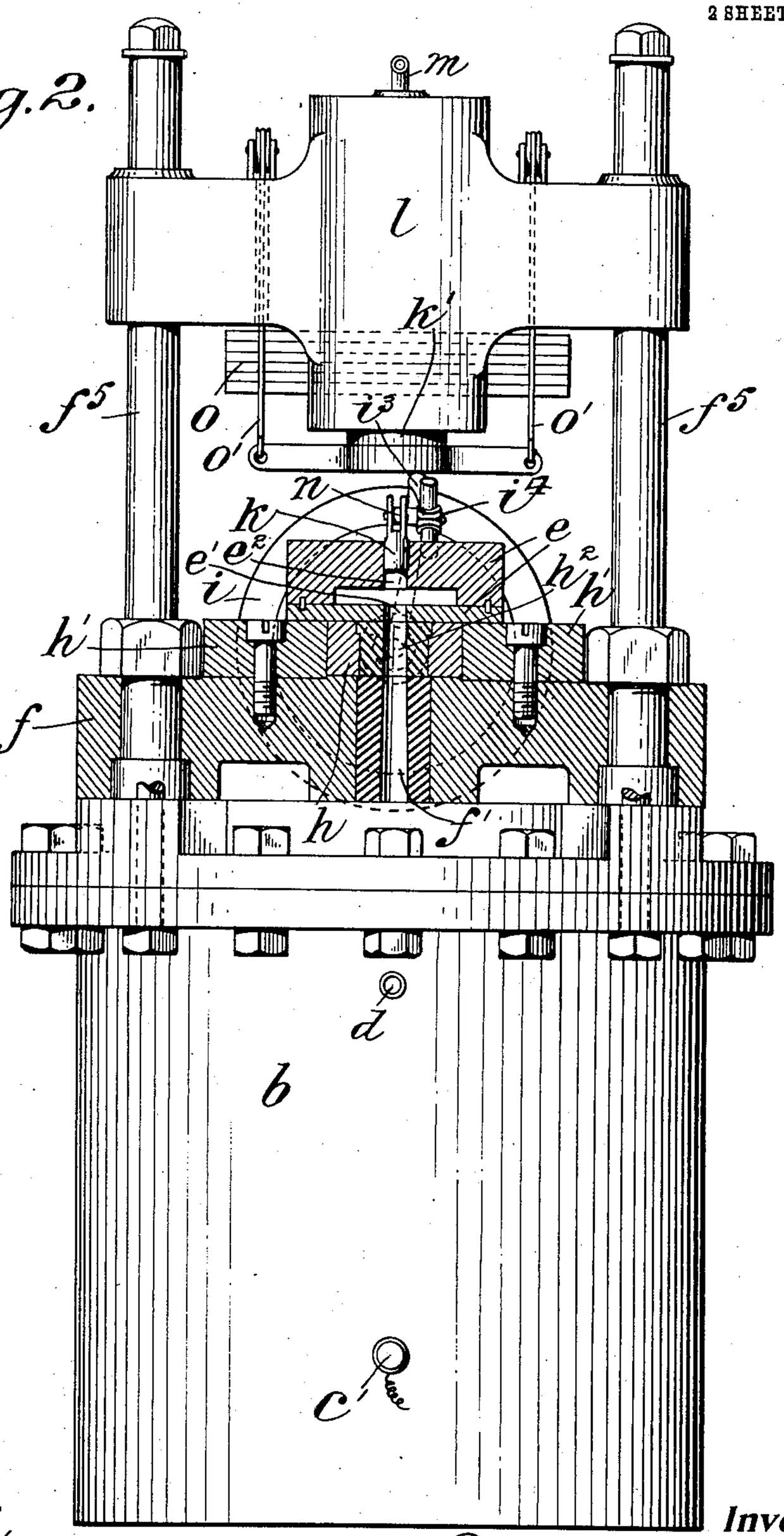
APPLICATION FILED JUNE 16, 1908.

969,539.

Patented Sept. 6, 1910.

2 SHEETS—SHEET 2.

Fig. 2.



Attest:

Ella J. Krueger

Thomas A. Price

Inventor:

by Frederick T. Kitchen

Redding, Greeley & Austin

Attys

UNITED STATES PATENT OFFICE.

