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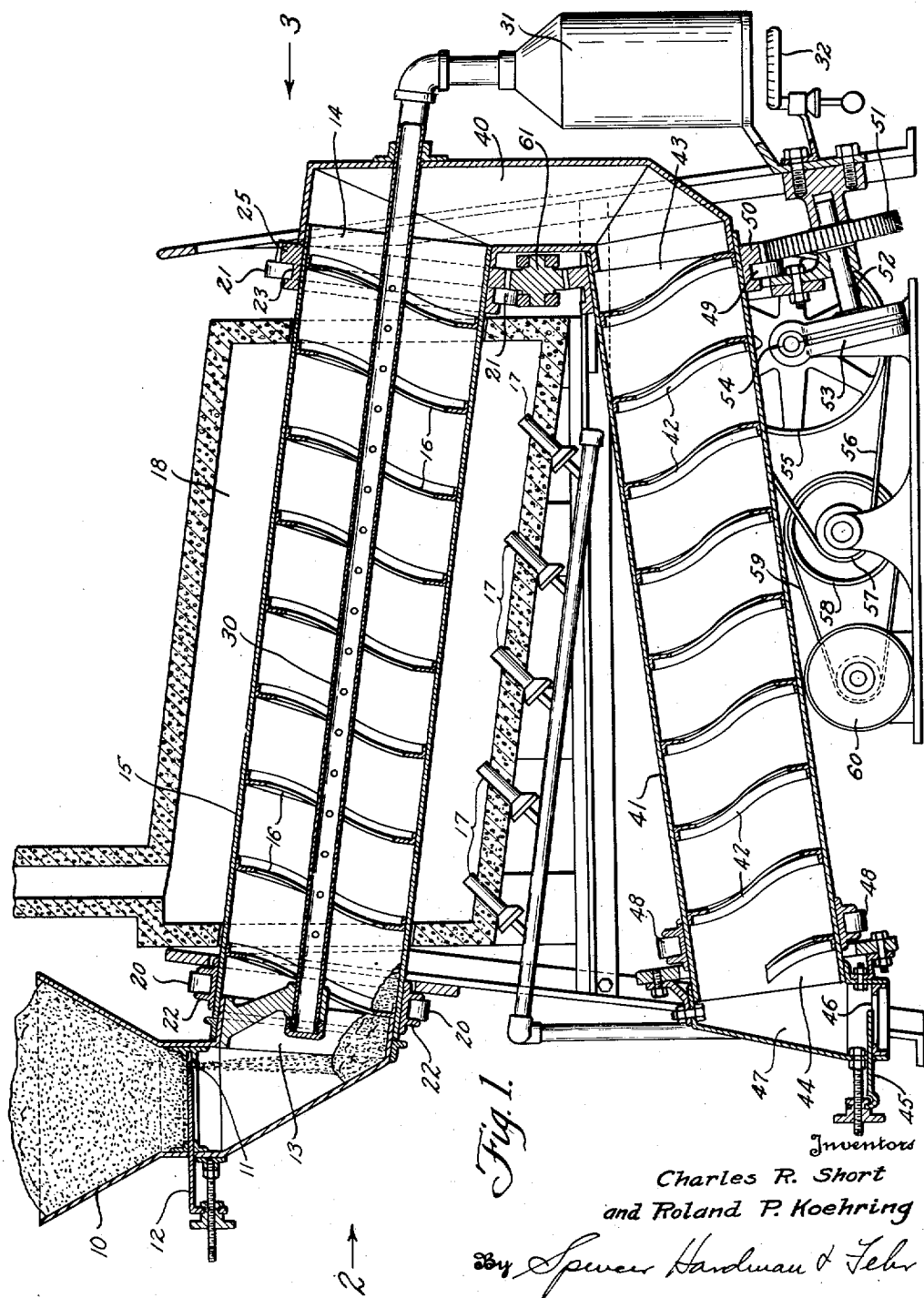
C. R. SHORT ET AL

