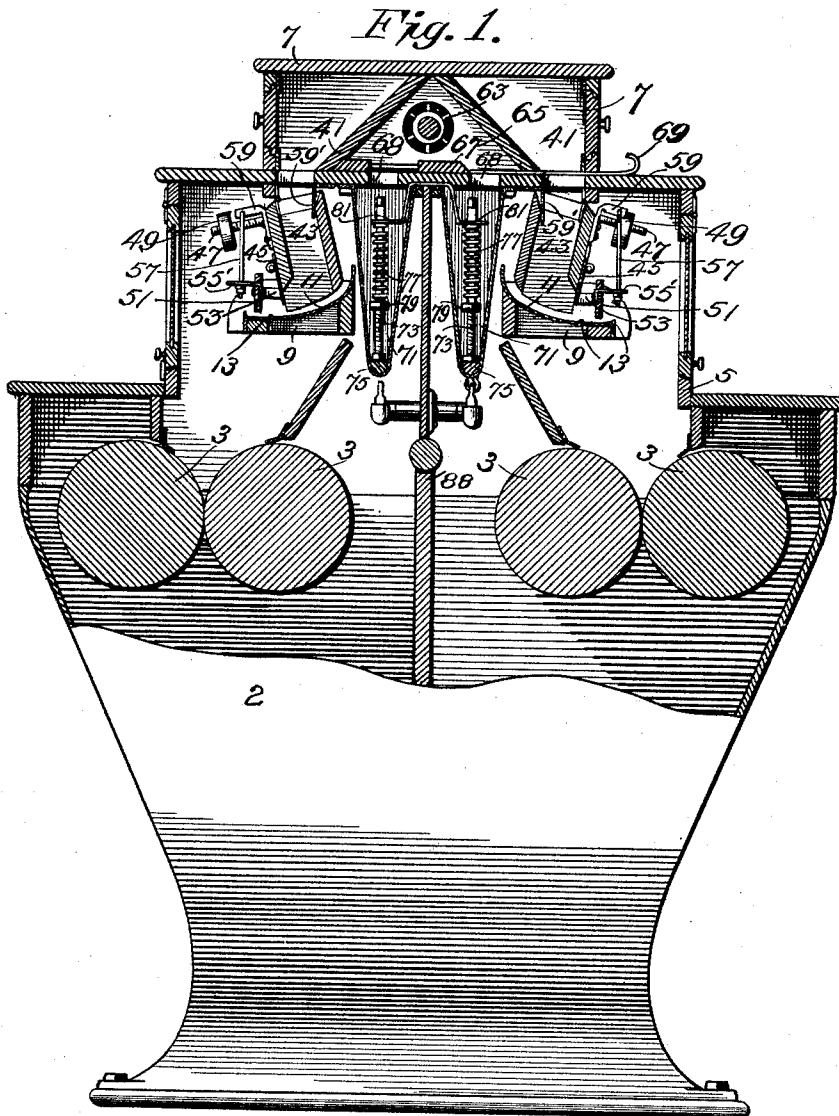


J. L. WILLFORD.

AUTOMATIC FEEDER FOR ROLLER MILLS.

No. 482,419.

Patented Sept. 13, 1892.



