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MEANS FOR FEEDING ORE ELEVATORS

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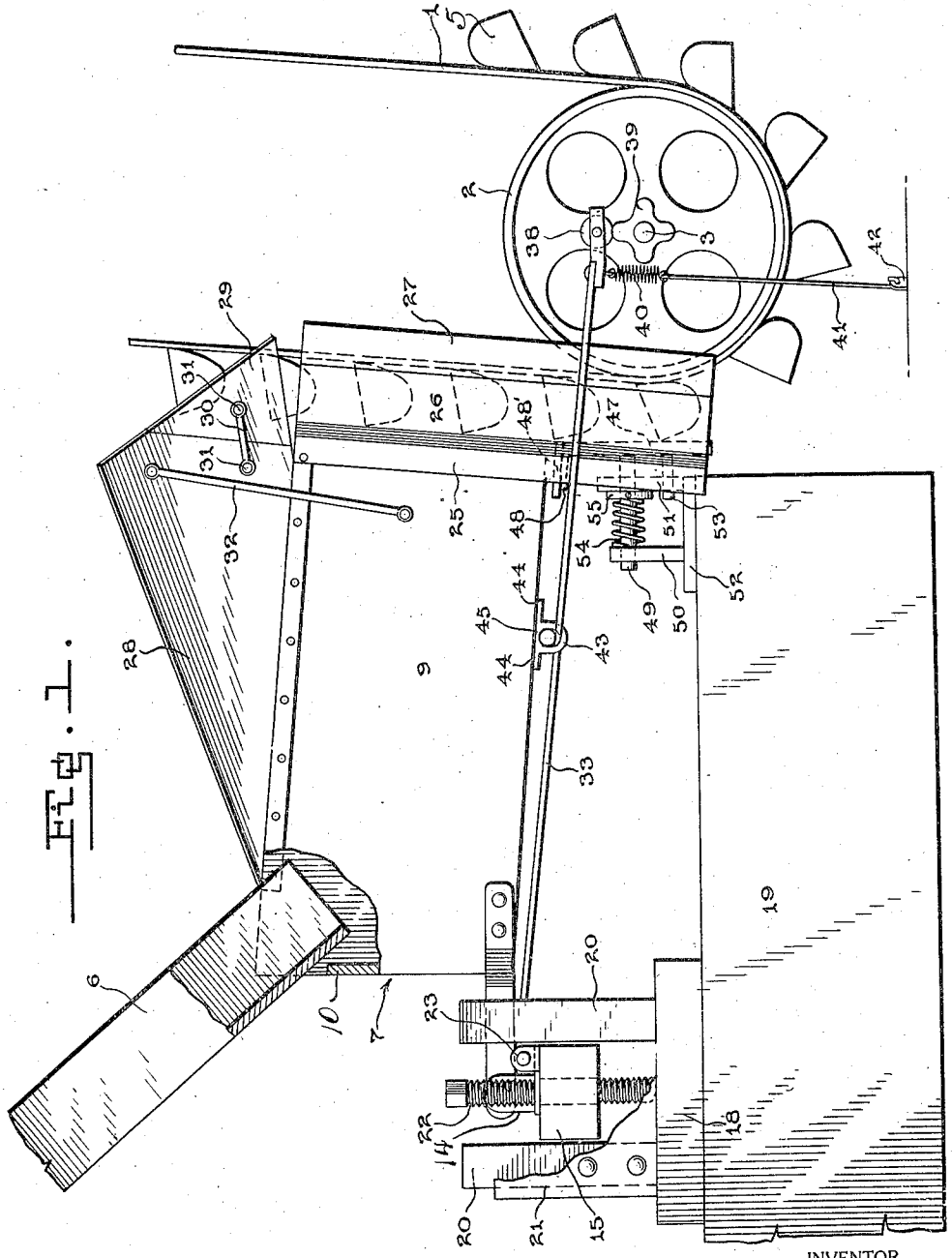


Fig. 1.

