June 30, 1931. W. H. LOCKERT ET AL 1,812,538

RUBBER MILL

Filed April 7 1928 4 Sheets-Sheet 1

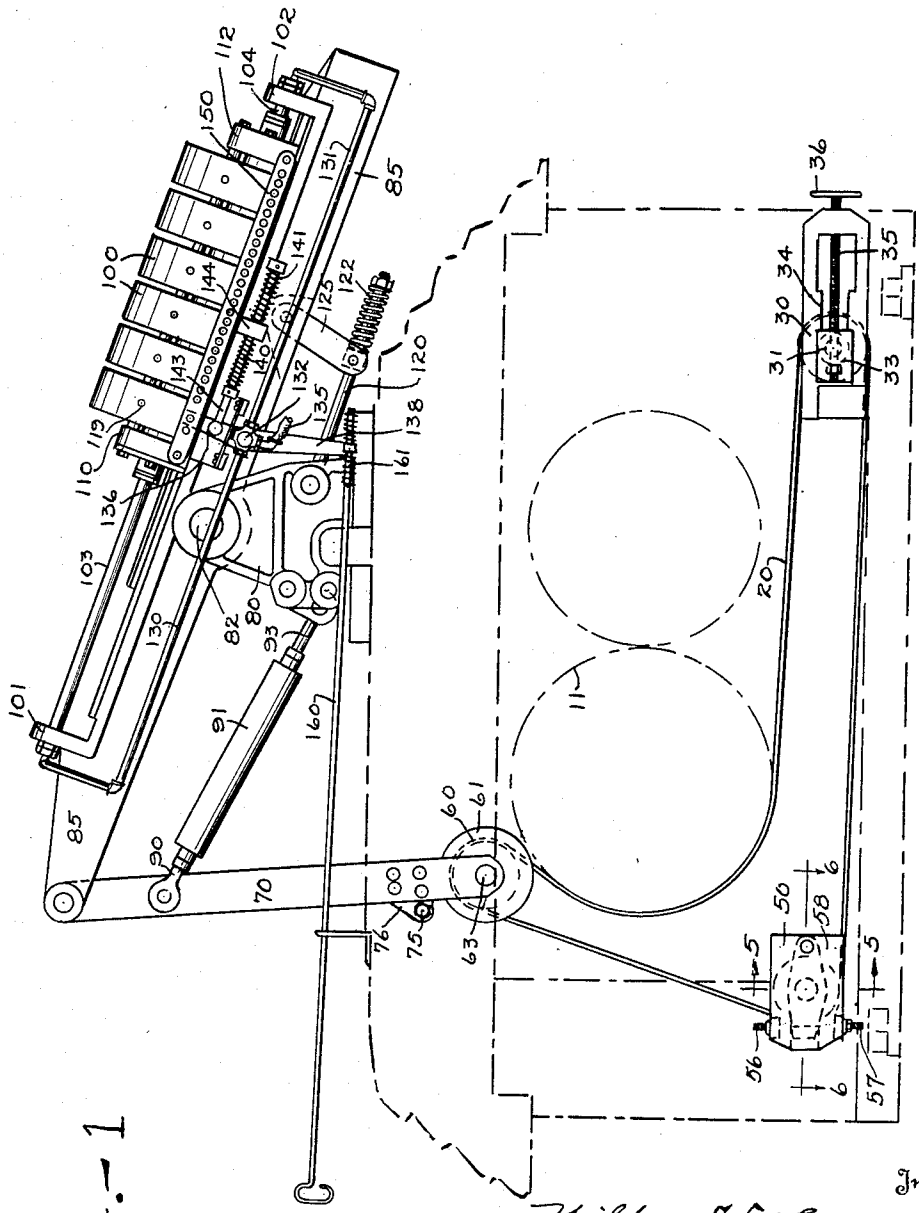


FIG. 1

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