(No Model.)

W. H. MASSER.

METALLURGICAL APPARATUS.

No. 427,701. Patented May 13, 1890.

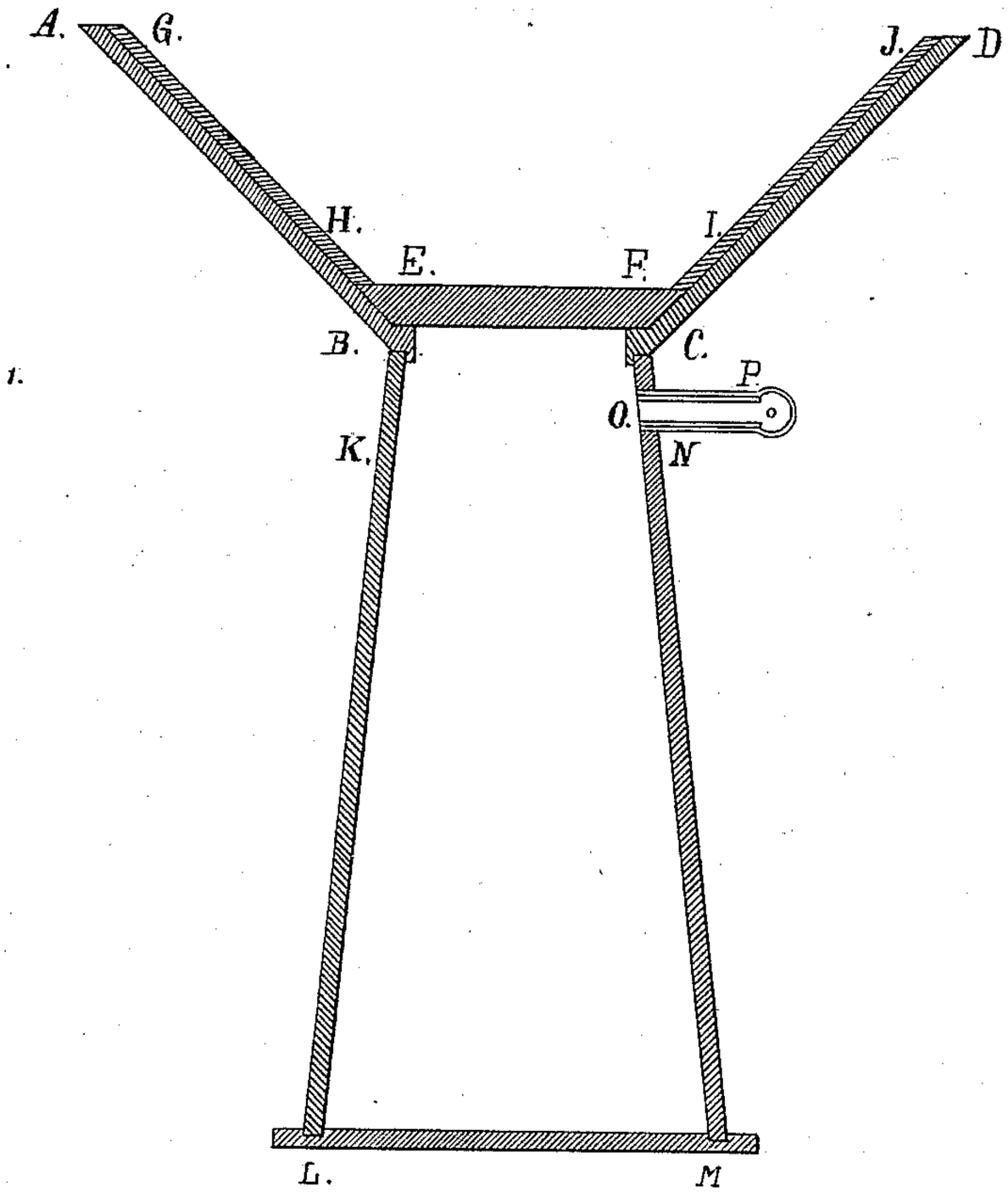

FIG. 1.

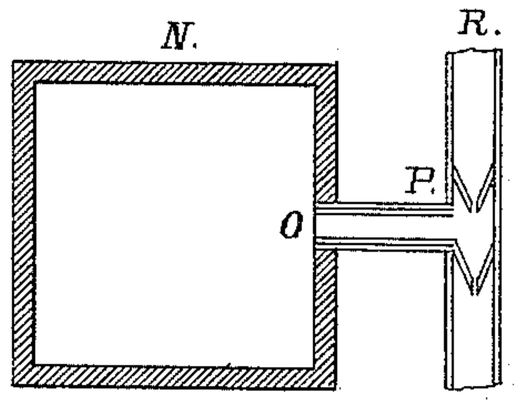

FIG. 2.

