

May 12, 1925.

1,537,759

J. M. FLEMING ET AL

GRINDING MILL

Filed June 25, 1923

4 Sheets-Sheet 1

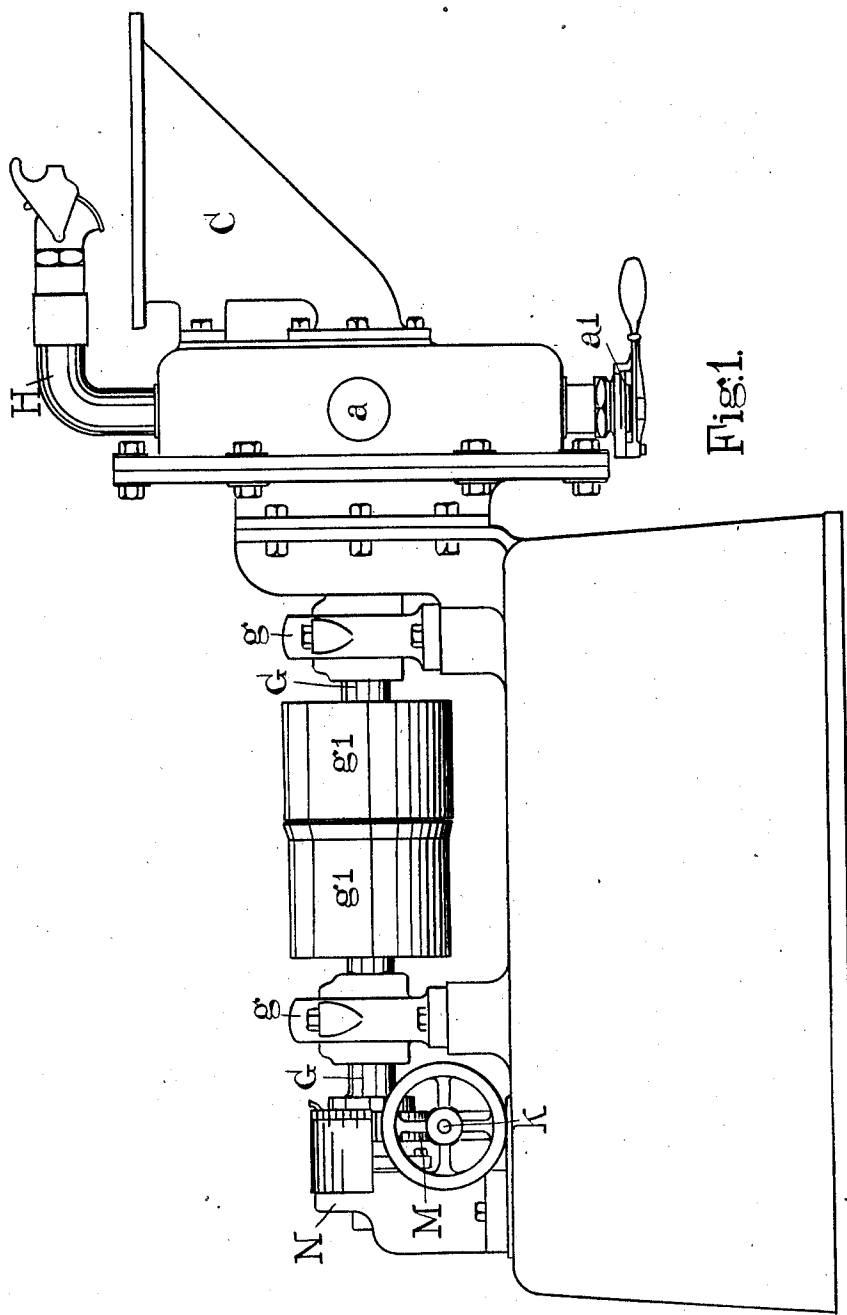


Fig. 1.