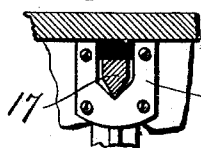
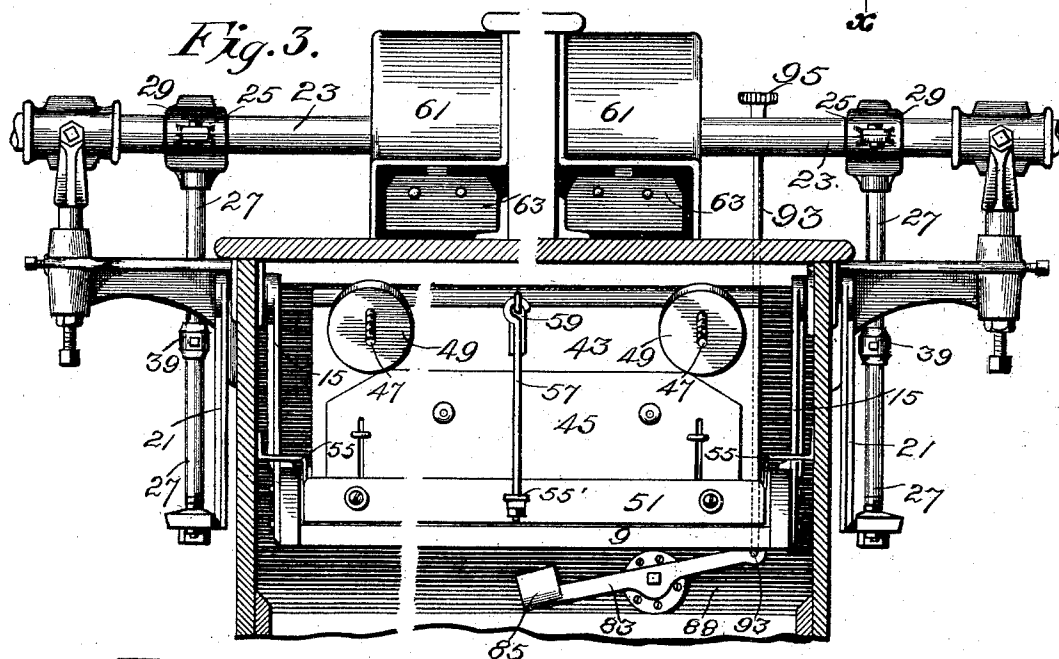
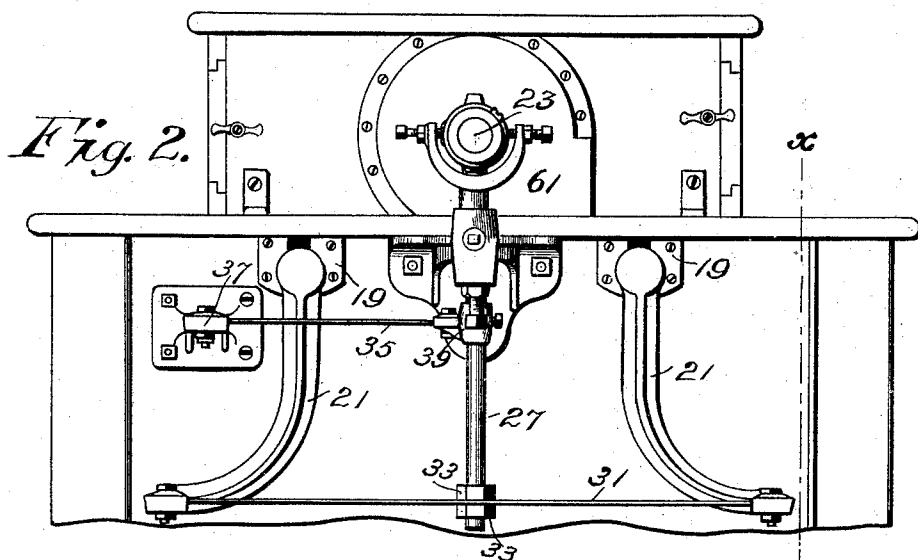
Witnesses.
C. E. Van Doren,
H. J. Lyon

Inventor,
Joseph L. Willford.
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(No Model.)

3 Sheets—Sheet 3.

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Fig. 6.