WITNESSES

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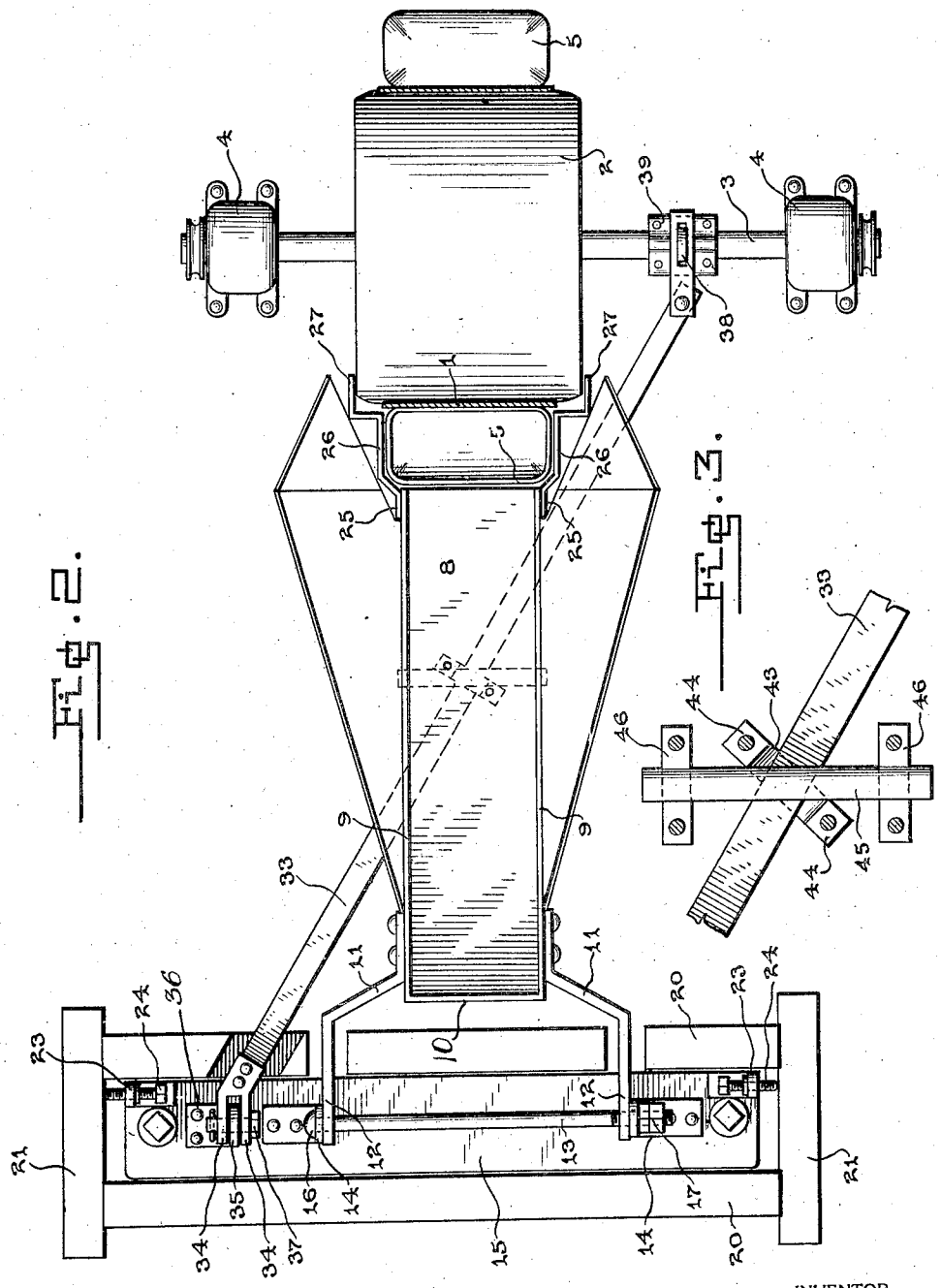


Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE.

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MEANS FOR FEEDING ORE ELEVATORS.

Application filed November 28, 1925. Serial No. 72,057.

My invention relates to improvements in means for feeding crushed ores, sand, gravel or like material to an elevator of the type adapted to effect a substantially vertical lift of such material, and it consists in the combinations, constructions and arrangements herein described and claimed.

