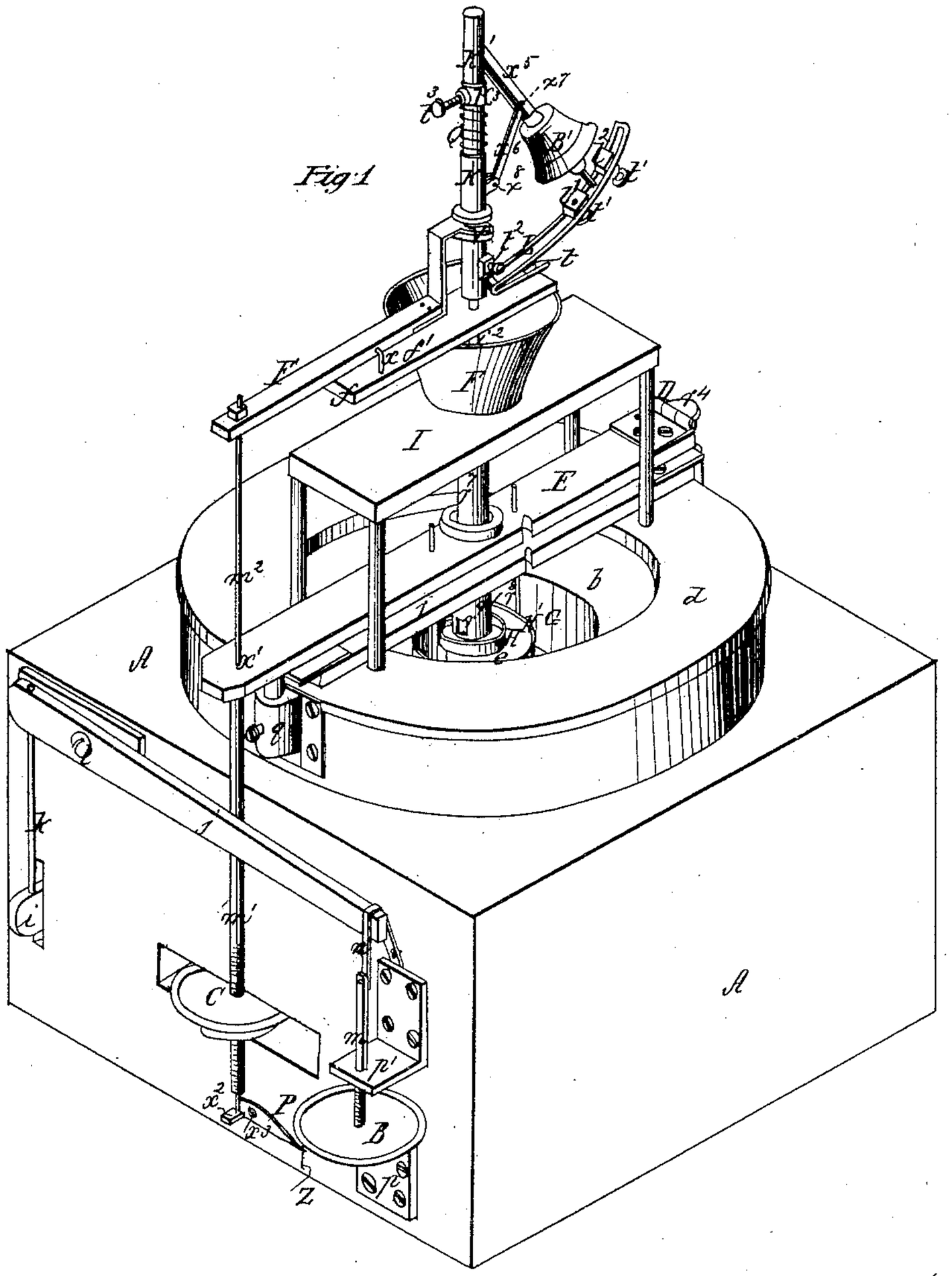
2 Sheets—Sheet 1.

J. M. CLARK.

GRINDING MILL.

No. 37,151. Patented Dec. 16, 1862.

Fig: 1



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2 Sheets—Sheet 2.

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Fig. 2.

