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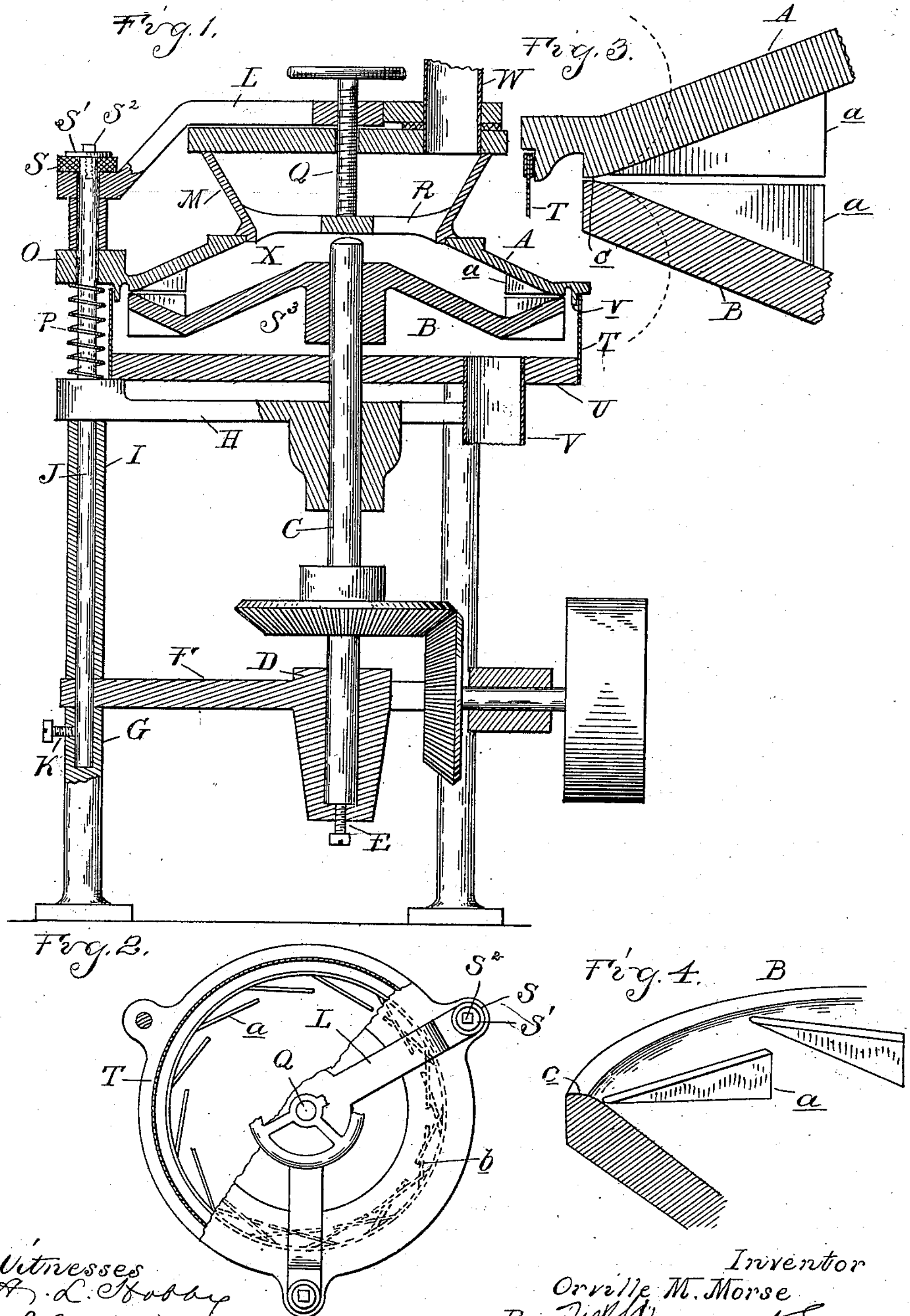
O. M. MORSE.

FLOUR MILL.

(Application filed Dec. 14, 1898.)

(No Model.)



Witnesses
A. L. Hobby
P. M. Hulbert

Inventor
Orville M. Morse
By Thos. S. Sprague & Son
Attys.

UNITED STATES PATENT OFFICE.

ORVILLE M. MORSE, OF JACKSON, MICHIGAN.

FLOUR-MILL.

SPECIFICATION forming part of Letters Patent No. 647,757, dated April 17, 1900.

Application filed December 14, 1898. Serial No. 699,225. (No model.)

