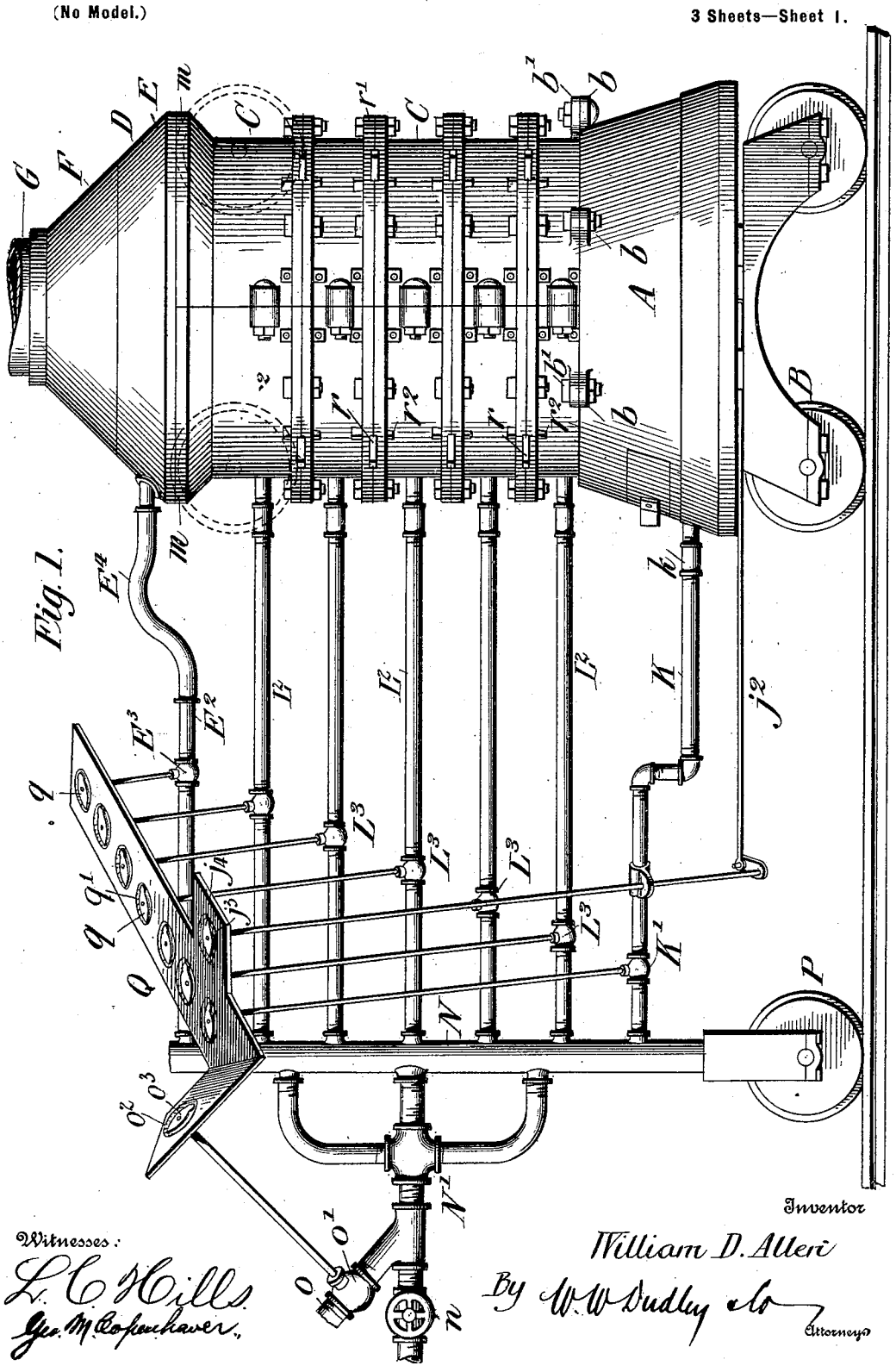
No. 651,224. Patented June 5, 1900.

W. D. ALLEN.

CASTING APPARATUS.

(Application filed Nov. 14, 1899.)