Elevators of the type comprising a rubber carrying belt provided at intervals with metallic buckets are commonly used in ore dressing operations for transferring ores vertically. Heretofore, such elevators have not been entirely satisfactory in that spawls, large pieces of "tramp iron" and like relatively large objects may fall in the shaft or "boot" in which the elevator moves and may be threshed around in the shaft, causing injury to the buckets or spawls, or other like objects may dodge between an ascending or descending bucket, whereby the elevator will be stopped and the continued flow of feed materials into the shaft will result in the filling of the boot. It then is necessary that the feed material be shoveled from the boot to release the elevator so that further operation of the latter will be permitted.

Another factor which causes wear and tear on the belt which carries the buckets results from the formation of a hard packed mass directly under the bottom pulley of the elevator, this mass being continually built up by the incoming feed material and the buckets on the descending side of the elevator are pressed forcibly against this bottom mass and are pulled through the space between the belt and the bottom of the boot or pit directly under the bottom pulley of the elevator, this action pressing the buckets against the belt, and the buckets, on reaching the top of the shaft and discharging their contents, are flipped outward away from the belt. This constant pressing and releasing of the buckets with every turn of the elevator and the fact that sand and grit are present cause rapid cutting of the belt by the buckets which are attached thereto.

An object of the present invention is to reduce the wear on the buckets and belt of an elevator of the character described so that the elevator not only will last a relatively long time in service but the operation thereof will not be interrupted because of necessity of repair or replacement of the elevator and the mass of the material which the device will deliver in a given time will be relatively great, thus permitting relatively great production of the apparatus with which the elevator is associated.

A further object of the invention is the provision of an improved means for feeding materials from a gravity chute or spout to the buckets of an elevator of the character described so that the velocity of the stream of feed material will be lowered during the passage of such feed material from the feed chute or spout to the buckets.

A further object of the invention is the provision of an improved feed means of the character described which affords facilities for jigging the feed material and at the same time for causing the feed material to move progressively toward the buckets from the feed chute or spout.

A still further object of the invention is the provision in a feed means of the character described of a feed material feeding box for delivering material from the chute or spout to the buckets and means for adjustably supporting the feed box so that the inclination of the bottom of the box can be varied to vary the rate of flow of the feed material on the bottom of the box and according to the various conditions which may be determined by the size of the respective particles of the feed material, inclination and capacity of the feed chute or spout, and like circumstances.

A still further object of the invention is the provision in a feed means of the character described of devices for preventing splashing of liquid at the sides of the box and a yielding guard or apron for preventing spawls or large particles of material from passing between the discharge end of the box and the elevator to position to lodge between the feed box and the elevator.

Other objects and advantages of the invention will be apparent from the following description, considered in conjunction with the accompanying drawings, in which—

Figure 1 is a side elevation of the improved device for feeding material to the buckets of a vertically moving elevator.

Figure 2 is a horizontal section through the elevator belt, showing the feed means in plan, and

Figure 3 is a fragmentary plan view showing the means for supporting the feed box so that it can be oscillated vertically, the feed box being omitted.

A traction elevator for effecting a substantially vertical lift of ore, crushed rock, or like material up a shaft may comprise a flexible carrying member, shown as being a belt 1, trained about a pulley 2 which is secured on a horizontal shaft 3. The shaft 3 is supported in the lower part of the shaft in bearings 4. The belt 1 carries spaced buckets 5, each of which has the open end or mouth thereof turned upward when the bucket is being moved upward, the rim edge of the bucket lying in a plane which is inclined slightly from the horizontal.

An inclined launder or chute 6 enters the shaft and discharges at one side of the path of movement of the ascending buckets on the belt 1 into a feeder box generally designated at 7. The feeder box 7 has a bottom 8, a pair of upstanding side walls 9 and a rear end wall 10, being open at its front end and at its top. A pair of supporting arms 11 respectively have the forward end portions thereof secured to opposite sides of the feeder box adjacent to the rearward end of the latter. The rearward end portions of the arms 11 are offset laterally outward as indicated at 12 and are provided with alined openings through which a horizontal shaft 13 extends, whereby the box 7 will be supported for swinging movement about the axis of the shaft 13. The shaft 13 extends through alined openings in the upstanding arms of brackets 14 which are secured on a block 15. The shaft 13 may have a head 16 at one end thereof and the opposite end portion thereof may be threaded for engagement with a nut 17 which can be tightened against the adjacent bracket 14 to draw the head 16 against the other bracket 14 and any appreciable axial movement of the shaft 13 thus prevented. The outwardly offset end portions 12 of the feeder box supporting arms 11 fit rather snugly between the upstanding arms of the brackets 14 so that movement of the arms 11—12 along the shaft 13 between the brackets 14 is prevented.

