R. PALMER & N. H. ADAMS.

METHOD AND APPARATUS FOR COMMINUTING METAL.

APPLICATION FILED MAR. 16, 1916.

1,213,896. Patented Jan. 30, 1917.

Fig. 1.

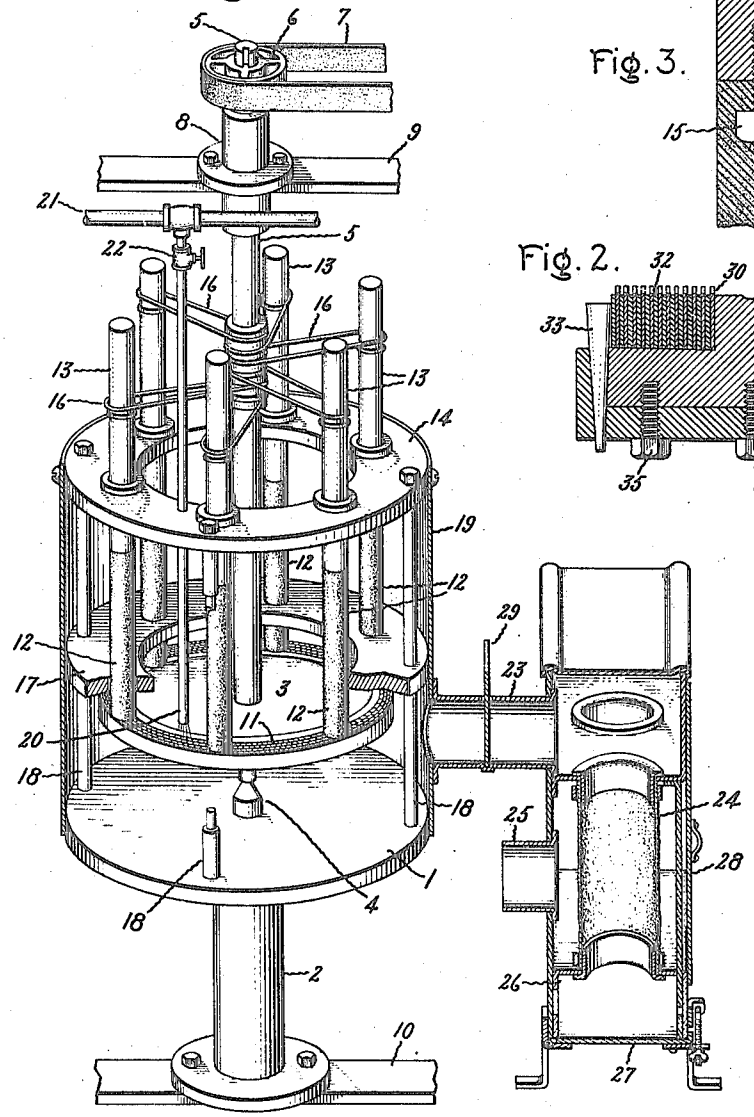



Fig. 3.

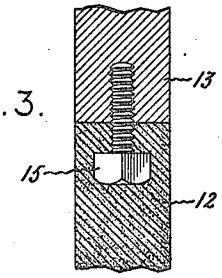
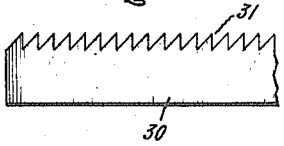



Fig. 2.




Fig. 4.




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# UNITED STATES PATENT OFFICE.

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## METHOD AND APPARATUS FOR COMMINUTING METAL.

1,213,896. Specification of Letters Patent. Patented Jan. 30, 1917.

Application filed March 16, 1916. Serial No. 84,728.

*To all whom it may concern:*

Be it known that we, ROBERT PALMER and NATHAN H. ADAMS, citizens of the United States, both residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Methods and Apparatus for Comminuting Metal, of which the following is a specification.

The present invention relates to the comminution or sub-division of metal, such, for example, as magnesium.

