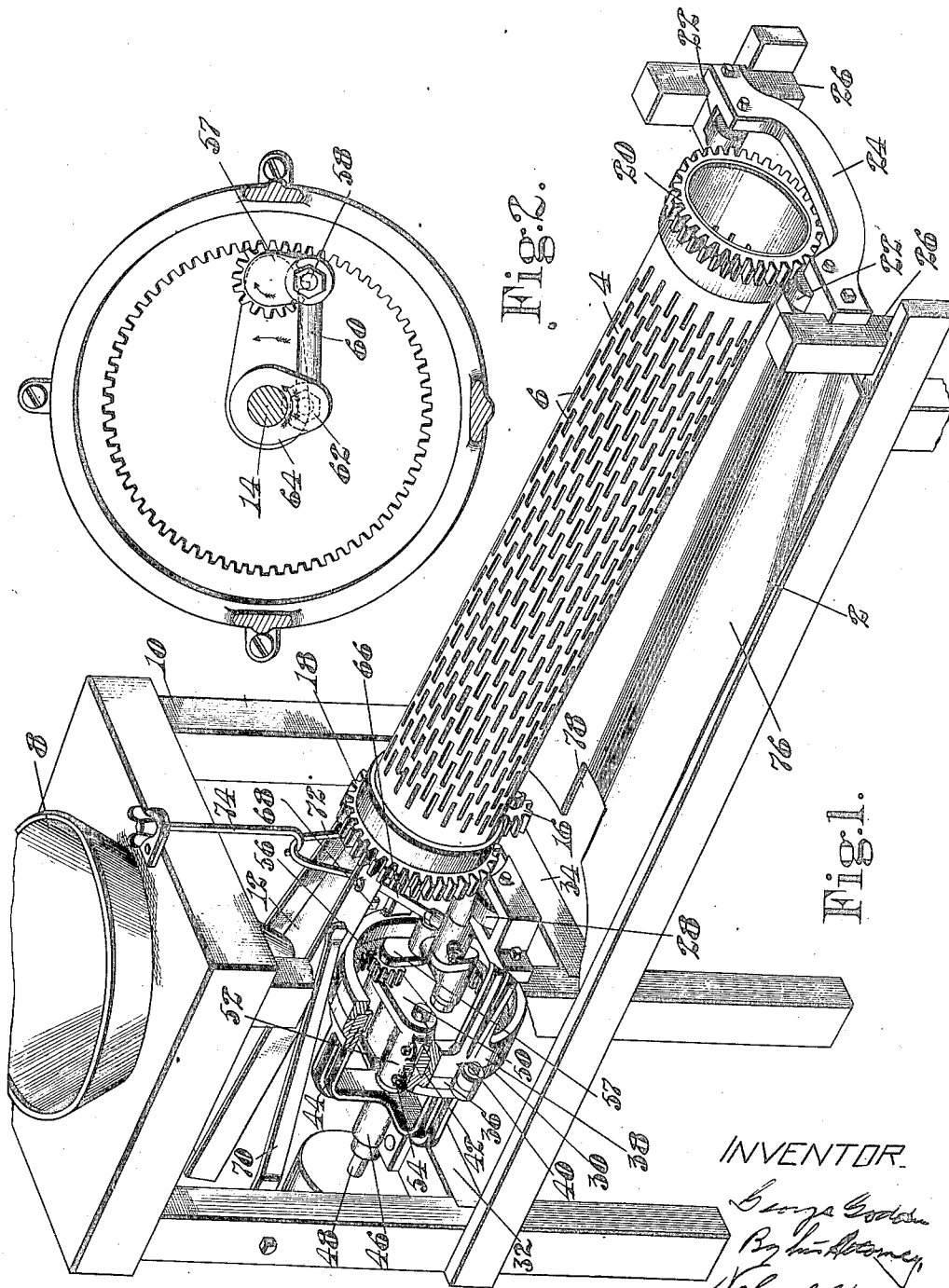




INVENTOR.
 George Goddu
 By *Wm. H. H. H.*
 Nelson M. Howard

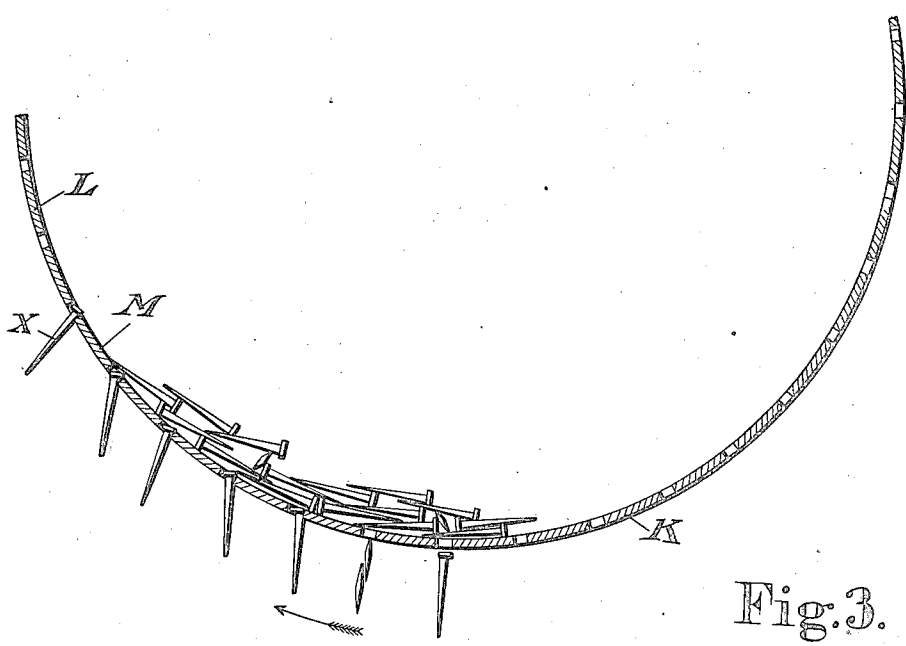


Fig. 3.

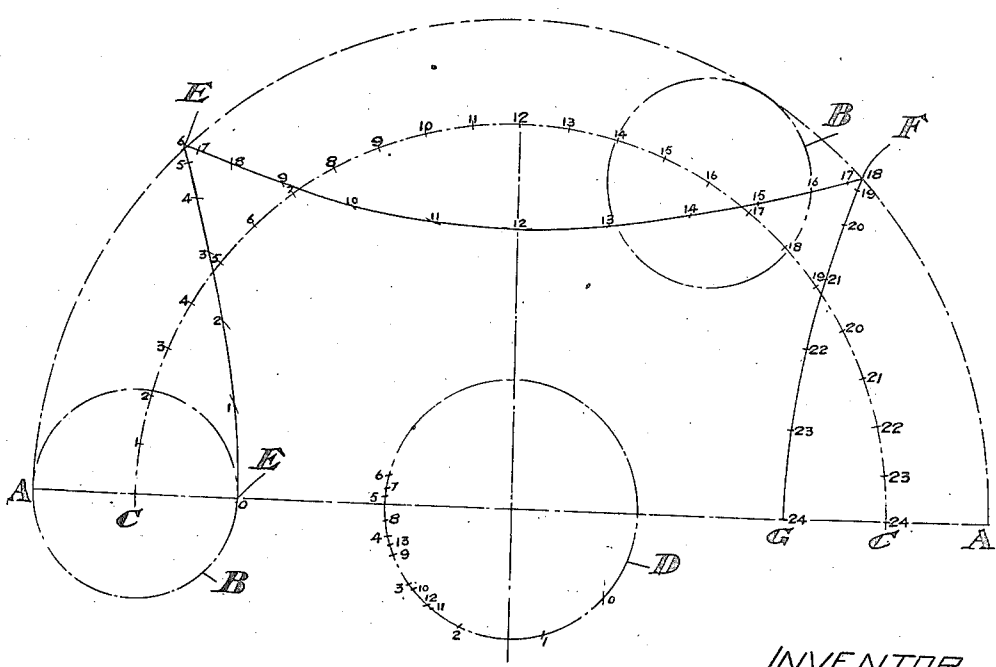


Fig. 4.

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UNITED STATES PATENT OFFICE.

GEORGE GODDU, OF WINCHESTER, MASSACHUSETTS, ASSIGNOR TO UNITED SHOE MACHINERY CORPORATION, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

METHOD OF AND APPARATUS FOR SORTING MATERIALS.

1,301,683.

Specification of Letters Patent.

Patented Apr. 22, 1919.

Application filed January 2, 1918. Serial No. 209,929.

To all whom it may concern:

Be it known that I, GEORGE GODDU, a citizen of the United States, residing at Winchester, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Methods of and Apparatus for Assorting Materials, of which the following description, in connection with the accompanying drawings, is a specification, like reference characters on the drawings indicating like parts in the several figures.

The invention relates to a new and improved method and apparatus for assorting materials, and is designed more particularly for use in the sifting of tacks, such as lastings tacks in shoe manufacture.

In the manufacture of tacks, pieces of scrap from the metal strips from which the tacks are made and tacks which are imperfect by reason of being too small or having small or imperfect heads are delivered by the tack making machine with the perfect tacks, and it is necessary and usual to sift the tacks in order to separate such pieces of scrap and imperfect tacks from the good ones.

