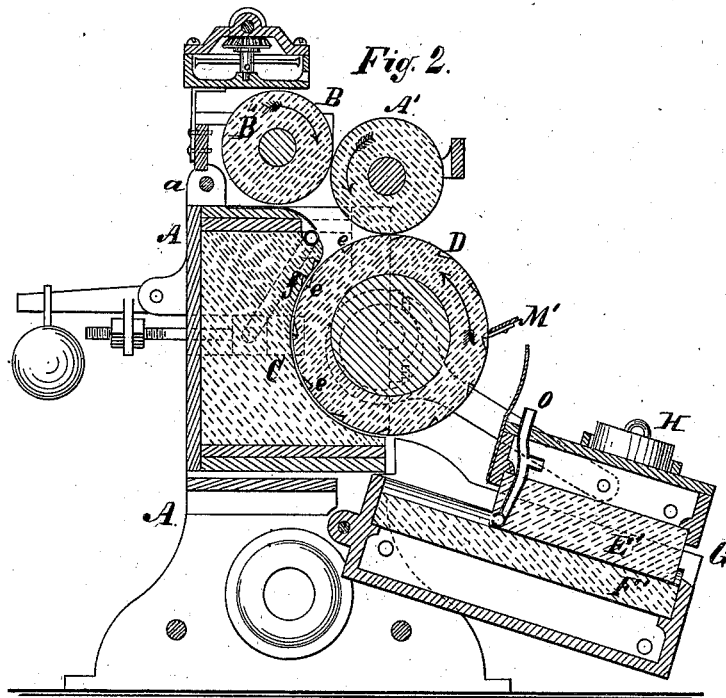
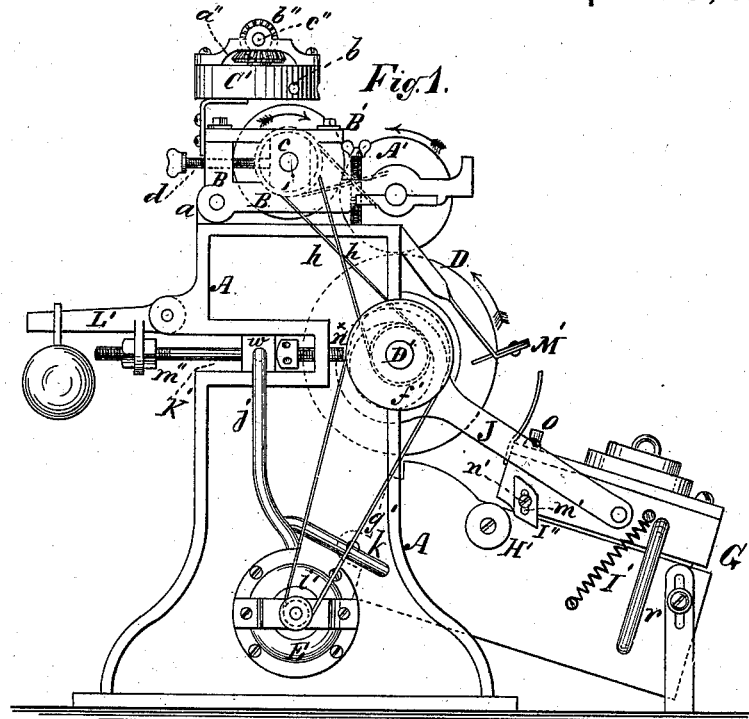


J. FITZGERALD.
Grinding-Mill.

No. 214,768.

Patented April 29, 1879.



