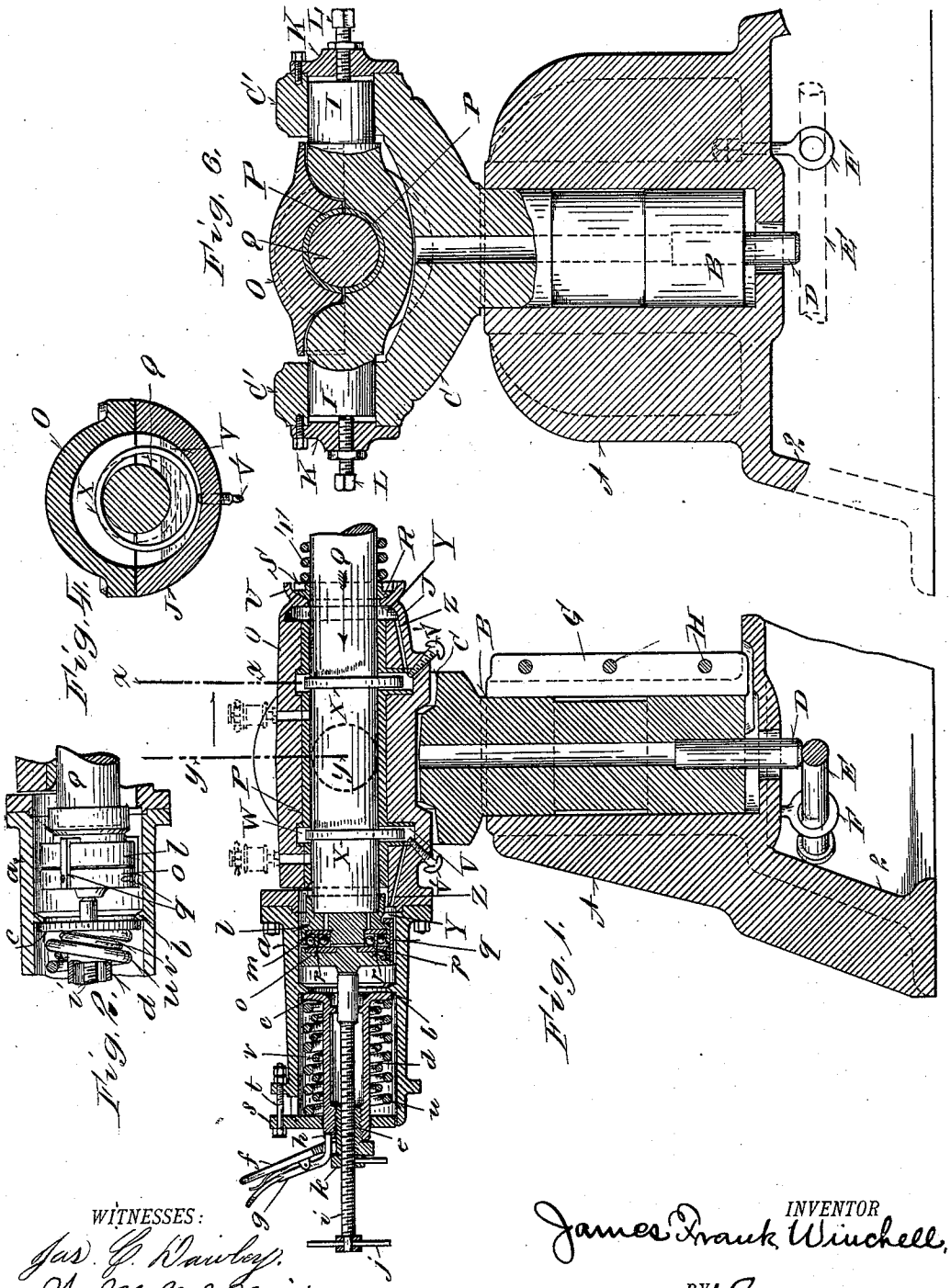
(No Model.) 2 Sheets—Sheet 1.

J. F. WINCHELL.

GRINDING MILL.

No. 536,410. Patented Mar. 26, 1895.



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(No Model.) 2 Sheets—Sheet 2.

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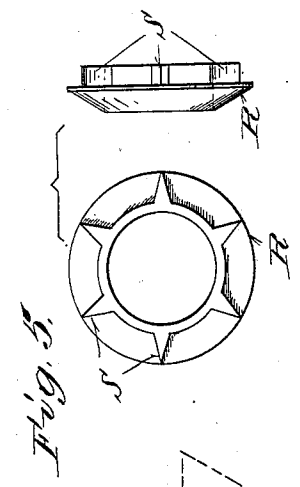

Fig. 5.

