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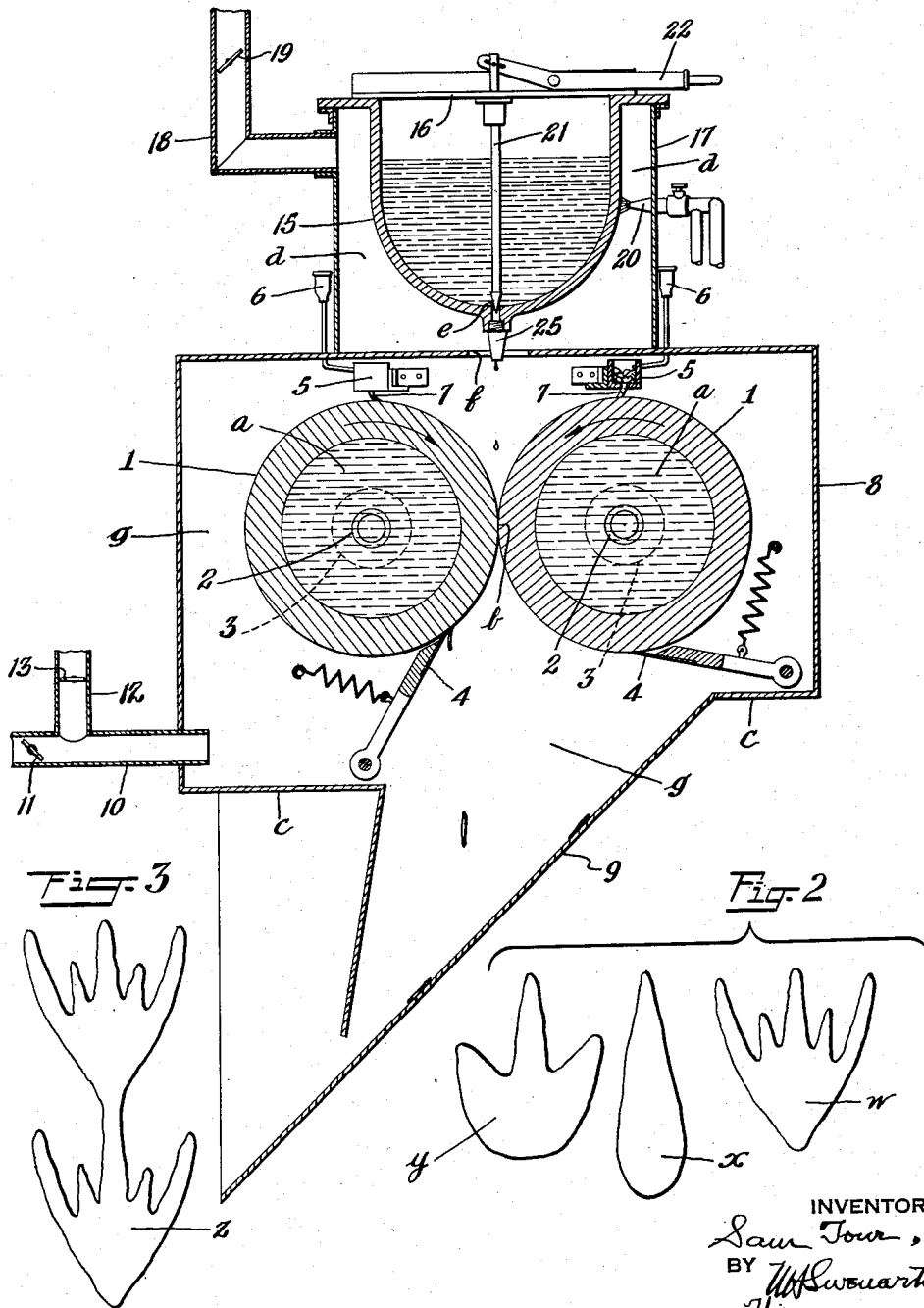
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2,199,191

METHOD OF MAKING DISCONTINUOUS METAL FLAKES, FLITTERS, OR SHRODE

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Fig. 1



UNITED STATES PATENT OFFICE

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METHOD OF MAKING DISCONTINUOUS METAL FLAKES, FLITTERS, OR SHRODE

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11 Claims. (Cl. 134—76)

This invention relates to the production of discontinuous metal flakes, flitters or so-called shrode directly from molten metal and has for its principal objects the provision of an efficient, highly economical, yet simple method for making a novel shrode product which is peculiarly adapted for making metal powders, such for example as aluminum bronze, gold bronze, and the like.

