

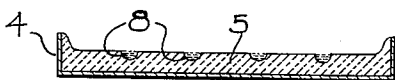
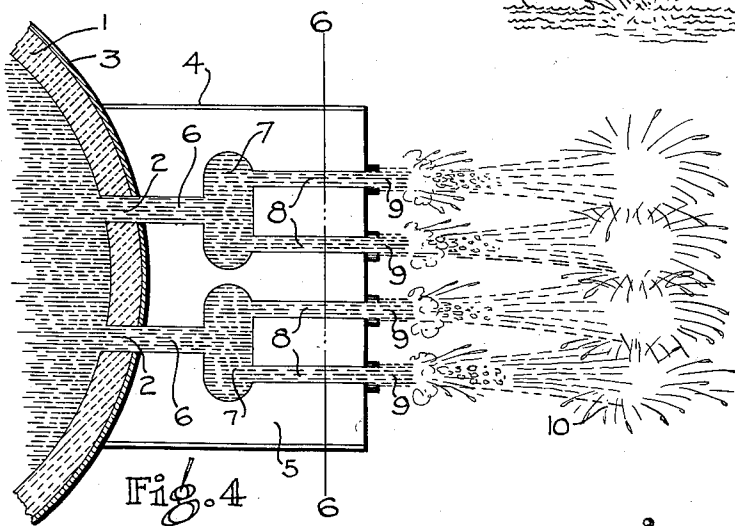
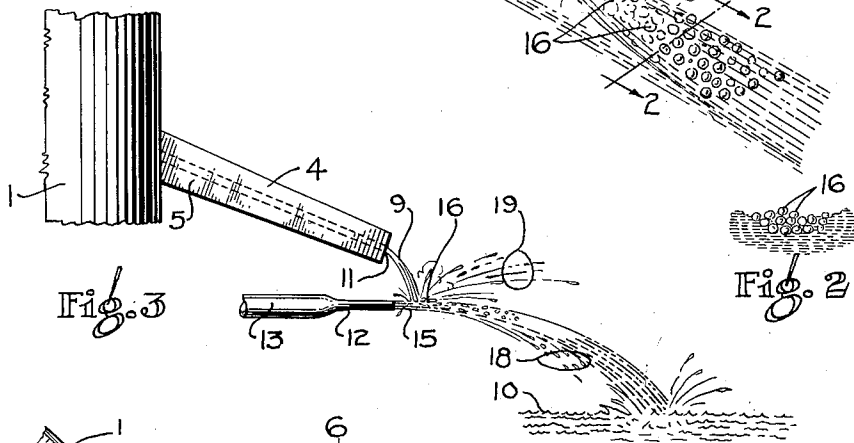
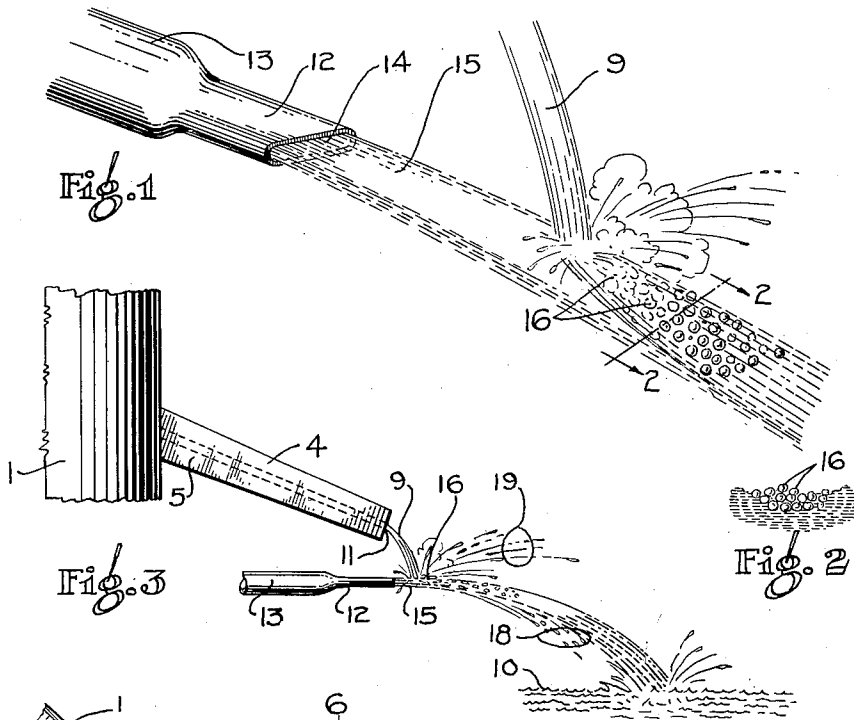
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PROCESS OF MAKING METAL ABRASIVE MATERIAL