(No Model.) 3 Sheets—Sheet 1.



Witnesses:
L. C. Hills
Geo. M. Coffenhaver.

Inventor
William D. Allen
By W. W. Dudley & Co
Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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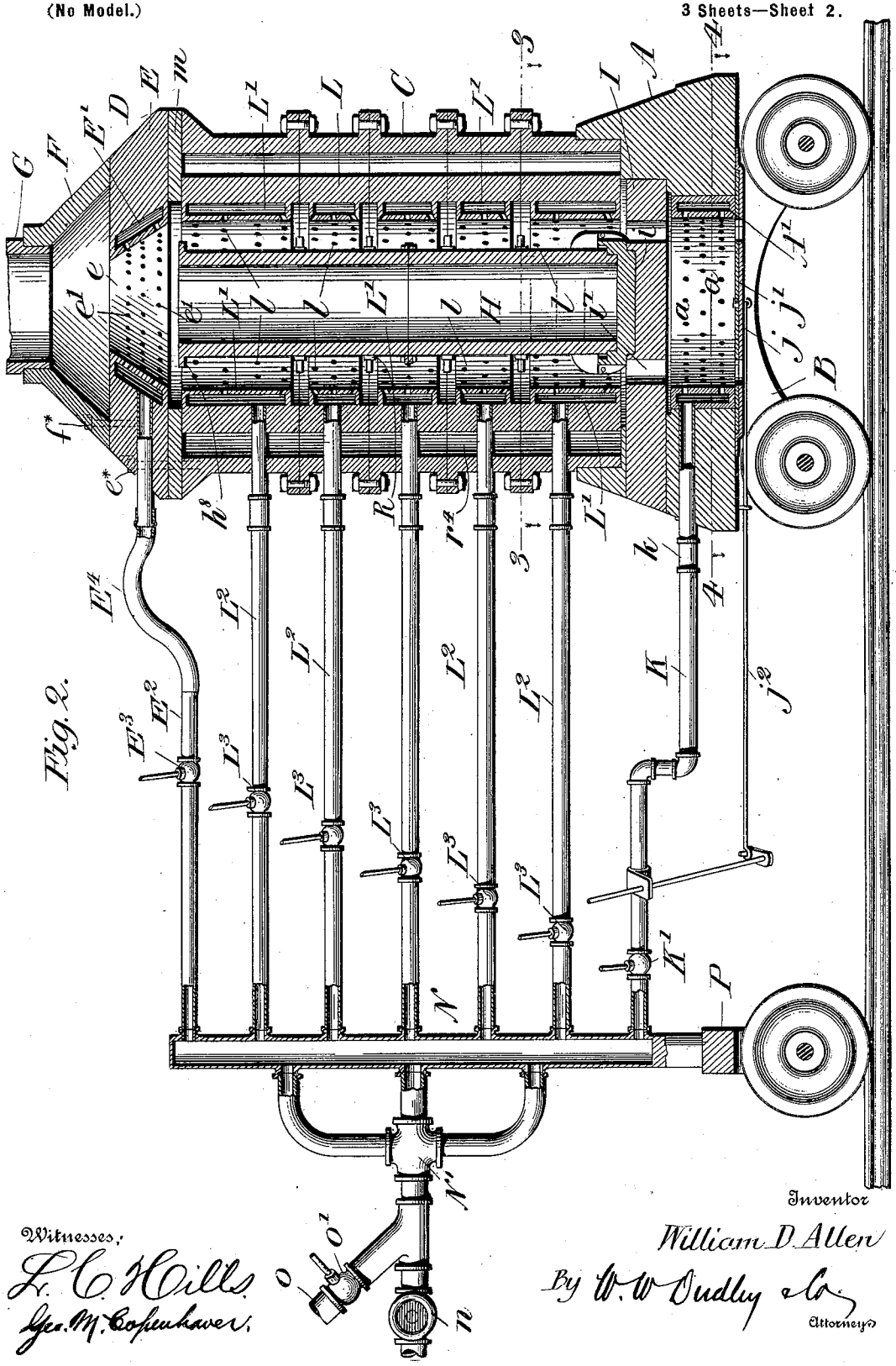


Fig. 2.