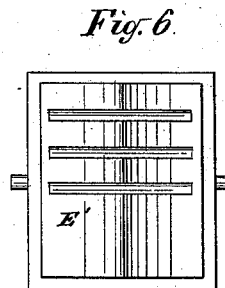
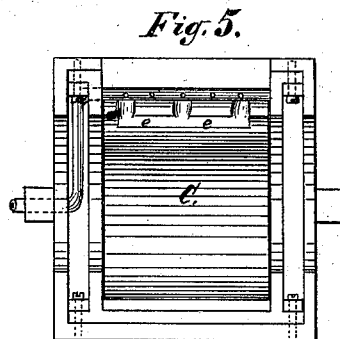
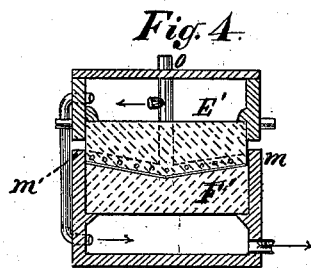
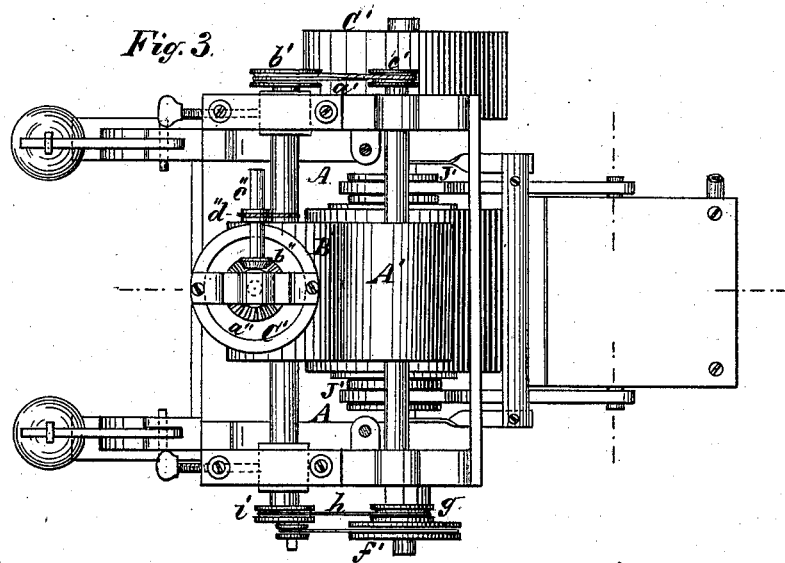
Witnesses:
Henry Eichling.
H. Wells Jr.

Inventor
John Fitzgerald
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UNITED STATES PATENT OFFICE.

JOHN FITZGERALD, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN GRINDING-MILLS.

Specification forming part of Letters Patent No. **214,768**, dated April 29, 1879; application filed August 8, 1878.

To all whom it may concern:

Be it known that I, JOHN FITZGERALD, of Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Grinding-Mills, of which the following is a specification.

This mill is designed for grinding either wet or dry materials, and it comprises certain novel combinations of parts, whereby a strong, simple, and efficient apparatus, capable of reducing the materials to any desired degree of fineness or comminution, is secured.

Figure 1 is a side elevation of an apparatus made according to my invention. Fig. 2 is a vertical longitudinal sectional view of the same. Fig. 3 is a plan view of the same, and Figs. 4, 5, and 6 are detached detail views of certain parts thereof.

At the top of the main frame A is a horizontal frame, B, pivoted at one end, *a*, to the main frame, and carrying two crushing and grinding rollers, A' B', so geared together, either by a belt, *a'*, and pulleys *b' c'*, as in the drawings, or by spur-gearing, that the roller A' shall have a circumferential motion somewhat more rapid than the roller B'.

When the apparatus is to be used as a paint-mill a hopper, C', having holes *b* to permit the flow of the wet material to the rollers A' B', is provided above said rollers, and is furnished with an internal stirrer rotated by gears *a'' b''* from a shaft, *c''*, which receives motion by a belt, *d''*, from the shaft of the roller B'.

The roller B' has bearings in sliding blocks or boxes *e*, which are adjustable by screws *d* to regulate the distance apart of the rollers A' B', according to the character and requirements of the material to be ground.

Below the rollers A' B' is a concave, C, into which plays a grinding drum or cylinder, D, the cylindric surface of which is scored across by recesses *e*, triangular in cross section, more fully represented in Fig. 2. The concave C, near its upper edge, is, or may be, formed with similar recesses *f*.

On one end of the cylinder-shaft D' is a driving-pulley, C', and on the other is a pulley, *g*, from which extends a belt, *h*, to a pulley, *i*, on the shaft of the roller B'. Another pulley, *f'*, on the shaft D' of the cylinder connects by

a belt, *g'*, with a pulley, *i'*, on the shaft of a fan-blower, E, from the outlet of which latter extend two air or blast pipes—one, *j*, connecting with the space between the cylinder and concave; the other, *k*, connecting with the space between the upper and lower stones of the muller G.