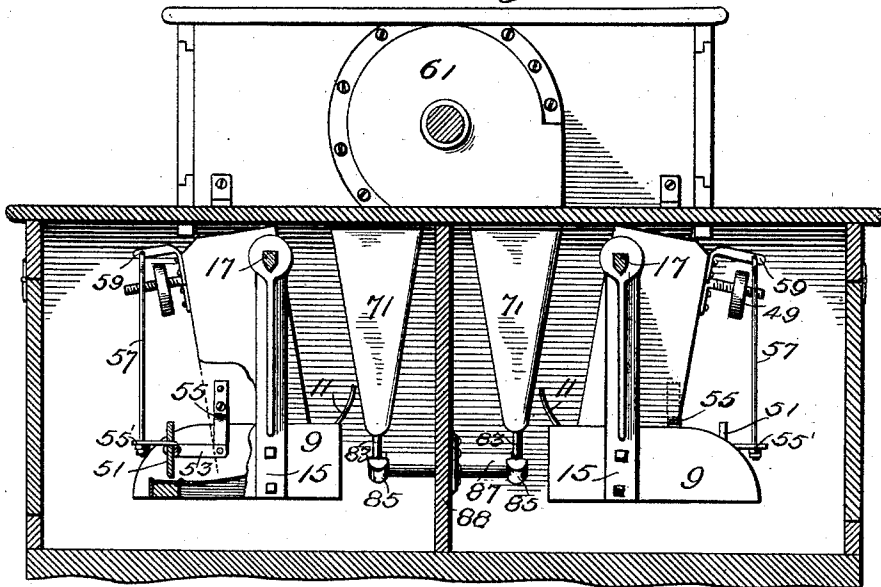


Fig. 7.

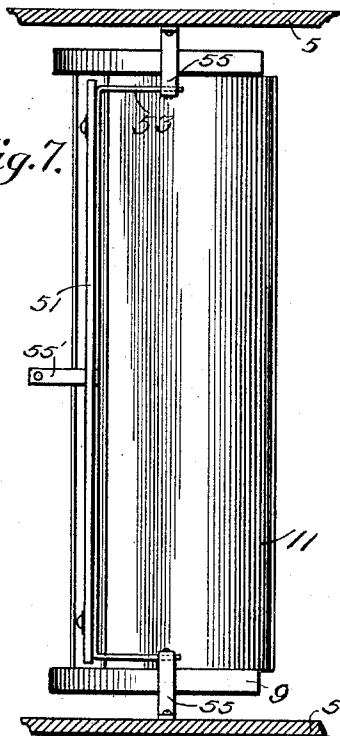
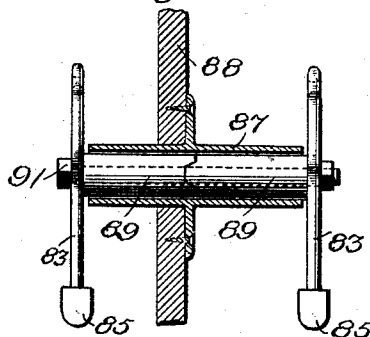


Fig. 8.



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UNITED STATES PATENT OFFICE.

JOSEPH L. WILLFORD, OF MINNEAPOLIS, MINNESOTA.

AUTOMATIC FEEDER FOR ROLLER-MILLS.

SPECIFICATION forming part of Letters Patent No. 482,419, dated September 13, 1892.

Application filed October 17, 1891. Serial No. 409,021. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH L. WILLFORD, of Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain Improvements in Automatic Feeders for Roller-Mills, of which the following is a specification.

This invention relates to improvements in automatic feeders for roller-mills; and the object I have in view is to provide an improved feeder by means of which the stock will be fed to the rolls and evenly distributed, regardless of the quantity of stock that is fed to the hopper.

The invention consists, further, in providing a balanced movement for operating the vibrating or swinging shoes of the feeder.

The invention consists, further, in an improved device for drawing off the hot air and steam from the material passing to the rolls and in means for cleaning this device.

The invention consists, further, in details of construction and combinations hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, forming a part of this specification, Figure 1 is a transverse vertical section of a roller-mill having my invention applied thereto. Fig. 2 is a side elevation of the automatic feeder, showing the means for operating the shoes. Fig. 3 is a vertical section on line *xx* of Fig. 2. Figs. 4 and 5 are details of the device for operating and vibrating the shoes. Fig. 6 is a side elevation of the feeder, with a portion thereof in section. Fig. 7 is a plan view of one of the swinging shoes having the automatic gate. Fig. 8 is a detail of the knockers used for cleaning the cloth of the suction device.

In the drawings, 2 represents the case of a roller-mill, which may be of any ordinary or preferred construction and may be provided either with a single or a double pair of rollers. As here shown there are two pairs of rollers 3 3, arranged in the machine in the usual manner.

