E. TOTMAN.
Grinding-Mill.

No. 221,707. Patented Nov. 18, 1879.

Fig1.

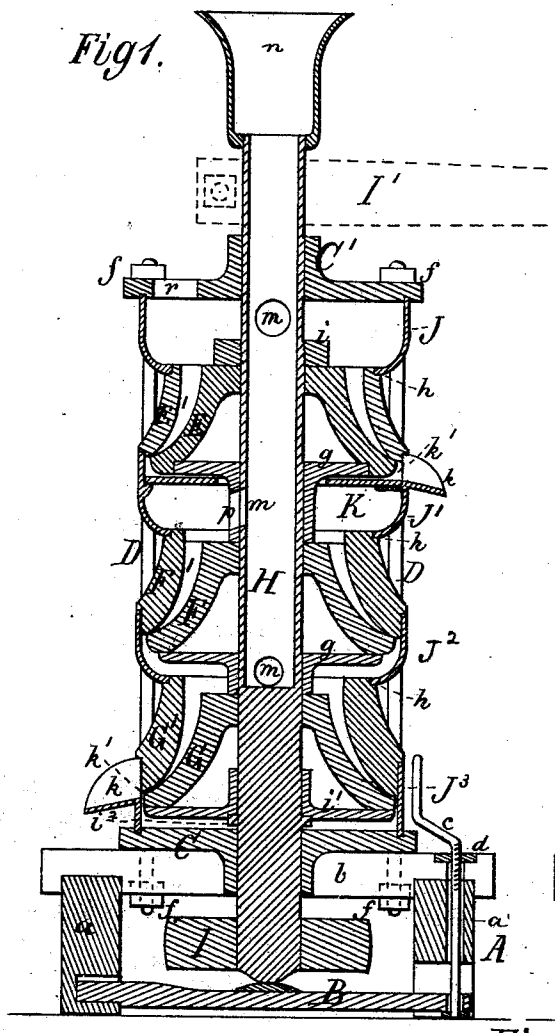


Fig2.

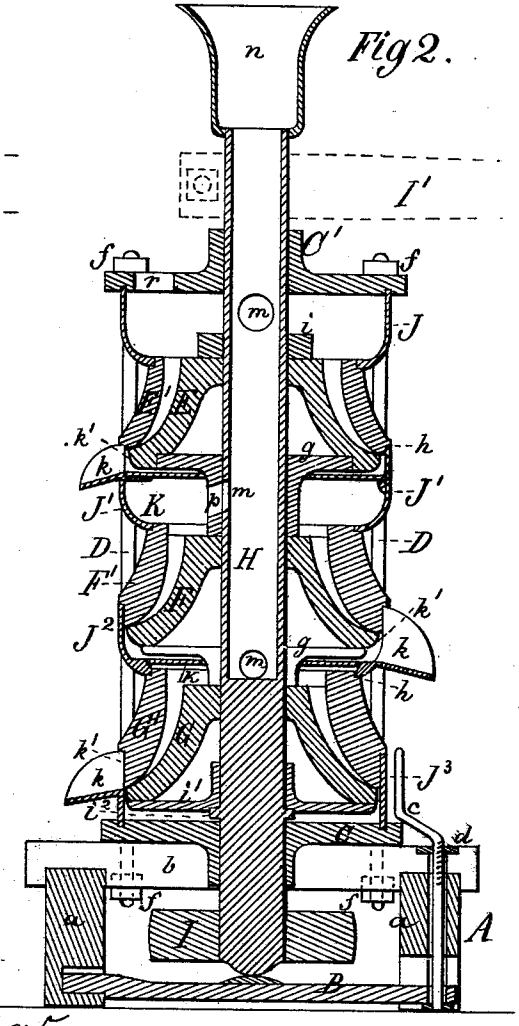


Fig3.

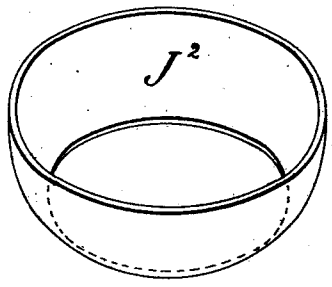


Fig5.

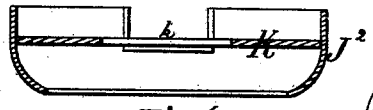


Fig6.

