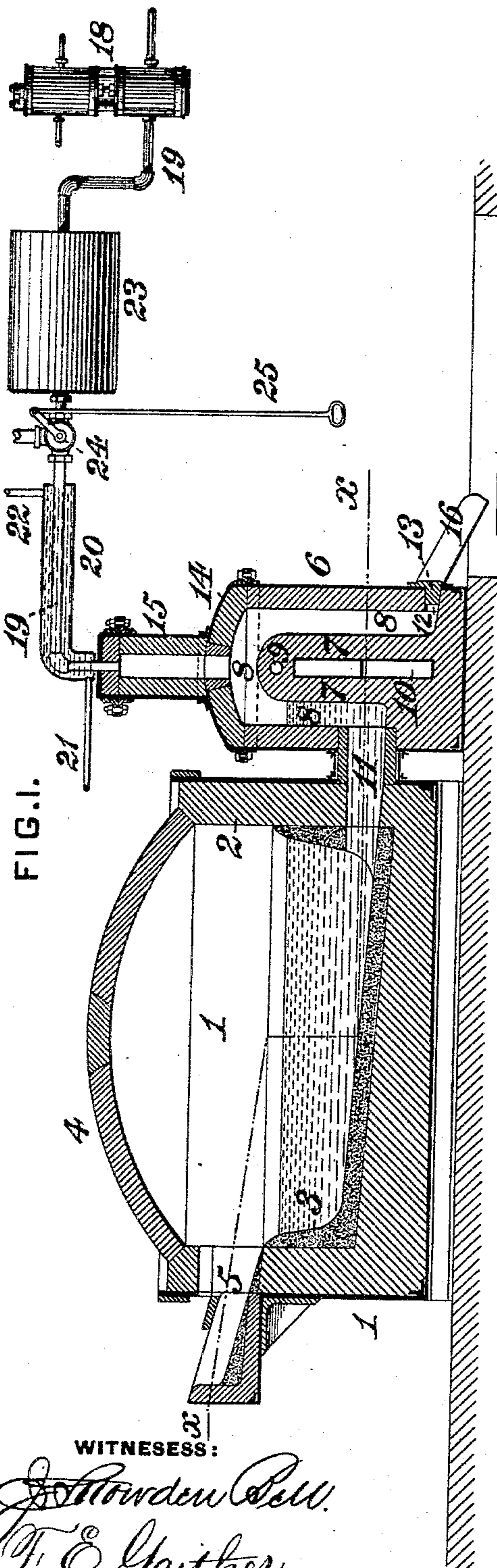


(No Model.)

G. W. GOETZ.
APPARATUS FOR TAPPING MOLTEN METAL.

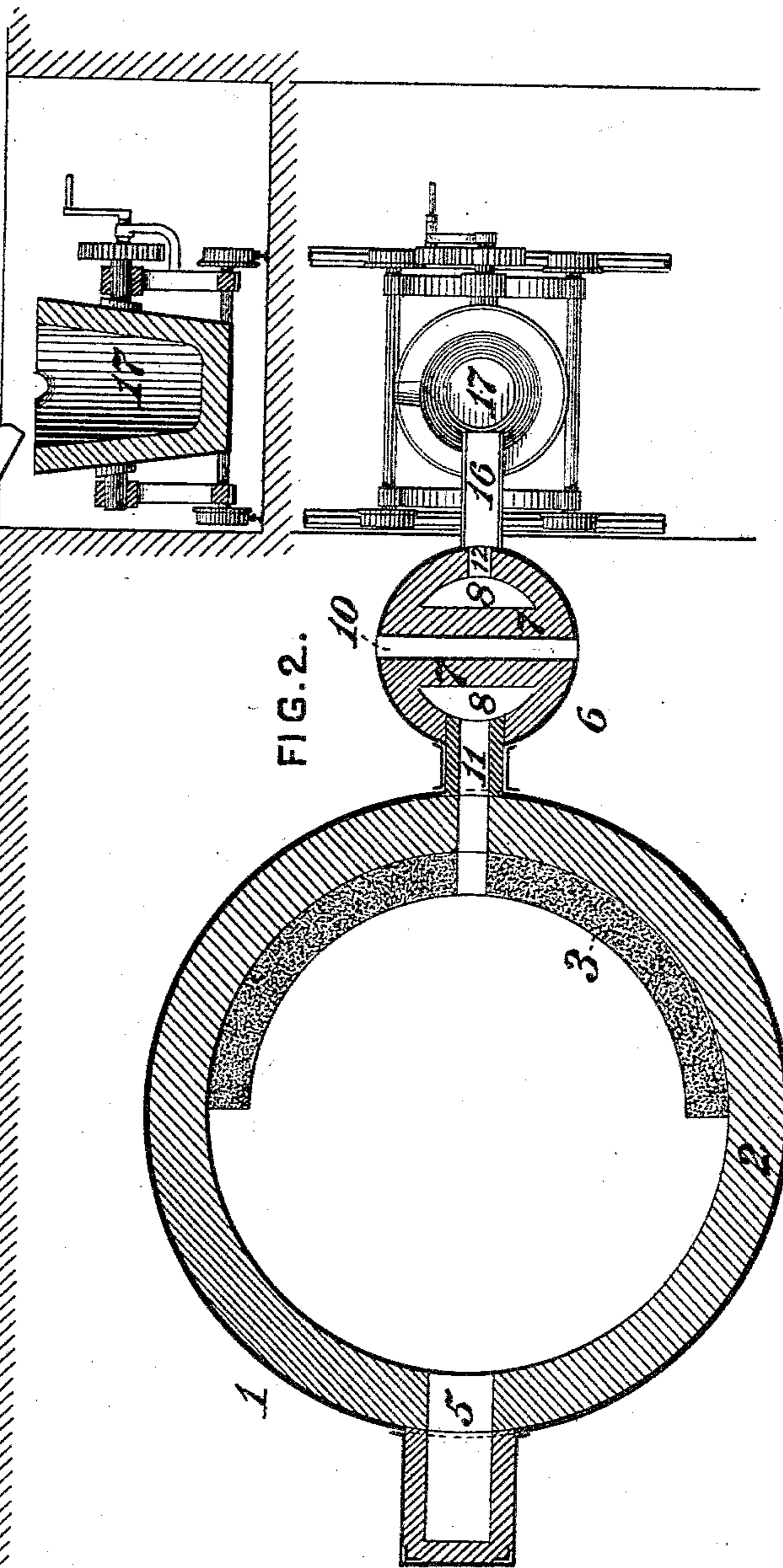
No. 414,397.