To all whom it may concern:

Be it known that I, ORVILLE M. MORSE, a citizen of the United States, residing at Jackson, in the county of Jackson and State of Michigan, have invented certain new and useful Improvements in Flour-Mills, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to a machine for grinding middlings; and it consists, essentially, in a machine embodying narrow smooth grinding-surfaces upon opposite grinding members arranged in grinding relation to each other, with power-feeding devices for forcing the material through between said grinding-faces to thereby subject them to an abrasive action and disintegrate or grind them.

The invention further consists in the construction, arrangement, and combination of the various parts, as hereinafter set forth.

In the drawings, Figure 1 is a vertical central section through a grinding-mill embodying my invention. Fig. 2 is a top plan view with parts broken away on one side to show the lower disk. Fig. 3 is an enlarged section through the grinding-faces of the grinding-disks. Fig. 4 is a sectional perspective view of one of the grinding-disks.

The mill preferably comprises two grinding-disks A and B. These disks are so arranged or combined with actuating mechanism that there is produced a relative rotary movement between the two—that is, one disk stands still and the other moves, as shown in the drawings in this case—or the two disks move in opposite directions, or the two disks move in the same direction with different speed.

What I consider the simplest and, as far as I now know, the most efficacious plan is to have one disk stationary and the other a movable disk. In this case I have shown the disk B as the driven disk and the disk A as the stationary disk. To this end the disk B is supported upon a shaft C, which at its lower end is supported in the stepped bearing D and may be adjustable vertically by means of an adjusting-screw E. The shaft C is driven by any suitable gearing, such as that shown in the drawings. The bearing D is supported in the cross-head or spider F, which at its end is supported on the standards G. In this case I have shown three standards, and the cross-head F has three arms, one extending to each standard.

H is a second cross-bar or spider, which is provided with a suitable central bearing for the shaft C and is supported by the sleeves I, resting upon the spider E.

Within the sleeves I are the posts or standards J, their lower ends preferably resting in sockets in the standards G and held therein, as by the set-screws K. These standards at their upper ends are connected by the bridge-tree L, and beneath this bridge-tree is a hopper M, which rests upon the upper disk A, which is ring-shaped, the hopper leading into the eye of the upper disk A and resting upon the upper edge of the disk, as plainly shown in the drawings.

The disk A on its edge is provided with the apertured ears O, which engage upon posts or stands J and have a free sliding movement thereon. Between these ears and the cross bar or head H are springs P, of sufficient length and tension to normally support the disk A out of contact with the disk B.

The disk A may be adjusted down toward the disk B by compressing the springs P, and this is done, preferably, by means of a screw Q, passing through a screw-threaded bearing in the bridge-tree L and bearing upon a bridge or cross-bar R in the middle of the hopper. Thus the upward strain upon the disk A is carried by the bridge-tree to the standards J. Above the bridge-tree upon the standards J are cushions S, either rubber or other elastic material, and these cushions I show as held in place by means of the washer S′ and the screw S^2.

From this description it will be seen that the disk A is held in grinding relation to the disk B by a holding device which makes an elastic cushion, so that if undue power should be exerted upward upon the disk A it might rise by compressing one or more of the cushions S. Thus if a nail or other hard substance were fed through the machine the upper disk would rise sufficiently at the point where the nail was fed through to allow it to pass without damage to the disks.

Below the disk B is a chamber S^3, formed by the board or plate U, and a skirt T, around the edge of the board U, rising to the disk A and in contact with a flange v thereon. From this chamber is a discharge-spout V.

W is a feed-spout which leads into the top of the hopper.

The two disks are so shaped as to form between them a feed-cavity X. This feed-cavity is preferably of some considerable size, and the material is fed from the hopper thereinto. This feed-cavity preferably narrows or contracts toward the periphery, and near the outer edge are the wings or ribs a, which extend to a point near the periphery of the disks and which are arranged at a sharply-acute angle to the edge of the disk, as plainly shown in Fig. 2. Each of the disks is provided with similar ribs, except that the ribs in the one disk are oppositely arranged to those in the other, as shown in dotted lines at b in Fig. 2. At the outer edge of each disk are the smooth curved grinding-surfaces c, the curve of these surfaces being arranged so that the nearest point of approach of the surfaces of the two disks is near the outer edge. These opposite-curved smooth grinding-faces I preferably form the same as two meeting faces of grinding-rolls, and to make this plain I have dotted in, in Fig. 3, the circles of which these faces are segments. I do not deem it essential that these curved surfaces shall be segments of a true circle; but I deem it desirable that they should be curved surfaces and should approach each other gradually from the inside toward the outside of the disks, as shown in the drawings.