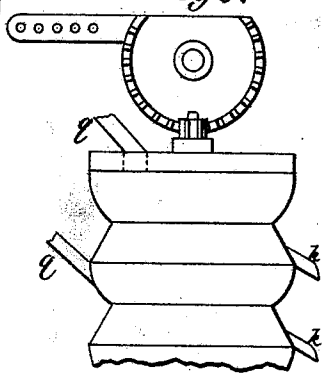
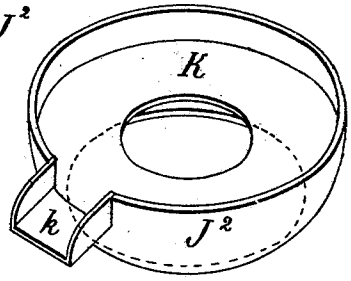


Fig4.



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UNITED STATES PATENT OFFICE.

EDSELL TOTMAN, OF BATAVIA, ILLINOIS.

IMPROVEMENT IN GRINDING-MILLS.

Specification forming part of Letters Patent No. **221,707**, dated November 18, 1879; application filed March 19, 1879.

To all whom it may concern:

Be it known that I, EDSELL TOTMAN, of Batavia, in the county of Kane and State of Illinois, have invented a new and useful Improvement in Grinding-Mills; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical central section of my improved mill as arranged for grinding coarse feed with its upper burrs, and fine meal or flour with its middle and bottom burrs. Fig. 2 is a vertical central section of the mill as arranged for grinding and discharging from all of its runners simultaneously. Fig. 3 is a perspective view of one of the sections of the outer shell or case of the mill, this ring being without a diaphragm and chute, and it serving as a substitute for the construction shown in Fig. 4, when the mill is to be adjusted as in Fig. 1. Fig. 4 is also a perspective view of one of the sections of the shell or case of the mill, a diaphragm with discharging-chute being combined with the section, this ring and diaphragm being used as a substitute for the ring shown in Fig. 3 when the mill is adjusted as shown in Fig. 2. Fig. 5 is a cross-section of Fig. 4. Fig. 6 is a view illustrating the mode of operating the runners of the burrs with a reciprocating motion, produced by windmill-power, and also a mode of feeding each of the burrs by a separate pipe instead of by a hollow perforated shaft.

One of the inconveniences heretofore experienced with portable grinding-mills is that of their not being capable of grinding grain fine enough, without undue heating of it, even for meal, this being due to the inadequacy for the purpose of the amount of grinding-surface secured in so small a compass; and another is that of such mills not being adapted for having their grinding-surface divided up into small sections in such a manner that one, two, three, or more burrs may be used for performing the grinding operation instead of a single large burr; and, finally, another is that such mills are not adapted for being adjusted for grinding and discharging both fine and coarse products at one and the same time separately, and then the whole grinding-surface capable of being adjusted either for grinding and discharging only fine or only coarse products, as circumstances may require.

It is important to have a mill capable of grinding grain and other substances to a state suitable for feeding stock, and during this operation, and by the same applied power, capable of grinding grain into fine meal or flour, as much time is saved thereby. It is also important to have a mill which can at will be adjusted for grinding grain or other substances into either only coarse or fine products, as this will enable the owner to grind a greater quantity of either very quickly in case a large quantity is suddenly demanded. And it is important to have such a mill so constructed that it may be adjusted to run the coarser product through only one set of burrs of a series, and the finer product through all or only a portion of such series of burrs.

My mill overcomes to a very great extent all of the inconveniences, and supplies the demands above referred to.

In the accompanying drawings, A is a strong foundation for the mill, composed of two sill-timbers, *a a*, and two cross-ties, *b b*. B is the bridge-tree or step for the shaft of the mill, attached by one end to one of the sills, and suspended at the other end by an adjusting-screw, *c*, which works in a nut, *d*, as shown. C C′ are top and bottom plates of the shell or casing of the mill; and D D are four cornerwise-arranged clamping screw-rods, passed up through the ties *b b* and ears of the plates C C′ in such manner that the shell-sections of the case and the stationary portions of the grinding-burrs of the mill are all firmly united and held together when the nuts *f f* on the ends of the rods are turned to the required extent.