Patented Nov. 5, 1889.



WITNESSES:

John W. Bell
F. E. Gaither



INVENTOR.

Geo. W. Goetz
by *George H. Christy*
Att'y.

UNITED STATES PATENT OFFICE.

GEORGE W. GOETZ, OF PITTSBURG, PENNSYLVANIA.

APPARATUS FOR TAPPING MOLTEN METAL.

SPECIFICATION forming part of Letters Patent No. 414,397, dated November 5, 1889.

Application filed September 27, 1889. Serial No. 325,287. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. GOETZ, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Apparatus for Tapping Molten Metal, of which improvement the following is a specification.

The object of my invention is to obviate the liability to accident and waste of metal which obtains in the ordinary method of tapping molten metal through an opening at or near the bottom of the furnace or chamber from which it is to be withdrawn and to admit of the periodical withdrawal of determined quantities of metal, as may from time to time be desired.

To this end my invention, generally stated, consists in the combination, with a furnace or other receptacle of molten metal, of a tapping-chamber having the general characteristics of a siphon, and provided with an ascending and descending passage communicating at top above an interposed partition-wall at a higher level than that of the molten metal in the receptacle, and having an inlet from said receptacle at or near the bottom thereof, and a tapping-hole and door at a lower level than the inlet, an exhaustor connected by a pipe with the upper portion of the tapping-chamber, and a regulating-valve controlling said pipe and adapted to establish communication between the tapping-chamber and the exhaustor or the atmosphere, respectively.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical central section through an apparatus for tapping molten metal embodying my invention, and Fig. 2 a horizontal section through the same at the line *xx* of Fig. 1.

My invention is herein illustrated as applied in connection with a storage-chamber 1, adapted to receive a comparatively large charge of molten metal from a furnace or series of furnaces and to retain the same in a fluid condition for a sufficient period to enable portions of the charge to be withdrawn at different desired intervals. It will be ob-

vious, however, that my improvement is applicable, under the same structural and operative principles and conditions, to the tapping or withdrawal of molten metal from a furnace in which its fusion has been effected.

The storage-chamber 1 may be of any desired shape and dimensions, being preferably, as shown, of cylindrical form, having a metallic shell lined with fire-brick or other refractory material 2, and faced upon its bottom and sides to a level slightly above that of its maximum charge of molten metal with an inner lining of refractory material 3. The chamber is closed at top by an arched cover 4, and is provided with a lateral charging-passage 5, through which the molten metal is supplied from a furnace by ladles or spouts, the chamber having been previously heated throughout, preferably by the combustion of gas introduced thereinto.

A tapping-chamber 6, formed of a metallic shell lined with refractory material, is erected adjacent to the storage-chamber 1, said chamber having a central vertical partition-wall 7 interposed between the two vertical portions of an inverted-U-formed passage 8 within the tapping-chamber, said vertical portions communicating at top above the top of the partition-wall, which is at a higher level than that of the maximum charge of molten metal supplied to the storage-chamber. A pipe 9, for the circulation of water, extends through the top of the partition-wall 7, to prevent the same from being burned away, and an air-passage 10 is formed in the wall below the pipe 9, to exert a cooling action thereon. The inner vertical portion of the passage 8, or that nearest the storage-chamber, is connected at its bottom therewith by an inlet 11, which is located at or near the bottom of the storage-chamber, and through which the molten metal will pass from the storage-chamber into the inner portion of the passage 8 and be maintained therein by the partition-wall at the same level as that of the metal which remains in the storage-chamber. The opposite or outer vertical portion of the passage 8 is extended downwardly to a level below that of the in-

let 11, and is provided at its bottom with a tapping-hole 12, which is closed by a suitable plug or door 13, of refractory material. The tapping-chamber is closed at top by a removable cover 14, having a vertical neck or tubular extension 15, communicating with the top of the passage 8. The tapping-hole is provided with a spout 16, through which the molten metal from the tapping-hole is delivered to a ladle 17.