Witnesses:
L. C. Hills
Geo. M. Copenhaver.

Inventor
William D. Allen
By W. W. Dudley & Co.
Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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Fig. 5.

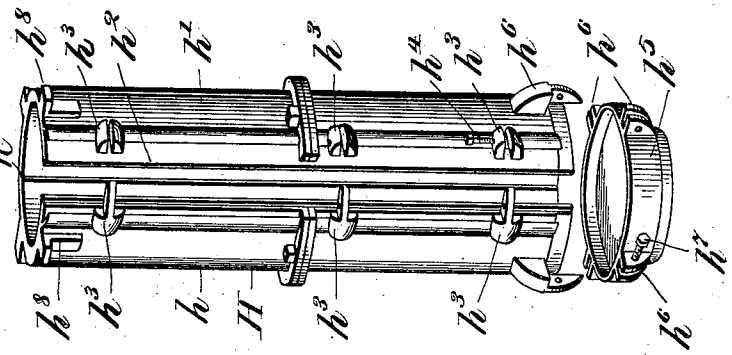


Fig. 4.

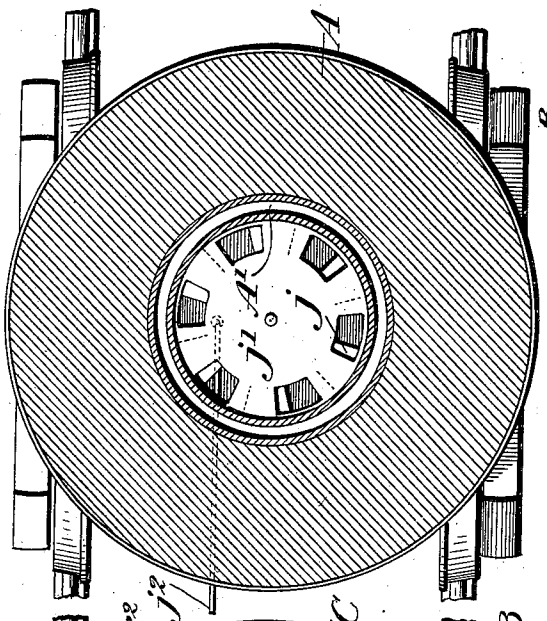
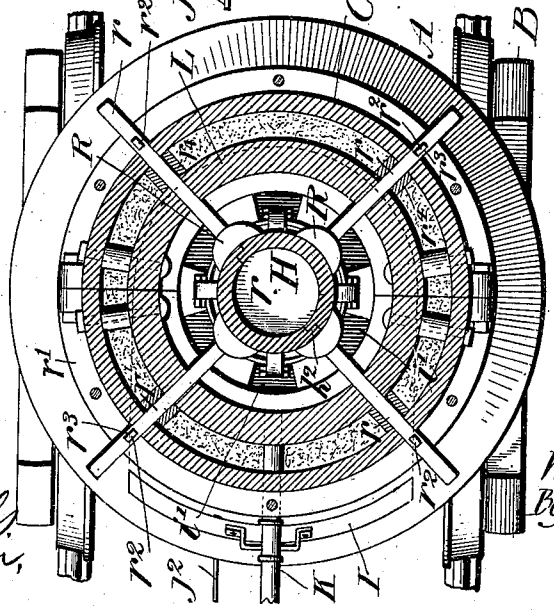


Fig. 3.



Witnesses:
L. C. Hills
Geo. M. Cofenhaver,

Inventor
William D. Allen
By W. W. Dudley & Co
Attorneys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM D. ALLEN, OF HUNTSVILLE, ALABAMA.

CASTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 651,224, dated June 5, 1900.

Application filed November 14, 1899. Serial No. 736,908. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM D. ALLEN, a citizen of the United States, residing at Huntsville, in the county of Madison and State of Alabama, have invented certain new and useful Improvements in Casting Apparatus; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

In my application for patent filed July 22, 1899, I have described and claimed a method of making metallic castings, consisting in subjecting an open-top mold or like vessel, into which the metal is poured, to the action of independent flames impinging on the mold at different heights, pouring the metal and successively extinguishing the flames, beginning with the lowermost, whereby the heat is withdrawn, commencing at the base of the mold and continuing gradually toward the top, the heat being finally confined to the exposed molten metal.

