

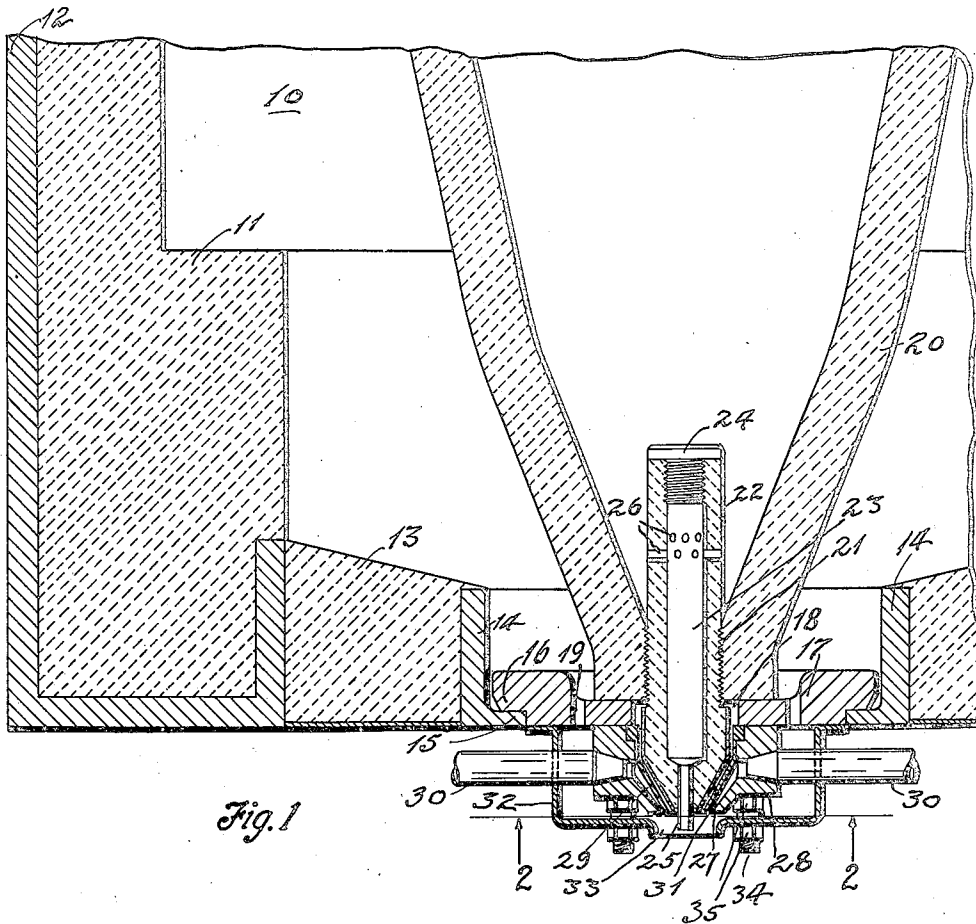
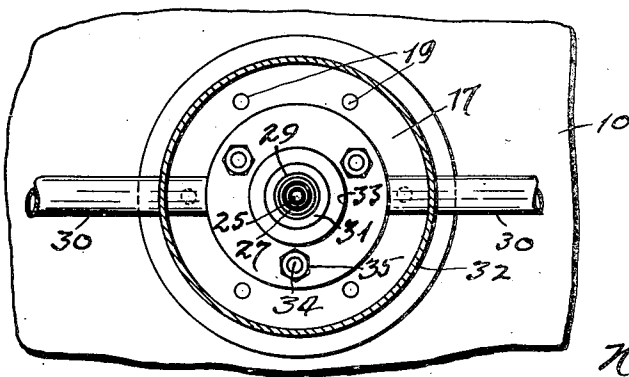
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METHOD OF MAKING LEAD COPPER PARTICLES

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METHOD OF MAKING LEAD-COPPER PARTICLES.

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This invention relates to the art of making fine particles of an alloy, or homogeneous mixture, by atomizing a molten mixture of desired metals.