It has been found that for certain purposes granular particles of magnesium, such as might be produced by pulverization at low temperature, do not give the results desired, for example, when the metal is burned for illuminating purposes. On the other hand, the sharp edges and greater mass of tiny chips, or turnings, of metal, such as produced by a cutting tool, burn in the desired manner.

It is the object of our invention to provide a method and apparatus for producing in quantity turnings of magnesium or other metal, of desired form and size.

In accordance with our invention, the metal is comminuted by the cutting effect of a plurality of teeth of suitable size and shape and the little shavings, or chips, are carried away by a fluid, such as air, so as to avoid clogging the engaging parts of the tool and metal acted upon.

It is an important feature of our invention to cause the engagement of the cutting teeth with the magnesium, or other metal body in such manner that successive cutting lines intersect prior cutting lines, as thereby the chips have a desired shape and size.

Other features and advantages of our invention will be pointed out in the following description and the appended claims.

In the accompanying drawing Figure 1 shows an apparatus as a whole in perspective, the casing being in part removed to show the interior construction; Fig. 2 is a fragmental sectional view of the serrated machining tool which cuts the particles of metal; Fig. 3 is a sectional view of the junction between the metal to be ground and the support; and Fig. 4 is a fragmentary side view of an element of the cutting apparatus.

The apparatus shown in Fig. 1 comprises a platform 1 mounted upon a pedestal or base 2. A plate 3 is rotatably mounted upon a bearing 4, and is connected to a shaft 5 carrying a pulley-wheel 6 over which runs a belt 7, or other means for revolving the plate. The shaft 5 passes through a bearing or collar 8 bolted to a rigid support 9 for steadying and centering the apparatus which is also bolted at its lower end to a support 10. The peripheral strip or section 11 of the plate 3 has a plurality of outwardly projecting cutting teeth shown at 31, Fig. 4. The construction of this annular cutting band will hereinafter be more fully described.

Held into engagement with the cutting teeth are a number of rods 12 of magnesium, or other metal, to be cut into fine particles. These rods of magnesium are most conveniently supported by being attached to rods 13 passing through the plate 14 forming part of the casing of the apparatus. The rods 13 also serve as weights to hold the magnesium rods against the cutting tool, and in part control the size and shape of the cuttings. One method of attachment found most convenient is shown in section in Fig. 3. As here illustrated the magnesium metal is cast around the head of a screw bolt 15, the shank of which is screwed into a recess in the rod 13. Each of the rods 13 is connected by a belt 16 to the revolving shaft 5 of the apparatus, thereby causing the rods of magnesium to rotate on their own axes while in engagement with the rotating plate 3. The lower ends of the magnesium rods pass through a plate 17 which is connected in common with the plate 14 by means of tie rods 18 to the base 1 of the apparatus. Surrounding the moving parts and connecting the base 1 and the plate 14 is a casing 19 of sheet metal.

As the plate 3 with its plurality of outwardly projecting teeth cuts the surface of the butt ends of the magnesium rods by its revolutions and as these rods rotate on their own axes, the teeth engage with the magnesium on lines intersecting with each other, thereby producing short turnings or chips, the size of which can be governed by the size, shape and spacing of the cutting teeth, and by the weight of the rods 13 as already mentioned. These chips are removed from the spaces between the cutting teeth by a blast of air, or other suitable fluid, furnished by a pipe 20 projecting through the casing 14, as indicated. This pipe may be suitably

joined to a pipe 21 supplying other similar devices and the flow of fluid may be adjusted by valve 22.

The particles of metal are removed from the milling device by suction applied through a conduit 23 and conveyed into a collecting device containing a screen or filter 24 of fabric, or the like, through which the air freely passes to an exhaust conduit 25. The particles of metal cling to the inner surface of the screen 24 until they drop by their own weight into a box 26 from which they may be removed periodically by opening a door 27. The door 28 gives access to the screen for cleaning or repairing it when necessary. In case the magnesium catches fire at the plate 3, a valve 29 may be closed to prevent spreading of the fire.