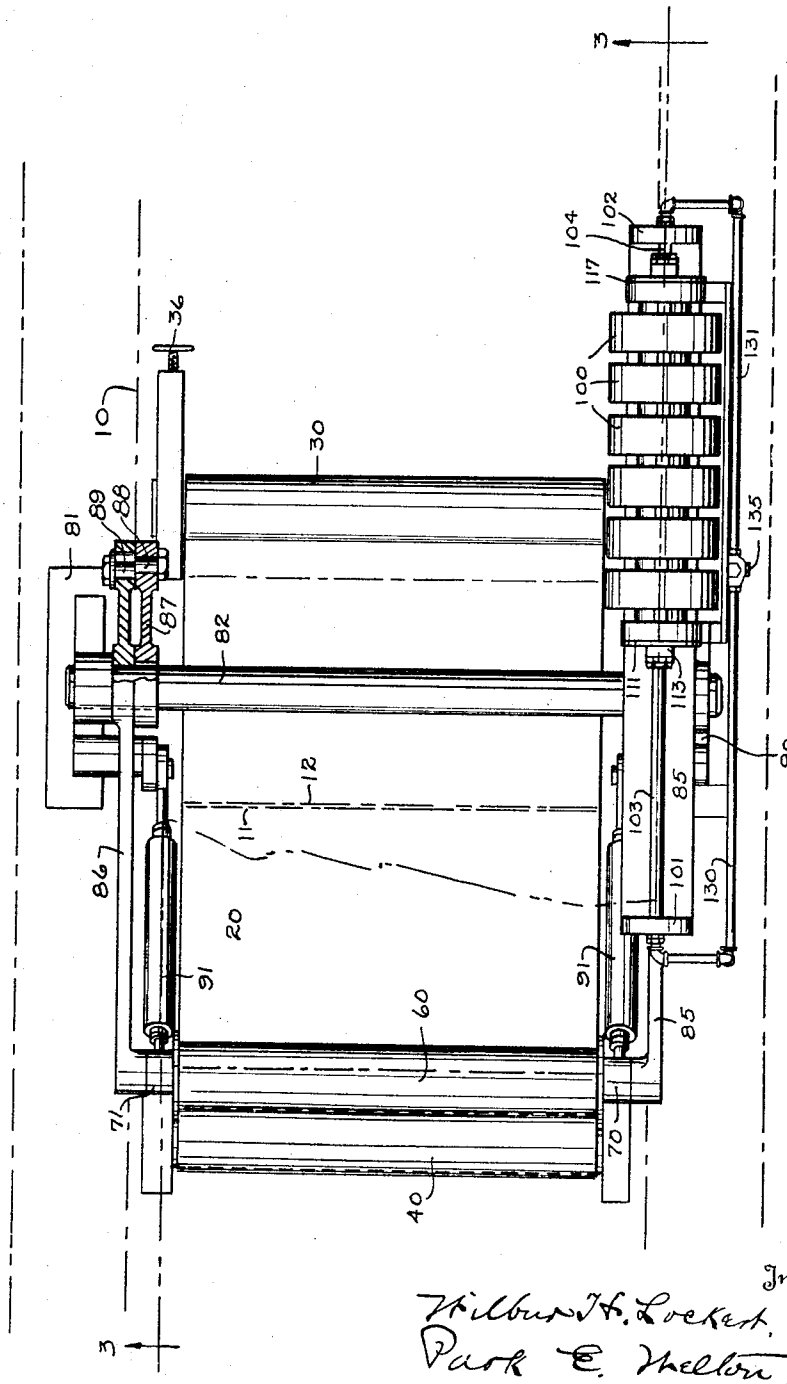


FIG. 2

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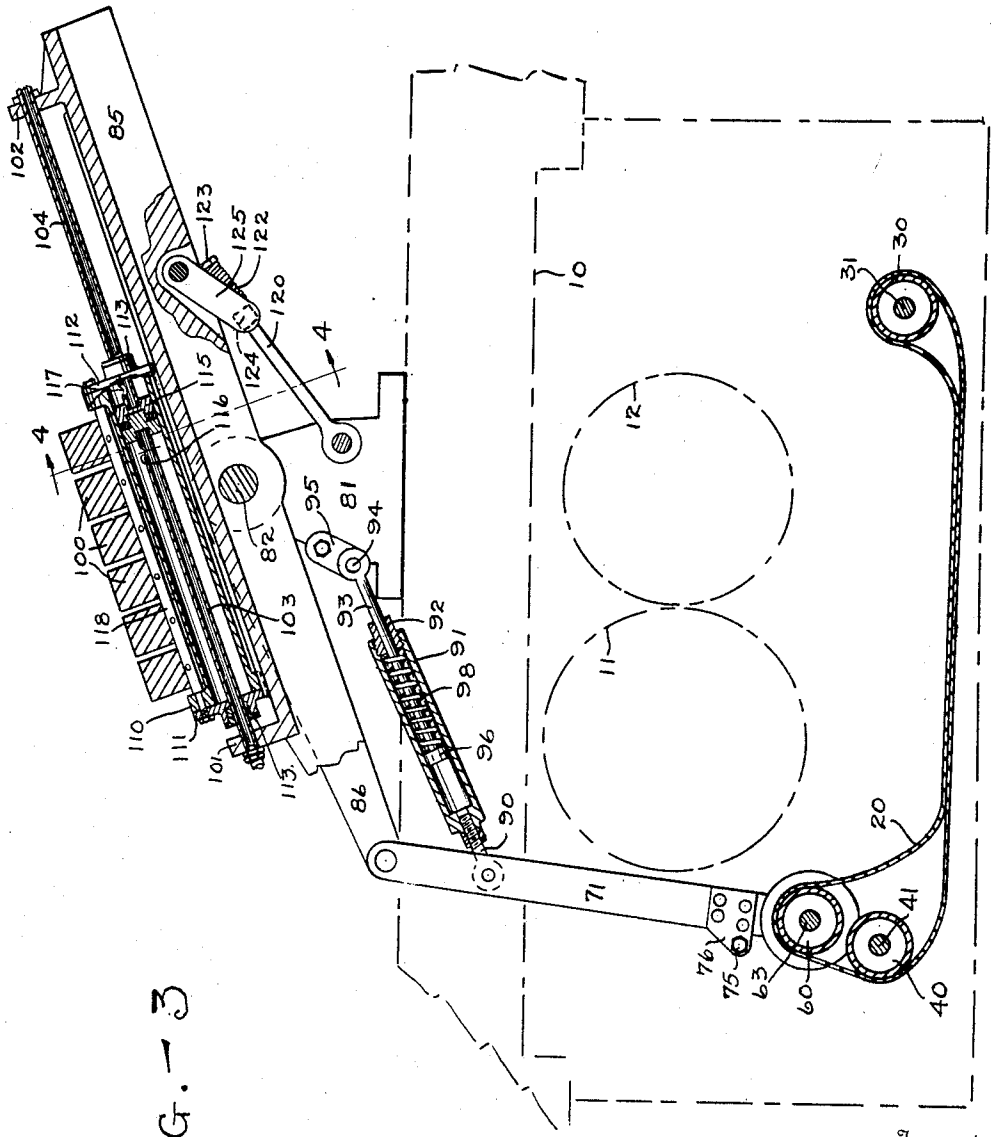


