

June 12, 1934.

F. N. G. KRANICK

1,962,778

HAMMER MILL

Filed Dec. 27, 1932

2 Sheets-Sheet 1

Fig-3

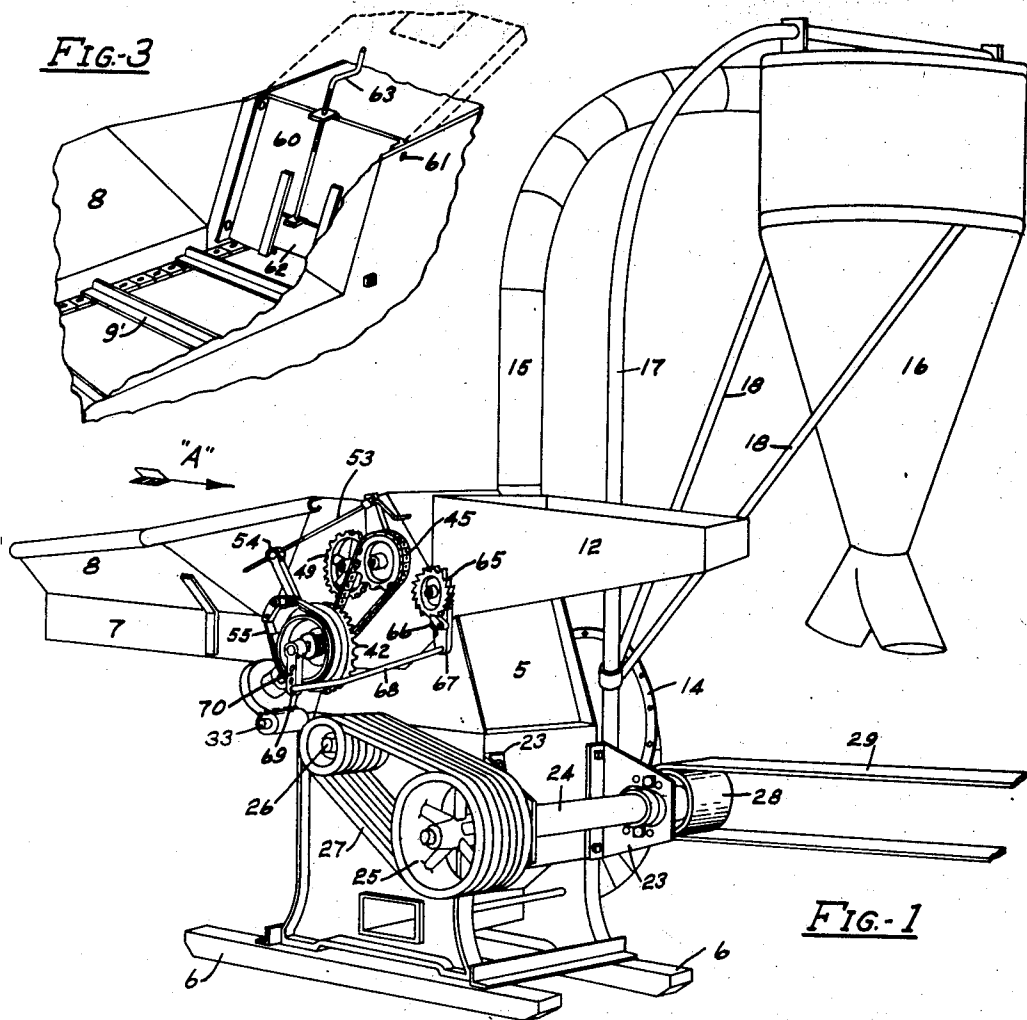
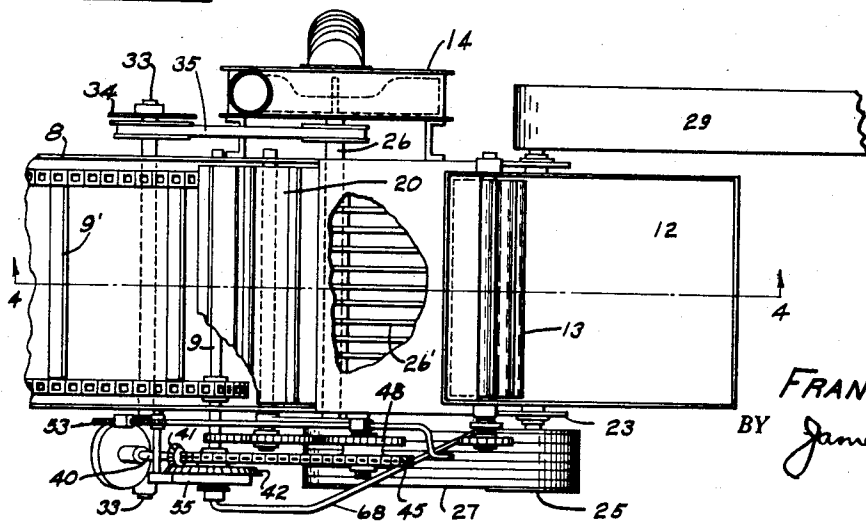