Arranged upon the casing of the roller-mill is a casing 5, that incloses the parts of the automatic feeder, and upon this casing is a hopper 7, into which the stock is fed and from each side of which it passes through the automatic feeder to the rollers 3 3. The feeder

that I have here shown is double, there being one part in each pair of rollers. As the two parts of the feeder are alike, I will in the following description refer to but one part of said feeder, it being understood that when a single pair of rollers is used only a single feeder is necessary.

Arranged in the feeder-casing is a swinging shoe 9. This shoe is provided with a curved upper surface 11, having its lowest point at the front of the shoe and being provided with the ribs or projections 13, over which the material must pass as it is fed from the shoe. This shoe is secured upon suitable hangers 15, that are provided with the knife-edges 17 and rest in suitable bearings 19, secured upon the frame of the machine. Outside of said casing said hangers are provided with the depending arms 21, and I prefer to construct said hangers with their bearings and the arms 21 all in one piece.

I provide means by which the shoes on both parts of the feeder may be oscillated or vibrated and at the same time have the movement completely balanced. For this purpose I arrange in suitable bearings a shaft 23, that may be driven by any suitable means. Upon this shaft, preferably at each end of the feeder, I arrange an eccentric 25, and I provide a rod 27, connected to said eccentric by a strap 29 and extending down at each end of the casing. A spring 31 is arranged to connect the lower ends of the arm 21 on the hangers, and the centers of these springs are connected to the rods 27, the ends of said rods preferably being screw-threaded and being provided with nuts 33, arranged upon opposite sides of each of said springs. A spring 35, arranged substantially at a central point between the spring 35 and the eccentric 25, has one end connected to a stationary support 37 upon the frame of the machine and its opposite end connected to the rod 27, preferably by means of a collar 39. The spring 35, it will be seen, forms the fulcrum for the operating-rod 27, and by this means the movement of the hangers is completely balanced.

Arranged beneath the hopper 41 and between the hopper and the shoe 9 is a swinging spout or valve 43. This valve is secured upon a suitable hinge beneath the hopper, so that

all the material passing from the hopper falls into and passes through said valve. Said valve is open at both ends, and its lower end is preferably of curved form, so as to conform, substantially, to the upper surface of the shoe 9. At its outer edge the lower end of the valve is cut away, so as to form an opening at the outer side of the valve through which the stock is allowed to pass from the valve over the outer edge of the swinging shoe. A gate 45 is arranged over this opening, and it may be adjusted so as to increase or decrease the size of the opening, as desired.

The valve 43 is provided, preferably, near its upper end with the projecting rod 47, said rods being, preferably, screw-threaded and provided with the adjustable weights 49. These weights may be adjusted so that the valve will stand normally in any desired position. They are preferably so adjusted that when the valve is in its normal position its lower end is thrown inward toward the inner end of the shoe 9, substantially as shown in Figs. 1 and 6.

An automatic gate 51 is arranged in front of the valve 43 and at a point over the forward end of the shoe 9. This gate is secured upon arms 53, that are pivoted to hangers 55, that are secured upon the wall of the casing. The lower ends of said hangers preferably extend inside of the shoe 9, as shown in Figs. 6 and 7. The gate 51 is capable of swinging upon its pivots toward and from the upper surface of the shoe 9, and said gate is provided, preferably, with a lug or projection 55', that is connected by a rod 57 to a lug or projection 59 at the upper end of the swinging valve 43. By this means it will be seen that as the supply of material through the hopper is increased a greater quantity will be supplied to the swinging valve 43, and this will tend to swing said valve outward toward the outer end of the shoe 9. This movement of the swinging valve will raise the gate 51 farther away from the surface of said shoe and permit the stock to be fed more rapidly to the rolls. As the supply of stock decreases the valve will swing inward and the automatic gate will be partially closed. In this way it will be seen that the stock will be fed evenly and in a thin sheet from the vibrating shoe to the rolls independently of the supply of material to the hopper.