FIG. 3

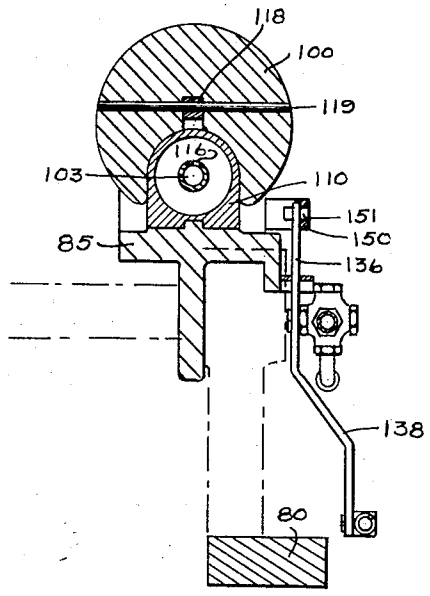
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RUBBER MILL

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FIG. 4



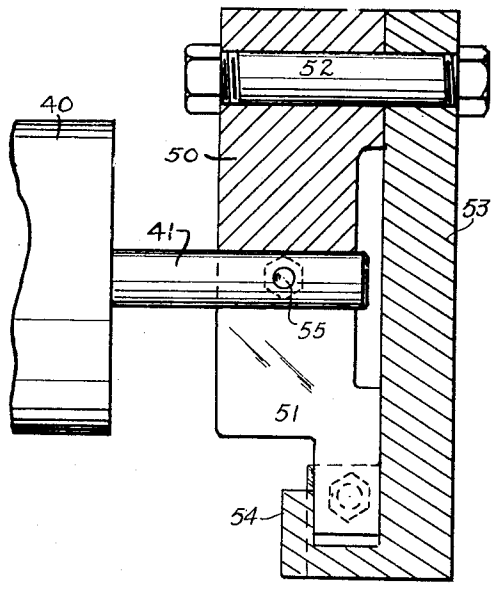


FIG. 6

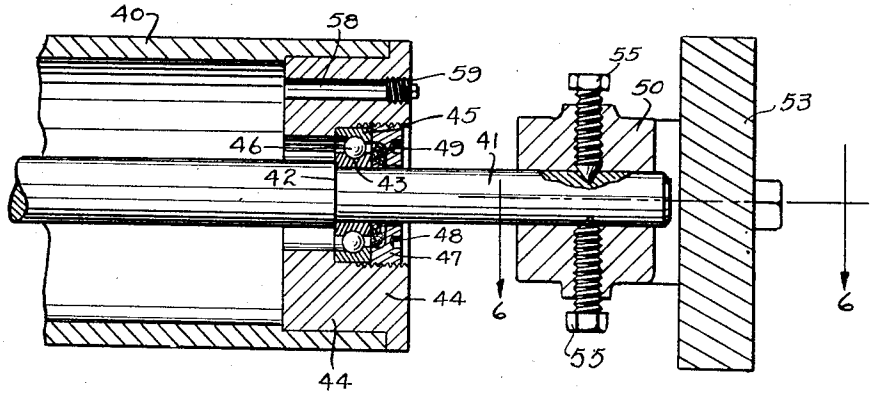


FIG. 5

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UNITED STATES PATENT OFFICE

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RUBBER MILL

Application filed April 7, 1928. Serial No. 268,322.