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4 Sheets-Sheet 2

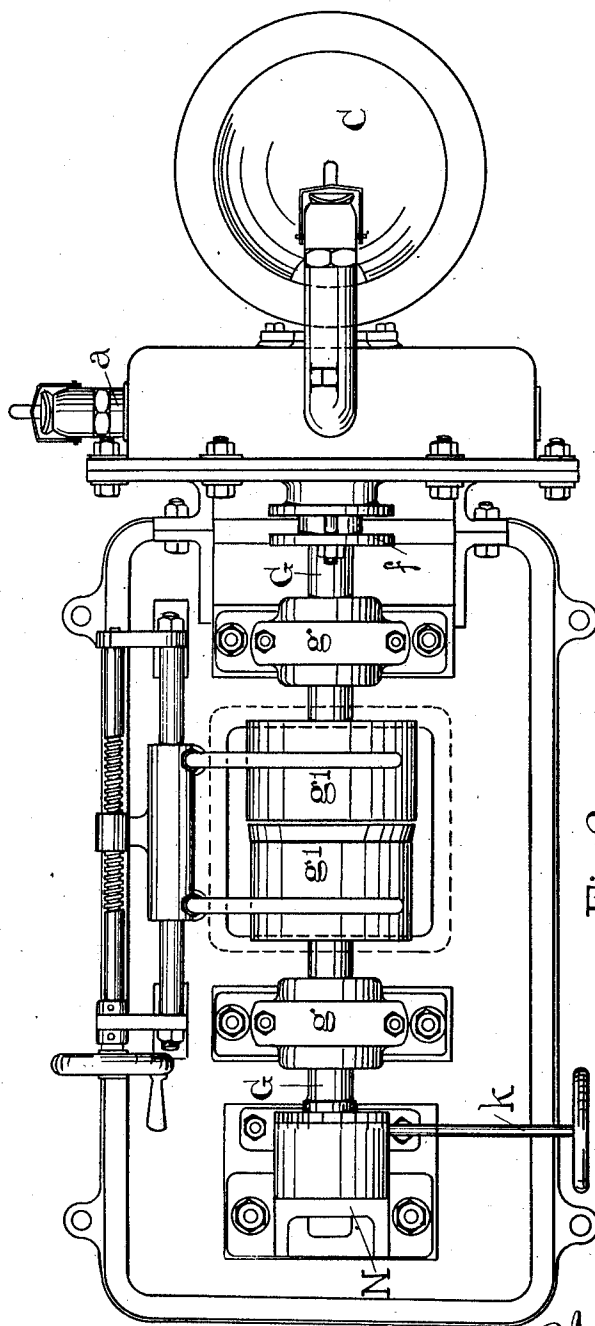


Fig. 2.

