No. 700,399. Patented May 20, 1902.

P. BARY.

PROCESS OF ELECTRICALLY PULVERIZING METALS.

(Application filed Apr. 11, 1901.)

(No Model.)

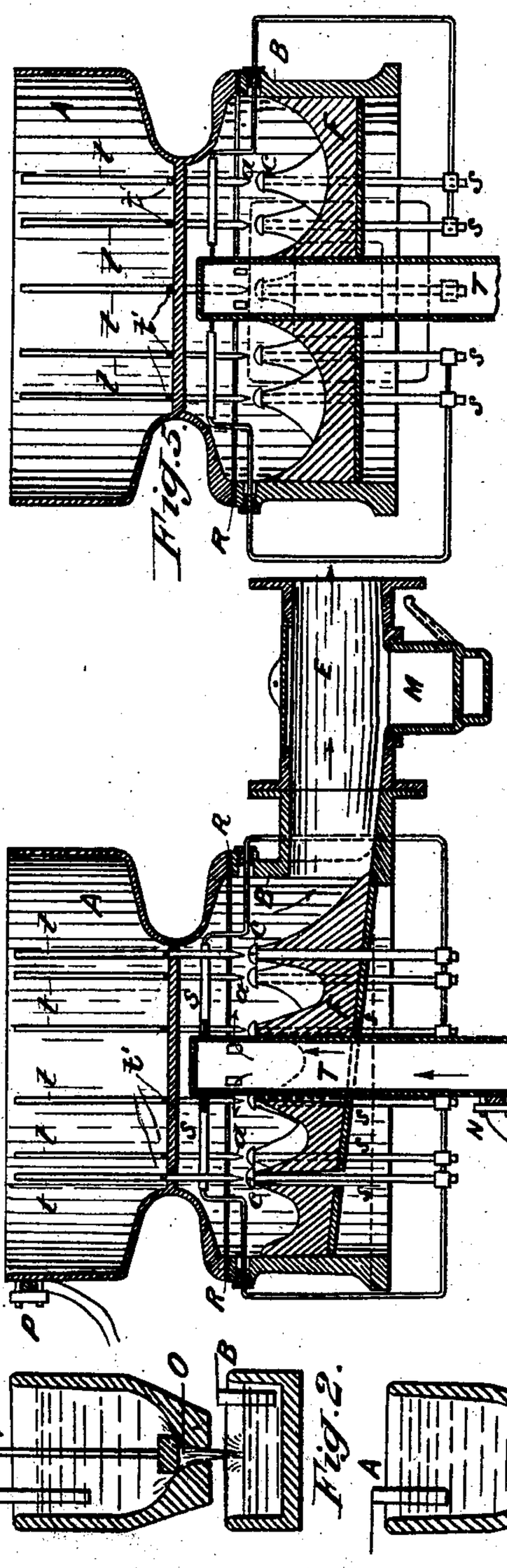

Fig. 5.

Fig. 4.