This invention relates to mechanism for operating the apron of a rubber mill. It has been customary to form such apron as an endless belt lying against the underside and front of the front roll and looping over a movable roller at the top, which was lowered from time to time to allow access to the front roll. Difficulties have been experienced in maintaining the apron support truly parallel with the surface of the roll, and unsatisfactory milling has resulted. Our invention not only provides efficient readily-operable mechanism for lowering and raising the apron to allow access to roll whenever desired, but this mechanism is so devised that when it raises the apron supporting roller it necessarily brings it into the accurate position parallel to the surface of the mill roll.

We accomplish the raising and lowering of the apron roller by means of a walking beam connected with such roller and a counterweight arranged to act as desired on one side or the other of the pivot of the walking beam, whereby this beam at one time will serve to lower the apron and another time to raise it. Manually controlled power means is provided for changing the application of the counter-weight as desired.

In our machine the apron extends around two stationary rollers and one floating supporting roller. Each of these rollers is mounted by internal rolling bearings on a shaft extending through the roller and adjustably supported at its ends. By positioning or shifting the shaft, the roller may be maintained as desired to keep a proper tension on the apron and to insure its accurate position, at the same time each roller may readily turn on its support.

Our invention includes the features above referred to, and others contributing to the efficiency of the machine, which will be apparent from the detailed description of a preferred embodiment shown in the drawings.

In the drawings, Fig. 1 is a side elevation of a rubber mill embodying our invention; Fig. 2 is a plan thereof; Fig. 3 is a sectional side elevation parallel with Fig. 1, the section being taken partly through the right hand portion of the machine and partly through the left hand portion, as indicated by the offset line 3—3 on Fig. 2; Fig. 4 is an approximately vertical enlarged cross-section through the walking beam and counterweight, as indicated by the line 4—4 on Fig. 3; Fig. 5 is an enlarged substantially vertical section on the line 5—5 of Fig. 1, intended to illustrate the bearing of any of the three apron rolls; Fig. 6 is a sectional plan of the shaft adjustment of the lower front roll, as indicated by the section line 6—6 on Fig. 1.

In Figs. 1, 2 and 3, the mill proper is indicated by broken lines, 10 designating the frame, 11 the front roll and 12 the rear roll. The apron 20 is an endless belt having a width corresponding to the length of the rolls. This belt loops around the three rollers 30, 40 and 60. The rollers 30 and 40 are stationary in operation, although on an adjustably positioned axis as hereinafter explained, while the roller 60 may be bodily lowered from the active position shown in Fig. 1 to that shown in Fig. 3 and returned, by mechanism hereinafter described.

It is highly important that each of the apron rolls be accurately maintained in parallelism with the axis of the mill rolls, and it is also important that they turn with as little friction as possible. Accordingly, each of them is mounted on ball bearings on a shaft which is adjustably supported.

We will describe first the bearing of the roller 40, illustrated in Figs. 1, 5 and 6.

Extending axially through the roller 40 is a shaft 41 (Fig. 5) having a reduced portion projecting beyond each end of the roller and thus having internally of the roller an abrupt shoulder 42. Mounted on the reduced portion and abutting the shoulder is an inner ball race 43. The roller 40 comprises a cylindrical shell having seated in its end portions heads 44 making a pressed fit with it. Mounted within each head and against a shoulder thereon is the outer ball race 45. Balls 46 roll between these races. A suitable ball retainer may be employed if desired, enabling the bearing to be slid as a unit over the end of the shaft 41 into place against the

shoulders of the shaft and head 44. In this position the bearing is retained by a disk 47 screwing into a threaded recess in the head 44 and abutting the outer race-way of the bearing. Suitable spanner openings 48 in the disk allow it to be readily turned into place. On the inner side of a disk is a suitable felt washer 49 preventing escape of oil from the bearing. The roll preferably contains oil or grease which may be supplied to it through an opening 58 in the head 40 closed by a plug 59, Fig. 5.

To enable the convenient removal of the roll 40, we mount its shaft 41 in a slot 51, Fig. 6, in supporting block 50 and secure the shaft in place by two set screws 55, Fig. 5. The block 50 is pivoted at 52 to a bracket 53 secured to the mill frame. This bracket may be formed as shown in Fig. 6, to overlap at 54 the free end of the arm 50 and thus guide it. The arm 50 is adjustable up and down by means of the two set screws 56 and 57, Fig. 1, screwing through ears in the bracket 53. The roller may thus be positioned accurately parallel with the mill roll.