The sifting of tacks is attended with many difficulties which have not been overcome successfully by known methods and devices. Tack sifters, as now commonly constructed, are made in the form of a perforated drum which is continuously rotated at a substantially uniform rate of speed. In the operation of such devices, the tacks are delivered by a chute to the bottom of the drum, and then the main body of the tacks is carried upwardly by the rotation of the drum in the direction of the rotation of the drum due to friction between the surfaces of the tacks and the drum. When they reach a point at which the force of gravity exceeds the friction between their surfaces and the surface of the drum, they fall back abruptly toward the bottom of the drum. Most of the tacks as they fall back do not reach the bottom of the drum, i. e., the point of intersection of the wall of the drum with the vertical radial plane of the drum, either by reason of their shanks first becoming engaged in the openings of the drum or because the friction between the tacks and the surface of the drum overcomes the tendency of the force of gravity to move them all the

way back. When, therefore, it is taken into account that the openings of the drum afford less and less opportunity for the pieces of scrap and imperfect tacks to fall there-through, as they are moved away from the vertical radial plane of the drum, by reason of the increasing inclination of the walls of the openings, it will be understood that the tacks are not given a full opportunity to pass through the openings of the drum by not being engaged in the openings until after the latter have passed by the vertical radial plane of the drum so that pieces of scrap and tacks, the heads and shanks of which are of a size to pass through the openings of the drum, frequently do not pass through such openings but remain in the drum and are discharged with the perfect tacks after the sifting is completed.

Another serious difficulty which is encountered in the operation of tack sifting devices is the clogging of the openings of the drum by tacks, the shanks of which have passed through openings in the drum but the head portions of which are too large to pass through. Such tacks frequently fail to fall from the openings back into the interior of the drum as the drum carries them in its rotation through the upper portion of its path of movement.

The object of this invention is to devise a method and apparatus for assorting which will avoid the above and other difficulties encountered in the practice of known methods and in the operation of prior sifting devices and which, without sacrifice of other utility, will effect the sifting of the tacks with great speed and accuracy.

In accordance with the principles of this invention, the rotation of the sifting drum is checked at intervals to facilitate the distribution of the tacks and other material over the surface of the drum to cause more of them to become engaged in the exit openings of the drum, to accelerate the passage of the tacks through the openings of the drum and to insure that tacks which have become engaged in the openings of the drum but which are too large to pass there-through will invariably fall back into the interior of the drum when they are carried to the upper portion of the path of movement of the drum.

Another feature of the invention resides in

first moving the tacks upwardly against the surface of the sifter away from the vertical radial plane of the sifter to distribute them over the surface of the sifter and then carrying them back past the vertical radial plane of the sifter in such manner that all the tacks which are of a size to pass through the openings of the sifter will do so.

Other features of the invention comprise novel operating means for the sifter and an impact member operated in a novel manner for effecting uniform delivery of the tacks from the chute to the sifter.

Although the invention will be described in its particular application to the sifting of tacks, it is, of course, recognized that the practice of the invention is not limited thereto but is broadly applicable to the treatment of materials generally. It is further recognized that the operating mechanism for the sifter may be employed in other relations, and that the details of the mechanism shown may be modified without departing from the invention, for which reason, the scope of the invention is intended to be limited only by the appended claims.

Other objects and features of the invention will appear as the description proceeds.

In the drawings,—

Figure 1 is a view in perspective of a sifting machine made in accordance with this invention;

Fig. 2 is a view in sectional elevation of a portion of the operating means for the sifting drum looking from the right in Fig. 1;

Fig. 3 is an enlarged detail sectional view of the sifting drum looking from the right in Fig. 1, and

Fig. 4 is a diagram illustrating the manner of operation of the operating means for the sifting drum.

As shown, the frame 2 of the machine has mounted thereon the sifting drum 4, the openings or interstices of which are preferably rectangular in form, as shown at 6, Figs. 1 and 3.

The tacks to be sifted are placed in a hopper 8 mounted in a vertical extension 10 of the frame 2 and pass from the hopper to a chute 12 which delivers them to the sifting drum 4.

The operating means for the sifting drum comprises a shaft 14 carrying a pinion 16 which meshes with gears 18 and 20 formed at the ends of the drum so that the drum may be readily reversed and driven from either end. The delivery end of the drum has its bearings on antifriction rolls 22 carried by a bowed frame 24 bolted or otherwise secured to the uprights 26 of the frame 2. As shown, the receiving end of the drum has its bearings on antifriction rolls 28 which are carried by a bearing member 30 in turn supported on braces 32 and 34 of the frame of the machine.

The bearing member 30 is preferably made in two parts, as shown in Fig. 1, the parts being in the form of bowl-shaped spiders 36 and 38, connected together by bolts or screws 40 which pass through lugs extended from the spiders. The spiders 36 and 38 are each formed with a ring in which is formed an annular recess, and when said spiders are assembled the recesses form an annular groove 42 in which is received the internally toothed annular gear 44.

The spider 36 is further formed with a bearing 46 in which is journaled the driving shaft 48 which extends into the spider 36 adjacent to the plane of the annular gear 44. There is mounted on the free end of the driving shaft 48 an arm 50 having a split hub 52 clamped to the shaft 48 by bolts 54.

