This invention relates to sorting machines. An object of the invention is the provision of a sorting machine capable of receiving a mixture of different sizes of material and segregating the different sizes into separate groups.

Another object is the provision of a sorting machine as described, which is capable of operating satisfactorily upon various kinds of material. Whereas the machine is particularly designed to sort headed pins such as screws, bolts, nails, rivets and the like, it is also capable of being employed to sort such articles as ball bearings.

A further object is the provision of a sorting machine which is capable of operating automatically, and which requires the services of an attendant for no purpose other than to supply the machine with material to be sorted and to remove from the machine, the several collections of segregated material.

The invention possesses other objects and advantageous features, some of which, with those enumerated, will be set forth in the following description of the invention's particular embodiment which is illustrated in the drawings accompanying and forming a part of the specification.

Referring to the drawings:

Figure 1 is a plan view of a sorting machine incorporating the essential features of the present invention;

Fig. 2 is a front elevation partly broken away and shown in section. The direction of view is indicated by the arrow 2 of Fig. 1;

Fig. 3 is a sectional view taken upon the line 3-3 of Fig. 2, through the driving shaft, to show the remainder of the machine in end elevation. The direction of view is indicated by the arrows. This figure shows the feeding hopper in non-feeding position;

Fig. 4 is a view similar to Fig. 3, showing the hopper elevated to feeding position;

Fig. 5 is a transverse, vertical sectional view taken upon the line 5-5 of Fig. 2, with the direction of view as indicated by the arrows;

Fig. 6 is a transverse, vertical sectional view taken upon the line 6-6 of Fig. 2, with the direction of view as indicated.

In terms of broad inclusion, the sorting machine of the present invention, comprises a pair of divergently arranged and helically grooved shafts journalled and coupled together for rotation in opposite directions. Means are provided for preferably periodically depositing material to be sorted upon the ends of the shafts which are closest together. From this point the material thus deposited upon the shafts, is carried toward the other ends thereof by the engagement of the material within the helical grooves; and when each piece of the material reaches that point at which the shafts are far enough apart to permit the piece to drop therebetween, that piece of material falls into a bin disposed below the shaft and provided with adjustable means for dividing the bin into a plurality of compartments wherein the several groups of sorted material will collect. Means are also provided for varying the angle of divergence of the shafts, as well as for varying both the maximum and minimum distances between the shafts, whereby the machine may be adjusted to accommodate different kinds of material to be sorted.

Specifically describing the invention in its most practical embodiment of which I am at present aware, the sorting machine is mounted upon a suitable framework consisting of spaced legs 11 and 12. Each leg is provided with an angle iron 13 and 14 respectively, these members being rigidly attached to the legs 11 and 12 in any suitable manner such as by screws or bolts 16 passing through the vertical legs 17 of the angle irons. The horizontal legs 18 are each provided with a transversely extending slot 19, and each supports a pair of bearing blocks 21. Each bearing block 21 is provided with a stud 22 rigid with the bottom thereof and extending downwards through the slot 19 of the associated angle iron 13, there being a nut 23 and washer 24 upon each stud 22, whereby the associated bearing block 21 may be clamped in adjusted position.

A pair of shafts 26 extend longitudinally of the machine, each shaft having a reduced portion 27 journalled in one of the bearing blocks 21. Each shaft 26 is also provided
adjacent one end thereof with a gear 28 rigidly mounted thereupon. The gears 28 are enmeshed with each other so that the shafts 26 are interengaged for rotation together in opposite directions.

Furthermore, the gears 28 are of the same diameter and carry the same number of teeth, so that the shafts rotate at the same rate. Each shaft 26 is provided with a helical groove 29, the groove 29 of one shaft being of pitch opposite to the groove 29 of the other shaft, as best shown upon Fig. 1. In other words, the groove 29 of the shaft 26 adjacent the front side of the machine, is of right hand pitch, whereas the other groove is of left hand pitch. Furthermore, the bottoms of these grooves, are rounded as clearly shown in the drawings.