An exhauster 18, which in this instance is a steam-actuated air-pump, is connected by a pipe 19 with the top of the vertical extension 15 of the tapping-chamber, the portion of the pipe 19 adjacent to the chamber being inclosed in a casing 20, through which a circulation of water is maintained by means of suitable supply and discharge pipes 21 22, to prevent overheating of the pipe 19. A vacuum-chamber 23, from which the air is normally exhausted as far as is practicable so to do, is by preference interposed in the pipe 19 between the tapping-chamber and the pump, in order that the exhaust of air from the passage 8, by means of which, as presently to be described, the molten metal is drawn from the storage-chamber, may be effected more rapidly than where the pump alone is employed. The pipe 19 is controlled by a three-way cock 24, which is located between the tapping-chamber and the vacuum-chamber 23, and is actuated by a rod 25, said cock being adapted to establish communication either between the tapping-chamber and the vacuum-chamber and pump or between the tapping-chamber and the atmosphere, as the case may be.

In the operation of the apparatus, the storage-chamber 1 having been heated and supplied with a charge of molten metal, the tapping-hole 12 closed by its plug 13, and the air exhausted from the vacuum-chamber 24, and it being desired to tap molten metal from the receptacle 1, the cock 24 is turned into position to open communication between the tapping-chamber and the vacuum-chamber 23, whereupon the air will be exhausted from the tapping-chamber and extension 15, and the pressure of the atmosphere on the surface of the molten metal in the storage-chamber will force the same into the tapping-chamber, entirely filling the passage 8 and rising above the same in the tubular extension 15 to a level above that of the metal in the storage-chamber, determined by the specific gravity of the metal and the degree of completeness of the vacuum effected by the exhauster. By removing the plug 13 of the tapping-hole 12 the pressure of the atmosphere on the molten metal in the storage-chamber will cause the molten metal to flow from the tapping-chamber through the tapping-hole, the quantity withdrawn being continuously replaced by a corresponding flow from the storage-chamber through the inlet 11, inasmuch as the discharge-open-

ing is located at a lower level than said inlet, and the passage 8 consequently acts in the manner of a siphon to effect a continuous outflow of metal. When a sufficient quantity of metal has been tapped out, the regulating-cock 24 is turned into position to open communication between the atmosphere and the upper tubular extension 15 of the tapping-chamber. Atmospheric pressure above the surface of the molten metal in the tubular extension being thereby reinstated, the molten metal therein falls by gravity in the inner vertical portion of the passage 8 to the level of the metal in the storage-chamber, and the metal in the outer portion of the passage flows out through the tapping-hole.

It will thus be seen that the whole or any desired portion of the molten metal in a furnace or storage-chamber may be removed therefrom as required, thus enabling determined quantities to be tapped off from time to time, as desired, without waste. The metal being retained during the intervals between the tapping operations by the partition-wall 7, liability to accident from breakage of the tapping-hole plug or failure to properly secure it in position is effectually prevented.

I claim as my invention and desire to secure by Letters Patent—

1. In an apparatus for tapping molten metal, the combination, with a molten-metal receptacle, of a tapping-chamber having an inverted-U-shaped passage communicating on one side with the receptacle and provided with an opening and door at a lower level on its opposite side, an exhauster communicating with the upper portion of the tapping-chamber, and a regulating-cock adapted to establish communication between the tapping-chamber and the exhauster or the atmosphere, respectively, substantially as set forth.

2. The combination, with a molten-metal receptacle, of a tapping-chamber having a vertical partition-wall extending above the level of the maximum charge of the receptacle, an ascending and descending passage formed on each side of and above the partition-wall, an inlet connecting one side of said passage with the lower portion of the receptacle, and a tapping-hole and door located on the opposite side of said passage at a lower level than the inlet, an exhauster, a pipe connecting the exhauster with the upper portion of the tapping-chamber passage, and a three-way cock controlling communication between the tapping-chamber and the exhauster and between the tapping-chamber and the atmosphere, substantially as set forth.

3. The combination, with a molten-metal receptacle, of a tapping-chamber having a vertical partition-wall extending above the level of the maximum charge of the receptacle, an ascending and descending passage formed on each side of and above the partition-wall, an inlet connecting one side of said passage with

the lower portion of the receptacle, and a tapping-hole and door located on the opposite side of said passage at a lower level than the inlet, a vacuum-chamber, a pipe connecting the vacuum-chamber with the upper portion of the tapping-chamber passage, a three-way cock controlling communication between the tapping-chamber and the vacuum-chamber or the atmosphere, respectively, and a pump communicating with the vacuum-chamber, substantially as set forth.

In testimony whereof I have hereunto set my hand.

GEORGE W. GOETZ.

Witnesses:

J. SNOWDEN BELL,
WILLIAM BEAL.