The arm 50 constitutes a part of the connections between the driving shaft 48 and the shaft 14 whereby, in the illustrated construction, rotary movement of the driving shaft in one direction is transmitted to effect movement of the shaft 14 alternately in opposite directions as will be more fully explained hereinafter. Said connections further comprise a pinion 56 journaled in the arm 50 and arranged to mesh with the teeth of the internal gear 44 when the arm 50 is swung around by rotation of the driving shaft 48. The pinion 56 carries a crank 57 from which the pin 58 projects. The pin 58, as shown in Fig. 2, is preferably positioned substantially in line with the periphery of the pinion. Said pin is connected by means of the link 60 to the crank pin 62 projecting from the crank 64 carried by the shaft 14.

An impact member in the form of a rod 66 extends from diametrically opposite sides of the shaft 14 and is arranged to impact against a lug 68 extending downwardly from the bottom of the chute and thereby vibrate the chute. The spring 70 tends to move the chute 12 in a direction opposite to that in which the chute is moved by the impact member 66. A suitable stop, not shown, limits the movement of the chute 12 under the action of the spring 70. The chute may be supported for movement by the impact member 66 in any suitable manner. As shown, the supporting means for the chute comprises a bowed rod 72 arranged to be engaged by a hook 74 extended downwardly from the vertical extension 10 of the frame 2.

The tacks which pass through the interstices of the screen, fall into the trough 76 and are delivered from the machine at 78.

The operation will be described with particular reference to Fig. 4 of the drawings, wherein the internal gear 44 is indicated diagrammatically by the semicircle A, the pinion 56 by the circle B, the path of movement of the axis of the pinion 56 by the semicircle C, the path of movement of the crank pin 62 by the circle D, and the hypocycloidal curve

defined by the crank pin 58 by the lines E—E, E—F, and F—G. If it be assumed that the crank pin 58 which, in the illustrated construction, lies substantially in the peripheral line of the pinion 56, is at the point indicated by O of the circle B of Fig. 4, then the crank pin 62, which is connected to the crank pin 58 by the link 60, will be positioned at the point designated O in the circle D. Upon rotation of the driving shaft 48, the pinion 56 which meshes with the internal gear 44 will be carried around within said gear. When the center of the pinion 56 is moved to the point I of the semicircle C, the meshing of the pinion 56 with the teeth of the internal gear 44 causes movement of the crank pin 58 from the point O of the circle B to the point I of the line E—E, and the movement of the crank pin 58 from the point O to the point I of the line E—E effects movement of the crank pin 62 from the point O of the circle D to the point I indicated on such circle, thus effecting rotation of the shaft 14 and consequently of the sifting drum 4 in a forward direction. Referring further to the diagram shown in Fig. 4, it will be noted that movement of the arm 50 by operation of the driving shaft effects movement of the center of the pinion 56 along the semicircle C to the respective points indicated by the numerals 1 to 24 on the semicircle C during which time the crank pin 58 is moved successively along the hypocycloidal path indicated by the lines E—E, E—F, and F—G, the crank pin 58 being in a position indicated in the diagram by any numeral when the center of the pinion 56 is at a point indicated in the diagram by a corresponding numeral. It will be further noted that when the crank pin 58 moves from the point O to the point 6 of the line E—E, the crank pin 62 is moved from the point O to the point 6 of the circle D, the crank pin 62 being at the point indicated by any numeral on the circle D at a time when the crank pin 58 is at a point on the line E—E indicated by a corresponding numeral. During the movement of the crank pin 58 from the point O to the point 6 of the line E—E, the crank pin 62 will be moved in a forward direction, thus effecting continuous forward movement of the shaft 14 and sifting drum 4. It will be understood by reference to Fig. 4 that the forward movement of the shaft 14 and sifting drum 4 will be most rapid during the first part of such movement, at which time the movement of the crank pin 58 in a direction to effect forward rotation of the shaft 14 by reason of the bodily movement of the pinion is supplemented by movement of the crank pin 58 in a direction to effect forward movement of the shaft 14 by reason of the rotation of the pinion 56 about its axis. It will be further noted that the effect of the bodily movement

of the pinion 56 to produce forward rotation of the shaft 14 is supplemented by the movement of the crank pin 58 due to the rotation of the pinion until about the time the point 3 of the line E—E is reached. During bodily movement of the pinion 56 from the point 3 to the point 6 of the semicircle C; however, the effect of the bodily movement of the pinion in effecting rotation of the shaft 14 in a forward direction is in part counteracted by the rotation of the pin 58 about the axis of the pinion 56 of the pin 58 which tends to move the crank pin 62 in a reverse direction. It follows, therefore, that movement of the pinion 56 from the point 3 to the point 6 of the semicircle C effects a relatively slow movement of the crank pin 62 as indicated on the circle D, and, as there indicated, the rate of movement of the crank pin 62 during the movement of the pinion 56 from the point 3 to the point 6 is gradually reduced.