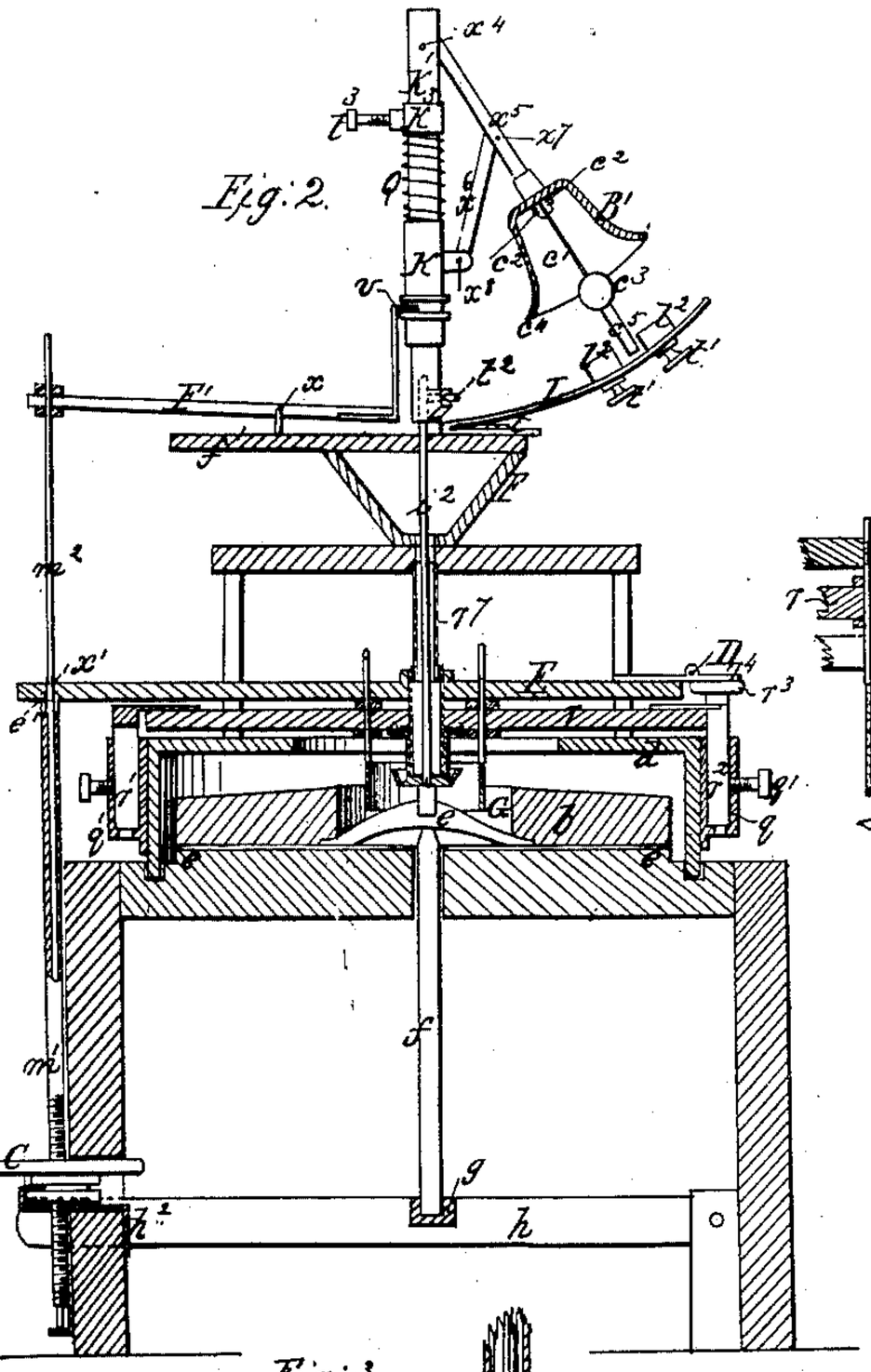


Fig. 5.

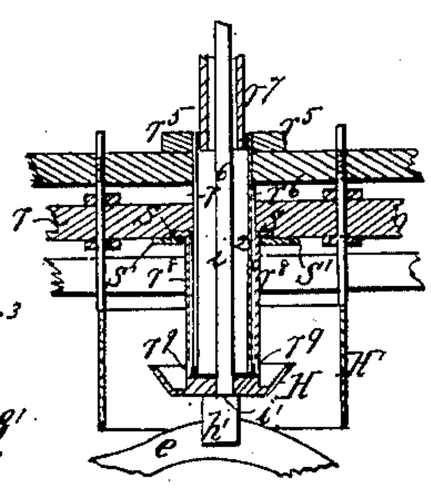


Fig. 4.