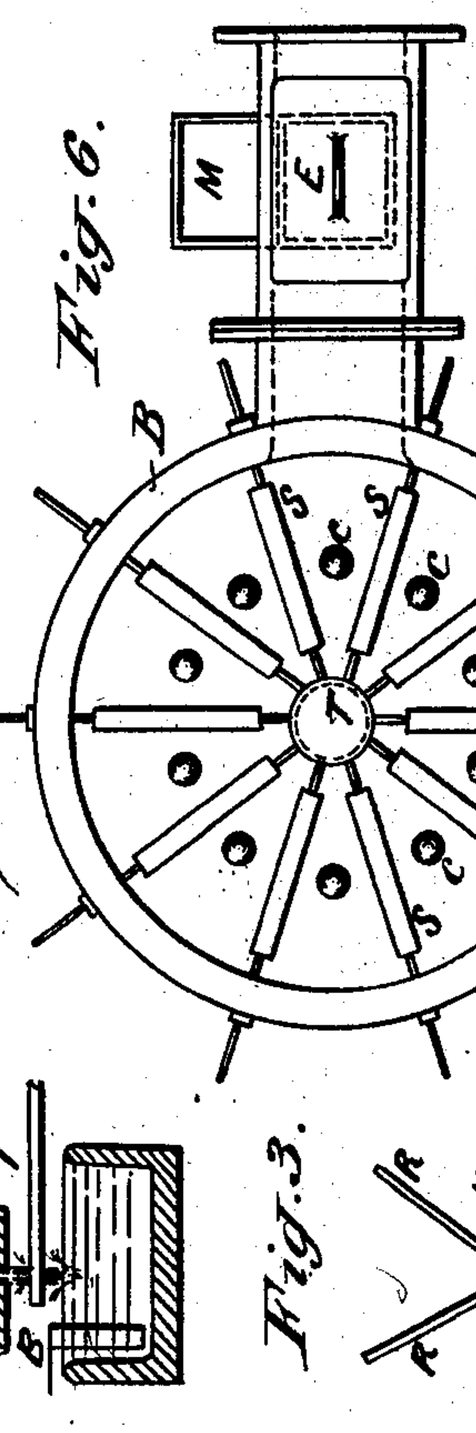

Fig. 6.

Fig. 7.

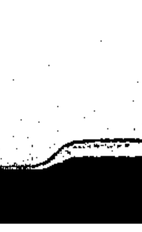

Fig. 1.

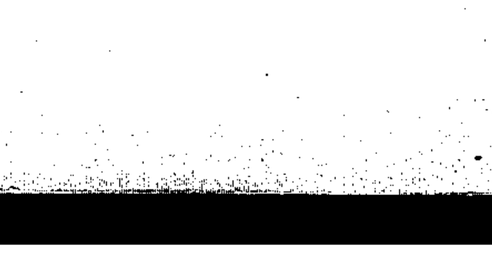

Fig. 2.

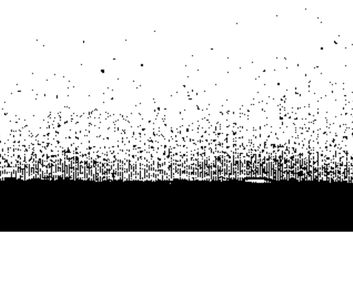

Fig. 3.

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UNITED STATES PATENT OFFICE.

PAUL BARY, OF PARIS, FRANCE.

PROCESS OF ELECTRICALLY PULVERIZING METALS.

SPECIFICATION forming part of Letters Patent No. 700,399, dated May 20, 1902.

Application filed April 11, 1901. Serial No. 55,313. (No specimens.)

To all whom it may concern:

Be it known that I, PAUL BARY, a citizen of the French Republic, and a resident of Paris, France, have invented certain new and useful Improvements in Processes of Electrically Pulverizing Metals, of which the following is a specification.

The object of my present invention is to provide an improved process of pulverizing metals by means of the volatilization in electric sparks produced at the point where the circuit is broken.

In the drawings, Figure 1 is a central vertical sectional view of one form of mechanical means for interrupting the circuit. Fig. 2 is a like view showing another form of mechanical means for a like purpose. Fig. 3 is a top plan view of still another form for breaking the circuit. Fig. 4 is a longitudinal sectional view of a fourth form of means for carrying out my process. Fig. 5 is a transverse sectional view thereof, and Fig. 6 is a plan view. Fig. 7 is a perspective view illustrative of one of the steps performed in carrying out the electrical process.

Let it be assumed that the metal to be pulverized is in a molten state and capable of flowing through an orifice, so as to form a thin liquid stratum. When an electric current is caused to pass through said liquid stratum, said current being brought thereto, for instance, by means of the electrode A, Fig. 1, dipped into the upper reservoir, and electrode B, located in the lower receptacle, the lower receptacle necessarily containing sufficient quantity of the molten metal to enable the electrode B to be engaged thereby, thus completing the circuit, and when by any desired means a break is produced in the liquid column a spark will be produced, which causes a certain quantity of metal to be vaporized. When the circuit is again closed and opened, and so on, a series of sparks will be produced, which form an atmosphere of metallic vapors, which may be carried into a condensation-chamber by means of a circuit of neutral gases. The liquid column may be broken either mechanically or electrically. The utility of the current is absolute, since it is intended to furnish by sparks the temperature needed to volatilize the metal whether the rupture is effected mechanically or electrically.