Fig-1

Fig-2



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FIG-4

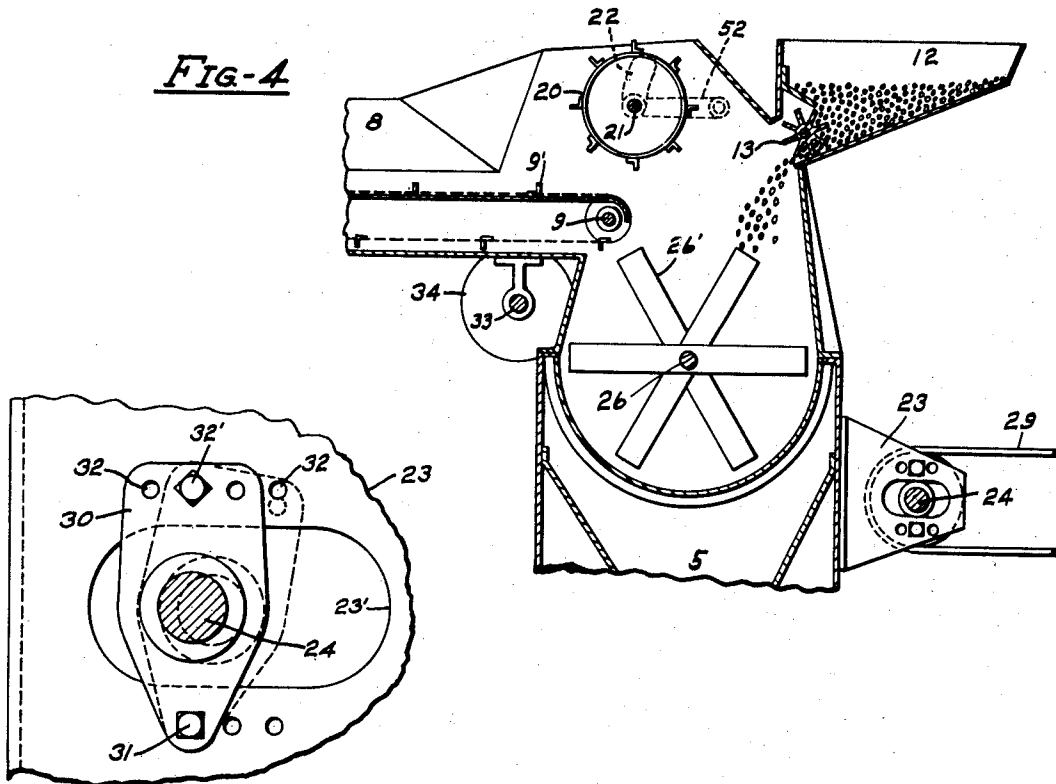


FIG-5

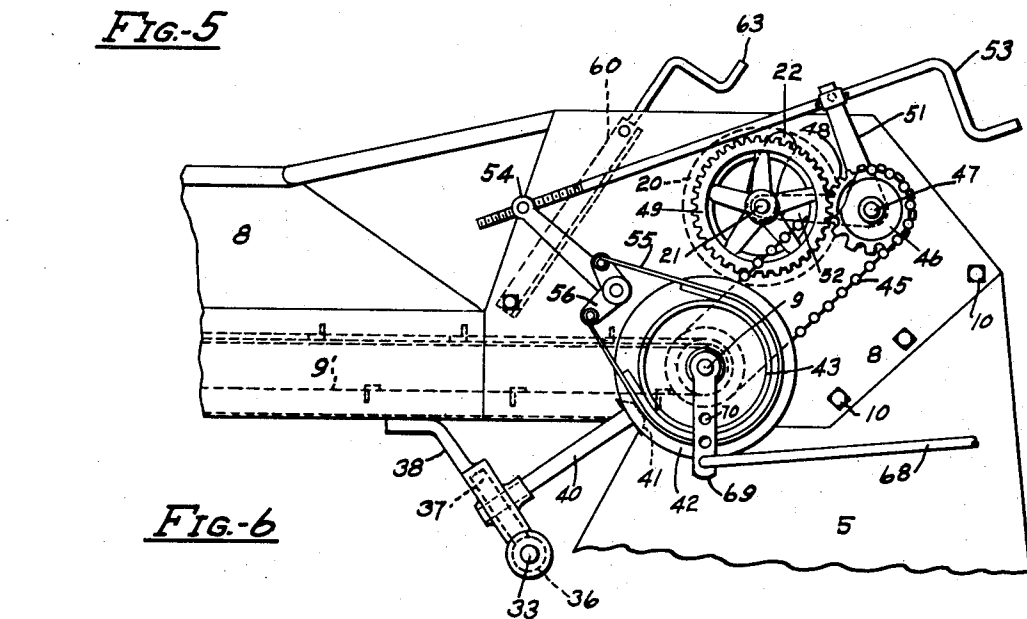


FIG-6

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UNITED STATES PATENT OFFICE

1,962,778

HAMMER MILL

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4 Claims. (Cl. 83—11)

In the operation of feed grinding mills of the hammer type it is essential for highly efficient results that the material be fed to the hammers in substantially uniform volume, that is, when such material as roughage is carried toward the hammers in uneven masses the feeding thereof should be temporarily stopped until sufficient has been taken away by the revolving action of the hammers to prevent excess feeding and slugging, and when such condition has been relieved the mechanism should instantly resume its normal feeding functions. It is the object of my invention, therefore, to provide means whereby the feeding mechanism will be automatically controlled to stop and start according to the varied conditions existing during the operation of the mill, and to maintain the constant speed of parts necessary to effect the feeding when overloaded conditions have been relieved, which I accomplish by a suitable speed governor and a volume governor cooperating with the driving mechanisms of the mill, and to also improve the mill in other respects, as will further appear.

