(No Model.)

3 Sheets—Sheet 1.

R. W. WELCH.

ROLLER MILL.

No. 572,589. Patented Dec. 8, 1896.

Fig. 1.

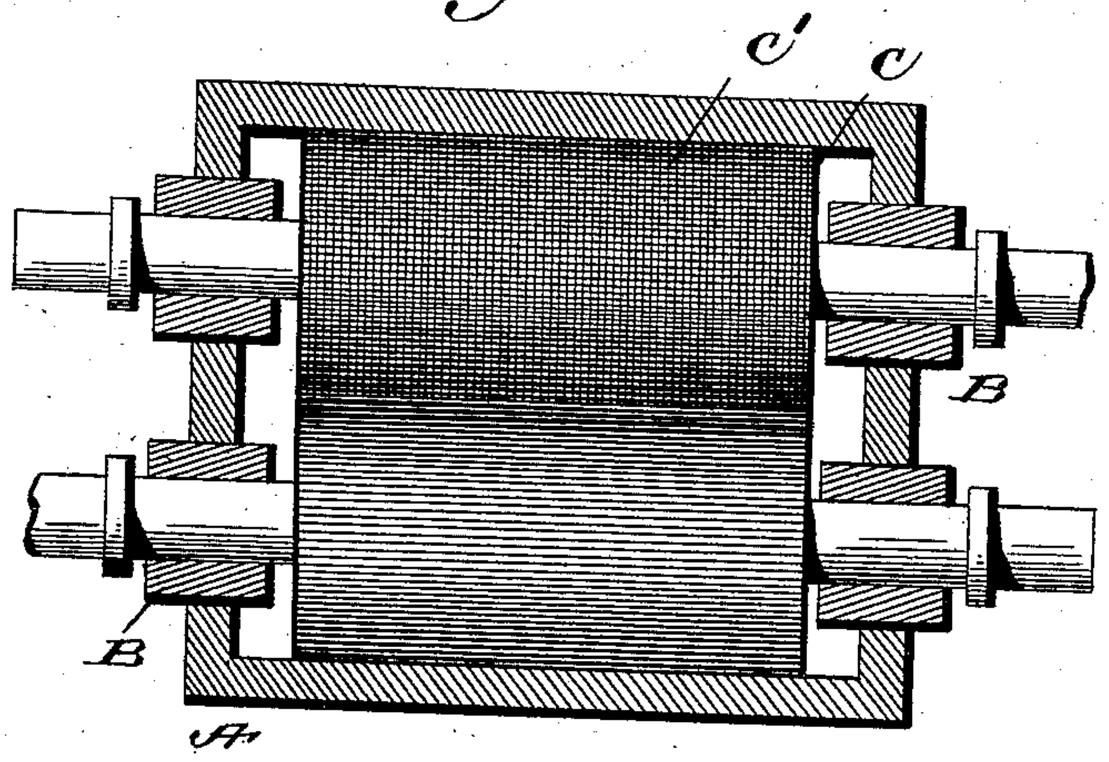

Fig. 2.