The mechanical means which may be employed are manifold, and in order to facilitate comprehension of the invention I will describe the preferred forms of such means. (*a*) A very simple means consists of a pad made of carbon or other suitable material and secured to the end of a rod T, alternately moved upward and downward, so as to alternately obturate and open the outlet O of the reservoir. (*b*) Another mechanical means consists of a rod T, Fig. 2, made of insulating material and oscillating in a horizontal plane, so as to cut the liquid columns at each passage. (*c*) Said horizontally-oscillating rod may be replaced by a series of rods R R R, Fig. 3, radially arranged on a common hub M, to which a suitable rotary motion is imparted.

One of the steps, the electric or preferred means, of carrying out the process is shown in Fig. 7 and is based upon the experimental fact that when a liquid conductor is traversed by a sufficiently intensive current said conductor will be contracted until it is completely cut off. When the conductor is formed, as herein described, of a thin liquid stratum, the current will be closed again immediately after the break thereof to be again broken, and so on. Thus I produce without the medium of mechanical means a series of quick interruptions—say several hundred per second, in accordance with the practical conditions—adapted to vaporize an important quantity of metal.

In Fig. 7, 1 designates a block of any suitable non-conducting material, the upper face of which, at the ends thereof, is provided with two cup-like cavities, as shown at 2. These cups 2 are connected by a shallow narrow channel 3. Mercury is then poured in in such a manner that the channel will contain only a thin stream.

Figs. 4, 5, and 6 of the accompanying drawings show a longitudinal section, a transverse section, and a plan view, respectively, of the special arrangement adapted for pulverizing tin, lead, and other easily-fusible metals and alloys or mixtures. The materials employed in the construction of said apparatus are evi-

dently to be selected so as not to be influenced by the metal to be pulverized. In said figures, A designates a tank adapted to contain molten metal flowing in thin strata through a greater or less number of nozzles *a a*, secured to tubes *t t*, secured to the bottom of the tank and having an orifice *t'* at their lower portion, said tubes having a sufficient length so that their ends will extend upward beyond the level of the molten metal. The object of said tubes is to provide means enabling a suitable point to reach the nozzles should the latter be obturated. The base B, on which rests the tank A, is insulated from the latter by means of a ring R, made of asbestos or other suitable insulating material. Arranged opposite to each nozzle is a head *c*, carried by a rod *s*, from which starts the current. The metal flowing from the nozzle drops upon the head and is deflected laterally upon the bottom F, made of fireproof material. The current is brought to the upper tank by means of a terminal P, to which is attached the feed-wire. The current is in communication through the molten metal with the thin strata formed between *a* and *c*. The current then passes through the rod *s*, electrically connected with a suitable resistance S, (serving to heat the tank A and hold the metal in a liquid state,) whence the current passes through the tube T, to which is attached at N the second wire. The tube T serves also the purpose of bringing into the apparatus the gases serving to carry away the metallic powder through the outlet E. Molten metal which has not been vaporized flows into the box or receptacle M, whence it is again brought into the upper tank.

The improved apparatus is adapted to be operated by alternate as well as by continuous currents.

The neutral gas brought into the apparatus through the tube T and serving to carry away the metallic powder may be of any desired nature, so as to act on said powder either for oxidizing or sulfurizing purposes.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A process for pulverizing metals, which consists in first, causing the metal to flow in streams, then passing electric currents throughout the length thereof, and then breaking said streams at a point in the flow traversed by the electric current to enable the current to act on the metal on each break of the circuit, substantially as described.

2. A process for pulverizing metals, which consists in melting the metal, causing the same to flow in streams, passing current of electricity through said streams of sufficient intensity to contract said streams until the same are completely cut off to enable the currents to act on the metal on each break of the circuit, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two witnesses.

PAUL BARY.

Witnesses:
ADOLPHE STURM,
EDWARD P. MACLEAN.