5 The usual method of making alloys, is to mix the metallic ingredients in a molten condition and allow them to harden. By this method, articles may be made of an alloy, or homogeneous mixture of metals, the ingredients of which are metals that are soluble
10 one in another. This method is not well adapted to making mixtures of metals that are not soluble or miscible, one in another, at all temperatures. Alloys of the latter-
15 named class of metals would be extremely useful for many purposes, if they could be commercially produced. Homogeneous mixtures, for example, of nickel and lead, copper and lead, and of many other metals,
20 not readily made by the usual method, can be produced by the method of this invention.

In this invention it is proposed to mix metals which do not alloy or only partially alloy when cold, but which are miscible when
25 in a molten condition. Copper and lead, for example, will mix intimately at certain high temperatures, but will separate out at the temperature at which the copper freezes or sets, so that, if copper and lead are mixed
30 together in a molten condition, the lead will segregate out and form a layer at the bottom of the copper as the melt solidifies.

In the method which forms the subject of this application, molten copper and lead, for
35 example, are poured into a crucible having a nozzle through which the molten metal will flow. The flowing molten metal, while maintained at a temperature above that at which the metals separate, is then atomized. The
40 resulting fine particles are found to be a homogeneous mixture of pure lead and copper. The particles cool so rapidly after they have been atomized, that there is no opportunity for oxidation to take place, and
45 no opportunity for the lead to separate.

The accompanying drawings illustrate an apparatus which may be used for producing copper and lead, or other homogeneous mixtures, of the class under consideration.

60 Fig. 1 is a cross-section through a portion

of a furnace, crucible and atomizing nozzle; and

Fig. 2 is a section on the line 2—2 of Fig. 1, the parts being viewed from beneath.

In the drawings, 10 indicates a combustion
55 furnace adapted to be heated by gas lead into it through a pipe (not shown). This furnace may be made of fire brick, or other refractory material 11, built up within a
60 shell 12 of iron, or other suitable metal. In the bottom of the furnace is an annular ledge 13, formed preferably of fire clay, the opening through which is lined by a collar
14, having an annular flange 15, provided with a central opening. Seated on the flange
65 15 by means of a flange 16, is a bottom plate 17, having a central hole 18 and one or more eccentrically placed holes 19. The collar 14 and bottom plate 17 may be made of cast
70 iron, or preferably of high-heat-resisting alloy, such as nichrome.

Seated on the bottom plate 17, is a crucible 20, the lower end of which has a hole registering with the opening 18. Fastened
75 in the hole of the crucible, as by screw threads 21, is a nozzle 22, the lower end of which projects below the crucible and the upper portion of which projects upward into the crucible. The said lower end tapers, and
80 is provided with a narrow axial orifice, which terminates in a counterbore 23 within the nozzle. The upper end of the nozzle is closed, as by a plug 24, shown in this case
85 as screw-threaded into the upper end of the nozzle. The small perforation in the lower end of the nozzle is lined by a quartz tube
25, which projects below the lower end of the nozzle. The crucible and nozzle may
90 be made of any suitable refractory material, such as graphite. Above the lower end of the chamber within the crucible, the nozzle 23 is provided with perforations, as at 26. These perforations serve to strain the metal
95 that flows from the crucible into the nozzle, to free it from dross, slag, etc., which might otherwise cause an obstruction in the quartz tube 25. The lower end of the graphite nozzle 22 is encased by a metallic shell 27, which mechanically strengthens its tapering
100 end.

