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E. HARRISON.

GRINDING-MILLS.

No. 193,652. Patented July 31, 1877.

Fig. 1

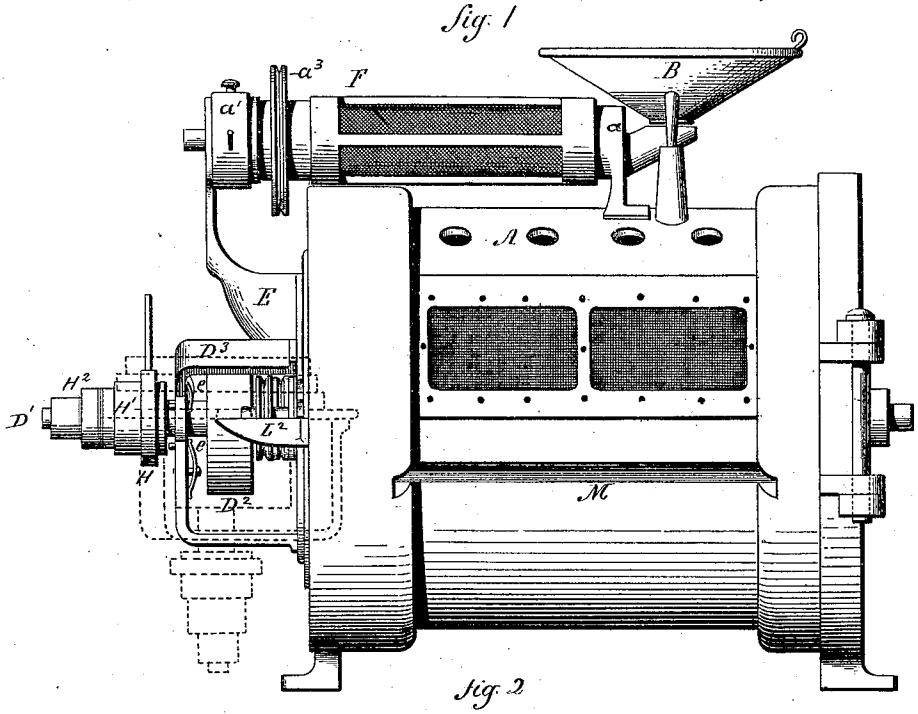
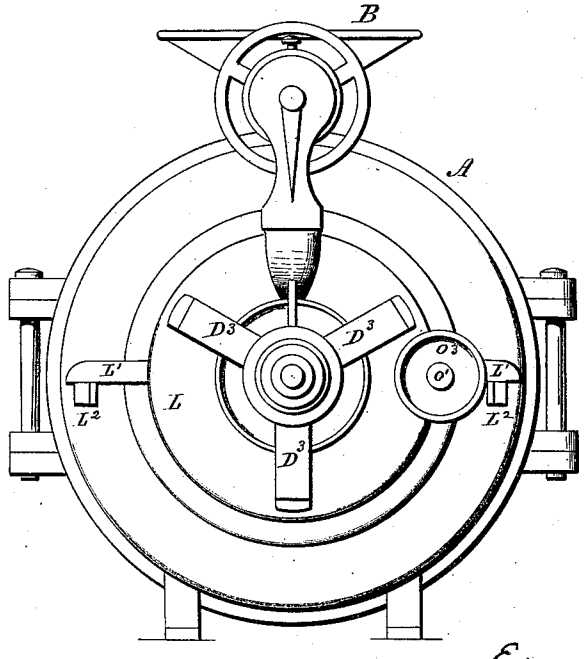


Fig. 2



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GRINDING-MILLS.

No. 193,652. *fig 3* Patented July 31, 1877.