Heretofore, as I am well aware it has been proposed as set forth in Patents Numbers #1,965,603, #521,791, #1,756,196, and #1,903,879, to form sheets or grids from plastic metal by rolling operations and also as disclosed in Patent #2,017,850 to form shrode from metal foil scrap or small sections cut from metal sheets by repeatedly passing the same through corrugated rolls. My investigations have led to the discovery that metal shrode, which is peculiarly suited for the production of metal powders as aluminum bronze, gold bronze and the like, can be expeditiously produced by a single pass of plastic metal in droplet form between pressure rolls, thus avoiding the necessity of the laborious operation of repeatedly passing small sections of foil or sheets between corrugated rolls as well as the inevitable clogging of such corrugations and the necessity for halting the operation for the purpose of cleaning the rolls besides having other advantages hereinafter set forth.

In the accompanying drawing I have illustrated a preferred embodiment of an apparatus or shrode making mill which is adapted for carrying out my novel method and for producing my improved shrode product, but it is to be understood that the same is merely illustrative of a type of apparatus which is suitable for such purpose.

Fig. 1 is a vertical section of such apparatus; and

Figs. 2 and 3 are plan views of pieces of shrode produced by my novel method in such apparatus.

Referring to the drawing and the construction shown therein, the numeral 1 designates a pair of hollow adjustable pressure rolls, the same being suitably mounted in the well known manner, on hollow centrally disposed journals 2 and 3 which later admit of the introduction into and circulation therethrough of a cooling medium *a* such as water or lubricating oil and the like, such rolls being of the type in common use in the art of milling rubber.

Suitable elastically mounted or spring-pressed doctor blades 4 are positioned adjacent the bottom of the respective rolls, the same being adapted

to strip the adhering metal flitters or shrode, formed as hereinafter described, from the rolls at points remote from contact or so-called "pinch" area *b*. Suitable oil or grease boxes 5 which are fed from cups 6, serve to supply oil or grease to wick members 7 that permanently engage the top of the rolls.

The said rolls are enclosed within a housing or shell 8 which has a hopper member 9 projecting from the bottom *c* thereof. A flue 10 controlled by a damper 11 projects into the housing immediately above the bottom *c* thereof and the same communicates with a chimney 12 controlled by a damper 13.

Above the main housing, a melting pot 15 is mounted, the same being desirable of being of elliptical cross section with major axis parallel to the rolls and said pot is adapted to be closed by a removable cover 16. The melting pot is supported within a supplemental housing 17 which encases the sides and ends thereof and forms a chamber *d*, said housing being provided with a chimney 18 that is controlled by a damper 19. An injector nozzle 20 projects laterally through the housing 17, the same being adapted to tangentially project an oil or gas flame around the outer periphery of said pot at a point below the cover.

The bottom of the pot 15 is provided with one or a plurality of apertures or valve-seats *e* each of which is tapped to receive a spout member 25 that is of sufficient length preferably to extend through an enlarged top aperture *f* formed in the top of the housing 8. A vertically adjustable rod or needle member 21, which is controlled by a handle 22, serves to control the passage of molten metal through the valve-seat *e*. As shown the tubes which interconnect the cups 6 and boxes 5 extend through the top of housing 8.

The method of producing metal flitters or shrode in the aforesaid apparatus is as follows:

The selected metal, whether in the form of scrap or chunks or as molten metal, is introduced into the open pot 15, with the needle valve closed, the cover is applied, and the pot is heated by a gas flame projected tangentially around the outer surface of the pot at a point preferably below the level of the metal charge when melted. Preferably a portion, only, of the gases of combustion from the burner 20 is vented through the chimney 18, the damper 19 being appropriately adjusted for that purpose, and the balance of these gases passes downwardly through the aperture *e* and into the chamber *g* of the main housing in which the rolls are mounted, and thence into

the chimney 12, the damper of which is suitably adjusted to permit the escape of such gases from the chamber *g* to the extent desired. Such neutral atmosphere around the rolls may also be created or supplemented by products of combustion or other inert gases introduced into the chamber *g* from an external source of supply thereof through the flue 10.