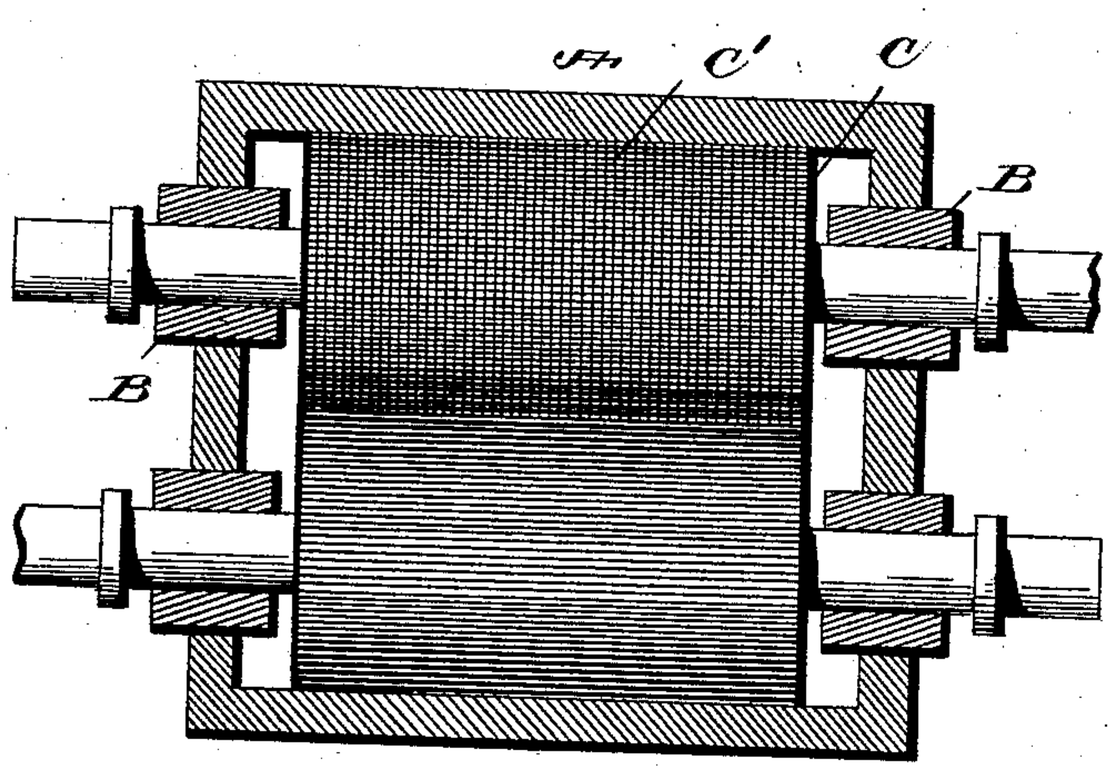

Fig. 1a

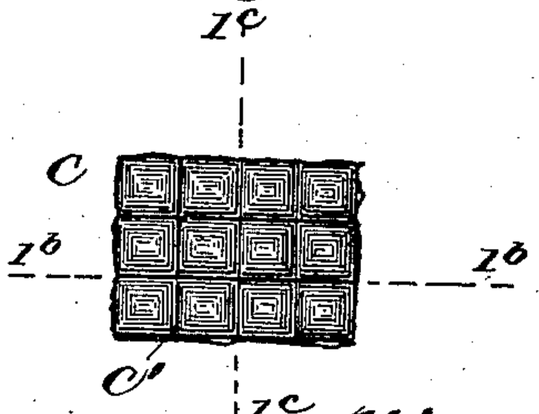

Fig. 1b

Fig. 1c

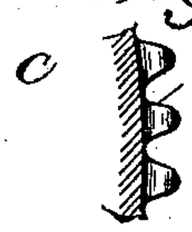

Fig. 2a

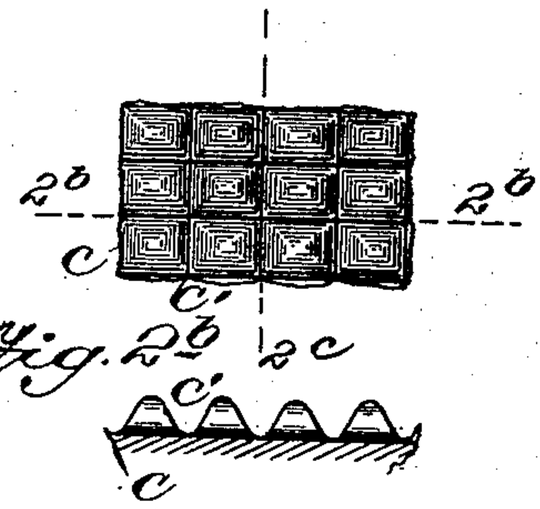

Fig. 2b

Fig. 2c.

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Fig. 3.