Between the plates C C′ three sets of grinding-burrs, E E′ F F′ G G′, are arranged, as shown. The number of burrs may be increased to any extent desired—say to twelve.

The runners E F G of the burrs above mentioned are fastened permanently to an upright hollow shaft, H, by means of a fixed shoulder, i^2, of the shaft, a screw-collar, *i*, and a tubular washer, *i′*, and they, with the shaft, may be revolved by either a pulley, I, on the lower end of the shaft, or by a lever, I′, (shown by

dotted lines,) on its upper end, according to the requirements of the work to be done. The runners are similar in form in their vertical section to the flaring end of a trumpet or bell, and the passage through them is much larger in diameter than the shaft H from the base to near the top, where it is just about equal in diameter to the shaft.

Between the runners T-shaped tubular washers are placed, and these washers are turned so as to fit the shaft truly, and their horizontal portions shall stand at right angles thereto.

By thus employing washers and constructing them as described they serve as a means for separating the runners and for centering them on the shaft and in the shell or case, while they form a base-support for their broader ends, as shown. These washers, by being perforated in their necks and applied so as to be turned one-quarter round, answer as cut-offs and inlets for substances to be ground, which are supplied through passages in the hollow shaft, as will be presently explained more fully.

The stationary portions E′ F′ G′ of the burrs serve, in conjunction with ring or shell sections J J′ J² J³, to make up the outer shell or case of the grinding-mill, and these parts E′ F′ G′ and J J′ J² J³ are of the form and construction substantially as shown in the drawings, or of any other convenient and proper form and construction, and they are tightly matched together by rabbet-joints at *h*, so as to be readily divisible when necessary; and all these parts are held in place by the plates C C, and the screw-rods D D and nuts *f f*, as will be seen from the drawings.

The revolving runners and their matching stationary grinding-rings are furrowed or dressed in any of the well-known and approved modes which will adapt them for grinding grain and other substances into either feed for stock or fine meal or flour, or for grinding both feed for stock and fine meal or flour simultaneously.

It will be understood that all the burrs are intended to be dressed alike, and that the fineness or coarseness of the ground products is regulated by setting the runners higher or lower on their shaft H—that is, the runner of the first set of burrs is set to grind feed for stock, the runner of the second set is arranged to grind finer, and the runner of the third set is adjusted to grind very fine, and this is accomplished by employing washers *g*, having necks of different lengths; and after the adjustments just described are made with the washers, any required nicer adjustments of all the burrs together may be made by the adjusting-screw *c* and bridge-tree B, in the usual manner; and, if desirable, each mill may be supplied with extra washers *g*, having necks of different lengths, and these may be used as circumstances may require.

The shaft H is made hollow, and in its periphery, just between each set of burrs and above the first set, a passage, *m*, is provided, and on its upper end a flaring hopper, *n*, is applied; and in the periphery of the necks of the washers *g* passages *p* are provided, said passages corresponding to the passages *m* in the shaft H.

By this construction of the shaft H and the washers *g*, the supply of substances to be ground may be introduced through the shaft and necks of the washers into the mill; and by turning the lowest two of the washers one-quarter around the shaft, the direct supply of grain to the lowest two sets of burrs can be cut off at these points, and the supply of grain to all three of the sets of burrs will be through the aperture *m* which is directly above the first set of burrs; and by turning the washers which may be above the first and third sets of burrs one-quarter around the shaft, the supply will pass through the aperture *m* above the second set of burrs; and by turning the first and second washers around the shaft, (if such first washer is provided,) the supply will pass through the aperture just above the third or lowest set of burrs.

In the drawings, Fig. 2, the mill is shown with a diaphragm, K, having a chute, *k*, at its outer edge and fitted below two sets of burrs, and each of the ring-shells J′ J² J³ is shown, provided with a discharge-passage, *k′*. Under this construction and arrangement each of the three sets of burrs grinds and discharges simultaneously, the supply of grain being through the respective passages *m* of the hollow shaft, and the ground product will be coarse feed suitable for feeding stock, provided the lengths of the necks of the washers *g* are all equal and the bridge-tree is properly adjusted.