The roller 30 is constructed in the identical manner of the roller 40. The projecting ends of the shaft 31, however, engage slidable blocks 33, Fig. 1, the movement of which enables proper alignment of the roller as well as a proper positioning of the belt to locate the roller 60 in just the region desired. To that end, we make each block 33 slidable on a guide-way 34, rigid with the frame, and we thread into each block a screw 35 provided with a hand wheel 36. This enables the roller 30 to be moved as desired.

The floating roller 60 which supports the upper loop of the belt in the front of the roll 11 is made identical with the roller 40 as shown in Fig. 5, except that at its ends this roller is provided with flanges 61 preventing longitudinal shifting of the belt on the roller. The ends of the shaft 63 of this roller are rigidly mounted in a pair of supporting links 70 and 71 which are operated by the walking beam, as hereinafter explained, to raise or lower the roll 60.

Mounted on top of the mill frame is a pair of aligned standards 80 and 81. Journalled in these standards is a horizontal shaft 82 extending across the mill. Rigidly secured to this shaft adjacent one end of the mill is the walking beam 85, the forward end of which is pivotally connected to the link 70. Mounted on the shaft 82 adjacent the other side of the mill is an arm 86 of the same length from center to center as the forward portion of the walking beam. The forward end of this arm 86 is pivotally joined to the upper end of the link 71 as shown in Fig. 3. Accordingly, the two ends of the roller 60 are suspended by means which may swing about the axis of the shaft 82.

In order to support the roller 60 with the accuracy desired, it is important that the forward arm of the walking beam and the arm 86 be not only of the same length, but extend exactly at the same angle from the shaft 82. To prevent any inaccuracy, from inaccurate key-ways for the walking beam or arm 86, we provide an adjustment for this arm. This is shown in Fig. 2. It is accomplished by making the arm 86 loose on the shaft, and providing a separate arm 87 keyed to the shaft and an adjustable connection between these two arms. This adjustable connection may comprise a pin 88 mounted in the arm 87 and having an eccentric portion 89 in a slot in the arm 86. When this pin is turned by a head thereon, then one arm is adjusted with reference to the other, and thus the arm 86 may be brought into accurate registration with the walking beam arm. When thus adjusted, a nut on the pin may clamp the arms 86 and 87 together.

Near their lower ends the links 70 and 71 may be braced by a cross-rod 75 shown as connected to suitable plates 76 secured to the links. Each link 70 or 71 is intermediately yieldingly connected to a lower portion of the supporting bracket 80 or 81. The construction is the same for each link, and as shown in Figs. 1 and 3, may comprise an eye-bolt 90 pivoted to a link and connected to a cylinder 91 having a head 92 through which slides a rod 93, the rear end of which is pivoted at 94 to a bracket 95 secured to the standard. The forward end of the rod 93 has a head 96 and a helical spring 98 within the cylinder is compressed between the rod head 96 and the end 92 of the cylinder.

The tendency of the springs 98 is to draw the cylinders 91 connected to the links toward the rear and thus pull the roll 60 into position over the roll 11 when the apron is taut as shown in Fig. 1. However, when the apron is being lowered, the compression of the spring allows the roll 60 to move forwardly about the periphery of the roll 11 as it descends into the position shown in Fig. 3.

Suitable means, about to be described, swings the walking beam whenever desired from the position shown in Fig. 1, to the position shown in Fig. 3, thus moving the support for the roller 60 downwardly so that it travels from the position shown in Fig. 1 to the position shown in Fig. 3. The means for swinging the walking beam comprises a counter-weight 100 and means for causing it to act on the rear of the walking beam as shown in Fig. 1, or on the front portion of the walking beam as shown in Fig. 3. This will now be described.

The walking beam 85 referred to is shown as a bar of T form in cross-section, Fig. 4. Rising from the top flange of this bar are a pair of ears 101 and 102 in which are rigidly mounted a pair of aligned pipes 103 and 104 parallel with the T-bar. Slidably mounted

on the T-bar and surrounding the pipes is a shiftable block 110. This block has a cylindrical interior and has heads 111 and 112 which carry stuffing boxes as 113 snugly embracing the corresponding pipe. The pipes are supported and closed at their adjacent ends by a member 115 which has a cylindrical exterior suitably packed against the wall of the cylinder bore 110. The member 115 thus constitutes a stationary piston head. Openings are made into the cylinder from the pipe 103 and 104 adjacent the piston, such openings being shown in Fig. 3 and designated 116 and 117 respectively.

The counterweight 100 preferably comprises a number of sections resting on the upper surface of the cylinder block 110. As shown in Fig. 4, each counter-weight section has an internal recess which embraces a stationary bar 118 carried by the cylinder block parallel with its top surface. Suitable transverse pins 119 pass through the counterweight section and bar and lock the sections in place.

The construction of sectional counterweight just described enables variable weight to be connected to the cylinder block as required. When the counter-weight sections are in place, they are rigid with the cylinder block, the cylinder block and removable sections constituting a unitary shiftable counterweight.