Witnesses
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UNITED STATES PATENT OFFICE.

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METALLURGICAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 427,701, dated May 13, 1890.

Application filed June 22, 1889. Serial No. 315,197. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HENRY MASSER, of the city and county of Los Angeles, and State of California, have invented a new Metallurgical Apparatus, of which the following is a specification.

It is a well known fact that many, if not all, metals under certain physical conditions have the property of absorbing gases, and often to form definite chemical alloys, as in the well-known palladium, sodium, and potassium hydrides.

When a metal like iron, steel, or bronze is melted, it will absorb a large quantity of hydrogen, and probably also other gases, derived from the hydrocarbon of the coal, from steam, and from the air. On cooling this melted metal its solvent power for gases increases till it reaches its solidifying point, when the solvent power falls abruptly. Then there is a violent struggle for the occluded gases to escape, when they are caught by the hardening pasty skin of metal in a number of more or less minute bubbles, tubules, or so-called "blow-holes." As the cooling metal gives up most of its gas at the solidifying point and the metal becomes more or less pasty at the same time, all the gas cannot escape, particularly if the gas-bubbles are coated with a film of melted slag. Owing to the great difference of the specific gravity of the metal and the gas, and also that the top of the mass of metal radiates the heat faster than the bottom and interior, the blow-holes collect more particularly at the top, decreasing from the outside inward and from top to bottom. Sometimes quite large cavities are formed on top. For instance, in a steel ingot the top will be quite porous, the middle more or less so, and only the bottom third or quarter will be homogeneous. These cavities or blow-holes filled with gas cause a weakness of the metal by diminishing its sectional area, and tensile strength by leaving flaws and hollow threads when the metal is worked under the hammer or in the rolls.

It has been proposed to remove occluded gases from molten metal by passing it through perforations in the bottom of a receiving-vessel into a collecting-vessel or mold in which a vacuum is maintained; but in such apparatus it is not possible to so break up the metal as to liberate all the occluded gases. In addition to this, the vacuum causes a rapid flow of the metal through the perforations as the vacuum becomes more perfect, the result of which is that the metal is rapidly transferred from one vessel to the other and is then subject to surface tension only.

It is the object of my invention to remove these occluded gases before the metal solidifies and to dissociate the objectionable gas alloys and metaloidal compounds. The way in which I propose to accomplish this is to run the melted metal into a suitable receiving-vessel, in the bottom of which is fixed a slab of unglazed porcelain, fire-brick, stone, or other porous material. This receiving-vessel is placed on or in connection with a collecting-vessel or with the mold, which in turn is in connection with a suitable fan or ejector, worked by steam, air, or water, as may be found most convenient. The pressure of the atmosphere will force the melted metal through the porous slab in the bottom of the receiving-vessel as a fine rain or mist into the collecting-vessel or mold, where there is a vacuum; hence by increasing the surface of the melted metal so enormously in this way all the occluded gases will be perfectly removed. For the same reason, and by having their tension lowered, the gas alloys and metaloidal compounds will be dissociated and the objectionable volatile elements will be given up in and removed by the vacuum. The resulting metal will be perfectly homogeneous and a much purer metal than any now obtained by other processes and having a greater tensile strength, if steel, than compressed steel. The process of compressing steel is the exact opposite of mine and is fallacious, because it does not remove the cause of the trouble.

My process is particularly applicable to the casting of ordnance and heavy castings and to the treatment of many metals for commercial purposes, particularly iron and steel.

Figure 1 is a vertical mid-section of an ingot-mold with my invention applied. Fig. 2 is a horizontal cross-section of the ingot-mold, taken through the injector.

The accompanying drawings will explain my invention.

A B C D, Fig. 1, is the receiving-vessel, in

which is placed the melted metal. It is lined with fire-clay G H I J, and in its bottom is placed a slab of porous material E F.

In the drawings the receiving-vessel is placed on an ingot-mold K L M N, the joint being made tight by a mechanical fit, a gasket of asbestus, or a luting of clay.

O P is a pipe-connection from the mold to the ejector, which can be suitably lined with a non-conducting material.

R S, Fig. 2, is a suitable ejector, operated by either steam, air, or water, as may be most suitable to produce the required vacuum.

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

In metallurgical apparatus, the combination of a collecting-vessel, vacuum-producing apparatus communicating therewith, and a receiving-vessel having a porous floor, impenetrable to the molten metal under its hydrostatic pressure, mounted over and communicating with such collecting-vessel.

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