It is readily apparent that by loosening the nuts 23 whereby the bearing blocks 21 are clamped to their respective angle irons 13 or 14, the spacing between the shafts 26, may be varied. It is intended that when the machine is in use, the shafts 26 shall be divergently disposed as clearly shown upon Fig. 1, with the ends of the shafts toward the left of that figure, further apart than the other ends. Not only can the angularity of the shafts be varied by this means, but also both the maximum and minimum distances between the shafts may be varied within the limits of the permissible depth of engagement of the gears 28.

One of the shafts 26 is extended as at 31, and carries a suitable universal joint 32 to which a driving shaft 33 is connected. This shaft 33 is journalled in a suitable outboard bearing 34 which is carried by a bracket 36 secured to one of the legs 12. The shaft 33 carries a driving pulley 38 or its equivalent. Obviously, however, it would be entirely within the scope of the invention to provide manually driven means for rotating the shafts instead of the pulley 38.

Means are provided for periodically depositing materials to be sorted upon the sorting screw shafts. A bracket 41 extending rigidly upwards from the leg 12, provides a journal for a stub shaft 42 upon which a gear 43 is secured. This gear 43 is considerably larger than either of the gears 28, and is enmeshed with one thereof, as clearly shown upon Figs. 3 and 4. Preferably the gear 43 has four times as many teeth as the gear 28 with which it is enmeshed; with the result that the stub shaft 42 rotates one-quarter as fast as the shafts 26. A feeding drum 46 is carried by the stub shaft 42, for rotation with the gear 43, and is provided with a long extension extending slot 47 in its circumferential face. A feeding hopper 48 is mounted for rotary movement upon the stub shaft 43—a roughly 'U'-shaped bracket 49 within which the hopper 48 is mounted, having its ends 51 extended and provided with suitable apertures within which the stub shaft 43 is situated. The hopper 48 is supported by means of a link 55, one end of which is pivoted to the hopper 48, and the other end to one arm 53 of a bell crank which is journalled upon a suitable pin 54 carried by an extension 56 of the bracket 41. The other arm 57 of the bell crank, is pivoted to a link 58 in which it is operably connected to a crank pin 59 carried by a disc 61 which is secured to the shaft 42. Inasmuch as the disc 61 turns with the shaft 42 the link 58 will be pulled downwards once during each revolution of the stub shaft 42, causing the bell crank to be pivoted about its pivot 54, raising the arm 53 of the bell crank, thus effecting raising of the hopper 48 in pivotal movement about the axes of the stub shaft 42. The parts are so proportioned and arranged that this upward pivotal movement of the hopper 48 occurs as the discharge gate of the hopper 46 and the slot 47 in the feeding drum 46, are in registration with each other as indicated upon Fig. 4.

A guiding hopper 66 is disposed in such position that it receives material falling from the slot 47 of the feeding drum 46 as the drum rotates and guides the falling material onto those ends of the shafts 26 which are proximal to each other. This guiding hopper 66 also carries a strip of leather 67 or other suitable material which is disposed above and closely adjacent the shafts 26, the purpose being to brush any material which happens to be resting upon other material supported by the shafts, off such other material and directly onto the shafts themselves.

A receiving bin 71 is mounted between the legs 11 and 12, and comprises a bottom 72, and front and back walls 73 and 74 respectively. The walls are provided with spaced vertical slots 75 within which partitions 77 are removably receivable. To facilitate positioning the partitions 77, the front wall 73 is removably mounted upon the legs 11 and 12, through the expedient of hooks 78 carried by the legs and receivable within suitable eyes 79 carried by the front wall 73. It is obvious that the partitions 77 may be arranged in any desired relative positioning so as to divide the bin 71 into a plurality of compartments so disposed under the space between the shafts 26, that the material falling through the space between the shafts, will fall into these compartments and thus be retained as sorted by the divergent shafts. It is also obvious that any other suitable type of receiving bin may be employed. I prefer to use some receptacle wherein the different compartments are adjustable so as to facilitate the retention of the sorted articles in groups, each of which contains articles of a single size and the size of the articles of each group being different from the size of articles of the other groups.
Operation