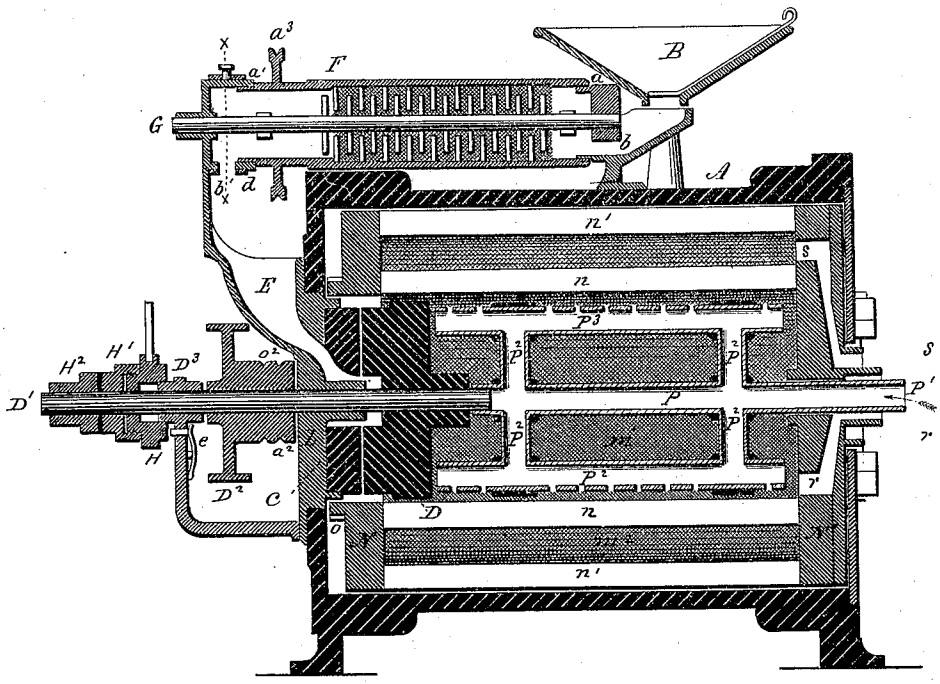


fig. 5

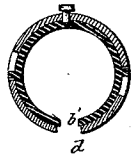
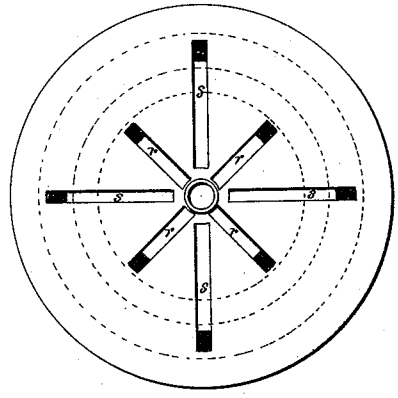


fig. 4



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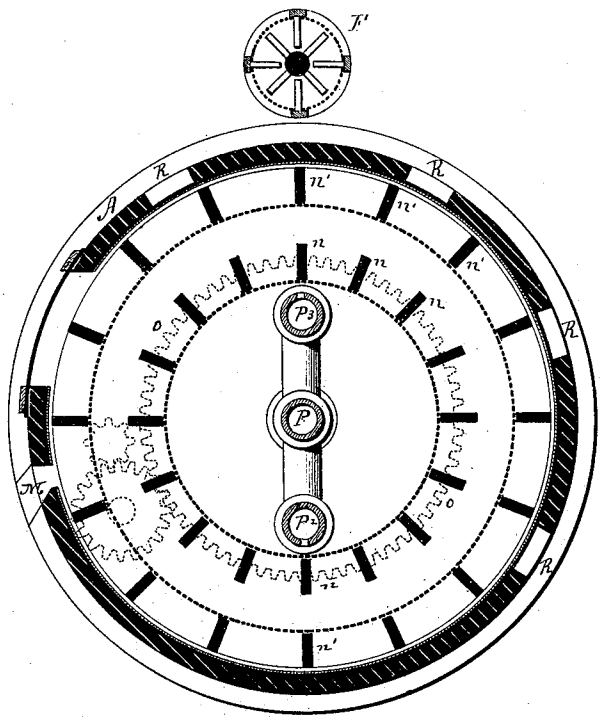
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No. 193,652. Patented July 31, 1877.

fig. 6



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UNITED STATES PATENT OFFICE.

EDWARD HARRISON, OF NEW HAVEN, CONNECTICUT.

IMPROVEMENT IN GRINDING-MILLS.