My present invention is directed to a means by which the above-stated method may be carried into effect, said means consisting, broadly, of a furnace adapted to inclose the open-top mold or like vessel and having around the wall of the mold-chamber a plurality of burners located in a number of planes and a separate valved fluid-supply pipe for the burners of each plane.

My improved furnace is adapted for employment in connection with the casting of metallic articles generally, regardless of their form, size, and weight and of the material of which they are composed, and while in the drawings and following description I have shown and set forth a furnace and mold capable of employment in the casting of articles of cylindrical form I wish it understood that such disclosure is merely illustrative and in no way constitutes a limitation.

In the drawings, Figure 1 is a side elevation of a casting-furnace embodying my invention. Fig. 2 is a vertical sectional view taken through the center of the furnace and fluid-supply pipes. Fig. 3 is a horizontal sectional view on line 3 3 of Fig. 2. Fig. 4 is a horizontal sectional view on line 4 4 of Fig. 2. Fig. 5 is a perspective view of the mold, showing the manner in which the parts are assembled.

Referring to the drawings by letter, A denotes the base of the furnace, which is preferably supported on a wheeled truck B, movable over rails, whereby the furnace is rendered portable. The furnace may be of any height and, if found desirable, may be further supported toward the upper end by other wheels movable over elevated rails. The furnace-casing C, which may be of any desired form in cross-section, is removably supported on the base A, a convenient means for securing them together consisting of lugs *b* on the base, which are bolted to lugs *b'* on the casing. The casing C is preferably built up of separable sections, whereby any desired height of furnace may be provided, and each of the sections is preferably formed in two parts or halves to facilitate its manufacture, the parts being separably secured together. The furnace-casing is surmounted by a cap D, composed of removable covers E F, and a stack G also removable.

The mold or like vessel H is vertically supported on a base-plate I, which is slidably arranged in a recess in the furnace-base and extends across the central opening of the latter. The plate is adapted to be withdrawn laterally to uncover the base-opening and permit the mold to be lowered out of the surface, in which case a chamber is provided below the furnace to receive the mold. The plate is provided centrally with a depression or recess *i*, conforming to the bottom of the mold which it receives, and around the depression or recess are openings *i' i'* for air. The air is for assisting combustion and is fed in through the base of the furnace, and means are provided for regulating the volume of air admitted, consisting of apertured circular damper-plates, one of which, *j*, is fixed, while the other, *j'*, is rotatable and is moved to adjust the size of the air-inlets. In the wall of the furnace-base, between the damper and plate, is an annular chamber A', to which is led a fluid-supply pipe K. Jet-apertures *a a* lead at intervals

from the chamber to the interior of the base, the fluid being ignited at the apertures to provide heating-flames for the admitted air. The apertures *a* are preferably located in a number of planes and are staggered to enable the formation of a continuous sheet of flame, through which the air rises, and thus highly-heated air is fed in regulated quantity to the mold-chamber burners presently to be described.

Within the furnace-casing C and concentric therewith is a casing L of sectional construction. It is my purpose to bolt or otherwise secure the sections of the inner casing to the corresponding sections of the outer casing, whereby, as above stated, any desired height of furnace may be provided. The inner-casing sections are each preferably formed in two parts or halves, similarly to the outer-casing sections. Each of the inner sections is provided with an annular chamber L′, into which gas or other fluid is introduced through a supply-pipe L^2, which is passed through the outer casing. Apertures *l l* lead from the chamber L′ to the interior of the inner casing or mold chamber, and the fluid being ignited at these apertures flames are provided which impinge against the mold for a purpose hereinafter stated. The apertures *l* leading from each chamber L′ are disposed in a number of planes (three being shown) and are arranged similarly to the apertures *a* in the base for the purpose of distributing the heat evenly throughout the entire surface of the mold, such even distribution being further insured by inclining certain of the apertures, as shown.