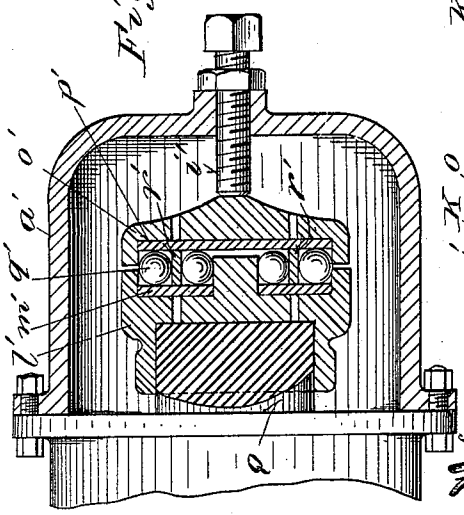

Fig. 6.

Fig. 7.

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UNITED STATES PATENT OFFICE.

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GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 536,410, dated March 26, 1895.

Application filed January 19, 1894. Renewed January 25, 1895. Serial No. 536,276. (No model.)

To all whom it may concern:

Be it known that I, JAMES F. WINCHELL, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Grinding-Mills, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in grinding mills, designed for the reduction of a large variety of articles, such as corn for animal feed, bone dried or cooked animal products, such as liver, hearts, &c., roots, bark, &c., and other articles used in various productive arts.

The improvements have reference to certain features of organization and construction designed to render the machinery of the mill more perfect in its operation, more lasting and more easily and effectively utilized; and these peculiarities will be fully described hereinafter and particularly pointed out in the claims.

In the accompanying drawings, on which like reference letters and numerals indicate corresponding parts, Figure 1, is a vertical sectional view through one of the bearings of the mill shaft with a portion of the shaft in elevation, and with my various improvements exemplified in their preferred form; Fig. 2, a similar sectional view of a portion of the adjusting mechanism for the shaft; Fig. 3, also a similar view of the bearing at the opposite end of the shaft, with a portion of the shaft in elevation; Fig. 4, a sectional view on the line $x\,x$ of Fig. 1; Fig. 5, a detail elevation of the dust obstructer; Fig. 6, a transverse vertical section of the shaft and bearing on the line $y\,y$ of Fig. 1; and Fig. 7, a side elevation of a grinding mill of the type to which my improvements are especially applicable.

The base of the mill is shown at 2, within the casing 3 of which, are the grinding heads, each being mounted on a shaft 4 and carrying a pulley 5. It will be seen that each shaft is mounted in two bearings or boxes and that at the outer end of one shaft there is certain adjusting mechanism. The details of these boxes or bearings, as also the details of this mechanism will be particularly described hereinafter. The boxes or bearings are designed to permit of universal adjustment, sometimes called universal motion. This is done, first, to facilitate adjusting the shafts so as to secure the tram of the grinding heads or plates and, secondly, to change the positions of the shafts as wear and strains get them out of alignment and destroy the tram of the grinders.

The letter A designates a part of the frame or fixed structure of the grinding mill, for the vertical shank B of the bearing yoke C. The pillar D, the bearing E and the eye-bolts F support and vertically adjust the yoke. The nuts on the bolts are manipulated for this purpose so that the bearing or box can be adjusted up and down.

The support A is divided by a vertical incision at G and its parts drawn by bolts H so that the shank can be clamped in adjusted positions.

At either end of the yoke C is a cap C′ which holds down the trunnions I of the bearing-block proper, designated J. Plates K, screwed or otherwise secured to the yoke and caps, are provided with adjusting screws L, which are used to adjust the bearing-block laterally to accommodate the proper position of the shaft. Lock or jam nuts serve to hold the adjusting screws L to set positions. A cap O fits upon the bearing block, and this cap and the bearing block itself carry boxes P of Babbitt metal or other suitable material.

The mechanism so far stated permits of four adjustments or movements of the shaft Q. The object of these four adjustments, as already intimated, is to accommodate the position and direction of the bearings to the position and direction of the shafts. It will be understood that difficulty always arises in getting the bearings of shafts which are to run at a very high speed, as is the case with these shafts (the speed being usually from fifteen hundred to eighteen hundred revolutions per minute) in such exact alignment with each other that there will be not the least binding of the shafts in the bearings. Thus, if it is necessary to adjust the axis of the bearing laterally it is done by operating the adjusting screws L. If it is necessary to swing the bearing slightly sidewise, it is done by turning the shank B in its support A. If it is necessary

to tilt the bearing slightly up or down it is done by a movement on the trunnions I, releasing caps C′ for this purpose. It also happens that it is sometimes desired to adjust the bearing bodily up or down. This is done by raising the eye-bolts F which act on the bar E and the pillar D.