When the pinion 56 is moved beyond the point 6 of the semicircle C, the tendency of the bodily movement of the pinion 56 to effect movement of the shaft 14 in the forward direction is more than counter-balanced by the rotation of the pinion 56 whereby the crank pin 58 is carried backward in a direction to effect a reverse rotation of the crank pin 62. For this reason, the movement of the pinion 56 from the point 6 to the point 11 of the semicircle C produces a movement of rotation of the crank pin 62 in a direction opposite to its first movement of rotation. After the pinion 56 has passed the point 11 of the semicircle C, further movement of the pinion again effects a movement of the crank pin 62 in a forward direction, since the tendency of the bodily movement of the pinion 56 to move the crank pin 62 in a forward direction is greater than the tendency of the rotation of the crank pin 58 in passing from the point 11 to the point 12 of the line E—F to effect rotation of the crank pin 62 in a backward direction. After the pinion 56 passes the point 12 of the line C, the tendency of the bodily movement of the pinion 56 to effect rotation of the crank pin 62 in the forward direction is again supplemented by the rotation of the pinion 56 and crank pin 58 so that there again ensues a period of relatively rapid forward rotation of the crank pin 62.

It will be clear from the foregoing that the movement of rotation of the shaft 14 in the direction of the bodily movement of the pinion 56 is of greater amplitude than the movement of rotation of the shaft 14 in the opposite direction. As illustrated in Fig. 4, the size of the pinion 56 is such that a complete rotation of the pinion is effected by bodily movement of the pinion about the driving shaft 48 through an angle of ninety degrees, as, for example, from the point

0 to the point 12 of the semicircle C, so that the crank pin 58 comes to the point 12 of the line E—F at the end of the ninety degree movement of the shaft 48, which is the position that such crank pin would occupy if no rotation of the pinion 56 about its axis were effected. It will thus be seen that the bodily movement of the pinion 56 through an angle of ninety degrees moves the link 60 and consequently the shaft 14 forward through an angle of 90 degrees, the rotation of the pinion 56 and crank pin 58 about the axis of the pinion serving to modify the movement of the shaft 14 as the pinion passes through its ninety degree movement without, however, affecting the ultimate result of the bodily movement of the pinion on the shaft 14 which is to move it forward through an angle of ninety degrees the same as though the crank pin 58 were mounted on the arm 50 instead of on the pinion journaled in said arm. It follows, therefore, that the rotation of the arm 50 effects a progressive rotation of the shaft 14 and consequently of the sifting drum 4 in a forward direction. The arrows on Fig. 2 indicate the direction of movement of the arm 50 and pinion 56, and the long and short arrows applied to the shaft 14 indicate respectively the directions of the longer and shorter movements of rotation of the shaft.

Preferably and as shown, the shaft 14 is geared to the sifting drum 4 in such a way that when the shaft is rotated in the direction of the long arrow, in Fig. 2, the sifting drum 4 will be rotated in the direction of the arrow on Fig. 3, and the sifting drum and the shaft 14 are further so geared together that during a single forward movement of rotation of the shifting drum, the part at the point K of the drum (see Fig. 3) will be moved to about the point L. In passing from the point K to about the point M, the rotation of the sifting drum is relatively rapid but from the point M to the point L, the rotation of the drum is relatively slow, being gradually diminished until the point L is reached. During the rotation of the drum from the point K to the point M, the tacks being sifted are carried upwardly by the rotation of the drum in the direction of the rotation of the drum. However, during the movement of the drum from the point M to the point L, the tacks which have been carried upwardly by the movement of the drum due to friction between the surfaces of the tacks and the surface of the drum, fall backwardly toward the bottom of the drum by reason of the friction between the tacks and the inner surface of the drum being overcome by the force of gravity. The sliding of the tacks back toward the bottom of the drum under the action of gravity is facilitated by the decreased speed

of rotation of the drum in passing from the point M to the point L and by the subsequent stoppage of the drum, thus effecting a better distribution of the tacks in the drum than if the drum were operated continuously at a uniform speed. By reason of the friction between the tacks and the inner surface of the drum and of the engagement of the tacks with the rectangular slots in the drum,—the larger portion of the tacks will not fall all the way to the bottom of the drum. The tacks contained in the drum at the time the forward movement of rotation of the drum ceases at the point L, lie in a row to the left of the vertical radial plane of the drum, as shown in Fig. 3. The backward movement of rotation of the drum is of an amplitude sufficient to carry the tacks from the position shown in Fig. 3 to the right across the radial vertical plane of the drum to about the point K (Fig. 3). The tacks and other materials which become engaged in the openings of the drum to the left of the vertical radial plane of the drum are thus carried across said plane so that they are given the fullest possible opportunity to pass through the openings of the drum. The subsequent forward movement of the drum from the point K to the point L again offers opportunity for each of the tacks engaged in any of the openings of the drum to pass through the same.

