

Oct. 27, 1942.

L. L. KING ET AL

2,300,124

DEVICE FOR SORTING RIVETS

Filed Jan. 9, 1939

4 Sheets-Sheet 1

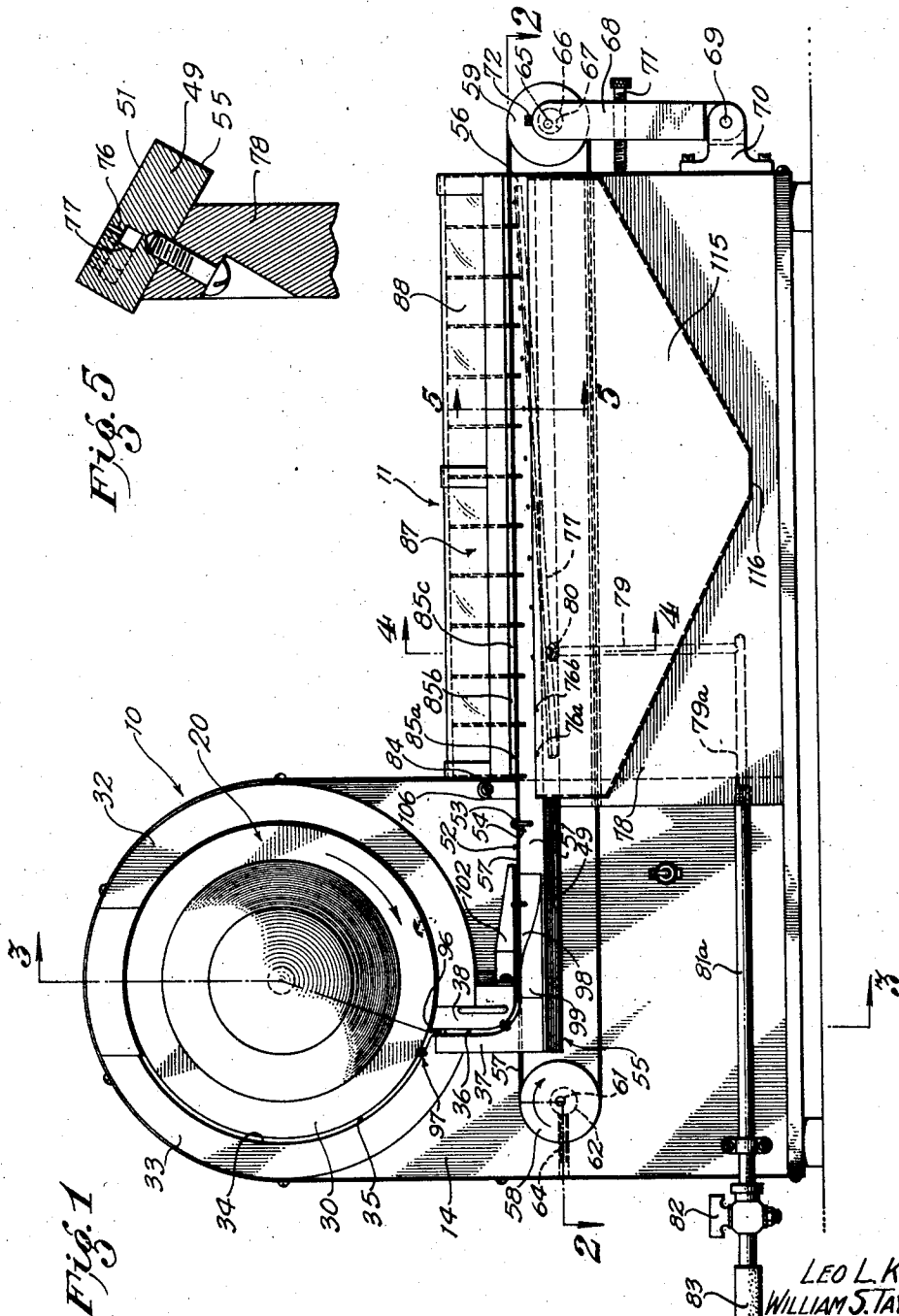


Fig. 1

Fig. 5