In the accompanying drawings, forming part hereof, Figure 1 is a perspective of a mill embodying my improvements; Fig. 2, a fragmentary detail plan; Fig. 3 a detail view of a part of my improved mill taken in the direction of the arrow A in Fig. 1; Fig. 4, a detail sectional view taken on the dotted line 4—4 in Fig. 2; Fig. 5, a detail view of a belt adjusting device which I employ; and Fig. 6 is a fragmentary side elevation illustrating a volume governor for controlling the material being fed to the mill.

In said drawings the numeral 5 indicates the mill body mounted upon skids 6 but which may be supported by any suitable framework, said body having detachably mounted thereon a shelf-feeder 7 provided with the sides 8, and an endless conveyor 9, 9'. The feeder is connected to the body by bolts 10 so that it with the parts associated therewith, as shown in Fig. 6, may be removed and replaced as a unit, the object of such arrangement being that the feeder may be removed and substituted by a trough into which material is loaded and then manually fed to the hammers, which latter method is sometimes followed according to conditions. A seed hopper 12 is mounted on the mill and is provided with a fluted roller 13 at its outlet for conveying seed from the hopper to be mixed with the roughage as it is being fed into the mill, as will further appear. The mill is also provided with a blower 14, 15, for discharging ground material into a dis-

tributer 16, all in a well known manner, the distributor being supported by a frame, as 17, 18.