The next feature of my invention to be described is that relating to preventing the ingress of dust or other foreign matter to the journal of the shaft. The device for this purpose is shown in detail in Fig. 5 and in section in Fig. 1, and it consists of a fan for producing a disturbance of the air, whereby such particles are blown away from the journal at and about the place where the shaft enters the bearing. It is formed of a ring R fitted snugly upon the shaft Q and having a considerable number of wings or blades S, which act as fans or blowers when the ring is rotated by the shaft. A spiral spring T about the shaft rests at one end against the ring and holds it in place within the cupped out portion U of the bearing-block J and its cap O. The other end of the spring is suitably resisted. It is just strong enough to keep the ring in easy yet close contact with the cupped out part. This device is very effective in practice.

The next feature of my invention, to be referred to, is that relating to the automatic and regular lubrication of the journal of the shaft. This consists in forming a suitable oil pocket V in the lower part of the bearing block J, and in further forming a slight annular recess or groove W in the bearing-block and its cap, and also in lining with the boxing metal P these pockets and recesses, whereby a place is made for the rings X. These rings are somewhat larger, say a third larger in diameter than the shaft, and they hang loosely and freely on the shaft and dip down into the oil in the pockets, as clearly shown in Figs. 1 and 4. When the shaft is rotated the rings also rotate, though more slowly, their movement being about their own axes as distinguished from swinging centrifugally around the shaft. In so moving they take up so much oil as adheres to them and deposit it on the shaft in a regular and constant manner, and this oil constantly spreads over the journal. The natural direction of the oil is outward along the bearing, and as it accumulates in the recesses Y it flows through the orifices Z back into the pockets V. By removing the screws V′ the boxes can be drained of oil which has become thick from usage. The recesses are lined with the boxing metal P to prevent the cast iron from being rubbed by the ring, and iron grit being carried to the journals.

I next come to describe that feature of my invention which relates to adjusting the shaft longitudinally, so as to regulate the distance between the grinding heads or plates, which latter are shown in dotted lines, Fig. 7. They are common in this class of machinery. These mills are frequently used in numbers in establishments where there is one skilled operator, and a number of unskilled workmen who merely supply the material to the mill and stop and start it, leaving the adjustment of the distance between the plates, whereby the quality or size of the product is determined, to the skilled operator. The object of this part of my invention is, therefore, to provide two sets of adjusting devices for the shaft; one for the skilled operator to adjust the heads or plates with; and the other for the ordinary assistant or workman to quickly separate the plates, so that they will not rub or touch one another when the material in the mill is run out, and yet without affecting or disturbing the adjustment before made by the skilled operator.

A sleeve *a*, secured by bolts or otherwise, to the adjacent end of the bearing block J, has a shoulder *b* against which fits the flange *c* of the gland *d*. Within this gland is screwed a sleeve *e* which is provided with an arm *f* carrying a spring latch or detent *g*. A recess *h*, formed in the outer end of the gland, receives one end of the detent, whereby the threaded sleeve is locked to the gland. This sleeve *e* is interiorly threaded and within it is screwed the adjusting screw *i*, which extends inward through the gland and outward beyond the sleeve, at which latter end it has a hand-hold *j*. A lock-nut *k* is screwed upon the screw *i* and acts to lock it in the sleeve *e*.

A cup *l* is fitted upon the shaft Q and within the cup, which is usually of brass, is fitted a hardened steel plate *m*. Another cup *o* carrying a similar hardened steel plate *p*, is attached to the cup *l* by means of several clips *q*. Between the hardened steel plates *m* and *p* are placed several rows of antifriction balls, separated by an intervening ring *r*, to prevent one series from rubbing on the other, an expedient which, in practice, has been ascertained to reduce friction between sets of balls. The inner end of the adjusting screw *i* is in contact with the cap *o*, and thence the pressure is applied to the shaft Q, the antifriction balls acting to prevent wear and excessive friction by the end-thrust of the shaft, due to the operation of grinding. It is not imperative that this ball bearing be used in connection with the quick-release mechanism described, as any antifriction device, such as wood, brass or other metal, &c., can be placed between the end of the shaft and the end of adjusting screw *i*.