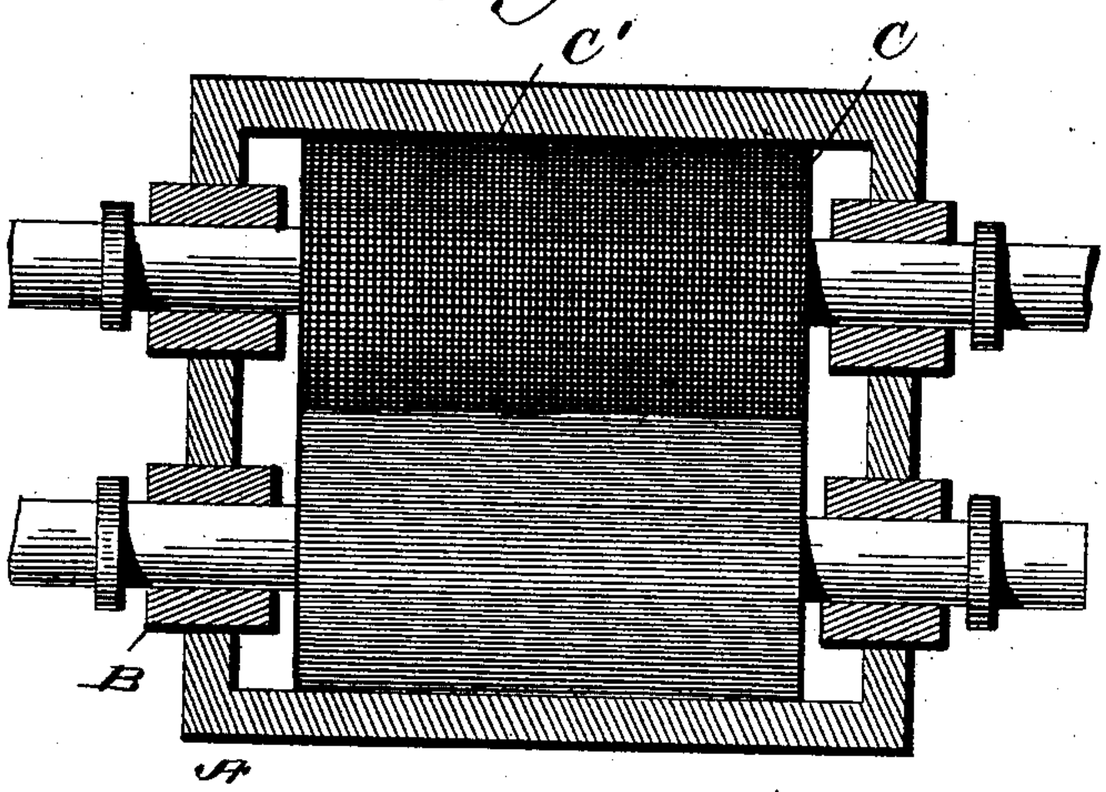


Fig. 3a

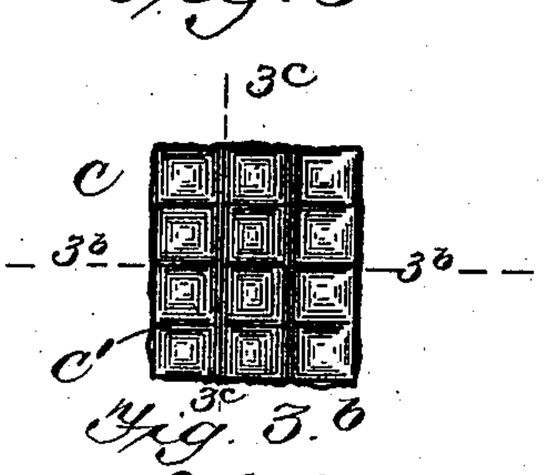


Fig. 3b

Fig 3c

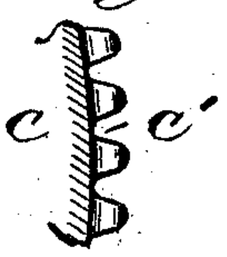