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4 Sheets-Sheet 3

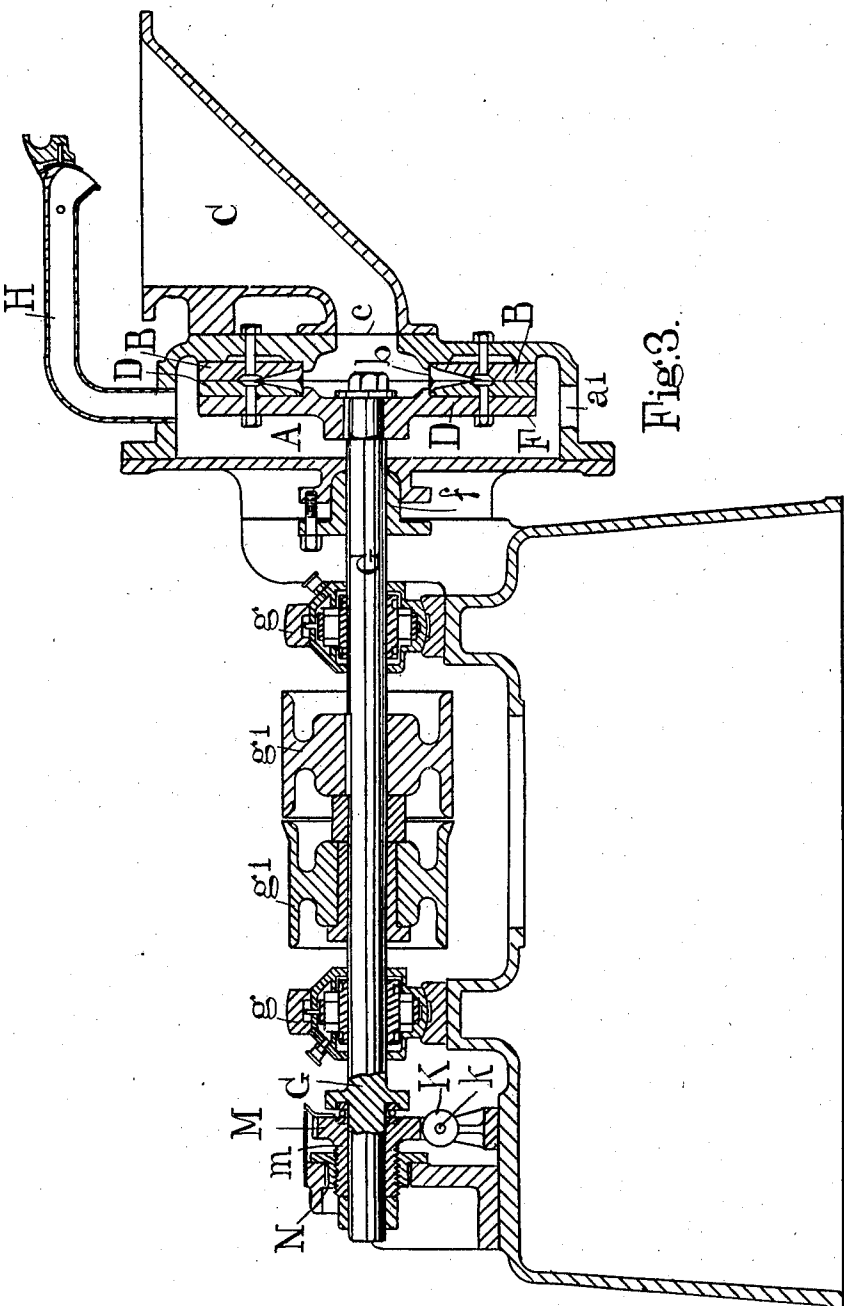


Fig. 3.

INVENTOR.