Specification forming part of Letters Patent No. **193,652**, dated July 31, 1877; application filed April 12, 1877.

To all whom it may concern:

Be it known that I, EDWARD HARRISON, of New Haven, in the county of New Haven and State of Connecticut, have invented a new Improvement in Grinding-Mills; and I do hereby declare the following, when taken in connection with the accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute a part of this specification, and represent in—

Figure 1, a side view; Fig. 2, an end view; Fig. 3, a longitudinal central section; Fig. 4, diagram of the discharge end of the bolt, to show the discharge-passages; Fig. 5, a section through the feed-opening of the scourer on line *x x;* and in Fig. 6, a transverse section enlarged.

This invention relates to an improvement in that class of grinding-mills designed for the production of flour, and with special reference to that class in which the bolt and grinding-stones are arranged in a single complete structure, such as known as "Harrison's Mill," some of the later improvements in which were secured to this applicant by Letters Patent of the United States, granted January 9, 1872, and parts of which are applicable to other mills; and it consists in the construction of the parts as hereinafter described, and more particularly recited in the several claims.

The grinding-mill and bolt are inclosed within the case A, on which the hopper B is arranged, for the reception of the grain to be ground. C is the bed-stone and D the runner-stone, the latter mounted on the mill-spindle D^1, to which power is applied through a driving-pulley, D^2, the spindle supported in a bearing in the head of the case, and in a hanger, D^3, outside the case. E is the feed-spout at the end of the cylinder to conduct the grain into the stone. Between the feed-spout E and the hopper B the scourer F is arranged. This consists of a cylinder, the surface of which is finely perforated, or with openings covered with netting, as seen in Fig. 1. This cylinder is mounted upon a bearing, *a*, near the hopper, and a similar bearing, a^1, on a support at the feed end. This cylinder is caused to revolve by connection with the mill-spindle through a pulley, a^2, on the spindle, and corresponding pulley a^3 on the cylinder. The two ends of the cylinder are open, so that the grain will pass from the hopper to the cylinder through a passage, *b*, and after working through the cylinder will drop through an aperture, b^1, to the feed-spout E. Running through the scourer F is a stationary shaft, G, supported at each end, and concentric with the cylinder. From this shaft numerous fingers project radially, and from the inner surface of the cylinder similar fingers project radially toward the shaft, so that the revolving fingers on the cylinder interwork with the stationary fingers on the shaft G; hence the grain is caused to gradually work through the cylinder, being all the while agitated, causing the dust and other foreign substances to pass out through the perforations in the cylinder, and the grain to go substantially clean to the grinder.

Over the aperture b^1 a gate, *d*, is arranged for the adjustment of that opening, consisting, as here shown, of a sleeve around the cylinder, with a corresponding aperture, so that the sleeve may be turned to open a greater or less portion of the aperture b^1.

For the purpose of adjusting the spindle a collar, H, is placed over the spindle and around the head of the hanger D^3, so as to have longitudinal play, but not to rotate with the spindle. Onto this collar a nut, H^1, is screw-threaded, and in rear of the nut H^1 the head H^2 is made fast to the spindle.

The collar H bears upon springs *e*, the strength of the springs being of a power greater than the thrust upon the shaft, caused by the grain pasing through; hence, by turning the nut H^1, the runner-stone will be drawn nearer the bed-stone, or recede from it, according to the direction in which the nut is turned.

In case a foreign substance harder than the grain should pass into the stones, the springs *e* would yield to allow that foreign substance to pass through without injury to the stone, and, so soon as it has passed, the springs will at once bring the runner-stone back to its proper relative position.

The bed-stone is set in a removable portion, L, of the head, and the bearings for the spindle are also attached to or made a part

of this movable portion; hence, by removing this part L the stones will be also removed. From this part or head L an arm, L^1, extends radially from each side, and beneath each of these arms is an arm, L^2, projecting longitudinally from the case.