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POWDERED IRON AND ZINC ALLOY

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2 Sheets-Sheet 1



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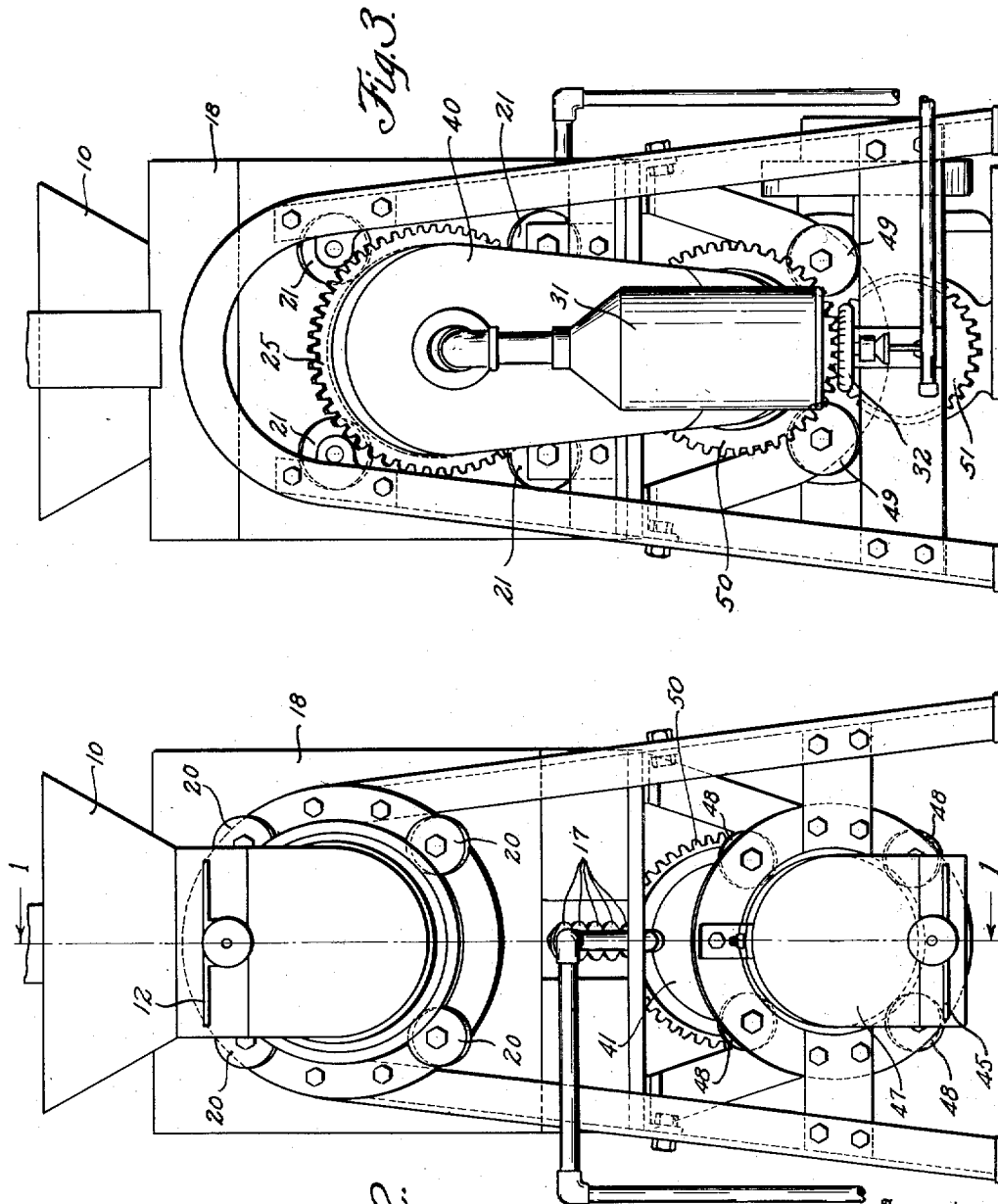


Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE

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POWDERED IRON AND ZINC ALLOY

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Application February 27, 1930, Serial No. 431,768

1 Claim. (Cl. 148—31)

This invention relates to the art of making a metal powder, the individual grains of which comprise two separate metals which do not easily alloy or diffuse into each other.