As will be seen from Fig. 3, if fluid under pressure is admitted to the pipe 104, it will shove the right hand end of the counterweighted cylinder rearwardly. As the center of gravity of such counter-weight then passes beyond the vertical plane along the axis of the shaft 82, this overbalances the weight of the parts supported by the forward part of the walking beam, and the beam tips gradually into the position shown in Fig. 1, the counter-weight coming into the position there shown at the end of the movement. Thereafter if pressure be relieved from the pipe 104 and admitted to the pipe 103, such pressure enters the cylinder through the opening 116 and acting on the forward head thereof, carries the counter-weighted cylinder forward, bringing its center of gravity beyond the shaft 82 and tipping the walking beam in the other direction into the position shown in Fig. 3.

When the counter-weight is in the position shown in Fig. 1, it is counter-balanced by the tension of the belt 20 and thus maintains that belt taut against the forward roll as shown. The walking beam in this position does not engage any fixed stop and the excess weight back of the pivot is sustained by the apron. We provide a cushioning device to stop the movement of the beam in the opposite direction as it lowers the roller 60. As shown in Figs. 1 and 3, this cushioning device comprises a rod 120 pivoted to the standard 80 and surrounded by a helical spring 122 between a head 123 on the rod and sliding block 124. This block is pivotally connected to a link 125 which is pivoted to the walking beam. When the walking beam is in the normal position shown in Fig. 1, the spring 122 is extended. However, as the beam swings into the lowering position shown in Fig. 3, the sliding block 124 compresses the spring 122, which acts as a shock absorber and cushioning stop for the beam.

The pipes 103 and 104 are connected by pipes 130 and 131 with a suitable controlling valve 132. This valve is preferably of the four-way type, so that compressed air from a pipe 135 may for instance be admitted to the pipe 130 and at the same time the pipe 131 be vented to the atmosphere. A movement of the valve plug to the opposite extreme position would connect the compressed air pipe 135 with the pipe 131 and vent the pipe 130, while a movement to an intermediate position would shut off the admission from the compressed air pipe 135 as well as the exhaust from either pipe 130 or 131. The oscillatory plug of this valve is connected with an operating arm 136, which is normally centered by means of a pair of springs 140 and 141 surrounding a rod 143 connected to the arm and compressed between heads on the rod and an abutment 144 on the side of the walking beam.

Secured to the side of the counter-weighted cylinder is a bar 150 having a row of holes anyone of which may be occupied by a projecting pin. A pair of such pins are so located in this bar that they will engage opposite sides of the arm 136 respectively, just as the counter-weight is coming to the end of its travel. This engagement swings the arm 136 through a small angle which turns the valve plug into an intermediate or neutral position shutting off the supply of compressed air which has moved the cylinder. This operation is entirely automatic and results at each end of the stroke of the cylinder.

It will be noticed that there are a number of holes in the bar 150 which may be occupied by the pins 151. As such pin operates to swing the valve to neutral position, it will be seen that we can by varying the position of this pin, control the movement of the counterweight. We can make it, for instance, move its center of gravity just past the pivot shaft 82, giving a slow swing to the walking beam, or we can make it move a considerable distance past such pivot shaft, resulting in a more abrupt movement of the apron roller 60.

Following the operation described, the cylinder remains in such position until compressed air is thereafter admitted to the pipe 104, if the parts were in the position in Fig. 3, or to the pipe 103 when the parts are in the position shown in Fig. 1. We effect this by

giving a further movement to the valve plug 132, which establishes the feeding and venting oppositely to the former connection.

To enable the valve to be turned manually as described, we mount on the plug an operating arm 138 which may be a downward extension of the arm 136. This arm 138 loosely surrounds an operating rod 160 between a pair of springs 161 mounted by the opposite sides of the arm and between pins in the rod. When the pin 151 carried by the counter-weighted cylinder engages the arm 136 to rock the valve plug into neutral position, this simply compresses one spring or the other 161 on the rod 160. Now, when it is desired to manually admit compressed air to corresponding pipe 103 or 104 to move the counter-weight, the rod 160 is simply pulled or pushed as the case may be, rocking the arm 138 and giving a greater turn to the valve plug 132, the compression of the springs 140 allowing this.

The movement described connects the compressed air admission pipe 135 with the corresponding pipe 130 or 131 and admits compressed air to the upper end of the cylinder and above the stationary piston 115. This displaces the arm 136 sufficiently so that when the pin 151 engages it, movement of the arm will again shut off the compressed air to the pipe with which it has been connected.