In this way a much more perfect assorting of the tacks is obtained than when the drum is rotated continuously in the same direction, since in such case the shanks of the tacks become engaged in the openings of the drum at a point to that side of the vertical radial plane of the drum in the direction in which the drum is rotated. At the time of the engagement, however, of the tacks with the openings in the drum, they are not given the fullest opportunity to fall through by reason of the inclined position of the walls of the openings in the drum, and as the drum continues to rotate in the same direction, the walls of the openings in the drum become inclined to a greater and greater degree, thus rendering more and more difficult the passage of the tacks through said openings. The tacks are finally carried above the horizontal plane of the axis of the drum to a point such that they may again fall toward the bottom of the drum. When, however, the tacks do again fall to the bottom of the drum, they are not likely to find engagement in the openings of the drum until after they are again carried past the vertical radial plane of the drum. Tacks and other materials which are of a size to fall through the openings in the drum may therefore be engaged time after time in openings thereof without ever being given a full opportunity to fall through such open-

ings and may eventually be delivered with tacks of a size larger than the openings of the drum upon the completion of the sifting operation. Two or three or even more siftings of the tacks are often necessary in the use of sifters as heretofore constructed and operated. In the use of a sifter operated by the mechanism of this invention, however, a single sifting of the tacks is generally all that is required.

Great difficulty has been experienced in the operation of sifters by reason of the tacks becoming engaged in the openings of the sifter and failing either to pass there-through or to fall back again into the bottom of the sifter when the openings in which they are engaged are carried through the upper portion of the path of movement of the sifter. By reference to Fig. 3, the tack X, for example, would be very likely to be carried all the way around by the sifter without being dislodged from the opening in which it is engaged by reason of the inertia of the tack and the centrifugal action of the drum which tend to retain the tack in the inclined position relatively to the surface of the drum in which it is shown. When, however, a tack so engaged in the opening of the drum is carried to the upper part of the drum, and the rotation of the drum is checked in that its speed of rotation is reduced or its rotation is stopped for an instant or, as in the illustrated construction, a movement is given to the drum in an opposite direction, the action of centrifugal force is reduced or destroyed, and the inertia of the tack causes it to move to an upright position radially of the axis of the drum whereby it is dislodged from the opening in the drum and falls down into the bottom of the drum.

The impact member 66 is so arranged that it is moved to impact against the lug 68 of the chute 12 when the shaft 14 and drum 4 are being rotated at their greatest speeds. Thus, when the sifting drum is being rotated at a relatively low average rate of speed, the impact member 66 will, nevertheless, strike a quick sharp blow on the lug 68, thus effecting a uniform distribution of the tacks in the chute and a uniform delivery of the tacks from the chute to the sifting drum. Since sifting drums of this kind can be operated efficiently only at relatively low speeds, difficulty has been experienced in the operation of machines, which, as commonly constructed, have the impact member mounted on the operating shaft of the sifting drum and in which the drum and shaft are rotated in the same direction at a uniform speed, by reason of the impact member not striking a sharp enough blow on the chute to distribute the tacks uniformly in the chute or to effect the uniform feeding of the same to the sift-

ing drum, the rapidity of operation of the impact member being, of course, dependent upon the rapidity of operation of the drum.

The path of movement of the crank pin 58 and the resultant operation of the shaft 14, sifting drum and impact member depends upon the distance between the pin and the axis of the pinion 56. If the pin is located farther from the axis of the pinion than in the illustrated construction, the reverse movement of the shaft 14 and the parts operated thereby will be greater than in the illustrated construction. If, on the other hand, the pin is located nearer the axis of the pinion, the reverse movement of the shaft 14 will be less than in the illustrated construction, and it is evident that the pin may be located at a point such that the reverse movement may be reduced to zero so that the sifting drum is caused to pause at intervals in its rotation, or the pin may be so located that the speed of rotation of the drum will be reduced at intervals without pause or reversal of motion. The invention embraces such modifications of the illustrated construction, it being noted that important advantages of the invention, such for example, as the better distribution of the tacks in the drum, the acceleration of the passage of the tacks through the drum opening, the dislodgment of the tacks from the drum openings, and the uniform feed of the tacks from the chute to the drum can be obtained without actually reversing the movement of rotation of the drum.

Having described the invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a machine of the class described, a sifting drum mounted for rotation, and means for rotating said sifting drum progressively in one direction constructed and arranged to impart intermittently to said drum a movement of rotation in the opposite direction.

2. In a machine of the class described, a frame, a sifting drum, mechanism for mounting said drum on said frame, said mechanism being unobstructed on one side so that the drum may be lowered into said mechanism or lifted therefrom and gearing associated with said frame and said drum for imparting a to and fro oscillating movement to said drum.

3. In a machine of the class described, an arc-shaped sifter and means for imparting a to and fro oscillating movement to said sifter constructed and arranged to impart to said sifter an oscillating movement in one direction of greater amplitude than the oscillating movement in the opposite direction.

4. In a machine of the class described, a sifter, operating means for said sifter constructed and arranged to impart to said

sifter movements in a forward direction and further constructed and arranged to impart to said sifter movements in the opposite direction to said forward movements of less extent than said forward movements.

5 In a machine of the class described, a sifting drum and automatic means for imparting uni-directional movements of rotation to said drum intermittently.

10 6. In a machine of the class described, a sifting drum and means for imparting uni-directional movements of rotation to said drum intermittently constructed and arranged to effect each separate movement at a

15 varying rate of speed.