FREDERICK T. KITCHEN, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO COMPRESSED METAL COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

CASTING APPARATUS.

969,539. Specification of Letters Patent. Patented Sept. 6, 1910.

Application filed June 16, 1908. Serial No. 438,723.

To all whom it may concern:

Be it known that I, FREDERICK T. KITCHEN, a citizen of the United States, residing in the borough of Manhattan of the city of New York, in the State of New York, have invented certain new and useful Improvements in Casting Apparatus, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

This invention relates to apparatus for the rapid casting of metals in hard molds, and while the improvements hereinafter described have been devised with special reference to the casting of the less readily fusible metals, such as brass, for example, they are nevertheless applicable with advantage to the casting of the more readily fusible metals and alloys.

It is the general object of the invention to improve the construction and operation of apparatus of this character.

More especially, one purpose in view is to provide improved means whereby the metal in the mold may be subjected to a high pressure until it has cooled, thereby producing a casting of thoroughly homogeneous character, conforming exactly to the configuration of the mold. Heretofore the molten metal has sometimes been forced into the mold by a plunger submerged below the surface of the molten metal in the melting pot, but the subjection of the pump to the action of the molten metal is greatly destructive of the pump. In other case, the molten metal has been forced into the mold by air or gas pressure on the surface of the molten metal in the melting pot or pressure pot, but such pressure is elastic and is not always efficient. In accordance with the present invention air, or preferably a nonoxidizing or deoxidizing gas under pressure, may be employed for the purpose of forcing the metal into the mold, but thereafter, communication between the interior of the mold and the melting pot being closed, the metal in the mold itself is directly subjected to the heavier pressure of a plunger which acts directly upon the metal in the mold.

Another purpose in view is to make the apparatus automatic as far as possible so that the operations may be carried on with great rapidity. Provision is also made for preventing any substantial reduction of temperature of the molten metal until it actually enters the mold.

Other features of improvement will be more particularly referred to hereinafter in connection with the description of the form of apparatus which has been chosen for illustration in the accompanying drawings, in which drawings—

Figure 1 is a view in vertical section of a casting apparatus which embodies the invention. Fig. 2 is a view thereof, partly in section, on a plane at right angles to that of Fig. 1, and partly in elevation.

In the apparatus shown in the drawings, a suitable crucible or melting pot *a* is placed in a furnace *b*, which is preferably an electric furnace, connections for current supply being indicated at *c*, *c'* and resistance for developing heat at c^2. The melting chamber *b'* of such a furnace may be readily made tight so that air, or preferably a nonoxidizing or deoxidizing gas, may be admitted under pressure from any suitable source for the purpose of driving the molten metal into the mold. A pipe *d* is shown in the drawing as adapted to conduct the air or gas under pressure to the melting chamber of the furnace, such pipe being provided with a three-way valve *d'* controlled by a suitable lever or handle d^2, so that air or gas under pressure may be admitted when it is desired to force the metal into the mold and that such pressure may be relieved after the mold has been filled. The mold, indicated at *e*, may be of any suitable construction, having an inlet for the molten metal, as at *e'*, and a chamber, as at e^2, for a plunger hereinafter more particularly described. The mold is preferably supported above the melting pot and is represented in the drawings as supported by the bottom plate *f* of a frame erected above the furnace, such plate *f* having a channel *f'* through which the molten metal may be delivered to the mold, as hereinafter described, which channel is continued downward into and below the surface of the molten metal in the crucible *a* by a tube f^2. The tube f^2 is preferably formed of a suitable electrically resistant material and is connected to the source of electric current for the furnace, as indicated at f^3, being properly insulated from

the furnace walls, as at f^4. As the tube f^2 thus receives a portion of the heating current it is itself maintained at a high temperature and the reduction of temperature of the molten metal is prevented.

Between the melting pot and the mold are interposed means for closing the communication between the mold and the melting pot after the mold has been filled, so that the metal in the mold may be subjected to pressure by the devices hereinafter described. As shown, such means comprise a slide valve h, mounted upon the plate f between guides h' and having a port or passage h^2 adapted to register with the channel f' when the mold is to be filled. Such valve may be operated by any convenient means. As shown, a hydraulic cylinder i is secured to the plate f, the piston i' thereof having a rod i^2 which is adapted, when pressure is admitted behind the piston, to push the slide valve h forward so as to cut off communication between the mold and the melting pot. Preferably the valve h is not permanently connected to the piston rod i^2, but is independent thereof so that a cool slide h may be readily substituted for the heated one as often as may be desired.