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PROCESS OF MAKING METAL ABRASIVE MATERIAL

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My invention relates to processes for making metallic abrasives and relates particularly to processes for making shot and grit of iron and steel or other metals of preferably substantially spherical form and of the size of shot or grit used for abrasive purposes.

In the production of iron or steel shot for abrasive purposes, it has been customary to direct flowing streams of molten iron metal downwardly on to jets of steam which issue from nozzles with very great force due to the very high pressure of steam contained in a boiler communicating with the nozzles.

Although this has long been the established method of making metallic abrasives of the type above referred to, I find that this old process is deficient in that among the sizes of metallic abrasive particles obtained, too great a quantity of extremely small sizes occur, and also there is too great a loss of iron by combustion while the particles are in the air where they are flung by the kinetic force of the steam to which the particles are subjected.

Also the particles obtained are not as efficiently chilled, that is they are not made sufficiently hard by the chilling action of the steam and air to which, in combination, they are exposed, since the chilling is not had with sufficient rapidity. Also in such prior processes, there is an undesirable irregularity of form in too great a percentage of the abrasive particles obtained as a result of the employment of the process.

An object of my present invention, therefore, is to provide an improved process for making regularly shaped particles of metallic abrasive of approximately spherical form and of intermediate sizes rather than of too large and too small sizes, in which so much of the material employed in the prior processes above referred to has resulted.

Another object of my invention is to provide an improved process providing an increased percentage of certain sizes of iron or steel shot, adaptable for abrasive purposes.

Another object of my invention is to provide an improved process whereby less of the iron employed for the making of metallic

grit will be oxidized by combustion during the process.

Another object of my invention is to provide an improved process for making metallic grit of the character above referred to, and whereby the expense, space required, and other disadvantages involving expense and inconvenience attending the production and employment of steam under high pressure, may be eliminated.

Other objects of my invention and the invention itself will become apparent by reference to the following description of a process embodying my invention, and in which description reference will be had to the accompanying drawing, wherein the making of metallic abrasive by the process of the said embodiment, is illustrated.

Referring to the drawing:

Fig. 1 illustrates a nozzle and a jet of water issuing therefrom and a stream of molten iron directed from above on to the said jet in the practice of my improved process.

Fig. 2 is a transverse section taken on the line 2—2 of the jet of Fig. 1.

Fig. 3 is a side elevational view of the apparatus of Fig. 1, and showing in addition the chilling water into which the particles formed fall.

Fig. 4 is a plan view of a fragment of the cupola from which the molten metal is supplied, and the inclined fire clay trough and channels therein for communicating molten metal from the cupola down on to the water jets, a plurality of which are shown, each similar to that of Fig. 1.

Fig. 5 is a view of some of the cast iron shot adapted for abrasive purposes formed by the process carried out as illustrated in the foregoing figures.

Fig. 6 is a view taken on the line 6—6 of Fig. 4.

Referring now to the different figures of drawing in all of which like parts are designated by like reference characters, at 1 I show fragmentary views of a cupola in which iron and steel are melted, the molten metal flowing therefrom in a continuous stream through openings 2 through a lateral side

wall 3 of the cupola on to an inclined discharge platform 4, which is faced with fire clay 5, in the upper surface of which molten metal conducting channels are formed.

5 In the embodiment illustrated, a pair of channels 6 lead each from one of the discharge openings 2 to receive molten metal from the cupola and communicate it to reservoir depressions 7, which, becoming filled with the molten metal, supply it to the pairs of channels 8, 8 and 8, 8, there being one pair of such discharge channels for each of the reservoirs 7.

10 The channels 8 being four in number in the embodiment illustrated, extend longitudinally downwardly at an angle of preferably from 30° to 35° to the horizontal, to discharge streams 9 of molten metal toward the surface of the large water pond 10, which is disposed at a distance of from two to three feet from the lower discharge end 11 of the platform.