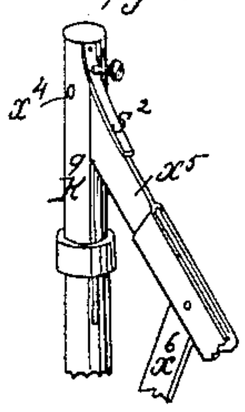
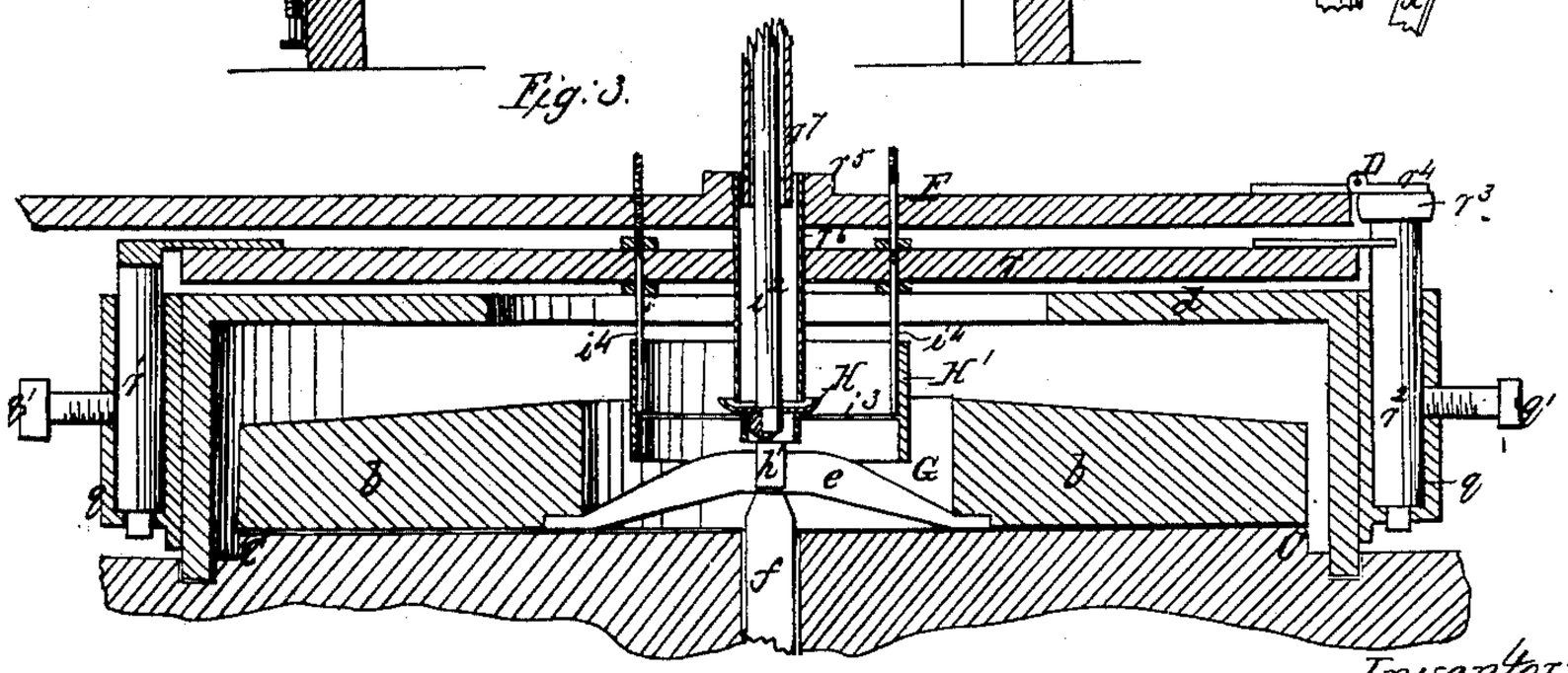


Fig. 3.



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UNITED STATES PATENT OFFICE.

JAMES M. CLARK, OF LANCASTER, PENNSYLVANIA.

IMPROVEMENT IN GRINDING-MILLS.

Specification forming part of Letters Patent No. **37,151**, dated December 16, 1862.