As hereinbefore stated, the metal in the mold, while it is still fluid and after communication with the melting pot has been cut off, is subjected to heavy pressure. This is accomplished by the plunger k which enters the mold and is carried by a hydraulic plunger k'; the cylinder k^2 for the latter may be formed in a crosshead l fixed upon the vertical rods f^5 which rise from the plate f of the frame. Liquid under pressure is admitted to the cylinder k^2 from any suitable source, sufficiently indicated by the pipe m, the admission of such liquid under pressure and the relief of pressure in the cylinder being conveniently controlled by a three-way valve, indicated at m', and provided with a lever or handle m^2 for the operator. Pressure may also be supplied to the cylinder i, for the operation of the valve h, from any suitable source, the same being sufficiently indicated by a pipe i^3, which may be controlled by a three-way valve i^4, so as to admit pressure behind the piston i or to relieve such pressure as may be required.

The valve i^4 might be operated by hand or by any suitable means. In the mechanism shown in the drawings it is automatically controlled, as to its movement in one direction, by the flow of metal into the mold, being operated by a lever n which is mounted on the mold and is operatively connected at one end with the plunger k and at the other end with the lever i^5 of the valve. As the molten metal fills the mold it causes the plunger to move outward from the mold and through the described connection to shift the valve i^4 so as to admit pressure to the cylinder i behind its piston i'. The slide valve h will, therefore, be thrust forward quickly to cut off communication between the interior of the mold and the interior of the melting pot, preventing the escape of the metal from the mold. As the slide valve h continues its forward movement a pin h^3 carried thereby strikes the arm m^2 of the valve m' and opens the valve, admitting pressure behind the hydraulic plunger k'. The downward movement of the hydraulic plunger k' drives the plunger k into the mold and the still fluid metal therein is therefore subjected to the high pressure behind the plunger and is forced under such high pressure into every part of the mold, securing a casting which conforms perfectly to the mold and at the same time is made thoroughly homogeneous. The high pressure is continued until the metal in the mold sets and then the valve m' is manipulated by the operator to relieve the pressure behind the plunger. The latter is immediately withdrawn, as by a counter weight o suitably connected, as by a chain o', with the plunger, and in its upward movement actuates the lever n to shift the valve i^4 for the purpose of relieving the pressure behind the piston i. The mold being then removed or opened in the usual manner for the ejection of the casting, the slide valve h is free to be thrust back by the operator into its initial position or to be replaced by a cool slide, if necessary. As soon as the parts are in readiness for another casting the valve d' is shifted by the operator to admit pressure into the casting pot and the operations are repeated as before.

It will now be seen that with the improved apparatus not only is oxidation of the metal guarded against, there being no contact of the metal with the air, and that provision is made against any undesirable reduction in temperature before it reaches the mold, and that the successive operations can be carried on with great rapidity, but also that the metal in the mold can be subjected to pressure much greater than that which is required or is desirable for the introduction of the metal into the mold, whereby it is possible to make castings of perfect shape and homogeneity.

It will be understood, of course, that various changes in details of construction and arrangement may be made to suit different conditions of use and that the invention is not limited to the precise construction shown and described herein.

I claim as my invention:

1. In a casting apparatus, a pot for molten metal, means to force the metal therefrom into the mold, a slide valve to cut off communication between the mold and the pot and prevent the escape of molten metal from the mold, a cylinder and piston to actuate the valve, a plunger adapted to enter the

mold to act upon the molten metal therein, and a cylinder and piston to actuate said plunger.

2. In a casting apparatus, a pot for molten metal, means to force the metal therefrom into the mold, a slide valve to cut off communication between the mold and the pot and prevent the escape of molten metal from the mold, a cylinder and piston to actuate the valve, a plunger adapted to enter the mold to act upon the molten metal therein, a cylinder and piston to actuate said plunger, and devices actuated by the movement of the plunger to control the pressure behind the piston in the first named cylinder.

This specification signed and witnessed this 6th day of June, A. D., 1908.

FREDERICK T. KITCHEN.

Signed in the presence of—
ELLA J. KRUGER,
AMBROSE L. O'SHEA.