When the metal has attained the desired degree of fluidity to admit of the same being delivered in separate drops from the spout 25, the needle valve or valves are opened and regulated to allow the escape of the metal as separate small drops or so-called droplets. The number of drops per minute from a single aperture must be decreased directly as the weight of the metal per drop is increased and increased directly as the diameter or speed of the rolls is increased and decreased as the thickness of flitter is decreased to insure that the metal will be delivered in separate charges to the rolls and, consequently, each separate drop will pass between the pressure rolls before a subsequently discharged drop engages the same. The tension on the rolls is suitably adjusted to produce flakes or flitters of the desired thickness from the drops of metal so delivered to the rolls and preferably the rolls are chilled by suitable cooling fluid, as water, oil or the like, which is continually circulated therethrough in order to cool the metal, as it passes between the rolls, to a solid condition.

Other methods of producing drops or droplets of molten metal and introducing them while still molten, semi-molten or plastic into the "pinch" region between the rolls may also be employed.

The passage of the molten, semi-molten or plastic metal through the space between the pressure rolls converts the same into small flakes or flitters corresponding in shape generally to those shown in Fig. 2, the size of such flitter being of course determined by the size of the drop delivered to the rolls and the degree of pressure applied through the rolls upon the plastic metal passing therebetween. While I prefer to so regulate the delivery of the drops upon the rolls so as to maintain the resultant flakes as separate entities, as delivered from the rolls, nevertheless, if desired the timing of the delivery of the drops can be such that one drop is delivered into the "pinch" of the rolls just prior to the departure of the last remaining portion of the previous drop therefrom, with the consequence that the resultant flakes or flitters or shapes will constitute an ornamental shape which consists of an interconnected series of flitters, such for example, as illustrated in Fig. 3.

The resultant flitters, either of the type shown in Fig. 2, or of the type shown in Fig. 3, are reduced to a powder in which the individual particles constitute small flakes of substantially uniform thickness or cross-section, by introducing flitters of the type shown in Fig. 2 directly into either a stamp mill or a ball mill, immediately after the same are recovered from the hopper, or, in the case of the attenuated flitters shown in Fig. 3, the same are first desirably cut in a chopping or cutting machine, following the recovery of the same from the hopper, in order to break up these flitters into smaller shapes and then the resultant particles are introduced into either a stamp mill or a ball mill wherein the same are reduced to a powder which corresponds generally to that obtained by pulverizing the individual flitters of the types shown in Fig. 2 in a ball mill.

The aforesaid flitters, whether of the shapes shown in Fig. 2 or of the attenuated shape shown in Fig. 3, as produced by my improved method, are remarkably uniform both in shape and thickness when produced under the same pressure and temperature and speed conditions as compared with other batches thereof so produced. The surface thereof is burnished by the action of the rolls and, due to the fact that the same may be produced as remarkably thin flitters, the same are peculiarly adapted for the production of metal powders, such for example of the types known as aluminum bronze and gold bronze where the same are intended for use either as a paint pigment or as the ingredient of a spray intended for superficial application to surfaces as movie screens and the like, owing to the unusual covering power and refractibility of such flake-like particles as exist in metal powders produced from the aforesaid flitters.

The production of metal shrode by my improved method will be accomplished with a minimum outlay for apparatus or the upkeep thereof and, furthermore, due to the fact that the flitters are produced from molten metal, it is wholly unnecessary to employ sheet metal or to produce metal foil therefrom all of which is a laborious and expensive operation, since raw material in any form is entirely suited for use in my improved process.

The maintenance of a neutral or non-oxidizing atmosphere around the rolls and if desired, even in the free space in the melting pot, materially facilitates the production of a flitter which preserves all of the desirable properties of virgin metal corresponding to the particular metal employed, besides insuring that a minimum pressure consistent with the particular thickness of flitter desired will be required as well as minimizing the wear and tear on the rolls due to the absence from the metal in contact with the rolls of any infusible or difficultly fusible oxides and abrasive oxides.

While I may employ rolls formed of heat-resisting alloy steel, it is also possible to utilize cast steel or cast iron rolls having sleeves formed of heat-resisting alloy steel shrunk thereon. Furthermore in order to distribute the wear on the rolls, due to the passage of the plastic metal therebetween in the rolling operation, it is preferable to longitudinally reciprocate the pot containing the molten metal, during the delivery of the droplets to the rolls, and as a consequence the wear on the rolls is so distributed that the surface thereof remains substantially smooth and even at all times.