To all whom it may concern:

Be it known that I, JAMES M. CLARK, of Lancaster, in the county of Lancaster and State of Pennsylvania, have invented certain new and useful Improvements in Alarm and Indicating Apparatus for Grinding-Mills; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, forming a part of my specification, and to the letters of reference marked thereon, like letters in the several figures indicating the same or analogous parts, and in which drawings—

Figure 1 is a perspective view of my alarm and indicating apparatus; Fig. 2, a cross-section of the same; Fig. 3, a like section, clearly showing the means of attaching and adjusting my invention to the "hoop," which incloses the "runner-stone;" Fig. 4, a view showing an alternative mode of applying a spring to the bell-arm or lever, somewhat simplifying the mode of applying a spring to said arm, as represented in Figs. 1 and 2; and Fig. 5 an enlarged view of certain parts contained in Figs. 1, 2, and 3.

My invention consists in providing a grinding-mill with a simple and effective apparatus, which, in a locality distant from the millstones, shall indicate "the run" of the stones and condition of "the feed," together with an alarm which within hearing distance shall indicate a variation in the speed of the "runner" and condition of the grinding from that desired by the attending miller.

It also consists in providing the means whereby a variation in the speed of the runner and the flow of the feed may be properly regulated upon an alarm or indication being given to the miller that the grinding of the grain is not being properly done.

It also consists in applying to a mill which is adapted to the grinding of grain by means or use of a "silent feed" a device or devices whereby the millstones may be made to grind either "coarse" or "fine" without at the same time affecting the flow of the grain from the hopper into the eye of the stones.

In the drawings, A indicates the foundation or Hurst frame for the support of the runner-stone *b* and bed-stone *c*, a hoop, *d*, being made to inclose the runner in the usual manner, and the runner being immediately supported by the "rynd" *e*, as shown, pivoted and made to revolve upon the lighter-shaft *f*, stepped as at *g* in the cross-tree *h*.

In Fig. 1 of the drawings, *i* indicates the projecting end of the lighter-lever, which, midway of its length, is made to support the cross-tree *h*, the rear ends of the lighter-lever and cross-tree being pivoted to the Hurst frame in the usual way. As represented in Fig. 1, the forward or projecting end *i* of the lighter-lever connects with a lighter-staff, *j*, by means of an iron rod, *k*, said lighter-staff being pivoted to the main frame A, as at *l*, and having its forward end connected with the screw-shaft *m* of a hand-wheel, B, by means of a leather or flexible strap or chain, *n*. This chain or flexible strap *n* may pass from its point of attachment to screw-shaft *m*, directly over the forward end of the lighter-staff, and be secured to the main frame A, as indicated in the figure, or it may be fastened to the upper side of the lighter-staff, or at any other convenient point near the forward end of said staff. The wheel B, a portion of which is made to revolve or work within a slot or recess cut in the main frame A, and is supported by a bracket, *p*, in a manner similar to hand-wheel C, as shown in Figs. 1 and 2, is made to so work upon its screw-rod *m* that when revolved to the right hand it will draw down the screw-rod through the brackets *p* and *p'*, and thus depress the forward end of the lighter-staff, and so consequently elevate the runner *b*. The movement or rotation of the wheel B being reversed of course will permit the forward end of the lighter-staff to rise and so depress the runner-stone *b*, the weight of the runner acting upon the lighter-staff to cause its forward end to rise to the limit permitted by the strap or chain *n*.

It will thus be perceived that when nails or other metallic or hard substances pass in between the millstones, which are liable to deface or injure the "dress" of the stones and cause the runner to jump and rotate unequally, the miller can, by a sudden pressure upon the lighter-staff, elevate the runner and so permit such substances to be instantaneously forced out from between the stones, the quick withdrawal of such pressure allowing the staff to resume its strain upon the strap *n* and so return the runner to its previously-working condition before it shall have gained an undue increase of speed by reason of its with-

drawal from working-contact with the grain being ground.