The block 15 is adjustable vertically and also is adjustable horizontally in a direction which is transverse to the longitudinal axis of the feeder box. A frame in which the block 15 is adjustably supported comprises a bottom 18 which is superimposed on a stationary support 19, a pair of side members 20 which lie in planes extending at right angles to the direction of length of the side members 9 of the feeder box, and a pair of vertical end members 21. Vertical adjusting and supporting screws 22 are threadedly engaged with vertical openings in the opposite end portions of the block 15 and rest at their lower ends on the bottom 18. The upper end portions of the screws 22 are non-circular and are adapted to be gripped by a wrench or like tool and it is obvious that the block can be adjusted vertically within limits in its frame by adjustment of the screws 22. The opposite end portions of the block 15 carry upstanding lugs 23 provided with screw threaded horizontal openings which are in alinement longitudinally of the block. Adjusting screws 24 are threaded through the openings in the lugs 23 and engage at their extremities with the inner faces of the end walls 21, whereby the block 15 can be adjusted longitudinally within the limits of its supporting frame.

The feeder box 7 has a pair of sides guards 25 having the rear edge portions thereof secured to the side walls 9 at the open end of the feeder box so that the major portions of the side guards extend beyond the feeder box at the open end of the latter. The position of the block 15 is adjusted in the supporting frame of the latter so that the extending portions of the side guards 25 will straddle the belt 1 and a plurality of the buckets 5 on the belt at the ascending side of the elevator, the side guards being bent so that their middle portions 26 lie close to the adjacent walls of each bucket 5 which moves between the side guards, and the extreme forward end portions of the side guards being offset outwardly at 27 to provide clearance for the peripheral portion of the pulley 2.

The feeder box also is provided with a pair of splash plates or guards 28 which have their lower edge portions secured to the sides 9 of the feeder box. The splash plates 28 extend outwardly and upwardly from the upper edges of the sides of the feeder box and carry forward extensions or wings 29 which extend outwardly, upwardly and slightly rearward from the upper edges of the side guards 25. The extensions 29 may be fastened to the splash plates 28 by bars, such as indicated at 30, and screws 31 or other suitable fastening devices and the splash plates may also be stayed to the sides of the feeder box by brace bars, such as indicated at 32.

A spring bar 33 extends underneath the feeder box 7 in a direction oblique to the direction of length of the latter and has the rearward end portion thereof turned parallel to the direction of length of the feeder box and formed with a pair of horizontally spaced forks 34 which straddle an upstanding arm 35 of a bracket 36 and are connected with the arm 35 by a horizontal pivot element 37. The bracket 36 is secured on the block 15. The forward end portion of the spring bar 33 carries a roller 38 which has the periphery thereof resting on and in contact with the periphery of a cam 39. The latter is secured to the pulley supporting shaft 3 and preferably has four radially projecting portions spaced equi-distant from

one another. A tension spring 40 is attached at its upper end to the forward end portion of the spring bar 33 and is attached at its lower end to a tie member 41 which is secured to a fixed support 42 that is located below the level of the shaft 3, whereby the roller 38 will be constrained to remain continuously in contact with the curved peripheral surface of the cam 39 and will be oscillated vertically a plurality of times during each complete revolution of the cam 39. The intermediate portion of the spring bar passes tightly through a substantially U-shaped clip 43 which has attaching end portions 44 secured flatwise to the bottom of the feeder box intermediate the width and length of the latter. The clip 43 also embraces a cross member 45 of circular cross sectional contour which is supported close to the bottom of the feeder box 7 by clips 46 so that the intermediate portion of the spring bar 33 will be in sliding contact with the curved surface of the cross member 45 and can impart a vertical oscillation to the feeder box through the cross member 45 and the clips 46 as the cam 39 rotates without any appreciable wear or stress on the spring bar, The feeder box thus will be jigged or oscillated vertically as the shaft 3 rotates.

