

M. J. DAVIDSEN.

GRINDING MILL.

APPLICATION FILED SEPT. 16, 1907.

983,028.

Patented Jan. 31, 1911.

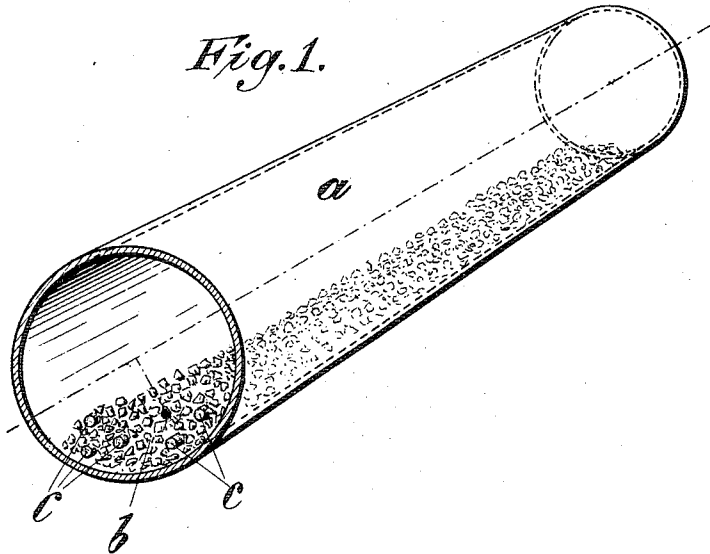
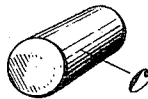


Fig. 2.



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UNITED STATES PATENT OFFICE.

MEYER JOSEPH DAVIDSEN, OF COPENHAGEN, DENMARK, ASSIGNOR TO F. L. SMIDTH & CO., OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

GRINDING-MILL.

983,028.

Specification of Letters Patent.

Patented Jan. 31, 1911.

Application filed September 16, 1907. Serial No. 393,252.

To all whom it may concern:

Be it known that I, MEYER JOSEPH DAVIDSEN, civil engineer, citizen of Denmark, residing at No. 33 Vestergade, Copenhagen, in the Kingdom of Denmark, have invented new and useful Improvements in Grinding-Mills, of which the following is a specification.

This invention relates to grinding mills in which the reduction to a finely powdered condition of coal, ore or other substances is effected by grinding bodies which are placed, together with the material to be pulverized, in a drum which is rotated at a relatively slow speed. The weight of the material to be powdered and of the grinding bodies, which together partially fill the drum, is considerable and the power required to rotate the drum is therefore considerable. Roughly speaking the h. p. required is measured by the product of the weight of the entire mass into the distance from the axis of the drum to the center of gravity of the mass, the length of the drum being disregarded. Economy in the power consumed, therefore, becomes a desideratum, and it is the object of this invention to enable equal results to be secured with a less consumption of power than has heretofore been possible or a considerably increased product for the same consumption of power.

The grinding balls usually employed in such mills are flint pebbles of considerable size, although attempts have been made to secure greater efficiency for these mills by the substitution of various other grinding bodies, such, for example, as long rods or bars of metal which retain their parallelism with the axis of the drum throughout the operation, and rectangular blocks of metal having plane surfaces and sharp corners. These attempts have apparently not been sufficiently successful to bring about any extensive substitution of such bodies for the flint pebbles which are generally used, but in the present invention it has been discovered that the greatest efficiency in such mills is secured by the employment of grinding bodies which furnish the maximum of surface for the same weight, and the grinding bodies used in accordance with the invention are therefore comparatively small, cylindrical bodies of any suitable metal. With such bodies it is found that very great fineness of the ground product can be secured with

a saving in h. p. of from forty to fifty per cent., as compared with the use of flint pebbles, in the treatment of such material as clinker and hard bituminous coal. Moreover, it has been found to be possible with such material to treat successfully damp material, such as damp coal, which, under treatment with flint pebbles, is generally compacted in scales or flakes which are not thereafter broken up. Among other advantages may be enumerated the following: The specific gravity of the grinding bodies being the same, a smaller total weight of grinding bodies may be employed; a reduction in the size of the machinery employed is possible; a finer reduction of the material can be effected; the small size of the metal grinding bodies permits them to be hardened practically throughout.

In the accompanying drawing in which the invention is illustrated, so far as it is capable of illustration, for the purpose of indicating visually the character of the invention, Figure 1 is an outline perspective or diagrammatic view of the cylinder or drum of a grinding mill with its charge of material to be powdered and grinding bodies. Fig. 2 is a perspective view, on a much larger scale, of one of the grinding bodies.

The cylinder or drum of the grinding mill, indicated at *a* in the drawing, may be of any suitable dimensions and may be rotated at the required speed by any suitable means and may be provided with suitable devices for the introduction and removal of the charge. Except for the provision, broadly, of a suitable container in which the material to be treated and the grinding bodies may be made to move together, the construction and arrangement of the mill and its parts are not material to the invention and therefore need not be further illustrated.

The invention is particularly concerned with the size and shape of the grinding bodies employed. Such grinding bodies, mixed with the material under treatment, are shown in mass, at *b* in Fig. 1, and one of such parts is shown at *c* in Fig. 2. As represented, each of such grinding bodies is a solid, relatively small cylindrical body. The precise dimensions of such grinding body are immaterial, but as an indication of the approximate dimensions it may be said that for most purposes highly satisfactory results are obtained with cylindrical

grinding bodies which have each a length of about five-eighths of an inch and a diameter of about three-eighths of an inch. The weight of each of such grinding bodies will depend, obviously, more or less upon the material of which it is made, a suitable average being about twenty grams.

The grinding bodies may be made of rods of iron or steel cut into short lengths, or even of the small cylindrical pieces which may be stamped out of sheets or plates of metal in the preparation of such plates or sheets for other uses. If desired, these bodies may be subjected to a hardening process which, on account of the small size of the bodies, hardens them practically throughout the mass of it.

I claim as my invention:

A grinding mill comprising a rotary drum in which the material to be ground and the grinding bodies are moved together, and grinding bodies each consisting of a solid cylinder of metal having a length of approximately five eighths of an inch and a diameter of approximately three eighths of an inch.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MEYER JOSEPH DAVIDSEN.

Witnesses:

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