To opposite sides of the hoop, as clearly shown in Figs. 1, 2, and 3, sockets q are attached, fitted to receive and hold in place pins r' r^2 by means of set-screws q', the pins being permanently secured to the ends of a cross-tie, r. Thus, when the cross-tie is made to occupy a position over the hoop, as indicated in Fig. 1, it may readily be adjusted to and held in any desired height above the hoop by means of the set-screws q', the unscrewing of the set-screws also as readily permitting of its removal when desired. The pin r^2, it will be seen, extends above the cross-tie r, and terminates in a broad flat top, r^3, to which one flap, r^4, of a butt-hinge, D, is brazed, the opposite flap of the binge being secured to a lever, E, as shown in Fig. 1. This lever E articulates upon the hinge D directly over the cross-tie r, and extends beyond the periphery of the hoop and the outside of the main frame A, as shown in last-named figure. Central of its length the lever E is made with a raised collar, r^5, which is perforated to receive and hold in place a grain-tube, r^6, of proper diameter to receive in its upper end a glass tube, r^7, which delivers the grain from the hopper F into the tube r^6 and thence into the eye G of the millstones. As seen in the figures, the tube r^6 passes vertically down through the center of the cross-tie r, the opening of the cross-tie for such purpose being large enough to permit of the up-and-down movement of said tube as it is caused to be elevated and depressed by the articulations of the lever E upon hinge D.

As shown in Figs. 1, 2, and 5, the tube r^6, at a point where it passes through the circular opening in the cross-tie r, enters into and is inclosed for the residue of its length by a revolving tube, r^8, having a flange, as at s, resting and revolving on a perforated disk, s', screwed to the under side of the cross tie. This tube r^8 at its bottom terminates in and is surrounded by a dish-shaped seed-cup, H, through the center of which a square hole is made to receive the square-formed lower end, i', of a spindle-rod, i^2. Projecting down from the bottom of the cup H and on both sides of the square opening formed for the reception of the bottom of the spindle-rod, lugs or couplings h' are formed—say, three inches apart, or having such sufficient space between them as to properly embrace or clasp the sides of the rynd e of the runner-stone b—at the same time leaving a sufficient space between the top of the rynd and the bottom of the seed-cup H to permit of the varying set of the runner without either bringing the top of the rynd in contact with the bottom of the cup or disengaging the lugs or couplings h' from their clasp upon the sides of the rynd. The tube r^8 at its bottom is perforated with slots or openings r^9 of greater length than width, and rising from the bottom of the tube. They are two in number and opposite each other.

In Fig. 3 it will be observed that the tube r^6 is not surrounded or inclosed by a revolving tube, r^8, carrying at its bottom a revolving seed cup or disk, H, but the seed-cup or disk revolves in and is supported by a cross-bar, i^3, placed centrally and transversely across the stationary grain-guard H', and so leaving a communication between the tube r^6 and the seed-cup all around the lower extremity of said tube, the said seed-cup or disk, as shown both in Figs. 3 and 5, being rotated in the same manner by the rynd e. It will thus be seen that in Fig. 5 the flow of the grain from the hopper into the revolving disk or seed-cup H is restricted to the exits r^9 from the tube r^6, whereas in Fig. 3 the flow of the seed is at all points of the bottom of the tube r^6.

In Fig. 5, as the lever E is elevated and depressed, carrying with it the tube r^6, more or less of the openings r^9 is exposed to the flow of the grain from the bottom of the tube, the maximum flow of the grain being limited by the capacity of the openings r^9, whereas in Fig. 3 the maximum flow of the grain into the cup or onto the disk H is only limited by the depression of the tube r^6 into the cup or the approach of the bottom of the tube toward the face of the disk or cup.

In Figs. 1, 2, 3, and 5 I have shown a stationary grain-guard, H', suspended from the cross-tie r, directly beneath the hopper and partly within the eye of the stones. The suspension of this guard from the cross-tie admits of its ready removal and insertion in working position, according as the cross-tie r may be adjusted over the runner or removed from such position. The function performed by said guard is to break the centrifugal force of the grain as it flies from the disk H and cause it to fall to the bed-stone without coming in contact with the sides of the eye G of the runner, and so be carried around with the runner, instead of being passed between the stones. The suspending-arms i^4 of the grain-guard H extend up through the lever E, and thus afford steady bearings for said lever. The outer end of the lever E, as at e', is recessed to fit upon the upper end of a screw-rod, m', which is held in position by a hand-wheel, C, the hand-wheel being sustained in position in a manner similar to hand-wheel B, a bracket attached to the frame A supporting the wheel at the same time that a portion of it engages with a circular groove cut in the wheel, as clearly shown in Fig. 2, whereby the wheel is held in place while it is being turned to the right or left hand for the purpose of elevating or depressing the screw-rod m', which in turn elevates the lever E or permits its depression, the lever in its descent being held on top of the rod m' by its own weight. As the tube r^6 is at its upper end attached to the lever E, it will thus be seen that the feed or flow of grain to the millstones can be regulated by the hand-wheel C.