Attached to the underside of the bottom plate 17, is a member 28, which forms portion of an annular nozzle to eject aeriform fluid for the purpose of atomizing metal issuing from the quartz tube 25. For convenience, the said annular nozzle may be called an air nozzle. The inner portion of the air nozzle is formed by a metallic member 29, which conforms substantially to the form of the member 27, and is spaced therefrom far enough so that there will be no binding of the parts, due to warping or expansion, under the influence of heat to which these parts are subjected. Tubes 30 conduct aeriform fluid from a source of pressure (not shown) into the space between the members 28 and 29, so that the aeriform fluid may issue through the circular opening 31 at high speed in a hollow converging stream, which has an entraining effect upon the metal issuing through the quartz tube 25, and atomizes the said metal. Surrounding the nozzles is a casing 32, that has perforations in its walls to admit the tubes 30, and also a bottom opening 33 to permit the exit of metal and the atomizing stream. The air nozzle and the casing 32 may be clamped to the bottom plate 17, by means of bolts 34 and nuts 35. The metallic parts 27, 28 and 29, may be made of some high-heat-resisting metal. The metal known commercially as "Resistal" has been found suitable for the purpose. Casing 32 should also be made of some high-heat-resisting metal, such as "Resistal", or an alloy sold under the name of "Ascology". "Resistal" is the trade name of an alloy containing 65 to 45 percent of iron, 5.5 to 27.5 percent chromium, and from 20 to 36 percent nickel, respectively, and a smaller percentage of silicon and carbon. "Ascology" is the trade name for a chromium-iron alloy containing about 14 percent chromium.

In carrying out this method, combustion should be started in the furnace 10, before conducting metal to the crucible 20, in order to heat the crucible and the nozzles, so that they will be at a sufficiently high temperature when the metal is poured into the crucible. The copper and lead, or other two metals, to be alloyed or made into homogeneous solid particles, are melted together, and the melted metals brought to a temperature at which they are thoroughly miscible. The mixture while at or above the temperature at which the metals intimately mix, is poured into the crucible 20. It flows into the counterbore 23 of nozzle 22, through the orifices 26, and out through the quartz tube 25. An aeriform fluid under pressure, in this case air, is lead through the tubes 30 into the atomizing nozzle, whence it issues in a hollow converging stream, around the quartz tube 25 to assist gravity in drawing the metal through said tube 25, and breaks

the stream of metal into small particles, which, when examined, are found to be composed of a homogeneous mixture of lead and copper.

By this method, alloys or homogeneous mixtures of copper and lead containing a lead content of any desired proportion may be made. The described fine particles of lead-copper have an extensive use in the manufacture of dynamo brushes, bearings and the like. These particles, each containing from, say, 2% to 20% of lead, may be compressed under heavy pressure, into the form of the desired article. They may then be heat-treated to a point where the particles will cohere, by reason of the union of portions of the lead content of contiguous particles, and form a mass of the desired form which may be readily machined.

If desired, the particles of lead-copper may be mingled with graphite, or any other suitable inert filling material, before being pressed to form, and may be then sintered together in a non-oxidizing atmosphere, so as to produce a porous body capable of absorbing oil. By mixing with the powdered metal, a quantity of volatile material, such as salicylic acid, the porosity may be increased or controlled. It is possible by this process, therefore, to readily produce articles of an alloy or homogeneous mixture of metals, which, so far as now known, cannot be practically produced by other methods.

The apparatus disclosed herein is claimed in another application filed of even date herewith, by Harry M. Williams and Victor W. Bihlman.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A method of making composite metal particles comprising a mixture of metals which do not alloy or only partially alloy, which consists in mixing said metals in a molten condition, and atomizing the molten mixture while it is at a temperature higher than that at which the metals tend to segregate.

2. A method of making composite metal particles comprising a mixture of copper and lead, which consists in mixing copper and lead in a molten condition and atomizing the molten mixture while it is at a temperature higher than that at which the metals tend to segregate.

3. A method of making composite metal particles comprising a mixture of metals which do not alloy or only partially alloy, which consists in mixing said metals in a container in a molten condition, said container having a nozzle through which the molten metal may flow, applying high heat

to said nozzle, and atomizing the metal issuing therefrom by a stream of aeriform fluid under pressure. tainer having a nozzle, maintaining said container in a highly-heated environment, 10 applying high heat to said nozzle, and atomizing the metal issuing therefrom by a stream of aeriform fluid under pressure.

5 4. A method of making composite metal particles comprising a mixture of metals which do not alloy or only partially alloy, which consists in mixing said metals in a container in a molten condition, said con- In testimony whereof I hereto affix my signature.

HARRY M. WILLIAMS.