After the bearing blocks 21 have been so arranged that the shafts 26 are disposed at the proper angularity with each other, the shafts should be put into rotation by starting the driving mechanism. Then the assortment of articles to be sorted, say for example, a collection of wood screws of mixed sizes, should be placed within the feeding hopper 48. Since the gear 43 is enmeshed with one of the gears 28, the feeding hopper 48 will be raised gradually as described hereinabove. Thus the screws will be slid toward the feeding drum 46, permitting a few of the screws to lodge within the slot 47; with the result that as the feeding hopper 48 is lowered again, these screws will be carried by means of the drum, past top center position and dropped into the guiding hopper 66, so that they fall upon the shafts 26. Regardless of whether the screws fall upon the rollers in such position that their shanks extend downwards through the space between the shafts, or whether the shanks rest upon a plurality of the crests of the grooves 29, the heads of the screws will engage toward the guide helical grooves, and thus be carried toward the opposite end of the machine, due to the rotation of the shafts. Should it happen that any of the screws, instead of falling directly upon the shafts, become lodged upon the top of other screws, the brush 67 will serve to remove these upper screws from those upon which they are resting, and cause them to fall directly onto the shafts 26.

In this manner each screw will be carried toward the distal ends of the shafts until such time as it reaches that point at which the space between the shafts corresponds in width to the greatest diameter of the head. Here the screw will be permitted to drop between the shafts into the compartment of the bin 71 immediately below. It is obvious that the smaller screws will drop into the compartments adjacent the head end of the machine, whereas the larger screws will be carried toward the other end and dropped into bins at a distance from the head end proportionate to the size of the screws.

Due to the reciprocation of the feeding hopper 48, the screws will be supplied to the sorting shafts in successive periods; and due to the operation of the feeding drum 46, only a relatively small number of screws will be deposited upon the sorting shafts for each reciprocation of the feeding hopper 48. This feature prevents clogging the machine by depositing upon the feeding rollers, too great a number of screws or whatever other type of article is being sorted.

It is to be understood that the details of the invention as herein disclosed, are subject to alteration within the spirit or scope of the appended claims.

I claim:

1. A sorting machine comprising a pair of slightly divergent rotatable members, means for rotating said members in opposite directions, a drum rotatable about an axis approximately parallel to said rotatable members, said drum having a longitudinally extending groove formed thereon constituting a pocket adapted to receive and discharge articles to be sorted between the proximal ends of said rotatable members, means for rotating said drum, a hopper adapted to receive articles to be sorted and feed them against the side of the drum, and means for periodically tilting the hopper.

2. A screw sorting machine comprising a pair of shafts having helical grooves of opposite pitch, the distance between opposed grooves on the shaft gradually increasing along the lengths of the shafts, means for rotating said shafts in opposite directions, a drum rotatable about an axis approximately parallel to the axis of the shafts, said drum having a groove formed thereon adapted to receive articles to be sorted and deposit them as an elongated mass between the proximal ends of the shafts, means for rotating the drum, a hopper pivotally mounted for movement about the axis of rotation of the drum adapted to feed articles against the side of the drum, and means for lifting the swinging end of the hopper periodically.

3. A screw sorting machine comprising a pair of shafts having helical grooves of opposite pitch, the distance between opposed grooves on the shaft gradually increasing along the length of the shafts, means for rotating the shafts in opposite directions, a drum driven by one of the shafts and rotatable about an axis approximately parallel to the axis of the shafts, said drum having a groove formed thereon adapted to receive articles to be sorted and deposit them as an elongated mass between the proximal ends of the shafts, a hopper pivotally mounted for movement about the axis of rotation of the drum, said hopper being adapted to feed articles against the side of the drum, and means driven by one of the shafts for causing the hopper to be tilted periodically.

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

NONIE E. FIELDER.