

W. FREEMAN.
METHOD AND APPARATUS FOR PULVERIZING MOLTEN MATERIALS.
APPLICATION FILED SEPT. 6, 1916.

Patented Nov. 6, 1917.

1,245,328.

Fig. 1.

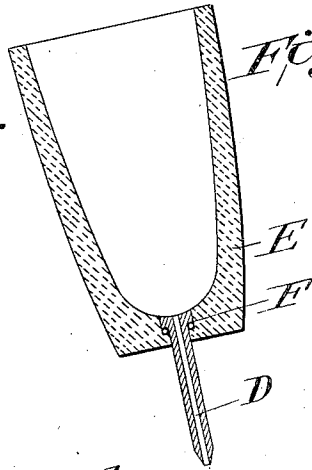


Fig. 2.

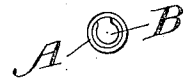
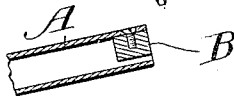
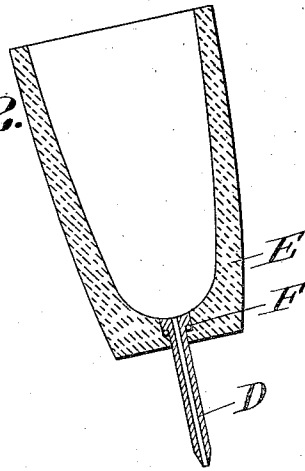


Fig. 4.

Fig. 3.

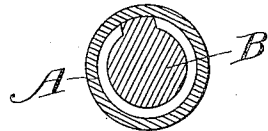
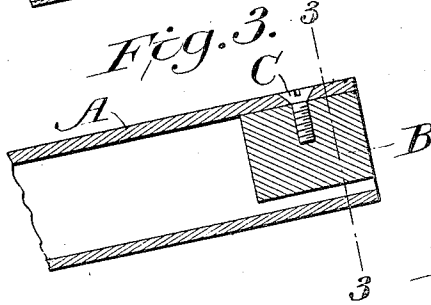


Fig. 5.

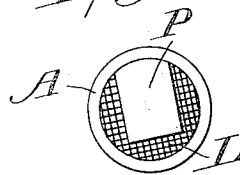


Fig. 6.

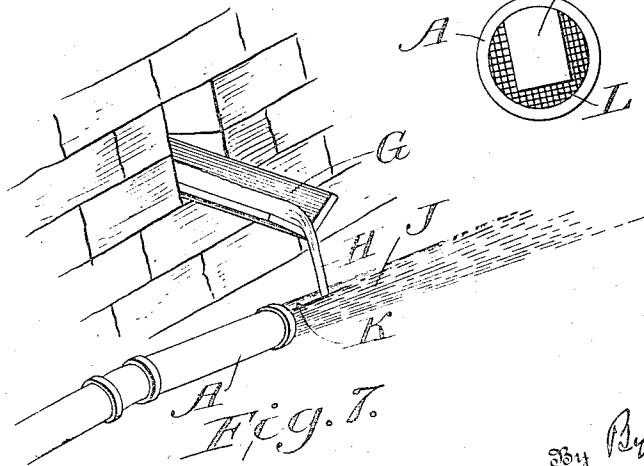
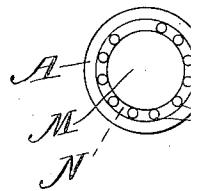


Fig. 7.

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UNITED STATES PATENT OFFICE.

WOOD FREEMAN, OF TACOMA, WASHINGTON.

METHOD AND APPARATUS FOR PULVERIZING MOLTEN MATERIALS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WOOD FREEMAN, a citizen of the United States, residing at Tacoma, in the county of Pierce and State of Washington, have invented certain new and useful Improvements in Methods and Apparatus for Pulverizing Molten Materials, of which the following is a specification.

My invention relates to a method and apparatus for the manufacture of very finely powdered material and in particular powdered metals, such as zinc or aluminum.

It has for its main object to produce particles of metal in an exceedingly fine dust-like condition and, free from oxid.