I is a hopper-stand attached to the hoop d, as shown in Fig. 1, and at its center supports

a hopper, F, over the eye of the stones. On top of the hopper a cross-support, f'', is attached, perforated centrally over the hopper to permit of the passage through it of the spindle-shaft i^2. This cross-support f'' also sustains a forked bent lever, F′, which articulates upon a fulcrum, as at x, the outer end of the lever being attached to an indicator-rod, m^2. The indicator-rod m^2 is made to pass freely through the outer end of the lever E at point x', the perforation for such purpose being sufficiently large to allow of the elevation and depression of the lever without affecting the movements of said rod m^2. Passing through the lever E the rod m^2 enters the screw-rod m', which is made tubular, and finally passes out of the lower end of said screw-rod and comes in contact with the lip x^2 of the index-pointer P, said pointer being so pivoted at x^3 as by its gravity to always keep its lip x^2 in contact with the lower end of the indicator-rod m^2.

To the cross-support f' a curved slotted way, L, is secured by a set-screw t, as shown, and so as to admit of the adjustment of the way toward or from the spindle-shaft i^2. Head-blocks l' l^2 are secured in the slotted portion of the way L by means of set-screws t', thus rendering said blocks adjustable, though they may be made stationary, and be permanently attached to the way at any given desirable points. The bent lever F′ is forked at its inner end, the tines v being of circular form, so as to embrace a sliding collar, K, as clearly shown in Fig. 2, said collar working freely up and down upon a bell-shaft, K′, the lower end of which is fitted to receive the upper end of the spindle-shaft i^2, as indicated in dotted lines, the two shafts being held together by a set-screw, t^2, as indicated in the figure. A second sliding collar, K^3, is also attached to the bell-shaft K′ above the collar K, and between them is interposed a coil-spring, Q, surrounding the bell-shaft, as shown. At the top of the bell-shaft, as at x^4, an arm, x^5, is pivoted, which, at its outer end, supports a bell, B′, as shown, said arm x^5 being connected to the sliding collar K by a connecting-arm, x^6, and the bell B′ in its vertical movements articulating upon the pivot-points x^4, x^7, and x of the bell-arm x^5 and connecting-arm x^6. The sliding collar K^3 may be set at any desirable point on the bell-shaft K′ by the set-screw t^3, and so compress the spring Q to any desired degree of tension to be overcome by the rotation of the bell. The bell B′ is provided with a clapper of peculiar formation, its arm c' being in the form of a flattened spring, and pivoted between the projecting lugs c^2, so as to allow the ball c^3, under certain circumstances, to oscillate from right to left, striking the sides of the bell, or from the left hand to the right hand, striking the sides of the bell, as the case may be, but under no circumstances permitting the ball c^3 to fall down upon the bell at the point c^4 of its mouth nearest to the bell-shaft K′. From the ball c^3 a tongue, c^5, projects, as clearly shown in Figs. 1 and 2, the curved way L being so set with reference to the lower end of the tongue as to allow the latter to pass over the former, but between the head-blocks l' l^2, when the mill is in operation and the bell B′ is being revolved horizontally with the spindle-shaft i^2 as its axis of motion. The bell-arm x^5 may be slotted, as shown in Fig. 4, and a flat spring, s^2, may be applied to resist the centrifugal action of the bell-arm x^5 and bell B′, as represented in said Fig. 4, in lieu of the coil-spring Q, as seen in Fig. 2.