15 Disposed horizontally below the platform 4 and in the vertical plane of one of the channels 8, are provided four discharge nozzles 12 for water pipes 13, which are in communication with a source of water under pressure, of say sixty pounds per square inch, such as in the case of pipes 13, which may receive water from the ordinary public service water system of a municipality.

20 The nozzles 12 may be formed as illustrated in Fig. 1 by flattening the ends of the pipes 13 to the form shown, whereby a rectangular discharge opening 14 is formed, this being preferably about six times as wide as its depth, so that water projected through the opening 14 will initially take the form of a ribbon of water 15 projected forwardly from the nozzle, as illustrated in the drawing.

25 The forwardly projected particles of water in the ribbon-like stream 15 cross the path of the downwardly flowing stream 9 of molten metal issuing from the particular one of the channels 8 which is disposed above the particular nozzle 12, with the result that the molten metal engaging the much more rapidly moving ribbon-like stream of water, is deflected from its trajectorial path, otherwise taken towards the pool 10, and is borne forwardly in the manner indicated at 16, largely, at first, on the upper surface of the stream of water 15, which, under the weight of the particles 16, takes a slightly channelled form shown in Fig. 2.

30 The molten metal at 16 rapidly achieves the form of approximately spherical particles, which, borne by the rapidly moving water, is rolled thereon, thus contributing to a more nearly spherical form than would otherwise be the case.

35 The particles become very rapidly chilled, until being considerably chilled they are borne forwardly on the surface of the stream

15 until at positions generally indicated at 18, in Fig. 3, they descend toward and into the body of water contained in the water pond 10, which is constantly renewed to reduce its temperature and to supply the loss by evaporation.

40 Although a few of the particles, in the operation of the process described, are blown off upwardly, as generally indicated at 19, from the surface of the water, these are in quantities much less than would be the case where live steam is employed, as in the prior process previously referred to, and also such particles as are so blown into the air upon contact with the water, are largely sufficiently chilled that little or no oxidation of the particles occurs in the air, whereas in the case of steam, a large quantity of such particles being blown into the air with very little preliminary chilling, they are oxidized in the air and those that are not completely oxidized are chilled at such a slower rate before striking the water, that the chilling which results in a hardening of the particles, is less efficiently accomplished than in applicant's process, where a very rapid chilling of the entire body of the particles is had.

45 The process above described is continuous so long as molten metal is supplied from the cupola 1 and accumulates in the reservoir 7, for supplying the channels 8 with molten metal to be directed thereby on to the high pressure streams 15 of preferably rectangular ribbon-like form shown at 15.

50 It will be obvious to those skilled in the art that abrasive material made according to the foregoing described process and apparatus may be treated by other processes subsequently to its manufacture to vary the hardness thereof if desired, for example by well known and understood heat treatment processes.

55 Although the apparatus may be rearranged considerably within the purview of my invention, the general relations as to angularity, trajectory, and positioning of the molten metal and water streams, substantially as illustrated in the drawing, are preferred. However, having thus described my invention in a specific embodiment, I am aware that numerous and other embodiments of my invention may be had wherein the principles of my invention will be employed, and I therefore claim my invention broadly as comprising all embodiments within the spirit thereof.

I claim:

1. The process of forming approximately spherical metal shot suitable for use for abrasive purposes comprising supplying molten metal in a restricted stream to a larger stream of water projected at a more rapid rate across and under the molten metal stream to intercept the same, and bearing particles of the metal on the surface of the stream, through air, and thereafter im-

mediately depositing the particles formed by the water into a body of water.

2. The process of forming approximately regular particles of metal shot suitable for use
5 for abrasive purposes, and hardening the same, comprising the directing of a limited stream of molten metal material in an inclined path downwardly to discharge it through air toward a pond of water, then intercepting
10 the downwardly falling molten metal by a wider stream of water projected across and under the path of the molten metal at a much greater velocity than that of the metal.

3. The process of forming approximately
15 regular particles of metal shot suitable for use for abrasive purposes, and hardening the same, comprising the directing of a limited stream of molten metal material in an inclined path downwardly to discharge it
20 through air toward a pond of water, then intercepting the downwardly falling molten metal by a wider stream of water projected across and under the path of the molten metal at a much greater velocity than that of the
25 metal, and then immediately depositing the particles of metal so formed in the body of water.

In testimony whereof I hereunto affix my signature this 31st day of December, 1929.

30 DAVID MARTIN.

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