No. 719,725. PATENTED FEB. 3, 1903.

C. BERTOU.

PROCESS OF PULVERIZING METALS.

APPLICATION FILED MAY 16, 1902.

NO MODEL.

Fig. 1.

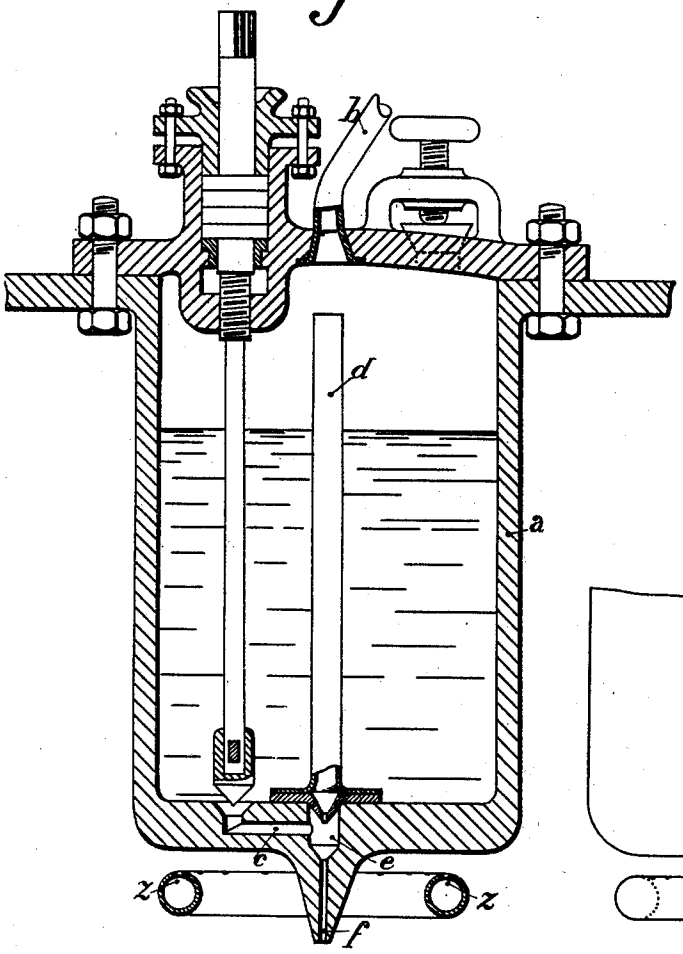
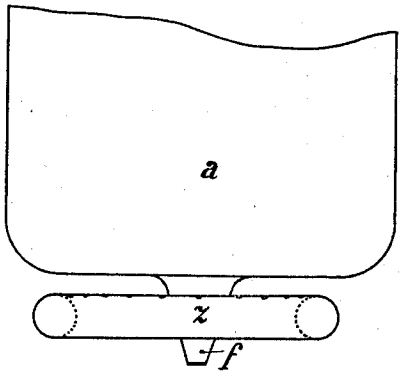
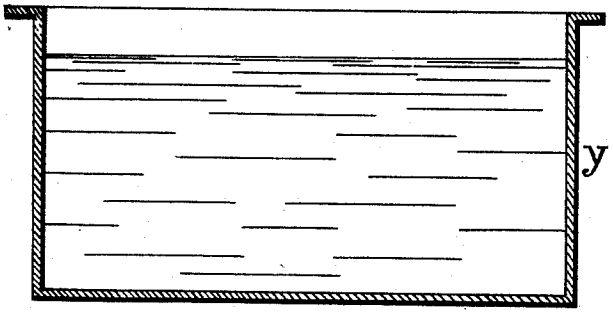
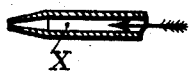


Fig. 2.







Witnesses:
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UNITED STATES PATENT OFFICE.

CAMILLE BERTOU, OF PARIS, FRANCE.

PROCESS OF PULVERIZING METALS.

SPECIFICATION forming part of Letters Patent No. 719,725, dated February 3, 1903.

Application filed May 16, 1902. Serial No. 107,654. (No specimens.)

To all whom it may concern:

Be it known that I, CAMILLE BERTOU, manufacturer, a citizen of the Republic of France, residing at 9 Rue Riquet, Paris, in the Republic of France, have invented a certain new and useful Process for the Pulverization of Metals, of which the following is a specification.

If metal is liquefied by heating and intimately mixed with an elastic fluid at a high pressure and if this mixture is allowed to escape in the form of a jet into a chamber in which the ordinary pressure prevails, the elastic fluid, owing to its sudden expansion, causes the pulverization of the metal which is mixed with it. Nevertheless hitherto when this method of effecting the pulverization of a metal has been attempted the difficulties encountered have been such that a satisfactory result could not be attained. There are various reasons for this, of which the following are the principal: So far the mixture of the metal in fusion and the elastic fluid has not been effected suitably, and the jet the expansion of which produces the pulverization has not been successfully formed. If for this purpose there is employed a simple injector in which the elastic fluid acts by suction, so as to draw in the fused metal and produce with it a mixture which escapes from this injector in the form of a jet, the operation is exceedingly defective. This is due to the fact that the suction exerted by the elastic fluid upon the metal is not sufficient to insure a regular flow of this latter, so that there are produced in the conduit through which the metal flows obstructions or stoppages which impede the operation. In addition to this it is impossible to obtain a sufficiently fine pulverization. On the other hand, if the jet consisting of the elastic fluid and the metal in fusion is merely permitted to expand in the atmosphere the metallic powder thus formed becomes oxidized in part. In addition to this it is necessary in order to collect it to receive it in a very large chamber, in which it is allowed to settle; but in spite of this the metallic particles adhere one to the other and agglomerate in such a manner that a fine powder without lumps is not obtained. Such a powder is the only product of any real value. It is therefore necessary to carry out difficult and costly sifting operations in order to effect a classification, and so finally obtain products of which only a portion presents the desired degree of fineness.