Secured to the top of the inner and outer casings is a plate *m*, which is centrally provided with an opening conforming to the cross-sectional area of the mold-chamber. On this plate *m* is pivoted, by means of a bolt or pin *e**, the cover E, which is of the laterally-swinging type and is provided with a central opening *e* of downwardly-flaring form. In the cover E around the opening is an annular chamber E′, receiving fluid through a supply-pipe E^2, and from the chamber extend a plurality of jet-apertures *e′ e′*, inclined downwardly to cause the flames issuing therefrom to impinge against the open top of the mold. The cover F, which is also of the laterally-swinging type, is pivoted by means of a bolt or pin *f** on the cover E and is adapted to be swung to one side during the pouring operation. The cover F forms the support for the removable stack G.

The fluid-supply pipes K L^2 E^2 commonly connect with a distributing-pipe N, to which is led a three-branch service-pipe N′, having a valve *n* to regulate the supply of fluid. Air under pressure is admitted to the service-pipe through a pipe *o*, which is provided with a valve *o′*. The pipe N and connections are preferably supported on a wheeled truck P. The pipes K, L^2, and E^2 are provided, respectively, with valves K′, L^3, and E^3, and to facilitate the manipulation of the valves and secure their accurate adjustment I provide the following means: At any suitable point, preferably above the pipes, I provide a table Q, to which are carried the extended stems of the valves, and on the stems are pointers *q*, which by the aid of gages *q′* determine the positions of the valves and enable the operator to accurately govern the supply of fluid to the burners. Likewise the air-supply is governed, the air-pipe valve being operated at the table, its stem carrying a pointer o^3 and the table having thereon a gage o^2. The damper-operating rod j^2 is also preferably carried to this table and is provided with a pointer j^4, which in connection with a gage j^3 determines the quantity of air to be admitted at the base of the furnace. Inasmuch as it may be desirable to detach the base of the furnace from the furnace-casings, or vice versa, the pipe K is provided with a union-coupling *k*. The lowermost pipe L^2 preferably connects with a fluid-chamber and burner openings or apertures at the upper portion of the furnace-base, and all of the pipes L^2 have union-couplings for a purpose similar to that of the pipe K. The supply-pipe E^2, which connects with the chamber in the cover E, is provided with a flexible coupling E^4 to permit the turning of the cover.

The mold H may be of any form dependent upon the shape of the casting to be made. The mold shown is of circular form and is constructed in three parts. The body of the mold is divided in halves vertically, the parts *h h′* having lapped joints h^2, and apertured lugs h^3 and bolts h^4 are employed to secure the parts together. The upper end of the mold is open, but its lower end is closed by a base-piece h^5, which is secured to the parts *h h′* when assembled by lugs h^6 and bolts h^7. At the upper end of the mold are trunnions h^8, by which the mold is raised and lowered. The mold may be constructed in sections, similarly to the furnace-casing, to enable the making of castings of any desired length, or instead of varying the height of the mold its depth may be changed by the employment of false bottoms, as will be understood. The mold is supported vertically by the base-plate I. To maintain the concentric position of the mold and brace it against outward strain due to the pressure of the contained metal, I employ abutments in the nature of concave shoes R R, which are secured on the inner end of arms *r r*, which pass through the inner and outer casings and extend beyond the latter sufficiently for manipulation. The arms are angular in cross-section and slide through angular apertures made in flanges *r′ r′* on the outer wall of the outer casing. The lugs are slotted vertically to receive wedges r^2 r^2, which engage the inner wall of any one of a number of slots r^3 in the arms, whereby the shoes are pressed against the mold to hold it rigidly. Between the inner and outer cas-

ings are sleeves r^4, which loosely encircle the arms. This annular space between the casing is filled with non-conducting material to minimize the heat radiation from the furnace.