The side guards depend below the level of the bottom of the feeder box and the rearward edge portions of the depending lower end portions of such side guards straddle the side edges of the body 47 of an apron which also has a rearwardly turned flange 48 at the upper end of the body 47. The flange 48 carries a wear plate 48′ which extends underneath the forward edge portion of the bottom of the feeder box close to the latter. The body 47 of the apron has a supporting arm 49 which extends slidably through alined openings in spaced upstanding arms 50 and 51, respectively, of a bracket 52 which is secured on the stationary support 19. A rearwardly extending guide arm 53 on the body of the apron extends slidably through an opening in the bracket arm 51. A compression spring 54 is coiled on the supportng arm 49 between the bracket arm 50 and a stop collar 55 which is secured on the arm 49. The spring 54 tends to urge the stop collar 55 and the arm 49 forward until the stop collar 55 contacts the bracket arm 51, at which time the body of the apron will be at the limit of its possible movement toward the belt 1. The spring 54 will yield in response to any considerable stress, such as would be caused when a spawl or other object lodges between a bucket 5 and the body of the apron, to permit the body of the apron to move rearwardly so that the relatively large object will be released and will fall from position between the bucket and the apron without undue wear or stress on the bucket or on the belt which supports the bucket and without stopping the usual movement of the belt and the bucket thereon. The specific yielding apron structure has been made the subject of my companion application for patent, Serial No. 72,059, filed November 28, 1925, and therefore will not be set out in the claims of the present application.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. The rearward end portion of the feeder box is adjusted so that the bottom of the feeder box will be inclined slightly downward toward its forward end and the side guards at the open end of the feeder box will be disposed symmetrically with respect to the side edges of the ascending stretch of the belt 1 and the sides of the buckets which are moving between the side guards. The belt may be inclined slightly away from the adjacent end of the feeder box. Ore, crushed rock or other like material is discharged from the chute 6 into the feeder box adjacent to the rearward end of the latter and is moved progressively on the bottom of the feeder box at a low rate of movement both because of the inclination of the bottom of the feeder box and the jigging of the feed box up and down as the shaft 3 turns. The material which has been discharged into the feeder box thus will be fed into the ascending buckets 5 without moving into contact with the belt and without causing undue wear or stress on the buckets or the belt.

Renewable metallic wear plates, not shown, may be provided on the surfaces of the feeder box which otherwise would be contacted by the feed material during the operation of the device.

Obviously, the invention is susceptible of embodiment in forms other than that which is illustrated in the accompanying drawings and I therefore consider as my own all such modifications and adaptations thereof as fairly fall within the scope of the appended claims.

I claim:

1. In a means for feeding material to the ascending buckets of a traction elevator for effecting a substantially vertical lift, a feeder box having an open end proximate to the path of movement of the ascending buckets and means connected with said feeder box at the end of the latter which is remote from the path of movement of said buckets for supporting said box for limited adjustment laterally.

2. In a means for feeding material to the ascending buckets of a traction elevator for effecting a substantially vertical lift, a feeder box having an open end proximate to the path of movement of the ascending buckets and means connected with said feeder box at the end of the latter which is remote from the path of movement of said buckets for

supporting said box for limited swinging movement vertically and for adjusting said box laterally and said remote end portion thereof vertically.

3. In a means for feeding material to the ascending buckets of a traction elevator for effecting a substantially vertical lift, a feeder box having an open end proximate to path of movement of the ascending buckets and side guards carried by said box to extend beyond the open end of the box in flanking relation to the path of movement of said ascending buckets.

4. In a means for feeding material to the ascending buckets of a traction elevator for effecting a substantially vertical lift, a feeder box having an open end proximate to path of movement of the ascending buckets and splash plates secured to the feeder box and extending upwardly and outwardly from the upper edges of the sides of the feeder box said splash plates having wing extensions at the upper ends of said side guards.