These objects I attain by delivering a stream of molten metal into a hollow, inclosing jet or stream of gas, such as cold air, traveling at sufficient velocity to break up the molten metal into fine particles. This hollow gaseous envelop is produced by blowing the gas through an annular nozzle, having at its upper portion an obstruction, so that the hollow jet delivered has, for a short distance only from the nozzle a vacant space into which the molten metal is delivered. The rapidly flowing gases by natural expansion however, soon close this space or aperture, so that the particles of metal as they are torn from the main body of metal are inclosed in a closed envelop or film of rapidly moving gas, and fine subdivision without spattering is thus obtained.

The operation of the method and the construction of the apparatus will be readily understood from the accompanying specification and from the drawing in which—

Figure 1 is a sectional elevation of the nozzle, feed tube and crucible;

Fig. 2 is a sectional elevation on a plane at right angles to Fig. 1;

Fig. 3 is a longitudinal section of the nozzle;

Fig. 4 is a section on plane 3—3 of Fig. 3;

Figs. 5 and 6 are end views of modified forms of nozzles, and

Fig. 7 is a perspective view of the apparatus.

Referring to Fig. 1, A is a tube connected at one end to a suitable pressure supply of gas, such as air, and having at its other end a block B of metal or other suitable material, formed as shown in Fig. 2 to leave an annular opening, except at the top. C is a screw for securing the block in place. The

molten metal is delivered through a tube D connected to a crucible or other receptacle for molten metal E, the tube being secured to the crucible in any suitable manner as by a locking ring F.

The operation of the construction just described will be apparent from the foregoing description and by reference to Fig. 7, in which G is a spout through which a stream of molten metal H is delivered through the space K into the interior of the annular jet, J, of pressure gas coming from the tube A.

As the freely falling molten metal is struck by the rapidly moving gas, it is subdivided into fine dust-like particles, and even when air is used, is so rapidly chilled that no oxidation occurs. Further the molten metal and gas meet each other in free space and out of contact with any metallic surfaces, so that there is no possibility of chilling and clogging the nozzle.

In actual operation the method, as above described, has been found to be entirely successful in converting molten metal into a fine powder.

By using an oxidizing gas heated to the necessary temperature, it is obvious that oxides of the metals could be produced.

Other forms of nozzle than that shown in Figs. 1 and 2 may also be used.

Thus in Fig. 5 the end of the tube A is provided with a screen L, and a blanket or obstruction P, of any suitable material serves to cut off a portion of the air so that in this case, also, a trough-shaped jet is formed.

In Fig. 6, still another modification of the nozzle is shown, the end of the tube A being closed by a plug M, which is in turn surrounded by a ring N having orifices O, from which issue a series of jets, these jets again forming a trough-shaped main jet.

I claim:—

1. The method of pulverizing molten materials, which consists in introducing the material into the interior of a partially enveloping tubular jet of rapidly moving gas, and then causing the jet to completely envelop and convey the material.

2. The method of pulverizing molten materials, which consists in introducing the material in a freely-falling stream into the interior of a partially enveloping tubular jet of rapidly moving gas, and then caus-

ing the jet to completely envelop and convey the material.

3. A nozzle for pulverizing molten metal, comprising a tube having at its end means
5 for forming a hollow, inclosing, tube-like jet or envelop of gas and means for causing, in proximity to the end of the tube, an opening in the top of said inclosing jet, through which opening molten metal may be introduced into the interior of the jet.
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4. A nozzle for pulverizing molten materials, comprising a tube having at its end means for forming a hollow tubular jet or envelop of gas, in combination with means
15 for producing an opening in said jet in proximity to the end of the tube, and means

for feeding the molten material in a freely-falling stream through said opening.

5. A nozzle for pulverizing molten materials, comprising a tube having a substantially annular orifice, interrupted at its upper portion, in combination with means for introducing the molten material into the interior of the gas-jet through the opening produced by the interruption of the annulus.
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In testimony whereof I affix my signature in presence of two witnesses.

WOOD FREEMAN.

Witnesses:

S. T. BLAIR,
R. B. CAPLES.