An end plate *s*, is adjustably connected by bolts and nuts *t*, to the sleeve *a*. Between this plate and the flange *c*, of the gland *d*, are placed a plurality of coiled springs *u* and *v*. The expansion of these springs acts to hold the gland within the sleeve *a*, and against the end-thrust of the shaft, transmitted to the gland through the adjusting screw *i*, and the devices interposed respectively between such screw and shaft and such screw and the gland. From this it will be understood that the lon-

gitudinal movement of the shaft Q, called the end-thrust, in the direction of the arrow, is resisted by the tension of these springs, while the distance between the grinding heads or plates or the inward adjustment of the shaft is determined by the screw *i*.

Incidentally I will remark that practice shows that a plurality of springs of the kind shown, with the same expansive force as one stouter spring of the same kind, are, nevertheless, more flexible and capable of yielding or compressing to a greater degree than one such spring; hence my employment of a plurality of them. They yield readily when any foreign substances, such as a nail, a stone, or anything not adapted to be ground by the plates, get between them accidentally.

In Fig. 3, is illustrated one end of one section of the shaft Q as also the other sleeve *a'*, the adjusting screw *i'*, the cups *l' o'*, the anti-friction balls *q'* and plates *m'* and *p'*, a ring *r'*, all of which are the same as in Fig. 1, except the screw *i'*.

Returning now to the matter of the nice adjustment by the skilled operator and the separation of the plates by the ordinary workman without affecting such adjustment, it will be understood that when the adjustment has been made through the screw *i*, it becomes fixed, but that by taking hold of the arm *f* and releasing the catch *g*, a turn of the threaded sleeve *e* will bodily withdraw the screw *i* which movement of the screw *i* is followed up by the shaft Q, yet without changing the relative position or adjustment of that screw and the shaft. Then when the arm *f* is returned to the position shown and the latch again engaged in the notch *h*, the screw *i* is returned to its adjusted position and the shaft likewise moved inward to the position it occupied before. Thus the skilled operator having made the desired adjustment for the quality or degree of reduction desired, the unskilled employé can separate the grinding plates or heads at will and reset the adjustment, yet without changing it.

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

1. In a grinding mill, the combination with the shaft, its bearing having a cupped-out portion at the end, and a ring fitted on the shaft and within the cupped-out portion, the ring having wings or blades on its outer side and a spring on the shaft arranged to press against the said ring and hold it in place within the cupped-out portion, whereby it is made to closely hug the walls of the cupped-out portion without unduly binding therein so that it will freely rotate with the shaft, thus making a close joint and at the same time producing air currents.

2. In a grinding mill, the combination with the main shaft and the adjusting screw, of two interposed cups, one against the shaft and one against the screw, and one of them having a projecting central portion, an inner series of balls supported thereby, a dividing ring outside of said balls and a series of balls on the outside of said ring, and a plate in each cup and between it and the balls.

3. In a grinding mill, the combination with the main shaft, of two adjusting devices that are interconnected, one of them to adjust the shaft inward, and one of them to adjust the other device outward, whereby the shaft may be adjusted to working position, and whereby both adjusting devices may be withdrawn without changing their relative position.

4. In a grinding mill, the combination with the main shaft of two adjusting devices, one to adjust the shaft inward and being itself mounted within and interconnected with the other, and such other device to adjust the first named outward, but being itself unconnected with the shaft, whereby one of the devices may be adjusted inward to adjust the shaft without disturbing the other, and whereby the latter may be adjusted outward without disturbing the relation of the two adjusting devices to each other.

5. In a grinding mill, the combination with the main shaft, of a gland, a screw-threaded sleeve carried thereby, an arm to screw and unscrew the sleeve and having a device to set the sleeve when screwed back to the previously determined position, and the screw mounted within the sleeve and adapted to adjust the shaft inward, the movements of the screw being independent of the sleeve, but the movements of the sleeve carrying the screw with it.

6. In a grinding mill, the combination with the main shaft, a bearing, a closed sleeve fixed to the bearing, a gland, a spring between the gland and the closed sleeve, another sleeve threaded into the gland, an arm carried by the latter sleeve, a latch carried by the arm and engaging with the gland, and a screw threaded into the latter sleeve, and a lock-nut on the said screw working against the said sleeve.

7. In a grinding mill, the combination with the main shaft, a sleeve fixed to its bearing having an interior shoulder and a cap plate carried by the sleeve, of a gland within the sleeve and resting against said shoulder, and coiled springs between the gland and the end plate, and an adjustable device between the gland and the shaft.

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

JAMES F. WINCHELL.

Witnesses:

OLIVER H. MILLER,

LIDA L. WINCHELL.