When it is desired to use the device as a set-feed, the swinging valve 43 will be adjusted by means of a movable weight, so as to bring it into the desired position for the feed required, and thereby the automatic gate 51 will also be set in the position desired. The gate 45 may also be adjusted so as to regulate the flow of material through said valve 43. A strip of cloth or other suitable material 59' may be secured beneath the hopper, so as to extend below the upper end of the valve 43 and close the opening between said valve and the under side of the hopper.

It is also desirable in a machine of this class

to provide means whereby the hot air and steam arising from the stock as it passes through the machine may be carried away, so as to keep the stock as dry and cool as possible. For this purpose I provide a suction device in connection with each part of the feeder. This consists, preferably, of a suitable fan-casing 61 and fan 63, secured upon the shaft 23 and arranged at each end of the hopper. An air-chamber 65 is arranged within the hopper, provided with openings communicating with each part of the feeder-casing and also with openings communicating with the fan-casing. A valve 67, provided with a handle 69, is arranged to close the opening 68, that extends from the air-chamber 65 into the feeder-casing. Pockets 71, of cloth or other suitable flexible material, are arranged over the openings 68 and within the feeder-casing. Rods 73 are arranged within said pockets and are connected to bars 75, that engage the cloth or material, and said rods are provided with suitable springs 77 and adjusting-nuts 79, by means of which said pockets may be held in a distended position. The upper ends of said rods preferably pass through suitable stationary bearings 81 and are capable of sliding upward in said bearings against the tension of said spring. I also provide means for striking upon said pockets for the purpose of jarring off any material that may be drawn against them by the air-current. For this purpose I provide a hammer or knocker in each part of the casing, by means of which a suitable blow may be struck against the lower ends of the pockets. This hammer consists, preferably, of a pivoted rod 83, provided with a hammer-head 85, located in each part of the casing immediately below the pocket 73. A sleeve 87 is preferably secured to the middle wall 88 of the casing, and two sleeves or tubes 89, having their ends notched, so as to engage each other, are arranged in said sleeve 87 and project slightly beyond the ends of said sleeves. One of the knockers is arranged against the end of the sleeves 89, and a bolt 91 passes through said knockers and through said sleeve 89. By this means the two knockers are secured together, so as to operate simultaneously. An operating-rod 93 has its lower end connected to one of said knockers and preferably extends through the top of said casing and is provided at its upper end with a head 95, by means of which said knockers may be operated. When the device is in operation, the hot air and steam will be drawn from above said rolls and from around said feeder into and through said pockets, which will retain all of the stock or material, while permitting the heated air and steam to be carried off by the fan. When it is desired to free said pockets from any material that may have accumulated thereon, the valves 67 are closed and the knockers are operated, so as to jar said pockets and cause any material that may be adhering thereto to drop off.

It will be seen that I provide an automatic

feeder in which the material as received from the hopper will be fed to the rolls in a thin sheet of uniform thickness as to width, and this will be done regardless of the quantity of material that is being fed. It will also be seen that the device will quickly and automatically adjust itself to any variations in the flow of material and that it may be readily set, so as to become a set-feed, when necessary. It will also be seen that the hot air and steam arising from the material will be drawn out of the casing without the removal of any of the material. It will also be noticed that the device for drawing off the hot air and steam is separate for each pair of rolls and that therefore the material that collects on the cloth when shaken off will drop into the same spout with the stock out of which it was drawn. This is important, as where a single suction device is applied to a large number of rolls the material drawn off will be of various grades and qualities and cannot be returned to the stock from which it is drawn, but must be carried off into a common spout or receptacle.

In practice I find that the curved upper surfaces of the vibrating shoes 9, in connection with the hangers arranged to move the shoes in a curved plane, cause the material to be fed from the shoes in an even and steady sheet materially different from that which is obtained by feeding the material from shoes having a flat or level upper surface and when the shoe is moved in a horizontal plane, where the material will be fed from the shoe in waves instead of in a steady unbroken sheet.

I claim as my invention—

1. The combination, in an automatic feeder, with suitable shoes and pivoted hangers supporting said shoes, of a spring connecting said hangers, an operating-rod connected to said spring, a spring-fulcrum connected with said rod, an operating-shaft, and an eccentric upon said shaft also connected with said rod, substantially as described.