The cutting tool preferably consists, as indicated in Figs. 2 and 4, of a plate 3 having a recess on its outer periphery on which is wound a strip of steel 30, or the like having a serrated edge 31, such, for example, as a band-saw, the teeth of which have no set. Spacers 32 preferably are provided between the adjoining sections of the toothed band 30 and the spacers and band when wound up are held firmly in position by a wedge 33 driven against them and between the plate 3 and the right angled plate 34 held against the lower edge of the outer periphery of the plate 3 by screws 35, as indicated in Fig. 2.

While we have indicated one preferred embodiment of our invention with a specific form of cutting tool, we wish it to be understood that various other means containing a plurality of cutting teeth may be used to achieve the purpose of our invention and various other modifications may be made without departing from the spirit and scope of our claims.

What we claim as new and desire to secure by Letters Patent of the United States, is:—

1. The method of comminuting metal which consists in producing relative motion between a body of said metal and a plurality of cutting teeth, acting upon the turnings of metal produced thereby with a current of fluid to remove the same from the cutting teeth, carrying away the turnings of metal by said fluid current and collecting the metal particles.

2. The method of comminuting magnesium which consists in turning off small chips from a body of magnesium with a tool having cutting teeth, shifting the relation of the magnesium body and said tool to cause the engagement of said teeth with the metal on lines intersecting prior lines of engagement, removing the turnings of metal by a current of fluid from the cutting teeth and collecting said turnings.

3. An apparatus for preparing comminuted metal which comprises a machining tool having a plurality of teeth, means for holding a body of magnesium in contact with said teeth, and means for producing relative motion between said tool and said magnesium body while continuously shifting the cutting travel of said teeth on said body to produce successive engagement of said teeth on intersecting lines.

4. An apparatus for sub-dividing magnesium which comprises a tool having a plurality of rows of cutting teeth, means for holding a body of magnesium in contact with said teeth, and means for producing relative motion between said tool and said magnesium in the general direction of said rows of teeth to turn off shavings of magnesium, and means for rotating said body of magnesium on its axis to change the surface subjected to the machining action.

5. An apparatus for sub-dividing magnesium which comprises a movably mounted tool having a serrated surface, means for rotating said tool, means for mounting one or more bodies of magnesium to bear against said serrated surface, means for rotating said bodies on their own axes, and means for collecting the particles of magnesium produced by the cutting action of said surface.

6. An apparatus for sub-dividing magnesium which comprises a tool having pointed teeth, means for holding a body of magnesium in cutting relation with said teeth, means for producing relative motion between said tool and said magnesium body, means for progressively changing the cutting travel of said teeth to cause successive engagement of said teeth with said magnesium body on intersecting lines, means for removing the particles of metal from said teeth, and means for collecting said particles.

7. An apparatus for comminuting soft metal comprising the combination of a plate having an annular serrated section, means for rotating said plate, means for holding a body of metal to be comminuted in engagement with said serrated section, means for rotating said metal body on its own axis, and means for carrying away the particles of metal cut from said body of metal by the serrations on said plate.

8. An apparatus for comminuting a soft metal comprising the combination of a circular plate, a band of metal having a serrated edge wound about the periphery of said plate, spacers between adjoining sections of said band, means for holding one or more bodies of metal to be comminuted to bear against the serrations of said band, means for revolving said plate, means for moving said bodies of metal to cause engagement of teeth on said band with said metal bodies on lines intersecting successively other lines of engagement, a tube for supplying a current of air to remove chips

or turnings of metal from said band, a conduit carrying away said chips, and means for collecting the chips.

9. An apparatus for comminuting metal, comprising means for holding said metal, a tool having cutting teeth engaging with said metal, means for causing relative motion between said metal and said tool, means for furnishing a blast of fluid for removing chips of metal from the cutting tool, and means for collecting said chips.

In witness whereof, we have hereunto set our hands this 15th day of March, 1916.

ROBERT PALMER.
NATHAN H. ADAMS.