5. In combination, a rotary horizontal shaft, a pulley secured on the shaft, a belt having an ascending stretch, a feeder box open at the end thereof proximate to the ascending stretch of the belt, buckets on said belt, means for supporting the box so that the bottom of the box will be inclined slightly downward toward said belt, and side guards on said box extending beyond the open end of the box in flanking relation to the edges of a portion of said ascending stretch of the belt and to a peripheral portion of said pulley.

6. In combination a rotary horizontal shaft, a pulley secured on the shaft, a belt having an ascending stretch, a feeder box open at the end thereof proximate to the ascending stretch of the belt, buckets on said belt, means for supporting the box so that the bottom of the box will be inclined slightly downward toward said belt, and side guards on said box extending beyond the open end of the box in flanking relation to the edges of a portion of said ascending stretch of the belt and to a peripheral portion of said pulley, said side guards being formed to lie close to the sides of buckets on the ascending stretch of the belt and close to said edge portion of the pulley.

7. In combination a rotary horizontal shaft, a pulley secured on the shaft, a belt having an ascending stretch, a feeder box open at the end thereof proximate to the ascending stretch of the belt, buckets on said belt, means for supporting the box so that the bottom of the box will be inclined slightly downward toward said belt, and side guards on said box extending beyond the open end of the box in flanking relation to the edges of a portion of said ascending stretch of the belt and to a peripheral portion of said pulley said ascending stretch of the belt being inclined slightly from the vertical in the direction away from said feeder box.

8. In combination, a rotary horizontal shaft, a pulley secured on the shaft, a belt trained about said pulley and having a substantially vertical ascending stretch, buckets on the outer side of said belt, a feeder box open at the end thereof proximate to said ascending stretch of the belt and supported at its opposite end to swing about an axis parallel to the axis of said shaft, a cam on said shaft, and a jigging bar extending underneath said feeder box and supported at one end to swing about an axis parallel to said shaft and supported at its opposite end on said cam.

9. In combination, a rotary horizontal shaft, a pulley secured on the shaft, a belt trained about said pulley and having a substantially vertical ascending stretch, buckets on the outer side of said belt, a feeder box open at the end thereof proximate to said ascending stretch of the belt and supported at its opposite end to swing about an axis parallel to the axis of said shaft, a cam on said shaft, and a jigging bar extending underneath said feeder box and supported at one end to swing about an axis parallel to said shaft and spring means holding said bar continuously in position to be actuated by said cam.

10. In combination, a rotary horizontal shaft, a pulley secured on the shaft, a belt trained about said pulley and having a substantially vertical ascending stretch, buckets on the outer side of said belt, a feeder box open at the end thereof proximate to said ascending stretch of the belt and supported at its opposite end to swing about an axis parallel to the axis of said shaft, a cam on said shaft, a jigging bar extending underneath said feeder box and supported at one end to swing about an axis parallel to said shaft, a roller supported by the other end portion of said jigging bar, and spring means connected with said bar for holding said roller continuously against said cam.

11. In combination, a rotary horizontal shaft, a pulley secured on the shaft, a belt trained about said pulley and having a substantially vertical ascending stretch, buckets on the outer side of said belt, a feeder box open at the end thereof proximate to said ascending stretch of the belt and supported at its opposite end to swing about an axis parallel to the axis of said shaft, a cam on said shaft, and a jigging bar extending underneath said feeder box and supported at one end to swing about an axis parallel to said shaft and supported at its opposite end on said cam, said jigging bar being formed of spring material.

12. In combination, a rotary horizontal shaft, a pulley secured on the shaft, a belt

trained about said pulley and having a substantially vertical ascending stretch, buckets on the outer side of said belt, a feeder box open at the end thereof proximate to said ascending stretch of the belt and supported at its opposite end to swing about an axis parallel to the axis of said shaft, a cam on said shaft, and a jigging bar extending underneath said feeder box and supported at one end to swing about an axis parallel to said shaft a cross member of circular cross sectional contour supported underneath said feeder box for spacing the jigging bar from the bottom of said feeder box, and a clip embracing the crossed portions of said cross member and the jigging bar and secured at its ends to the bottom of said feeder box.

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