When it is desired to remove the stones, as for dressing or renewal, the head L is detached from the case, and, resting on the arm L^2, is turned over, as indicated in broken lines, Fig. 1, so as to support the stone in a horizontal plane. The runner-stone may then be removed, and the bed-stone redressed or reset without entire removal from the case. This arrangement is exceedingly convenient and useful for the examination or repair of the grinding apparatus.

Within the case A the bolt is arranged. This consists of two heads, N N′, connected by numerous bars, *n* and *n′*, the series *n* being within the series *n′*. On the inside of the inner series is a netting, *m*, and on the inside of the outer series a finer grade of netting, thus forming two cylinders or sieves, the net-work being what is commonly called "bolt-cloth."

The inner head N is supported on a bearing in the cylinder outside the stone, as seen in Fig. 3, and the other head in a bearing in the other end of the cylinder, but so as to revolve freely within the case and around the stones, and is caused to revolve in substantially the same manner as the bolt in the patent before referred to—that is to say, the gear *o* is formed on the head, and into this a pinion on the shaft o^1 works, and this pinion is turned directly from the mill-spindle by a belt from a pulley, o^2, to a pulley, o^3, on the shaft o^1.

The meal passes from the stones directly to the inner bolt, and is sifted through the inner bolt, the coarser portion left therein, the finer passing to within the outer bolt m^1, and there again sifted—the finest portion passing through, the middlings remaining.

The coarser portion or bran passes to the opposite end of the cylinder, thence out through passages *r*, the middlings through similar passages *s*, while the finer flour will pass out through an aperture, M, in the side of the case. Thus the material which does not pass through the bolt is led to a central discharge, entirely away from and independent of the fine-flour-discharge opening, the bars *n′* forming sweeps to carry the flour around the case to the discharge.

As a means for ventilating the mill, there is arranged in connection with the mill-spindle, and so as to revolve with it, a tube, P, the outer end supported in a bearing in the head of the bolt, the tube opening outward, as at P^1. From this tube radial tubular arms P^2, more or less in number, extend to tubular bars P^3, parallel with the tube P, and so as to run near the surface of the inner bolt. These bars P^3 are perforated with numerous holes on their extreme outer surface; hence, revolving rapidly, as they do, (the same velocity as the stones,) air is drawn in through the opening P^1, and discharged through the perforations in the bars P^3 with considerable force against the inner bolt. The air thus drawn in is forced to pass out through the discharge-openings of the mill, and thereby tends to dry the flour or remove the natural dampness therein contained.

The mill-case is provided with an opening, R, and this opening covered by a woolly open woven material, and the dust which would be blown from the flour will be caught by this fibrous material, and thus will be produced the most perfect ventilation of the mill. The woolly material may extend entirely around the inner surface of the case, and the case be provided with numerous openings, if desired. The blower, as the revolving perforated arms may be called, also serves as beaters or sweeps to properly work the flour through the inner bolt.

I do not broadly claim several radial passages in the head of a grain-screen leading to a central outlet, as such, I am aware, is not new.

I claim—

1. In combination with the grinding-stones and hopper of a mill, the horizontal revolving cylinder between the hopper and the feed-spout, the stationary shaft G, provided with radial fingers intermediate with radial fingers on revolving cylinder, and substantially as and for the purpose specified.

2. The combination of the stones of a grinding-mill, the mill-spindle, the springs *e*, collar H, and adjusting-nut H^1, substantially as and for the purpose described.

3. In a vertical grinding-mill, the arrangement of the stones on a removable head, combined with arms L^2 on the case, and corresponding arms or bearings L^1 on the said removable head, substantially as and for the purpose described.

4. In combination with a grinding-mill, two or more concentric bolt-screens, the outward bars or sweeps *n n′*, and radial passages *r s*, in the head, leading respectively from each bolt to independent concentric discharge-spouts, substantially as described.

5. In combination with a grinding-mill and revolving bolt, a blower, consisting of the hollow shaft concentric and revolving within the bolt P, tubular arms P^2, and perforated tubular bars P^3, parallel to said shaft P, substantially as and for the purpose specified.

6. The combination in a bolting-mill, of the cylindrical bolt, the revolving tubular blower, and the openings in the bolt-case, covered by an open fibrous material, substantially as described.

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Witnesses:

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