Having thus described my invention, what I claim and desire to secure by Letters Patents is:

1. A method of making metal flakes, flitters or shrode, which comprises delivering separate drops of molten, semi-molten or plastic metal into contact with a pair of rolls in pressure engagement with each other, causing said rolls to rotate to effect the passage of the metal therebetween, while simultaneously chilling said rolls and stripping the resultant metal flake from said rolls.

2. A method of making metal flakes, flitters or shrode, which comprises delivering separate drops of molten, semi-molten or plastic metal successively into contact with a pair of rolls while the same are in pressure engagement with each other, causing said metal to pass between said rolls while same are rotating and stripping the resultant metal flakes from said rolls.

3. A method of making metal flakes, flitters

or shrode, which comprises successively delivering separate drops of molten, semi-molten or plastic metal into contact with a pair of rolls while the same are rotating and in pressure engagement with each other and while such rolls are confined within a neutral, non-oxidizing atmosphere, causing said metal to pass between said rolls while subjecting the metal on opposite sides thereof to pressure from each roll and then stripping the resultant flakes from said rolls.

4. A method of making aluminum bronze powder, which comprises delivering separate drops of molten, semi-molten or plastic aluminum or aluminum alloy metal into contact with the upper surfaces of a pair of rotating rolls, causing said drops to separately pass between said rolls while subjecting the same to the combined pressure of said rolls, stripping the resultant metal flakes from said rolls and then recovering and comminuting said flakes.

5. A method of making aluminum bronze powder, which comprises delivering separate drops of molten, semi-molten or plastic aluminum or aluminum alloy metal into contact with the upper surfaces of a pair of rotating rolls, causing said drops to separately pass between said rolls while subjecting the same to the combined pressure of said rolls, stripping the resultant metal flakes from said rolls and then recovering and comminuting said flakes in a ball mill or a stamp mill.

6. A method of making aluminum bronze powder, which comprises delivering, by gravity, drops of molten, semi-molten or plastic aluminum or aluminum alloy metal into contact with a pair of rolls while the same are rotating in pressure engagement with each other, and while said rolls are confined within a neutral non-oxidizing atmosphere, causing said metal drops, so delivered, to pass between said rolls while subjecting the metal to the pressure thereof, stripping the resultant flakes from the rolls and recovering and comminuting the same.

7. A method of making aluminum bronze powder, which comprises delivering, by gravity, drops of molten, semi-molten or plastic aluminum or aluminum alloy metal into contact with a pair of rolls while the same are rotating in pressure engagement with each other, and while said rolls are confined within a neutral, non-oxidizing atmosphere, causing said metal drops, so delivered,

to pass between said rolls while subjecting the metal to the pressure thereof, stripping the resultant flake from the rolls and recovering and comminuting the same in a ball mill or a stamp mill.

8. A method of making gold bronze powder, which comprises delivering separate drops of molten, semi-molten or plastic copper or copper alloy metal into contact with the upper surfaces of a pair of rotating rolls, causing said drops to separately pass between said rolls while subjecting the same to the combined pressure of said rolls, stripping the resultant metal flakes from said rolls and then recovering and comminuting said flakes.

9. A method of making gold bronze powder, which comprises delivering separate drops of molten, semi-molten or plastic copper or copper alloy metal into contact with the upper surfaces of a pair of rotating rolls, causing said drops to separately pass between said rolls while subjecting the same to the combined pressure of said rolls, stripping the resultant metal flakes from said rolls and then recovering and comminuting said flakes in a ball mill or a stamp mill.

10. A method of making gold bronze powder, which comprises delivering, by gravity, drops of molten, semi-molten or plastic copper or copper alloy metal into contact with a pair of rolls while the same are rotating in pressure engagement with each other, and while said rolls are confined within a neutral non-oxidizing atmosphere, causing said metal drops, so delivered, to pass between said rolls while subjecting the metal to the pressure thereof, stripping the resultant flakes from the rolls and recovering and comminuting the same.

11. A method of making gold bronze powder, which comprises delivering, by gravity, drops of molten, semi-molten or plastic copper or copper alloy metal into contact with a pair of rolls while the same are rotating in pressure engagement with each other, and while said rolls are confined within a neutral, non-oxidizing atmosphere, causing said metal drops, so delivered, to pass between said rolls while subjecting the metal to the pressure thereof, stripping the resultant flake from the rolls and recovering and comminuting the same in a ball mill or a stamp mill.

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