7. In a machine of the class described, a sifter, and automatic means for imparting uni-directional movements to said sifter intermittently, constructed and arranged to

20 impart to said sifter a progressive movement in one direction.

8. In a machine of the class described, a sifting drum, means for imparting uni-directional movements of rotation to said drum intermittently, constructed and arranged to effect each of such movements of

25 rotation at a rate of speed varying from a relatively high rate during the first part of such movement to a relatively low rate during the latter part of such movement.

9. In a machine of the class described, a sifting drum, means for imparting a movement of rotation to said drum of an amplitude to carry the material in the drum upwardly to a point such that the pieces of material will fall toward the bottom of the drum and at a rate of speed during the latter part of such movement of rotation less than during the first part of such movement to facilitate the descent of the material in the drum, said means being further constructed and arranged to impart a movement of rotation to the drum in the opposite direction to cause the material, which by the first

40 movement of the drum was carried upwardly on one side of the drum and caused to fall toward the bottom of the drum, to be moved across the vertical radial plane of the drum to facilitate the delivery through the openings of the drum of pieces of material of a size to pass therethrough.

50 10. In a machine of the class described, an arc-shaped sifter, means for operating the sifter constructed and arranged to oscillate the sifter through an angle sufficient to carry the material being operated upon upwardly against the side of the sifter and to permit the material to fall toward the bottom of the sifter and further constructed and arranged to impart to the sifter a movement of rotation in the opposite direction subsequently to the descent of the material toward the bottom of the sifter.

11. In a machine of the class described, a

sifting drum, means for operating said drum constructed and arranged to carry the material being operated upon upwardly against the side of the drum and further constructed and arranged to move the material in the opposite direction across the vertical radial plane of the drum.

12. In a machine of the class described, an arc-shaped sifter, and mechanism constructed and arranged to carry the material being operated upon upwardly against the side of the sifter, to permit the material to fall toward the bottom of the sifter, and to carry the material backwardly across the vertical radial plane of the sifter subsequently to its descent toward the bottom of the sifter.

13. In a machine of the class described, a sifting drum, operating means therefor constructed and arranged to impart to said drum a movement of rotation in a forward direction whereby pieces of material engaged in the openings of the drum by reason of some portion thereof being too large to permit them to fall through said openings are carried upwardly with the drum, and being further constructed and arranged to check the rotation of said sifting drum at intervals to cause the pieces of material engaged in the openings of the drum to fall from said openings.

14. In a machine of the class described, a sifting drum, operating means therefor constructed and arranged to impart to said drum a movement of rotation in a forward direction whereby pieces of material engaged in the openings of the drum by reason of some portion thereof being too large to permit them to fall through said openings are carried upwardly with the drum, and being further constructed and arranged to check the rotation of said sifting drum at intervals less than 270° in the rotation of the drum to cause the pieces of material engaged in the openings of the drum to fall from said openings.

15. In a machine of the class described, a sifting drum, means for rotating said drum comprising a rotary driving member, a rotary driven member operatively connected to said drum, and positive connections between said rotary driving member and said driven member constructed and arranged to impart uni-directional movements of rotation to said sifting drum intermittently.

16. In a machine of the class described, a frame, a bearing member rigidly secured to said frame, a rotary driving member journaled in said bearing member, a rotary driven member also journaled in said bearing member, connections between said rotary driving member and said rotary driven member constructed and arranged to impart uni-directional movements of

rotation to said driven member intermittently, and a sifting drum operatively connected to said driven member.

17. In a machine of the class described, a frame; a bearing member mounted on said frame, a driven member journaled in said bearing member, a sifting drum having one of its ends bearing on said bearing member and operatively connected to said driven member, and means for imparting to said driven member movements of rotation alternately in opposite directions.

18. In a machine of the class described, a sifter and operating means for said sifter comprising a rotary driving member, a rotary driven member operatively connected to said sifter, and connections between said driving member and said driven member constructed and arranged to transmit a movement of said driving member in one direction to effect movements of said driven member in opposite directions and comprising an arm extending substantially transversely of said driving member and cranks carried by said arm and said driven member respectively.

19. In a machine of the class described, a sifter, and operating means for said sifter comprising a rotary driving member, a rotary driven member operatively connected to said sifter, a stationary gear, an arm carried by said driving member, a pinion on said arm meshing with said gear, cranks carried by said pinion and said driven member respectively, and means for operatively connecting said cranks.

20. In a machine of the class described, a sifting drum and operating means for said drum comprising a rotary driving member, a rotary driven member operatively connected to said drum, an arm carried by said driving member, a pinion journaled in said arm, cranks mounted on said pinion and said driven member respectively, a link connecting said cranks, and means for rotating said pinion upon rotation of said rotary driving member.

21. In a machine of the class described, a sifter, operating means for said sifter comprising a rotary driving member, a rotary driven member operatively connected to said sifter, an arm mounted on said driving member, a pinion carried by said arm, means for rotating said pinion upon rotation of said driving member, cranks carried by said pinion and said driven member respectively, a link connecting said cranks having its point of connection with the crank of said driven member more remote from the axis of said driven member than is the point of connection of said link to the crank of the pinion from the axis of the pinion.