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4 Sheets-Sheet 4

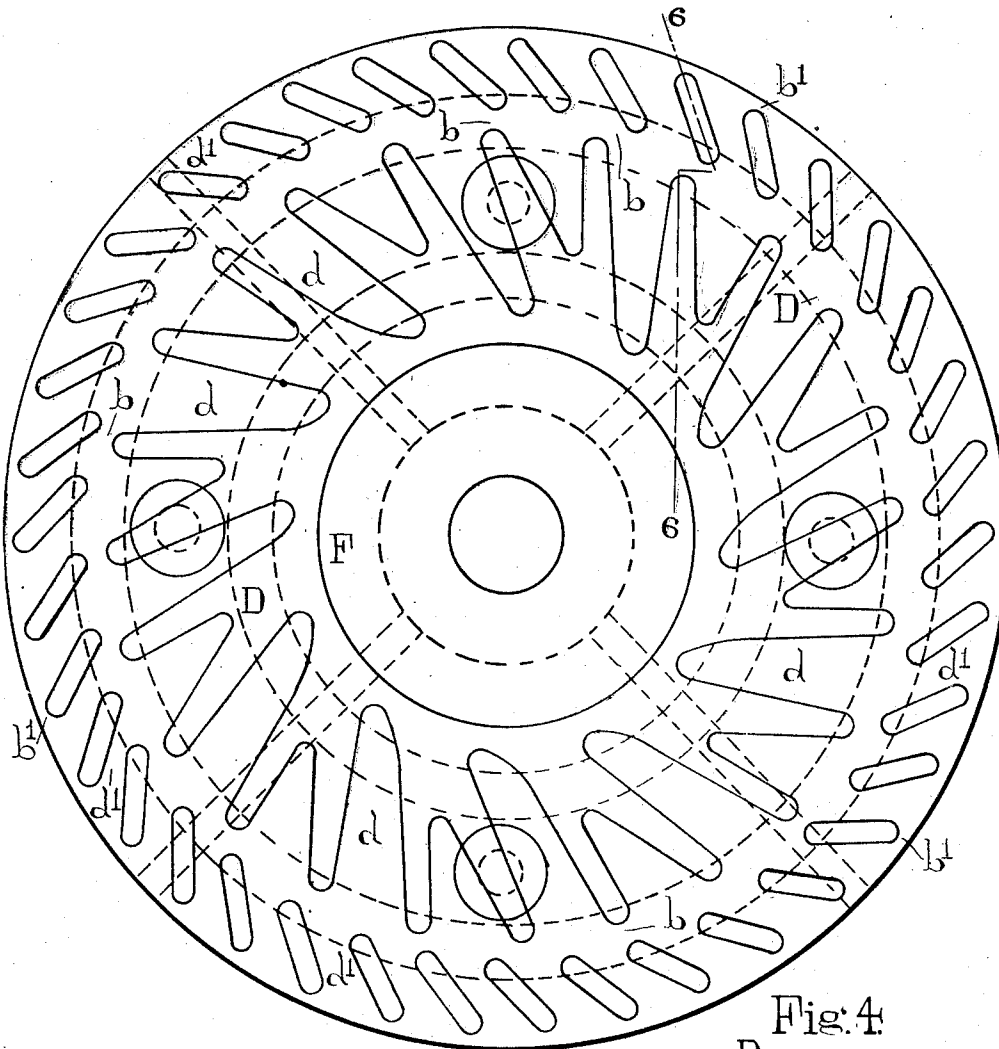


Fig. 4.

Fig. 6.

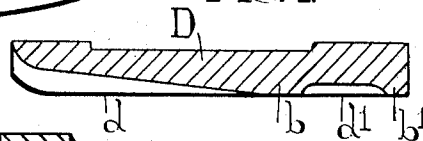
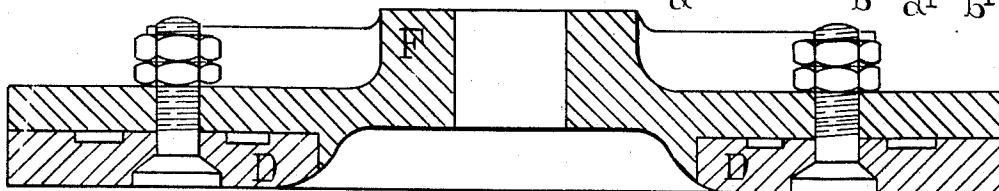


Fig. 5.

INVENTOR.

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UNITED STATES PATENT OFFICE.

JOSEPH M. FLEMING AND WILLIAM H. BARNES, OF MANCHESTER, ENGLAND.

GRINDING MILL.

Application filed June 25, 1923. Serial No. 647,742.

To all whom it may concern:

Be it known that we, JOSEPH MASON FLEMING and WILLIAM HENRY BARNES, both British subjects, residing at Manchester, county of Lancaster, England, have invented certain new and useful Improvements in Grinding Mills, of which the following is a specification.

This invention relates to grinding, mixing or incorporating mills applicable for treating substances in a liquid, semi-liquid or granular state, such as paints, colours, enamels, varnishes, compositions, dyes, chemicals, printing inks, pottery slip, chocolate, emulsions and other pastes, liquids, semi-liquids and powder of various descriptions.

The apparatus comprises an enclosed stationary chamber or container in which vertical or inclined grinding discs are placed, a stationary disc or discs with a central or eye feed affixed to the casing and a rotary disc mounted on a horizontal shaft operating against the face of the stationary disc or between two stationary discs, a feed hopper or pipe being fitted to the casing on the outside through which the material is fed to the centre of the disc.

The invention will be fully described with reference to the accompanying drawings.

Fig. 1 is a side elevation.

Fig. 2 is a plan.

Fig. 3 is a longitudinal section.

Fig. 4 is a front elevation of the driving plate F and grinding ring.

Fig. 5 is a sectional elevation of same on line 5-5.

Fig. 6 is a section of grinding ring on line 6-6.

The apparatus is constructed with an enclosed grinding chamber A at one end in which is fitted a stationary grinding disc or ring B bolted to the casing and provided with a central or eye feed at *b*. A hopper C or feed pipe is bolted to the outside of the casing from which the material to be ground is fed through an opening *c* in the casing.

A rotary grinding disc or ring D is mounted in the chamber A in close proximity to the fixed disc or ring B. It is bolted to a driving plate F on the end of a horizontal shaft G which projects through a suitable gland or stuffing box *f* into the chamber A.

The grinding chamber A is provided with

a discharge aperture or valve *a* at any distance above the bottom preferably about on a level with the feed inlet *c* and with a second discharge aperture and valve *a'* in the bottom through either of which the ground material may be discharged at a continuous and constant speed according to the length of time it is desired to maintain it in the apparatus.