The object of this invention is to obviate these defects—that is to say, to obtain a perfect mixture of fused metal and fluid under pressure, while preventing clogging, and to then collect the metallic powder in a small space without possibility of oxidation or agglomeration.

In order to produce the mixture of elastic fluid and fused metal and the formation of the jet, instead of relying upon an effect of suction of the fluid under pressure I operate by forcing. In order to effect this, I submit the fused metal to a very high pressure, which forces this metal to flow through a conduit opening into that through which the fluid under pressure flows. The mixture which results from the meeting of the two currents escapes through a passage, upon leaving which the fluid expands, and so produces the desired pulverization. In order to prevent oxidation and agglomeration of the metallic powder so produced, while at the same time preventing the necessity for its dispersion in a large space, instead of merely permitting the jet to expand in the atmosphere I submit it to the action of a liquid—that is to say, it is received in a mass of water or other liquid, or such liquid is directed upon the jet itself. In either case the liquid, owing to its contact with the fine metallic particles, instantaneously cools these particles and facilitates their precipitation. The characteristic features of my improved process are therefore, on the one hand, the application of a pressure exerted upon the fused metal in order to cause it to flow and to mix with the elastic fluid in such a manner as to form with it a jet the expansion of which produces pulverization and, on the other hand, the mingling of the jet of pulverized metal with water for the purpose indicated. In practice I utilize, in order to force the fused metal under pressure, the elastic force of the fluid itself, the mingling of this fluid with the metal, and its expansion, producing pulverization. The elastic fluid under pressure which I prefer to employ is superheated steam; but I do not wish to limit myself to this particular fluid. The greater

the pressure of the elastic fluid the finer is the powder obtained. Thus in order to obtain exceedingly fine powders I employ steam at a pressure of twenty to thirty kilograms per square centimeter.

Means for carrying out the invention is illustrated in the accompanying drawings, in which—

Figure 1 is a diagrammatic view in section of a suitable form of apparatus. Fig. 2 illustrates means for directing water upon the jet.

a is a hermetically-closed vessel containing the fused metal and which in the present case is heated by means of a gas-ring *z*.

b is a pipe through which the elastic fluid under pressure is admitted to the vessel *a* above the level of the metal in fusion.

c is a conduit provided with a regulating pin-valve, through which the metal is forced, owing to the strong pressure exerted upon it by the elastic fluid.

d is a tube which passes through the fused metal and opens in the vessel *a* above the level of the fused metal. This tube therefore receives the superheated steam, which it conducts to *e*, where it mixes with the metal forced through the pipe *c*. This mixture escapes through the passage *f*. Upon leaving the passage *f* the jet is received in the mass of water contained in the vessel *y*, Fig. 1, or instead of this the water may be directed upon this jet by means of an injector-nozzle X, such as that illustrated in Fig. 2.

My process is especially applicable to the pulverization of readily-fusible metals, such as lead, tin, antimony, bismuth, and even zinc and copper, and also alloys of these metals.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. A process for the pulverization of readily-fusible metals, which consists in forcing the fused metal to flow under the action of a strong pressure exerted upon it, utilizing the elastic force of the fluid itself and forcing it to mingle with a current of elastic fluid under pressure with which it forms a jet, the sudden expansion of which causes the pulverization of the metal.

2. A process for the pulverization of readily-fusible metal which consists in forcing the fused metal to flow under the action of the pressure exerted upon it by an elastic fluid under a strong pressure, utilizing the elastic force of the fluid itself, and mingling such metal and fluid forming a jet, the sudden expansion of which causes the pulverization of the metal.

3. A process for the pulverization of readily-fusible metal, consisting in forcing the fused metal to flow in a current, mingling the same with a current of elastic fluid, utilizing the elastic force of such fluid itself to create a strong pressure, the mingling of which forms a jet and submitting the same at the moment of its expansion to the action of the liquid with which it mingles.

4. A process for the pulverization of readily-fusible metals, consisting in forcing the fused metal to flow in a current which mingles with a current of elastic fluid under strong pressure with which it forms by sudden expansion a jet upon which a current of liquid is directed, and utilizing the elastic force of said fluid itself to force said fused metal, substantially as specified.

5. A process for the pulverization of readily-fusible metals, consisting in forcing the fused metal to flow, under the action of a strong pressure exerted upon it, in a current which by the elastic force of a fluid mingles with such current of elastic fluid which is also under strong pressure, with which it forms a jet which is submitted to the action of a liquid with which it mingles, substantially as specified.

6. A process for the pulverization of readily-fusible metals, consisting in forcing the fused metal to flow under the action of a strong pressure exerted upon it, in a current which mingles with a current of elastic fluid, also under strong pressure, with which it forms a jet upon which is directed a current of liquid, substantially as specified.

7. A process for the pulverization of readily-fusible metals, consisting in forcing the fused metal to flow, under the action of a pressure exerted upon it by an elastic fluid under strong pressure, in a current which mingles with a current of the elastic fluid, with which it forms a jet which is submitted, at the moment of its expansion, to the action of a liquid with which it mingles, substantially as specified.

8. A process for the pulverization of readily-fusible metals, consisting in forcing the fused metal, under the action of a pressure exerted upon it by an elastic fluid under strong pressure, to flow in a current which mingles with a current of the said elastic fluid, with which it forms a jet upon which is directed a current of liquid, substantially as specified.

In testimony whereof I have hereunto set my hand, in presence of two subscribing witnesses, this 3d day of May, 1902.

CAMILLE BERTOU.

Witnesses:
EDWARD P. MACLEAN,
HENRY A. BERTIN.