2. The combination, with the independent vibrating shoes and their supporting-hangers, of springs connecting said hangers, an operating-rod, and an eccentric for moving said rod.

3. The combination, with the vibrating shoes and their supporting-hangers, of suitable springs connecting said hangers, rods connected with said springs, springs forming fulcrums for said rods, and eccentrics for operating said rods, whereby a balanced motion for said shoes is provided.

4. The combination, with the feed-shoes, of the hangers connected to said shoes and provided with the knife-edge bearings 17, the arms 21, formed integrally therewith, and the spring 31, connecting said arms, substantially as described.

5. The combination, with the vibrating shoe, of the hangers connected therewith and provided with the knife-edge bearings 17, the arms 21, formed integrally therewith, the

spring 31, connected to said arm, and the operating-rod connected to said spring, substantially as described.

6. The combination, with the vibrating shoe and the hopper, of the swinging valve arranged between said hopper and said shoe, through which the material from said hopper passes, and a gate connecting with said swinging valve and arranged to be raised or lowered by the movement of said valve, substantially as described.

7. The combination, with a vibrating shoe and hopper, of the swinging valve arranged between said hopper and shoe and arranged to receive the material from said hopper and means for balancing said valve, substantially as described.

8. The combination, with the vibrating shoe, of the hinged valve arranged above said shoe and having an adjustable gate at its lower end and means for counterbalancing said valve, substantially as described.

9. The combination, with the vibrating shoe having a curved upper surface, of the pivoted valve arranged above said shoe and having a curved lower end.

10. In an automatic feeder, a valve consisting of a receptacle open at its upper and lower ends and mounted upon a suitable pivot, and the shoe arranged beneath and in proximity to the lower end of said valve, whereby the lower end of said valve swings over said shoe as the supply of material varies, and a gate connected with said valve and arranged to be raised and lowered by the movement of said valve, substantially as described.

11. In an automatic feeder, a valve having open upper and lower ends and mounted upon a pivotal support, a counterbalance-weight connected with said valve, a shoe arranged beneath the lower end of said valve and over which said lower end of the valve is moved as the supply of material to said valve is varied, and a gate connected with said valve and arranged to be raised and lowered by the movement of said valve, substantially as described.

12. In an automatic feeder, the combination, with a vibrating shoe, of a swinging valve arranged above said shoe, a pivoted gate arranged above said shoe, and a connection between said gate and said valve, whereby said gate is automatically raised or lowered by the movement of said valve.

13. The combination, with the feeder and rolls, of a suction-fan, the pockets arranged within the casing, means for distending said pockets, and the knockers arranged to operate upon said pockets, substantially as described.

14. The combination, with the feeder and rolls and the casings 2 and 5, of the air-chamber 65, arranged above said casing 2, the fans connected with said air-chamber, openings 68 between said air-chamber and said casing, pockets arranged in said casing and covering said openings, spring-controlled devices for

distending said pockets, and means for jarring said pockets, substantially as described.

15. The combination, with the feeder and rolls and the casing 5, of the air-chamber 65, 5 arranged above said casing and connected therewith by suitable openings, valves 67 for closing said openings, suction-fans connected with said air-chamber, pockets arranged over said openings 68, spring-controlled devices for 10 distending said pockets, and suitable knockers for jarring the material that adheres to said pockets, substantially as described.

16. The combination, in an automatic feeder, with a vibrating shoe, of hangers supporting 15 said shoe, a draft-bar operating said shoe, springs arranged between said shaft and said hangers, and a suction-fan arranged upon the

shaft by which said shoe is operated and arranged to create a suction through the casing in which the shoe is located. 20

17. The combination, in an automatic feeder, with the vibrating shoe and the shaft provided with eccentrics connected through suitable springs with said shoe for operating the same, of the suction-fans mounted on said 25 eccentric-shaft and arranged to create a suction through the casing in which the shoe is located.

In testimony whereof I have hereunto set my hand this 9th day of October, 1891.

JOSEPH L. WILLFORD.

In presence of—

A. C. PAUL,

BESSIE BOOTH.