In practice the mold containing the matrix is positioned in the mold-chamber of the furnace with its open top approximately flush with the top of the furnace-casing. If the material of the matrix is such as will require drying, the burners are ignited and adjusted to give a gentle heat, after which the burners are adjusted to heat the mold to a degree approximating that of the molten metal when run. The cover F is then withdrawn from the opening in the cover E and the metal is poured through the opening into the mold, the flames from the burners in the cover E playing upon the stream, and thereby avoiding chilling. The flames from the casing-burners impinge, as before stated, against the outer surface of the mold, and the mold is thus heated evenly throughout, the heat being maintained during the pouring operation. The mold is of such a depth as will permit of the pouring of a quantity of metal in excess of that ordinarily required to fill the matrix; but this excess or surplus of metal contributes to the making of the complete casting, as will presently appear. It will be understood that previous to and during the pouring operation the valves and damper are adjusted to obtain the best results in the direction of heat. After pouring the cover F is preferably closed in order to remove the chilling influence of the outer air. The burners are now successively extinguished, beginning at the lowermost plane of casing-burners, whereby the heat is withdrawn from the mold first at the base thereof and thereafter gradually toward the top, and, lastly, the molten metal exposed through the open top of the mold is alone subjected to the direct action of the flames of the uppermost burners, which flames impinge against the metal in a downward direction. The effect of the withdrawal of the heat in the manner stated is to preserve the fluidity of the metal at successive portions of the casting, whereby any contraction or shrinkage is at once compensated for by the molten metal, which through gravitation fills the spaces as they are formed, the surplus being sufficient to the making of a complete flawless casting. The maintenance of the molten condition to prevent the formation of fissures, pipes, blow-holes, and like defects has the advantage of prolonging the period of cooling, whereby there is secured a perfectly-homogeneous structure and one that is exactly conformable to the matrix. It may be found necessary in some instances to accelerate the cooling of the castings, and this may be accomplished by introducing cold air through the damper-openings after the casting operation.

My improved furnace while perfectly adapted for carrying my invention into effect is extremely simple in construction and may be made at a comparatively-low cost. By the construction employed the mold may be inserted and removed either at the top or bottom, inasmuch as provision is made for removing the cover E and also the supporting base-plate.

Although the drawings and above description are directed to a furnace chiefly designed for casting cylindrical articles, it is evident from the foregoing that furnaces embodying my invention may be of any form dependent upon the shape of casting to be produced.

I claim as my invention—

1. In a casting-furnace, the combination with a casting-chamber, of a plurality of burners around the wall of the chamber located in a number of planes, a plurality of burners above the casting-chamber and communicating therewith, and a separate valved fluid-supply pipe for the burners in each plane and those above the casting-chamber.

2. In a casting-furnace, the combination with a casting-chamber, of a plurality of fluid-chambers around the wall of the casting-chamber located in a number of planes and provided with burner-openings, a plurality of burners above the casting-chamber, a plurality of burners below the casting-chamber, and a separate valved fluid-supply pipe for each fluid-chamber and for the upper and lower burners.

3. A casting-furnace having at its top a removable cover carrying burners, a casting-chamber in the wall of which are fluid-chambers located in a number of planes from which lead burner-openings, and a separate valved fluid-supply pipe for each fluid-chamber and for the cover-burners.

4. A casting-furnace having at its top a removable cover carrying burners, a base provided with a removable mold-supporting plate and provided with burners below the plate and a damper below the burners, a plurality of burners located in a number of planes in the wall of the casting-chamber, and a separate valved fluid-supply pipe for the burners in each plane and for the burners in the cover and base.

5. A casting-furnace having at its top a removable cover carrying burners, a removable base provided with a removable mold-supporting plate and provided with burners below the plate and a damper below the burners, a plurality of burners located in a number of planes in the casting-chamber, a separate valved fluid-supply pipe for the burners in each plane and for the burners in the cover and base, a table to which the stems of all of the valves and damper are carried, and devices on the stems and table to indicate the adjustment of the valves and damper.

6. A casting-furnace having around the wall of its chamber a plurality of burners located in a number of planes, a separate fluid-

supply pipe for the burners in each plane, a removable cover at the top of the furnace carrying burners, a base for the furnace having a removable plate affording a support for the casting vessel, and adjustable abutments supporting and bracing the vessel laterally.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM D. ALLEN.

Witnesses:
C. A. WILLIAMS,
J. S. KINGSBERY.