In Fig. 1 of the drawings the mill is shown with the ring J², and the diaphragm K with its chute *k*, as shown in Fig. 2, removed, and a ring, J², having no discharge-passage *k′* in it, (see Fig. 3,) substituted for it. Under this construction and arrangement the upper set of burrs grinds and discharges a coarse product suitable for feeding stock, and the other two sets of burrs grind fine meal, the grain being ground taking its course through the aperture *m* above the second set of burrs, (the lower aperture *m* being now closed,) and passing first through the grinding-surfaces of burr F F′, and from thence through the grinding-surfaces of the burr G G′.

If it is desired to pass the substances to be ground through all three sets of burrs, a ring, J², similar to that shown in Fig. 3, is made to take the place of the ring J′, and diaphragm K, with chute *k*, (shown in Fig. 1,) and the washers *g* of the burrs F F′ and G G′ are turned one-quarter around, so as to close the supply-passages *m* just above the said burrs. Thus adjusted, the mill will present a grinding-surface equal to the three burrs, and the grain will be ground into fine meal without being overheated, as when only one set of burrs is

employed, provided the washers are of the proper lengths and the bridge-tree is adjusted for such grinding.

It is advantageous to run the meal over a number of connected, yet independent, burrs, as by this means the danger of heating is not so great, and the draft or strain upon the mill will not be as great, even though the same amount of work is being performed, as when the surface is all connected and a large body of grain is being acted upon at one point by one set of burrs adapted only for fine grinding. This is due to the fact that the several sets of burrs serve to distribute the strain or resistance upon the mill, one set doing the preparatory grinding, another set still further reducing, and the third or others (accordingly as the case may be) finishing the grinding of the grain into meal or flour; and thus the power required to do the work will not be so great as in other mills when the preparing and finishing operations are done by one set of burrs, nor will the liability of heating the meal be so great.

The mill, as described, if provided with twelve or more burrs, may be operated from the top of the shaft H by horse-power through the lever I′, and when provided with three or four burrs may be worked by manual power; or, if preferred, it may be worked from below the shaft through the pulley I by steam or other power.

Instead of having the shaft H hollow and to revolve, it might be made solid, and be worked by a windmill-power through a pinion and a reciprocating toothed segment, as illustrated in Fig. 6. Under such construction the grain might be fed to each of the burrs by a separate tube, *q*, as illustrated in said figure.

In operating with a reciprocating motion the burrs would vibrate in the shell or case, and the ground substances would gradually work their way down through the mill. The supply of grain to the mill, when it is adjusted for passing the substances entirely through it, might be through a passage, *r*, in the plate C′; or, if desired, one kind or grain might be supplied through the tubular shaft H, with apertures *m* open to the second and third sets of burrs, and another kind of grain supplied through the aperture *r* to the first set of burrs. Under this construction and arrangement the supply-aperture *m* above the first set of burrs should be closed by a suitable washer, and the mill adjusted as shown in Fig. 1.

What I claim is—

1. A series of grinding-burrs around an adjustable vertical shaft, the moving portions of which burrs are separated by tubular washers, which serve for centering and adjusting the burrs, and the stationary portions of the burrs, in conjunction with shell-rings, forming the outer sectional case of the mill, and being united and held together around the moving portions by means of plates and screw-rods, substantially as and for the purpose described.

2. A set of grinding-burrs, E E′, having a discharge-passage, *k′*, in their shell, and provided with a removably-applied ring, J′, and a diaphragm, K, having a discharge-chute, *k*, in combination with two or more sets of grinding-burrs, F F′ and G G′, on the same shaft, and connected by rings, whereby either two products, which are relatively one coarse and the other fine, may be ground at the same time and discharged separately from the case of the mill, or only one product, which is either coarse or fine, may be ground and discharged through the said case, substantially as and for the purpose described.

3. The combination of the perforated tubular shaft H, a series of tubular washers, *g*, having perforations adapted to register with the perforations in the said shaft, and a series of grinding-burrs around the shaft, substantially as and for the purpose set forth.

4. The combination of the outer shell or case, provided with the passage *r* and with one or more removably-applied rings, J′, having the diaphragm K and chute *k*, one or more intermediate runners, F, the upper and lower runners, E G, a tubular perforated shaft, H, and perforated washers *g*, substantially as and for the purpose described.

5. The combination of one or more removably-applied rings, J′, provided, respectively, with a removable diaphragm, K, and chute *k*, and a series of grinding-burrs, substantially as and for the purpose described.

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