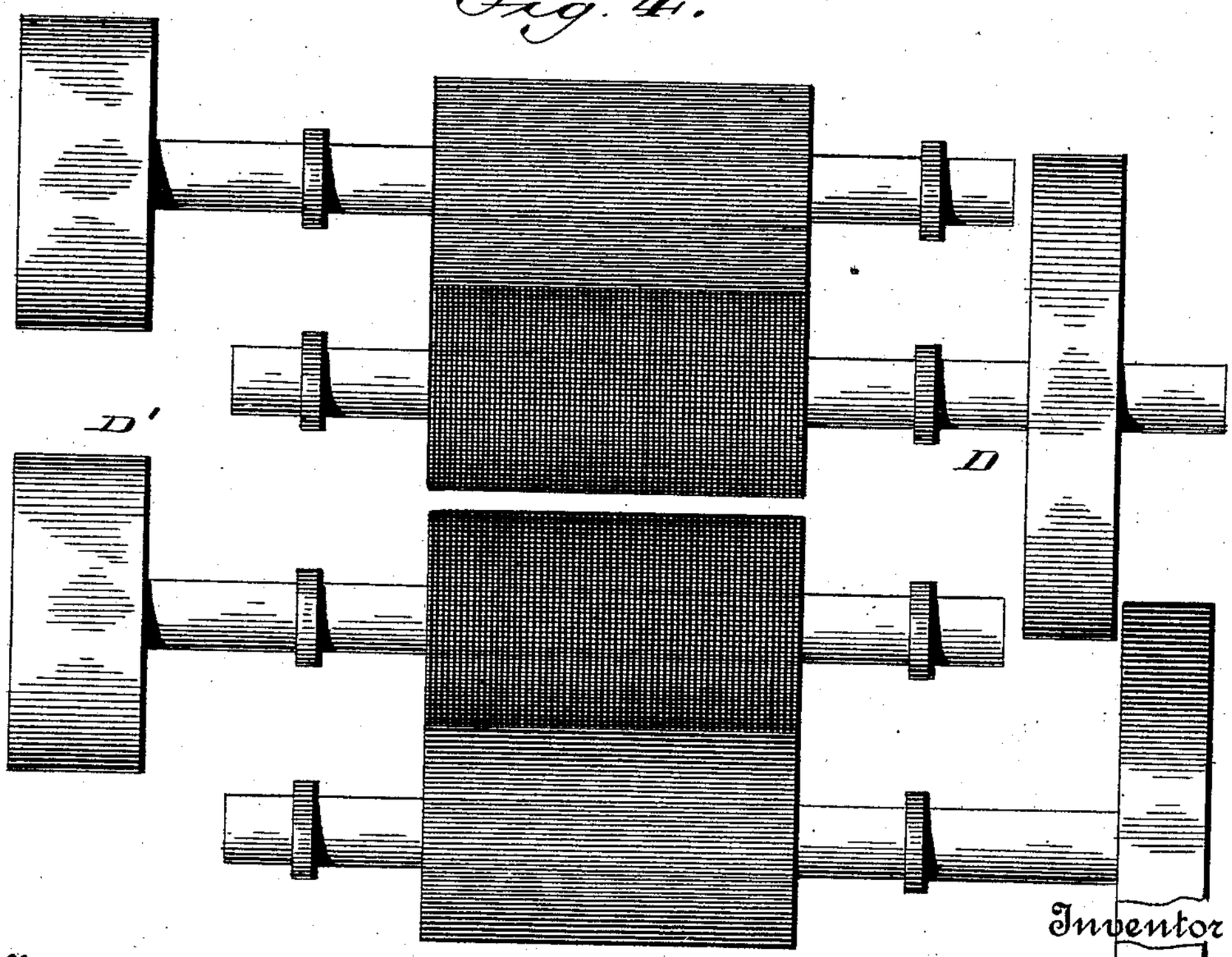


Fig. 4.



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(No Model.) 3 Sheets—Sheet 3.

R. W. WELCH.

ROLLER MILL.