It will be understood from the above description that we have provided a counter-weight which normally serves the purpose of maintaining proper tension on the belt, but whenever desired, may be shifted by power under manual control into position where it lowers the belt to allow access to the rolls. The speed of such lowering may be controlled as desired, according to the setting of the pin which swings the valve to neutral position. When the counter-weight has been shifted and has thereby lowered the front end of the apron, it effectively holds it lowered so that the operator may safely perform work on the mill; then when he is ready to resume the normal operation, it is simply necessary for him to actuate the controlling rod to admit compressed air to the upper end of the cylinder and thereby shifting the counter-weight to the other arm of the walking beam.

We claim:—

1. In a machine of the character described, the combination with a roll and an endless apron having one reach adapted to bear against the roll, of a supporting roller around which the apron loops, a pair of suspended links connected at their lower ends to the ends of the roller for supporting it, and means including a counter-weight for pulling up on said links to raise the roller or allowing said links to descend to lower the roller.

2. The combination with a rubber mill and an endless apron having one reach adapted to bear against the roll of the mill, of levers mounted above the mill, links depending from said levers for supporting the upper portion of the apron, and power controlled means for operating said levers in unison to raise or lower the apron.

3. In a machine of the character described, the combination with a roll and an endless apron having one reach adapted to bear against said roll, of a supporting roller around which the upper portion of the apron loops, a pair of members connected to the ends of the roller for supporting it, a counter-weight for normally maintaining an upward pull on said members to maintain tension on the belt, and means for shifting the point of application of the counter-weight to lower the belt.

4. The combination with a roll and an endless apron having one reach adapted to bear against said roll, of a walking beam, mechanism connecting the same with a floating support for the apron, a counter-weight, and means for applying it to the walking beam either side of the pivot thereof as desired.

5. The combination with a rubber mill and an apron, of a walking beam and a rigidly connected rock arm mounted above the mill, depending links from the forward ends of the walking beam and arm to the means supporting the loop of the apron, a counter-weight, and means shifted by power for causing the counter-weight to act on the walking beam on one side or the other of its pivot as desired.

6. The combination with a mill roll, an endless belt adapted to coact therewith, a roller extending through the belt and adapted to support it, a pair of links connected with the ends of the roller leading upwardly therefrom, a walking beam mounted on the mill frame and connected at one end with one of the links, an arm connected with the other link, a shaft on which the walking beam and arm are mounted, and means for giving said shaft a partial rotation in one direction or the other as desired, comprising a counter-weight and means for causing the counter-weight to act on the walking beam on one side or the other of the vertical plane through the shaft.

7. The combination with a roll and an endless apron coacting therewith, of depending mechanism connected with the apron to support it, a cylinder and piston, one of which is capable of movement, means for admitting compressed fluid to the cylinder to effect such movement, and a counter-weight acting on the depending mechanism to raise or lower it as the center of gravity of the counter-weight is changed by means of such movement.

8. The combination with a roll and an endless apron having one reach adapted to bear against the roll, of a walking beam supporting the apron, a counter-weight mounted on the walking beam, and means for shifting it

to either side of the pivot of the walking beam.

9. The combination with a roll and an endless apron, of a walking beam, mechanism connected with the beam for supporting the apron, a cylinder movably mounted on the walking beam, a stationary piston within said cylinder, means for admitting fluid under pressure to either side of said piston to move the cylinder lengthwise of the beam, and a counter-weight carried by the cylinder.

10. The combination with a roll and an endless apron adapted to coact therewith, of a floating member supporting an upper loop of the apron, a walking beam connected therewith and a counter-weight made of a selected number of sections, and means for causing the center of gravity of the combined counter-weight to act sometimes on one side of the pivot of the walking beam and sometimes on the other side.

11. The combination with an apron, of a floating roller supporting the same, a support depending from above and connected with said roller, a shiftable weight acting to raise or lower the support, fluid pressure mechanism for shifting the weight, and a shut-off valve for the fluid pressure mechanism actuated to neutral position by means of the travelling weight.

12. The combination with a support for an apron, of a walking beam, a shiftable counter-weight thereon, fluid pressure mechanism for shifting the counter-weight, a valve for shutting off the fluid pressure, a bar carried by the shiftable counter-weight, and a member adjustably mounted on the bar and operating the valve when the counter-weight has shifted a desired amount.

13. The combination with a mill roll and an endless apron coacting therewith, of a walking beam adapted in one position to hold the apron taut and in another position to lower it, a counter-weight, fluid pressure mechanism for causing the counter-weight to be effective first on one side of the walking beam and then on the other, a valve for controlling the fluid pressure mechanism, and a hand device for operating the valve.

14. The combination with a mill roll and apron, a floating roller standing within a loop of the apron, a walking beam, mechanism connecting the same with the supporting roller, means for shifting the walking beam in one direction or the other to lower the roller or to hold it elevated, and a shock absorber to cushion the blow when the walking beam lowers the roller.

15. The combination of a mill roll, an endless apron coacting therewith, a floating roller supporting the same, a rock shaft, a pair of arms thereon, a pair of links leading from the arms to the ends of the roller, and an extensible device engaging said links between their support and the roller, whereby the roller may move away from the mill roll as it descends.