In the side walls 8 of the feeder I mount a floating feed roller 20 of any desired construction and which is provided with a shaft or trunnions 21 80 which fit into slots 22 at either side so that the roller may be raised and lowered by pressure of material passing thereunder. Upon each side of the mill body are brackets 23 in which I mount a jack-shaft 24 having a pulley 25 connected to 85 the hammer-supporting shaft 26 by a belt 27 preferably of the multiple type, shaft 26 carrying hammers 26' of any desired construction and arrangement, and which shaft 24 at its opposite end is provided with a pulley 28 adapted to be 70 driven by a belt 29 connected to a source of power such as a tractor. The brackets 23 have slots 23' therein so that shaft 24 may be adjusted in reverse directions longitudinally of the mill to increase or decrease the tension of belt 27, and which is accomplished by plates 30 through which the shaft extends, said plates being pivotally connected to the bracket 23, at 31, and swung in opposite directions, as indicated by the dotted lines in Fig. 5, to be connected in one of the 80 holes 32 by a bolt 32', by which means said shaft 24 may be shifted back and forth as desired and secured in adjusted position by the bolt 32'. Beneath the feeder I mount shaft 33 upon which is a clutch pulley 34 and associated parts 85 constituting a speed governor of well known construction connected by a belt 35 to shaft 26 and driven thereby, said shaft 33 at its opposite end having an enclosed worm 36 meshing with an enclosed worm-wheel 37 supported by a bracket 38 90 from the feeder, said gears 36 and 37 acting as speed reduction means for the part driven thereby. Said worm-wheel 37 has a shaft 40 extending therefrom having at its end a bevel gear-wheel 41 meshing with a freely running gear 42 adjacent 95 a brake wheel 43 mounted on the conveyor shaft 9 by which the conveyor is actuated, and which gear and wheel include clutch mechanisms (not shown). The brake 43 and gear wheel 42 and associated parts are illustrative of a volume 100 governor, but which generally and in details of construction may follow the type of automatic friction clutch fully disclosed in Patent No. 1,330,193, dated May 10, 1920, and therefore further specific explanation will not be referred to 105 herein, as any appropriate mechanisms for the purpose may be employed. The conveyor shaft 9, driven by the bevel gear 41 through the gear 42, is connected by a sprocket-and-chain system 110 45, the chain passing about the sprocket 46 on stud

shaft 47, Fig. 6, which carries a pinion 48 engaging and driving the gear 49 for rotating roller 20 of which it forms a part. On the stud-shaft 47 I pivotally mount a lever having the arms 51, 52, the latter being connected to roller shaft 21, and arm 51 supporting adjusting rod 53 trunnioned thereon, the opposite end of the rod being threaded into a keeper 54 to which a brake band 55 is adjustably attached, as by the bell-crank 56, in a well known manner, and which band passes about brake 43 on shaft 9, all of which parts, excepting a portion of rod 53, being enclosed in a casing (not shown) to prevent accidents, and which constitute a volume governor well known.

I am enabled to readily adapt the feeder for handling small grains and seeds as well as coarse material and roughage by pivotally mounting a gate 60, as at 61, between the walls of the feeder adjacent the inner end of the conveyor 9', and providing in the lower side thereof a valve 62 which may be regulated by the adjusting rod 63. When feeding the finer material the gate is closed so that it will be conveyed through the valve opening, and when coarse material or roughage is being fed to the hammers the gate 60 is swung away from the entrance to the roll 20 as indicated by the dotted lines, Fig. 3. For some feeding purposes it is desirable to nicely proportion the feed ingredients, which is satisfactorily accomplished by introducing the coarse material and roughage into the mill separately from the finer material such as oats, soy beans and the like, for which purpose I provide the hopper 12 having the rotatable gate 13, upon the shaft of which a ratchet 65 is secured, which is engaged by a pawl 66 supported on bracket 67, the latter being connected by a pitman 68 adjustably secured to an arm 69 by means of openings 70 therein, and which arm is mounted on the conveyor shaft 9. It will be understood, therefore, that the action of the gate 13 is controlled by the volume governor and that by connecting pitman 68 so that it may be adjusted on the arm 69 said gate may be controlled to feed fast and slow through the action of the pawl 66 advancing the ratchet one or more notches at each reciprocation of the pitman as may be determined. I am thus enabled to automatically introduce finer material to be mixed with roughage in desired proportions and to maintain the uniform mixing of the materials through the action of the speed and volume governors so that the speed of rotation of the gate 13 will at all times be in proper relation to the speed of the conveyor 9'; in other words, the feeding of the roughage and small grain will be controlled by the speed governor, and the volume governor will control the amount of roughage fed by raising the upper feed roller and stopping the feed conveyor 9', which action will automatically stop the flow of the small grain from hopper 12 until sufficient material is advanced from beneath the roller 20 to return it to normal working position, at which moment all of the working mechanisms will simultaneously resume operation. In combining the roughage feeder and seed hopper as disclosed, and the actuating mechanism associated therewith, a mill is provided which is automatic in action and of advantage to the user as absolute control of the ratio of small grain to roughage is assured for obtaining a balanced ration for the feeding of livestock.