To the discharge apertures *a a'* a pipe (not shown) may be fitted to maintain the material at any desired level within the grinding chamber. And to the top of the chamber may be fitted a pressure relief column or pipe of such a length that whilst providing relief from internal pressure, escaping fumes or gases may be condensed and returned to the chamber thereby minimizing loss by evaporation when dealing with a very volatile grinding medium.

This relief pipe H may be turned over the feed hopper so that the rotary disc D will act as a centrifugal pump when the discharge apertures *a a'* are closed and maintain a circulation through the pipe H. The material is thus returned to the grinding discs and passed therethrough any desired number of times until the desired consistency or degree of fineness is obtained.

If instead of being turned over the feed hopper the pipe H is turned to one side of the hopper, the discharge from the chamber A may be effected through it.

By any of these arrangements of discharge pipes and valves the flow of ground material can be regulated to any speed or stopped at will, irrespective of the degree of pressure applied to the grinding discs, and without stopping the machine. A liquid seal may also be fitted at the base of the feed hopper or inlet to minimize the admission of air into the casing or grinding chamber and consequent aeration of the product.

The grinding discs or rings B and D are made with two or more distinct grinding areas *d d'* on the same surface of each disc or rings of grinding surface divided by a plain or uncut ring *b* and a plain or uncut ring *b'* around the peripheral edge. The rotation of the grinding disc D maintains the material in constant agitation in the chamber A thereby preventing the heavier material from settling at the bottom.

By the retention of material in the chamber A during the process of grinding the

heat generated due to the friction of grinding between the rings or discs B and D will be uniformly dissipated into the comparatively large quantity of material contained in the casing, minimizing the risk of overheating any portions of the charge, reducing loss by evaporation, and permitting the use of relatively high speeds in grinding. If desired the chamber A may be water jacketed to keep it cool.

The horizontal driving shaft G is mounted in suitable bearings *g* and fitted with driving pulleys *g'*.

The pressure of the rotary grinding disc D against the disc B is regulated and adjusted by a worm K engaging a worm wheel M at the end of the driving shaft G. The boss *m* of the worm wheel M is provided with a fine pitch screw which is screwed into a fixed bearing N and the end of the shaft G or a shoulder upon the shaft bears against a ball thrust bearing on the face of the worm wheel M. The teeth of the worm wheel are sufficiently wide and of such a shape as to allow a to and fro movement of the wheel past the worm without throwing the worm out of gear. The axle *k* of the worm K is mounted in fixed bearings. By this construction adjustment of the grinding discs in very fine stages is obtained which will not slack back during prolonged running.

What we claim as our invention and desire to protect by Letters Patent is: —

1. A grinding, mixing or incorporating apparatus comprising in its construction an enclosed stationary grinding chamber adapted to contain a fluid mixture, a fixed vertical grinding ring fitted therein with central feed aperture, a feed device fitted thereto feeding into the aperture in the fixed grinding ring,

a vertical rotary grinding disc mounted within the grinding chamber, a horizontal driving shaft to which the rotary grinding disc is affixed, a frame and anti-friction bearings to support the driving shaft and grinding disc, driving pulleys on the shaft, a thrust collar on the driving shaft, a screwed boss carried in a screwed bracket abutting against the thrust collar of the shaft and a worm wheel on the boss and a worm to rotate it to apply the desired pressure to the grinding discs.

2. Grinding, mixing or incorporating apparatus comprising in its construction an enclosed stationary grinding chamber adapted to contain a fluid mixture having discharge apertures *a a'*, a fixed vertical grinding ring fitted therein with central feed aperture, a feed device fitted thereto feeding into the aperture in the fixed grinding ring, a vertical rotary grinding disc mounted within the grinding chamber, a horizontal driving shaft to which the rotary grinding disc is affixed, a frame and anti-friction bearings to support the driving shaft and grinding disc, driving pulleys on the shaft, a thrust collar on the driving shaft, a screwed boss carried in a screwed bracket abutting against the thrust collar of the shaft and a column fitted to the top of the grinding chamber whereby the material may be discharged or circulated and means for closing the discharge apertures *a* and *a'*.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

J. M. FLEMING.
WM. H. BARNES.

Witnesses:

J. OWDEN O'BRIEN,
BRIAN O'BRIEN.