16. The combination with a mill roll, of an endless apron adapted to coact therewith, a supporting roller around which the apron extends, a walking beam and a rock arm on a rock shaft, supporting links connecting the rock arm and walking beam with the roller, means for operating the walking beam to raise or lower the links, and a pair of members pivotally anchored at one end and at the other end pivotally connected respectively to said supporting links, each of said members being extensible to allow the supporting roller to swing as it passes up or down about the mill roll.

17. The combination with a rubber mill, of an endless belt adapted to coact with a roll of the mill, a roller standing within said belt and assisting in positioning it and comprising a cylindrical sleeve having an internal bearing race, a through shaft mounted coaxial with the roller and having external bearing race within the roller, rolling members between said races, said shaft extending beyond the cylindrical shell, and disks having openings through which the shaft extends, said disks screwing into end portions of the shell beyond the bearings and operating to maintain the bearings in place.

18. The combination with a rubber mill, of an endless apron, a roller occupying said apron comprising a cylindrical shell having a rolling bearing on a coaxial shaft which extends beyond the shell, pivoted blocks in which the ends of the shaft are mounted, and mechanism for adjusting the position of said blocks.

19. In a machine of the character described, the combination with a roll and an apron coacting therewith, of a roller around which the apron loops, means for moving the roller upwardly to cause the apron to bear against one of the rolls and for moving the roller downwardly to slacken on the apron, and a mechanism for positively moving the roller laterally away from the roll during such downward movement.

20. The combination with a rubber mill and an apron coacting with a roll of the mill, of levers mounted above the mill, links depending from said levers for supporting the upper portion of the apron, means for operating said levers in unison to raise or lower the apron, and mechanism acting on the links to swing them positively toward and from the roll during the raising and lowering movement.

21. In combination with a rubber mill and an apron coacting with a roll of the mill, a roller over which the apron extends, depending links for carrying the roller, an intermediately pivoted beam to which the links are connected, and mechanism for swinging the beam on its pivot.

22. In combination with a roll of a floating roller movably supporting an apron coacting with the roll, a walking beam and mechanism for swinging the walking beam on its pivot, and links connecting the walking beam with said floating roller.

23. The combination with a rubber mill having a pair of rolls, an endless apron, a roller over which the apron loops, a mechanism for supporting said roller, a cylinder and piston, and a connection between the movable member thereof and the supporting mechanism whereby the roller may be moved to render the apron active or idle.

24. In combination with a mill roll and an apron, a floating roller standing within a loop of the apron, a walking beam, mechanism connecting the same with the supporting roller, a cylinder and piston, one of which is movable, and mechanism whereby the moving element may operate the walking beam.

25. The combination with a roll and an endless apron having one reach adapted to bear against said roll, of a lever pivoted intermediate its end, a counter-balance slidably mounted thereon, means for changing the position of said counter-balance on the lever to either side of the pivot thereof as desired, and additional means associated with the lever for maintaining the apron in coaction with the roll or not, according to the position of the counter-balance.

26. The combination with a mill roll, an endless apron coacting therewith, a floating roller supporting the same, a pair of links supporting the roller, and means acting on the links to move the roller away from the mill roll as the roller descends.

27. The combination with a roll and an endless apron coacting therewith, of depending mechanism connected with the apron to support it, lever mechanism acting on the depending mechanism to raise or lower it, a cylinder and piston, one of which is capable of movement, means for admitting compressed fluid to the cylinder to effect such movement, and means whereby such movement actuates said lever mechanism.

28. The combination, with a rubber mill, of an apron, a floating roller embraced by the apron and adapted to support it in a loop, a pair of depending links supporting the roller, a pair of rock arms supporting the links, a rock shaft on which said arms are mounted, and power mechanism for rocking the shaft.

29. The combination with a mill roll, of an endless apron adapted to coact therewith, a supporting roller around which the apron extends, an operating mechanism, supporting links connecting thereto and to the roller, and a pair of members pivotally anchored at one end and at the other end pivotally connected respectively to intermediate regions of said supporting links, to cause the supporting roller to swing as it passes up or down about the mill roll.

30. The combination with a rubber mill, of an apron, means supporting a loop of the apron, a walking beam, means depending therefrom and connected to said supporting means, means for providing a counterweight adapted to act on the walking beam, and means causing such counterweight to act on either side of the pivot of the walking beam as desired.

31. The combination with a rubber mill, of an apron, means supporting a loop of the apron, a walking beam means depending therefrom and connected to said supporting means, and fluid pressure means for shifting the center of gravity of the walking beam to either side of the pivot thereof.

In testimony whereof, we hereunto affix our signatures.

WILBUR H. LOCKERT.
PARK E. WELTON.