5 In Serial No. 333,013, filed by Charles R. Short on Jan. 16, 1929, there is disclosed a porous metal bearing material containing cast iron powder, zinc powder, and copper powder, and also various other examples of porous metals which included
10 cast iron powder as one of the original ingredients. That prior Short application also disclosed the step of preliminarily heat-treating a mixture of cast iron powder and one of the other constituent
15 powders, for example zinc powder, to form a metal powder whose individual grains contained both iron and zinc, diffused or alloyed together.

Now this present invention has for an object to more fully disclose and to provide improvements in the process of making a metal powder whose
20 individual grains contain an alloy of two or more metals which have little affinity for each other, for example, cast iron and zinc.

Another object of this invention is to provide a practical commercial process and apparatus
25 therefor for continuously producing the composite metal powder described above.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of one form of the present invention is
30 clearly shown.

In the drawings:

Fig. 1 illustrates an apparatus for producing the
35 composite metal powder of this invention. The view is taken on line 1—1 of Fig. 2.

Fig. 2 is one end view of the apparatus, and Fig. 3 is the other end view thereof.

For the purposes of illustration there will be
40 described the process of producing a fine metal powder whose individual grains are composed of cast iron with a surface coating of zinc iron alloy thereupon.

Cast gray iron powder may be obtained by
45 comminuting gray iron borings or chips in an impact machine and passing through a 100-mesh screen to produce a powder of uniform fineness. The desired quantity and proportions of gray iron powder and zinc powder is placed into the
50 hopper 10 of the apparatus from which it passes slowly and continuously by gravity and vibration through the regulated opening 11 of the slide valve 12 down into the entrance end 13 of the rotating iron cylinder 15. Cylinder 15 has a
55 spirally arranged internal flange 16 therein which

acts as a conveyor to cause the metal powder to move slowly therethrough by tumbling it along against the flange or baffle 16. The metal powder will of course tend to rotate with the cylinder 15 on the side thereof moving up, but when it moves
5 about one-eighth revolution or more it will fall back upon itself toward the bottom of the cylinder, and while tumbling back the baffle 16 will cause it to move toward the exit end 14. Thus, the rotation of cylinder 16 not only slowly moves
10 the metal powder from its entrance end to its exit end, but it also constantly agitates the powders by causing the particles to tumble over and over upon each other, thus causing the particles to rub upon each other over all their sur-
15 faces and at the same time insuring that the metal powders will be very uniformly heated throughout the entire mass.

The cylinder 15 is shown heated by the gas burners 17 which are preferably so uniformly
20 distributed in the heating chamber 18 that the products of combustion will uniformly heat that portion of cylinder 15 which extends through the heating chamber 18. Cylinder 15 is supported at its front end upon the stationary rollers 20
25 (see Fig. 2) which ride within a suitable channel 22 fixed to cylinder 15, as shown in Fig. 1. At its rear end, cylinder 15 is similarly supported upon four stationary rollers 21 which ride in channel 23 which is preferably formed integral with the
30 large annular gear 25 by means of which the cylinder is rotated as will be described herebelow. When the metal powder reaches the exit end 14 of cylinder 15 it drops down through the stationary duct 40 by gravity whereupon it enters
35 the rotating cooling cylinder 41. The metal powder is slowly transferred through the cooling cylinder 41 by any suitable conveyor means, but in the drawings there is illustrated a spirally arranged internal baffle 42 within cylinder 41 which
40 serves to convey the powder through the cylinder in the manner above described for the heating cylinder 15. The baffle 42 constantly tumbles the metal powder over and over upon itself while it is cooling, thus facilitating its cooling, and at
45 the same time preventing any tendency of the particles to cohere and form larger particles while at the higher temperatures as might occur under some circumstances. The powder of course enters cooling cylinder 41 at its entrance end 43
50 and passes out at the exit end 44. A suitable regulating valve 45 provides a regulated opening 46 only sufficiently large for the metal powder to drop through as it accumulates in the exit chamber 47, whereby entrance of air from the
55