22. In a machine of the class described, a sifter, operating means for said sifter comprising a rotary driving member, a rotary

driven member operatively connected to said sifter, an arm mounted on said driving member, a pinion journaled in said arm, means for effecting rotation of said pinion upon rotation of said driving member, and connections between said pinion and said driven member constructed and arranged to transmit movement from said pinion to said driven member.

23. In a machine of the class described, a sifter, operating means for said sifter comprising a rotary driving member, a rotary driven member operatively connected to said sifter, an arm carried by said driving member, and means operatively connecting said arm and said driven member constructed and arranged to transmit a rotary movement of the arm in one direction to effect uni-directional movements of said driven member and said sifter intermittently.

24. In a machine of the class described, a sifter, operating means for said sifter comprising a rotary driving member, a rotary driven member operatively connected to said sifter, an arm carried by said driving member, a crank carried by said driven member, and a connection between said arm and said crank constructed and arranged to effect backward and forward movement of said crank upon uni-directional rotation of said arm.

25. In a machine of the class described, a frame, a sifting drum mounted on said frame, a chute for delivering the material to be sifted to said drum, a driven member journaled in said frame and operatively connected to said drum, operating means for said driven member constructed and arranged to impart to said driven member movements of rotation alternately in opposite directions, and an impact member operated from said driven member and arranged to vibrate said chute.

26. A machine of the class described having, in combination, a frame, a sifter mounted on said frame, a chute arranged to deliver the material to be sifted to said sifter, an impact member, and operating means for said sifter and impact member constructed and arranged to move said sifter and impact member at varying rates of speed, said impact member being arranged to strike said chute during the period of rapid operation of the shifter and impact member.

27. A machine of the class described having, in combination, a sifter, a chute for delivering material to be sifted to said sifter, an impact member for vibrating said chute, and operating means for said impact member comprising a rotary shaft, and means for rotating the shaft at the time of the operation of the impact member on said chute at a higher rate of speed than at other times to strike a sharp blow on said chute.

28. In a machine of the class described, in

combination, a rotary driving member, a rotary driven member, and connections between said driving member and said driven member constructed and arranged to transmit a rotary movement of said driving member in one direction to effect a rotary movement of said driven member alternately in opposite directions and being further constructed and arranged to effect rotary movement of said driven member in one direction of greater amplitude than the movement of said member in the opposite direction whereby a progressive movement is imparted to said driven member.

29. In a machine of the class described, a rotary driving member, a rotary driven member, and connections between said driving member and said driven member constructed and arranged to transmit movement of said driving member in one direction to a movement of said driven member in opposite directions and to impart to said driven member movement in one direction at a relatively high initial rate of speed during the first part of such movement and at a relatively low rate of speed during the latter part of such movement.

30. In a machine of the class described, a rotary driving member, a rotary driven member, and positive connections between said driving member and said driven member for transmitting rotation of said driving member to effect unidirectional movements of rotation of said driven member intermittently and constructed and arranged to impart to said driven member a progressive movement in one direction.

31. In a machine of the class described, a rotary driving member, a rotary driven member, a stationary gear, an arm carried by said driving member, a pinion on said arm meshing with said gear, cranks carried by said pinion and said driven member respectively, and means for operatively connecting said cranks.

32. In a machine of the class described, a rotary driving member, a rotary driven member, an arm mounted on said driving

member, a pinion journaled in said arm, means for effecting rotation of said pinion upon rotation of said driving member, and connections between said pinion and said driven member constructed and arranged to transmit movement from said pinion to said driven member.

33. The method of sifting which consists in carrying the material upwardly against the side of the sifter by imparting a movement of rotation to the sifter and permitting the material to fall toward the bottom of the sifter and then carrying the material backwardly past the vertical radial plane of the sifter by imparting a movement of rotation to the sifter in the opposite direction.

34. The method of sifting which consists in delivering the material to be sifted to a sifter, carrying the material to be sifted upwardly against the surface of the sifter and permitting the material to descend by gravity toward the bottom of the sifter, and then carrying the material backwardly past the vertical radial plane of the sifter.

35. The method of sifting which consists in delivering the material to be sifted to a sifting drum, rotating said drum, and checking the rotation of said drum intermittently to overcome the tendency of the centrifugal force of the drum to prevent the pieces of material engaged in the openings of the drum from falling back into the drum when such pieces of material are carried through the upper portion of the path of movement of the drum.

36. The method of sifting which consists in delivering the material to be sifted to a sifting drum, rotating said drum, and checking the rotation of said drum intermittently at intervals less than 270° in the rotation of the drum to throw down into the drum the pieces of material engaged in the openings of the drum as said openings are carried through the upper part of the path of movement of the drum.

In testimony whereof I have signed my name to this specification.

GEORGE GODDU.