With my alarm and indicating apparatus thus constructed it is evident that the movement of the runner-stone b will be communicated through the rynd e, the cup H, the spindle-shaft i^2, bell-shaft K′, sliding collar K, connecting-arm x^6, and bell-arm x^5, to the bell B′, and that the speed of the runner will govern the centrifugal elevation of the bell from its axis of motion—to wit, the spindle-shaft i^2. We will suppose, then, that the desired speed has been given to the runner to suit a given rate of grinding, according to the judgment of the attending miller, and that such speed has caused the bell to assume the centrifugal elevation indicated in Figs. 1 and 2. This being done, the head-blocks l' and l^2 are slid toward the tongue c^5 so as to just allow the tongue to pass between the blocks without touching them. During the act of the centrifugal elevation of the bell to the position shown in the figures, it is evident that the movement of the sliding collar K will be imparted to the lever F′, and thence to the indicator-rod m^2, and thence to the lip x^2 of the index-pointer P, thus causing the latter to indicate on a scale, z, the rate of speed of the runner and the proper grinding of the grain, according to the judgment of the operator. Now, it is apparent that so long as the speed of the runner remains the same no alarm will be given by the bell and no change will take place in the position of the index-pointer P; but if for any cause the speed of the runner should be materially increased the tongue c^5 of the bell will be made to strike the head-block l^2 at each revolution of the runner-stone, thus giving the alarm to the miller that the speed of the mill has changed, and that the grinding is being improperly done, and such fact will also be communicated to him if he is in sight of the index-pointer P, but out of hearing of the alarm-bell, since the increased speed will cause the pointer P to rise on the scale z. If, on the contrary, the speed of the runner should materially decrease, then the tongue c^5 will be made to strike the head-block l', and so give an alarm, while at the same time the index-pointer P will be made to run down or be depressed on the scale z, and so register the degree of decrease of speed from that originally fixed by the miller. Whichever of these two conditions may happen, it is also apparent that the original speed of the stones may be reattained by the ad-

justment of the set of the runner through the movement of the hand-wheel B, thus elevating or depressing the runner, and consequently increasing or retarding its speed, as the case may require.

It often happens, that for a given rate of speed of the runner, it is desirable to increase or diminish the feed of the grain, and this it is desirable to do in that class of grinding-mills which operate with what is known as the "silent feed;" and it also often happens that without any change of the feed, it is desirable to increase or diminish the speed of the runner. By my construction either of these conditions or results can be attained independently of or without affecting the other.

I would here state that for the purpose of imparting the motion of the runner to the bell, it is of importance to make the connection between the lower end of the spindle-shaft i^2 and the revolving disk H, as described, since when it becomes necessary to remove the spindle-shaft from its working position it can be readily withdrawn through the eye of the hopper, and also through the perforation in the cross-support f' on top of the hopper, which act could not be done if a box were set upon the lower extremity of the spindle-shaft, into which a square projection from the bottom of the disk or seed-cup should be made to fit. It should also be stated that I contemplate attaching my alarm and indicating apparatus, or either of them, to the old fashioned damsel-shaft, running from the eye of the millstones.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The mode, substantially as described, of attaching the cross-tie r and lever E to the hoop d, for the purpose specified.

2. A revolving grain-cup or disk, H, having couplings or lugs h' and an attached tube, r^6, in combination with the rynd e.

3. Applying to millstones a silent feed which is not effected by the act of setting the stones to grind either coarse or fine, substantially as described.

4. Suspending the revolving cup or disk H from the cross-tie r by the tube r^3, or its equivalent, in the manner and for the purpose set forth.

5. Suspending the stationary grain-guard H′ over the eye of the stones, and so that it may be removed therefrom with the cross-tie r, for the purpose set forth.

6. The combination and arrangement of the lever E, cross-tie r, and hoop d, substantially in the manner and for the purpose set forth.

7. The combination of the feed lever-rod m' and rod m^2, substantially as and for the purpose set forth.

8. Operating an alarm, and also an indicating apparatus, by means of a shaft which receives motion directly from the central portion of the millstone runner, for the purpose specified.

9. The combination of the alarm apparatus, and the indicating apparatus with the centrally-located shaft i^2, substantially as described, for the purpose set forth.

10. A lighter-staff, j, in combination with the screw-shaft m, substantially as described.

11. The head-blocks l l^2, whether stationary or adjustable, in combination with the way L, substantially as described, for the purpose set forth.

12. Applying to the bell-shaft K′ a bell-arm, x^5, and bell B′, which by their centrifugal action effect the alarm, in conjunction with head-blocks l and l^2, or their equivalents, substantially as described.

13. In a bell which constitutes a part of a centrifugal governor, so hanging the "clapper" on a pivoted spring-arm that it has unobstructed freedom to move back and forth in the line of rotation of the bell, against the inner sides of the bell, but is prevented from coming in contact with the bell in a direction at right angles thereto, substantially as described.

I hereby disclaim the alarm and indicating device, figured and described in Appleton's Dictionary of Arts, volume 1, page 902, published in 1852, the same being old and in common use.

Witness my hand and seal, in the matter of my application for Letters Patent for improvements in grinding-mills, this 5th day of June, A. D. 1862.

JAMES M. CLARK.

Witnesses:
ROBT. W. FENWICK,
EDWIN S. JACOB.