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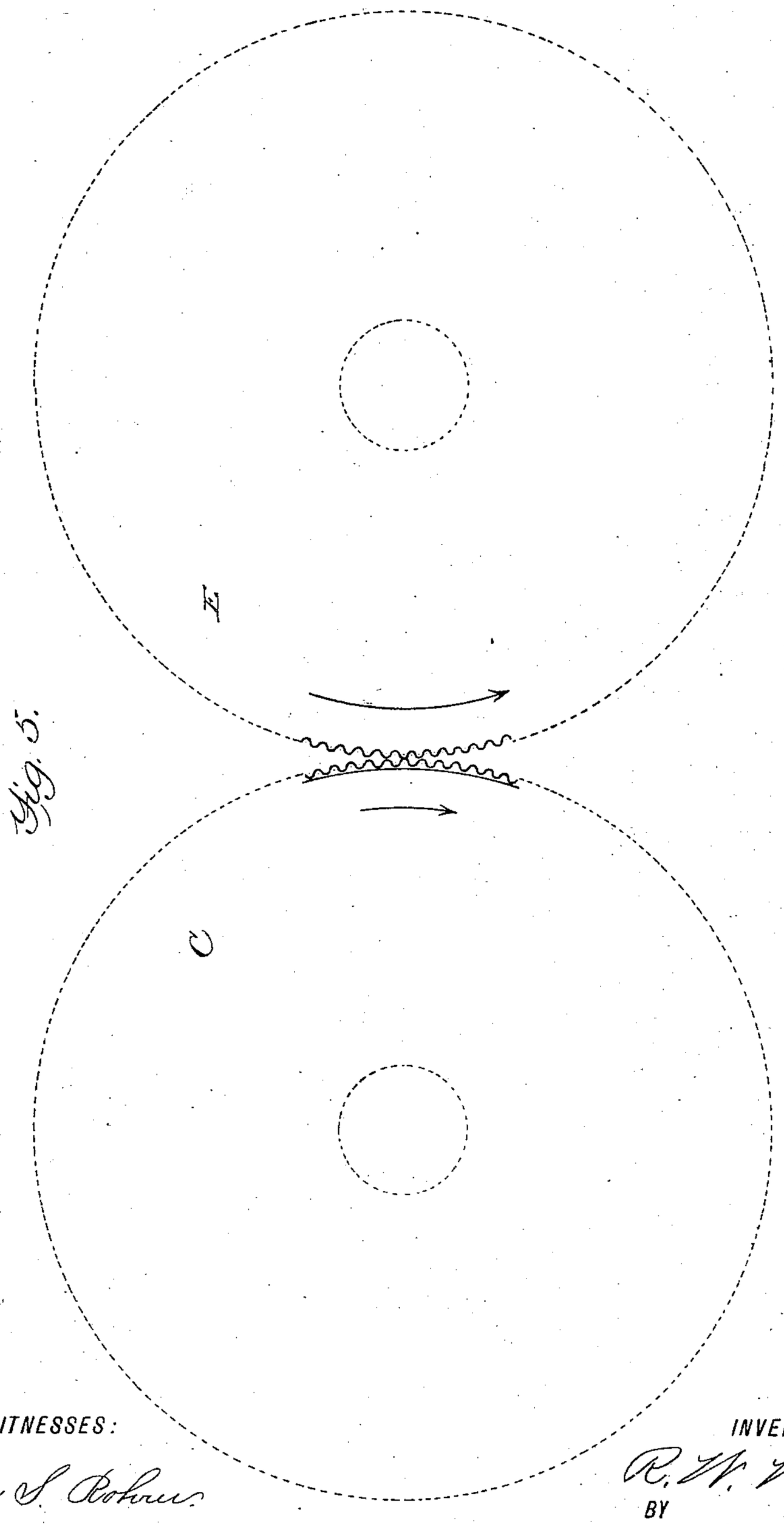

Fig. 5.

WITNESSES:

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BY

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ATTORNEYS.

UNITED STATES PATENT OFFICE.

ROSIA W. WELCH, OF BALTIMORE, MARYLAND, ASSIGNOR OF FIVE-SIXTHS TO MICHAEL A. McCORMICK, MICHAEL MULLEN, AND JOSEPH S. TAYLOR, OF SAME PLACE.

ROLLER-MILL.

SPECIFICATION forming part of Letters Patent No. 572,589, dated December 8, 1896.

Application filed January 20, 1896. Serial No. 576,067. (No model.)

To all whom it may concern:

Be it known that I, ROSIA W. WELCH, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Roller-Mills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In the production of flour it is desirable to remove the germ and the bran as completely as possible and to use the smallest practicable number of rollers. It is further indispensable to high-grade flour that its natural granular character should not be destroyed by rubbing the particles between the reducing-surfaces. With these facts in view I employ two or three pairs of coacting rollers so formed that the material is nowhere rubbed between parallel surfaces and drive the rollers of each pair at different rates of surface speed. To obtain such coacting surfaces without sacrificing the proper reducing effect, the working surface of one roller of each pair is formed into a series of ribs by small, accurately-cut, or milled grooves parallel to its axis, and the companion roller is correspondingly ribbed and also provided with similar grooves running around it circumferentially and dividing the ribs into rectangular approximately-pyramidal projections. The rollers thus formed are adjustably mounted in the usual way to run in close proximity.