room into cylinder 41 is substantially prevented. Cylinder 41 is supported at its exit end upon the rollers 48 and its entrance end upon the rollers 49 in a manner similar to that described above for cylinder 15. Cylinder 41 is driven by the large annular gear 50, through the gear 51, shaft 52, worm wheel 53, worm 54, pulley 55, belt 56, speed reduction pulleys 57 and 58, belt 59, and electric motor 60. Of course any other suitable power means may be employed for rotating cylinder 41 at a relatively slow speed such as best adapted to cool and agitate the metal powder passing therethrough. Gear 50 on cylinder 41 is geared to gear 25 on cylinder 15 through the small gear 61 suitably journaled upon the stationary frame of the machine.

It will now be clear that both the heating cylinder 15 and the cooling cylinder 41 will be simultaneously rotated at a relatively slow speed by the motor 60, and that the metal powders will pass continuously and slowly from the hopper 10 through the heating cylinder 15 and the cooling cylinder 41 and drop by gravity from the exit chamber 47 through opening 46 of valve 45.

In order to facilitate the diffusion of the zinc into the iron particles as they pass through the heating cylinder 15 a fluxing atmosphere is provided therein which also excludes the air and so prevents oxidation of the metal powders. In the apparatus shown in the drawings, the fluxing gas is continuously fed to cylinder 15 through the central pipe 30 which has a large number of small apertures distributed over its length. The fluxing gas now preferred is ammonium chloride which may be conveniently supplied at a desired constant rate by heating a container 31 containing a supply of ammonium chloride by means of a small gas burner 32. It will be noted that both cylinders 15 and 41 and their connecting chamber 40 will become filled with the fluxing gas and that air will be prevented from entering in any substantial quantity by the regulated valve 12 at the hopper 10 and by the regulated valve 45 at the exit chamber 47 even though the metal powder is continuously passing in and out of the

apparatus. The escape of the fluxing gas through the crevices around the ends of the rotating cylinders will substantially prevent the entrance of air at these points.

When cast iron and zinc powders are being used the temperature of the powder within cylinder 15 is preferably raised to around 950° F. and is maintained at that temperature for about twenty minutes while being constantly agitated and rubbed together by the spiral baffle 16 as it passes through the cylinder. During this heating and agitating treatment the particles of gray iron are surfaced with an alloy of zinc and iron due to the zinc from the zinc particles diffusing into the surface of the iron particles. This coating of zinc iron alloy on the iron particles is somewhat porous or spongy, which property is beneficial when this zinc iron metal powder is briquetted and sintered with copper powder, or other metals easily alloyed with zinc, as described in the above mentioned application, Serial No. 333,013, since the copper may enter the pores, thus have a greatly increased surface of zinc iron alloy to act upon. It is believed that the bond between the copper particle and the iron particle is a bond including an alloy of copper, zinc and iron whereby the iron and copper particles are very strongly bonded together. The ammonium chloride gas assists in securing the diffusion of the zinc into the iron particles by providing a non-oxidizing atmosphere and also operating as a flux to reduce any metal oxides which may be present on the metal particles.

While the form of embodiment of the present 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 claim which follows.

What is claimed is as follows:

As a composition of matter, finely divided cast gray iron powder the separate particles of which are alloyed with zinc only on the surface thereof.

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