In the operation of this machine, which in this case is shown especially designed to work upon middlings, the material is fed into the hopper M, and from thence will find its way, either by centrifugal action or by gravity or by other means, into the path of the ribs a, when by the action of the ribs upon their opposing disks the material will be positively fed outward through the restricted space between the rounded smooth marginal grinding-faces. The effect of this is twofold. There is a grinding effect, due to the forcing of the material between the two smooth surfaces radially, which, in effect, is substantially the same as passing the material through a pair of grinding-rolls and added to this effect is the abrasive action due to the rotation of one disk upon the other, this abrasive action taking effect at an angle to the radial path of the material. In other words, there is a crushing action radially and an abrasive action transversely to the crushing action. The effect of this is to break up the larger bits of flour-making material in the middlings without compacting it or flattening it, as is done to a considerable degree where the rolls alone are used. It also seems to separate the individual particles or cells from one another without breaking them into fragments or impalpable powder, which deteriorates the quality of the flour.

I find from actual experiment and use that not only do I obtain from this mill a much larger percentage of the flour from the middlings at each reduction than by the use of the rolls alone, but I also obtain a better grade of flour, leaving the middlings in better shape for further treatment and reduction, because of not being compacted, which, as previously explained, is done to a more or less degree where the roll action alone is used.

It will be seen that the construction which I employ is exceedingly simple and easy to manufacture. The adjustment of the disks one to the other may be accomplished by turning either the screw E or the screw Q, and the very finest adjustment between the two grinding-faces may thus be obtained. It will be observed that my mill does not belong to that class of feed-mills having corrugated disks, with the corrugations extending to the periphery thereof, the grinding being effected by the corrugations or teeth in the disks, and the feeding being effected solely by the slight angle at which these grooves are arranged.

The grinding in my mill is done while the material is being forced between the smooth grinding-surfaces, and it requires two things—first, that these grinding-surfaces shall be arranged in "grinding relation" to each other and have a relative movement, and, second, that there shall be a power-feed mechanism of sufficient energy to force the material through the space between these grinding-surfaces.

My device is intended for use in grinding middlings. It has been found useful in grinding the stock—for instance, say, at the fifth reduction—after it comes from the rolls in a more or less flattened condition. The result of passing it through my machine is to disintegrate it and separate the cells, so that it bolts much freer. It is obvious from this that the grinding-faces in my machine must be arranged in substantially the same relation to each other as are the grinding-faces of the ordinary grinding-rolls—that is, practically in contact—so that whatever material is forced through them will be abraded. It is also necessary that these faces should be held together with sufficient power to prevent the force-feed devices from unduly separating, so as to allow the material to go through without the proper abrasive action. This arranging the grinding-faces in the relation described is what I call arranging the faces in "grinding relation"—that is, so near together that the middlings cannot drift through, but must be forced through by power-feed devices, and will be abraded while thus on the grinding-faces.

I am aware that there has been a millstone dress in which there was a plain margin; but in such dress the material was ground of necessity before it reached such plain margin to such a size that it would drift or pass through this plain margin without abrasion if it had been ground to the desired size by the machine, and the only grinding which could take place on such marginal surface was upon such extra-large pieces of irregular shape which might enter sidewise and possibly be ground by being turned over while between such marginal faces; but such millstone dress as last referred to had no force-feed means sufficient to force middlings between grinding-surfaces when held together in what I call "grinding relation."

While I show the grinding-disks in this case arranged in a horizontal plane, this is not essential, as experiments show that they may be arranged in a vertical plane.

What I claim as my invention is—

1. In a grinding-mill, the combination of two grinding members having a cavity between them and grinding-surfaces at the points of nearest approach, means for effecting a relative movement between the grinding-surfaces, and means arranged out of grinding position for positively forcing the material between the grinding-surfaces directly from the cavity.

2. In a mill for grinding middlings and like stock, the combination of two grinding-rings having a cavity between, a smooth, restricted, grinding-surface at the point of nearest approach of said rings, and force-feed or conducting-wings, in the cavity, the approximate faces of said wings being on planes separated farther than the grinding-faces.

3. In a mill for grinding middlings and like stock, the combination of two disks, oppositely arranged, and having a feed-cavity between, marginal, restricted grinding-faces on said disks, and feed-wings on the opposing faces of said disks, oppositely inclined, said wings being arranged substantially tangential to a circle drawn around their inner ends, and said wings being out of grinding relation, substantially as described.

4. The combination of two relatively-revoluble grinding-rings dished upon their opposing faces and formed with a smooth grinding margin at their point of nearest approach, and having force-feed or conducting-wings upon the dished portion of said faces, the upper edges of said wings being in planes respectively below and above the planes of said grinding-margins so that they do not come into as close proximity to each other as do said grinding-margins.

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

ORVILLE M. MORSE.

Witnesses:
JAMES WHITTEMORE,
M. B. O'DOGHERTY.