In the drawings, Figure 1 is a plan view of one pair of rollers. Figs. 1^a, 1^b, and 1^c are enlarged fragmentary views showing, respectively, the surface, an axial section, and a transverse section of the circumferentially-grooved roller of Fig. 1. Figs. 2, 2^a, 2^b, and 2^c are views strictly analogous, respectively, to those just mentioned, but showing the circumferential grooves as more widely separated or fewer to the inch than the longitudinal grooves. Figs. 3, 3^a, 3^b, and 3^c show in like manner the annular grooves as deeper than the longitudinal grooves, as well as fewer to the inch. Fig. 4 shows in plan two sets of rollers like those of Fig. 1, but with driving-pulleys mounted upon the shafts respectively, the speed being supposed inversely proportional to the diameter of the pulleys. Fig. 5 is an enlarged end view of the rollers of Fig. 3, the arrows indicating by difference in length the fact of difference in surface speed.

In the views, A and B designate, respectively, a casing and roller-bearings of any approved form.

In Figs. 1 and 5, C E are rollers approximately in contact and forming a coacting pair. They may be considered as originally smooth and perfect cylinders of steel having uniform equidistant grooves *c*, Figs. 1^a, 1^b, and 1^c, milled in their surfaces parallel to their axes, the roller E not being otherwise cut, but the roller C being further provided with circumferential grooves *c'* at the same intervals as the grooves *c*. The projections and ridges thus formed are not sharp-edged and of course do not mesh in any case, but the paths of the extreme outer parts of the two rollers very nearly osculate. The two rollers thus formed are arranged to run at different rates of surface speed, and preferably, but not of absolute necessity, the one having longitudinal grooves only has the higher rate. It is indispensable that the speeds should differ, else there would be only crushing and the slipping of particles of the crushed grain down the inclines of the little ribs and pyramids, and the proper disintegration would not occur.

If grain be fed to the rollers thus formed and arranged, the kernels are crushed between the grooved faces and torn into small particles by the more rapid movement of one of the crushing-surfaces, but practically no part of the berry is rubbed into impalpable powder, because there are no considerable surfaces running parallel or nearly so, and, further, because the granules are not repeatedly acted upon, but instantly pass into the circumferential grooves and escape. It is probable that the unbroken longitudinal ribs of the one roller, by their rapid rotation, draw air through the circumferential grooves of the other, aiding the instant escape of the flour and cooling the rollers. In any case the absence of tendency to heat in operation is

marked. Practically, this construction and arrangement gives a far larger percentage of patent or strictly granular white flour than is obtained with other corrugated rollers with which I am acquainted, and, further, cutting of the germ and bran is so far avoided that the lower grades of flour produced are unusually clean and white, as well as more nearly all granular. Still further, with all this gain in product the number of sets of rollers needed is greatly reduced, with a corresponding saving in primary cost, in repairs, and in power.

As is well known, winter wheat is hard and brittle, while spring wheat is softer and more inclined to be plastic or gummy, as a rule, although there are material variations in different samples of both kinds. Whatever the character of the grain, these rollers, if properly adjusted for the particular case, give good results; but to facilitate adaptation to different degrees of fineness that may be desired in the product and to secure the desired approximately perfect granular character indispensable to high-grade flour, whatever the character of the grain from which it is made, it is advantageous to make the annular grooves of one pair of rollers fewer to the inch than the longitudinal grooves, and also to make the annular grooves of one pair deeper than the longitudinal grooves. The wider spacing is shown in Figs. 2 and 3 and the deeper cutting in Fig. 3.

What I claim is—

1. In a roller-mill, the combination with a roller having its convex face formed into a series of fine longitudinal ribs by grooves parallel to its axis, of a coacting roller similarly grooved and also provided with analogous circumferential grooves, substantially as set forth.

2. The combination with a roller having its convex face formed into ribs by small grooves parallel to its axis, of a coacting roller similarly grooved and further provided with analogous circumferential grooves deeper than the longitudinal grooves which they cross.

3. The combination with a roller having its convex surface milled both longitudinally and circumferentially to form approximately pyramidal projections, of a coacting roller milled longitudinally only, and means for imparting to the two different rates of surface speed.

In testimony whereof I affix my signature in presence of two witnesses.

ROSIA W. WELCH.

Witnesses:
WARREN C. STONE,
ALEX. MAHON.