The muller G is composed of the two stones E' F'. The lower stone, F', has its upper surface sloping downward and inward from each lateral edge, or, in other words, is of a trough-like form, and receives the upper stone, E', the surface of which, being just the reverse of the other, fits snugly therein, but is capable of longitudinal motion, as herein presently explained.

The form given to the two stones E' F' is more fully shown in the cross-section, Fig. 4. To further aid in keeping the upper stone in place, the lower one may be provided with the side flanges *m*. A weight, H, may be placed upon the upper stone to increase its abrading power when desired. This may also be accomplished by springs I', arranged to pull downward upon said upper stone. Upon the sides of the lower stone are friction-rollers H', and on the sides of the upper stone are inclined planes I''. A longitudinal or reciprocating motion is given to the upper stone by means of rods J, which extend from eccentrics (or, in lieu of eccentrics, cranks) J' on the shaft of the cylinder. As the upper stone is drawn inward the inclines I'' ride upon the friction-rollers H' and lift the inner end of the upper stone to permit the ready feeding of the material between the two stones of the muller. The inclines, or, in other words, the blocks, upon which they are formed, are made vertically adjustable upon the upper stone by means of slots *m'* and set-screws *n'*, in order that the lift of said upper stone may be raised at will.

The pipe *k* from the fan-blower connects with the hollow interior of the lower stone, and from the latter extends a flexible pipe, *r*, which, in like manner, connects with the hollow interior of the upper stone. From the latter a portion of the air passes down to the space between the stones, while the surplus passes off through an outlet, *o*.

The stones are cooled, not alone by the air

forced between the stones, but also by the flow of air through the hollow interiors of the stones. By closing the outlet *o* to a greater or less extent the air may be injected between the stones with any required degree of force.

The concave is placed within a suitable frame or boxing provided in the frame of the machine, and is supported on two studs, *w*, projecting one from each end of the concave and fitting into slots or guides *k'* in the frame. The concave is pushed forward toward the cylinder by the loaded bent levers *L*, the lower arms of which are formed by adjustable screws *m''*.

Set-screws *n** limit the movement of the concave toward the cylinder, according as the mill is adjusted to grind one material or another.

The pipe *j*, by which air from the fan-blower is supplied to the space between the concave and the cylinder, fits to a passage extending through one of the studs *w*, through the interior of the concave, the air finally making its exit through one or more openings to the space between the cylinder and the concave. At *M'* is a scraper arranged to prevent the undue adhesion of material to the outer face or side of the cylinder.

In the operation of the apparatus the material to be ground passing between the rollers *A' B'* is not only crushed, but, from the fact that the surface of one roller moves faster than that of the other, the material is simultaneously subjected to a rubbing action, which very greatly promotes its disintegration. It then passes between the cylinder and concave, and is subjected to a further grinding and abrading action, and from there it passes between the stones of the muller, and is triturated to a still further and more uniform degree of fineness.

It is to be observed that the material while passing between the cylinder and the concave is kept cool by the injected air, as is also the case with the said material while passing through the muller.

It will also be seen that a more or less grinding effect may be obtained from the rollers *A' B'*, which, although moving in opposite directions, may be brought more or less in contact by screws *d* with the effect just noted.

I do not here claim the muller as a distinct apparatus, inasmuch as I propose to claim it in another and separate application for Letters Patent.

Of course the rollers *A' B'*, the concave, the cylinder, and the stones of the muller may be of stone, iron, or other suitable substance or material.

What I claim as my invention is—

1. The muller *G*, constructed substantially as described, in combination with the cylinder *D* and concave *C*, the muller being operated from the shaft of the cylinder, the whole combined for operation, substantially as and for the purpose herein set forth.

2. The apparatus composed of the cylinder, concave, muller, and fan-blower, all connected substantially as set forth, to operate in unison, for the purpose specified.

3. The combination of the friction-rollers *H'* on the lower stone of the muller, the inclined planes *m'* on the upper stone of the muller, the eccentrics on the shaft of the cylinder, and the rods *J*, all substantially as and for the purpose specified.

JOHN FITZGERALD.

Witnesses:

H. WELLS, Jr.,
A. R. PAGE.