In the manner described it will be understood that I may employ any suitable type of speed governor, indicated at Fig. 2, for automatically

maintaining the volume governor at required speed after the latter has been declutched and the conveyor idle so that when excess quantities of material have been removed by the hammers and by the action of feed roller 20 which combs the upper portion of the material, said volume governor will again clutch to instantly impart the necessary speed to the conveyor. When excess quantities of material are fed, or when roughage is fed in uneven bunches, the feed roller 20 will be raised together with parts associated therewith, at the same time pivoting the lever arms 51, 52, which action causes the arm 51 to pull the rod 53 and therefore, through the parts 54, 56, tighten the band 55 about the brake 43 of the volume governor and declutch the latter from gear 42, thus automatically stopping the conveyor 9, 9', until sufficient material has been taken away by the rotating hammers, and roll 20, and as the roll is caused to lower by such reducing volume, it returns to normal position and the governor again clutches to continue operation of the feeding mechanisms as a whole. In this manner the volume of material being fed is governed and the feeding mechanism protected from excess feeding and slugging. Therefore, in providing means for governing the speed of the mill in cooperation with means for automatically governing the volume of material being fed it will be apparent that I am enabled to obtain an even and positive feeding of such material, as the discharge from the conveyor to the hammers is effectively regulated at all times by the coacting speed and volume governing means; and to insure maintenance of uniform speed of the entire actuating parts it will be understood that in controlling the tension of the drive belting 27 in the manner disclosed such result is accomplished.

I claim as my invention:

1. In a machine of the character described, a shaft having hammers thereon, an adjustable shaft, means for driving said latter shaft, means connecting the adjustable shaft to the hammer-shaft, means for shifting the adjustable shaft to regulate the connecting means, a worm-shaft, means connecting the hammer-shaft to the worm-shaft including speed governing means, a conveyor having a shaft, a hopper having means for feeding material to the hammers, means connecting the feeding means to the conveyor shaft for actuating said feeding means to deliver material to the hammers, means engaging the worm-shaft and conveyor shaft for controlling the latter, a feed roller having a shaft, and volume governing means associated with the roller and the conveyor shaft for regulating the feed between the conveyor and roller and also the feeding means of the hopper and actuating simultaneously with the speed governing means for controlling the movement of the conveyor.

2. In a machine of the character described, a detachable feeder embodying an endless conveyor having a shaft, means for driving the shaft, a second shaft embodying a worm, means on the latter shaft for governing the speed thereof, means associated with said worm for reducing speed, a gear wheel engaging and driven by said speed reducing means, a brake adjacent the gear, a floating roller adjacent the brake and gear-wheel, a band about the brake, a stud-shaft, a sprocket on the latter, a sprocket-and-chain system connected to the brake and gear wheel shaft and to said sprocket, a pinion on the stud-shaft,

a gear-wheel on the roller and driven by the pinion, a pivotally mounted lever connected to the roller, a seed receptacle, means actuated by the conveyor for removing seed from the receptacle, and means connecting the lever and brake band for stopping rotation of the conveyor shaft when said roller is raised to inactive position.	80
3. In a machine of the character described, a shaft having hammers thereon, a driving shaft, means connecting the driving shaft and hammer shaft, means for actuating the driving shaft, a worm shaft, means connecting the hammer shaft to the worm shaft including speed governing means, a conveyor having a shaft, means engaging the worm shaft and conveyor shaft for controlling the latter, a feed roller having a shaft, and volume governing means associated with the roller and the conveyor shaft for regulating the feed between the conveyor and roller and actuating simultaneously with the speed governing means for controlling the movement of the conveyor.	95
4. In a machine of the character described, a feeder embodying an endless conveyor having a shaft, means for driving the shaft, a second shaft embodying a worm, means on the latter shaft for governing the speed thereof, means associated with said worm for reducing speed, a gear wheel engaging and driven by said speed reducing means, a brake adjacent the gear, a floating roller adjacent the brake and gear wheel, a band about the brake, sprocket supporting means, a sprocket on the latter means, a sprocket-and-chain system connected to the brake and gear-wheel shaft and to said sprocket, a pinion on the sprocket support, a gear-wheel on the roller and driven by the pinion, a pivotally mounted lever connected to the roller, and means connecting the lever and brake band for stopping rotation of the conveyor shaft when said roller is raised.	95
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