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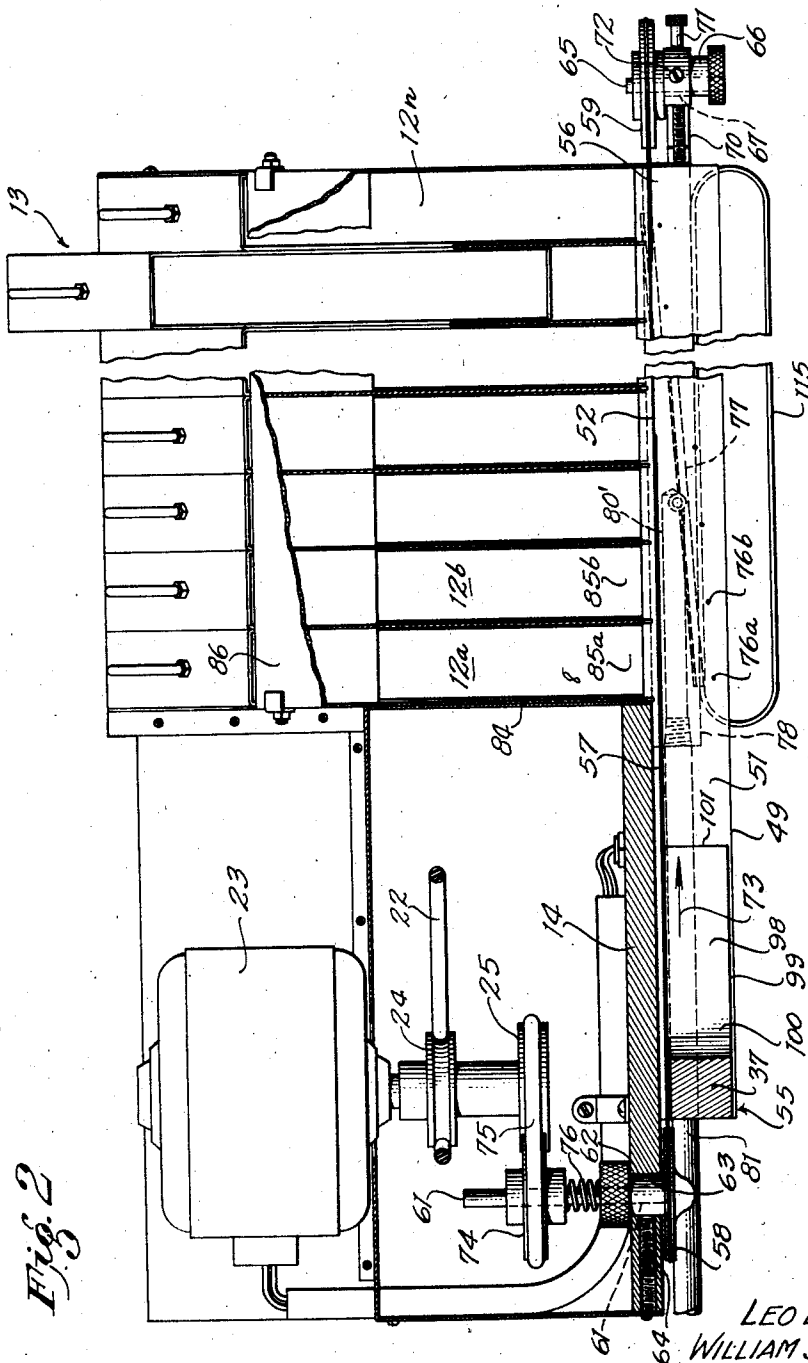
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4 Sheets-Sheet 2



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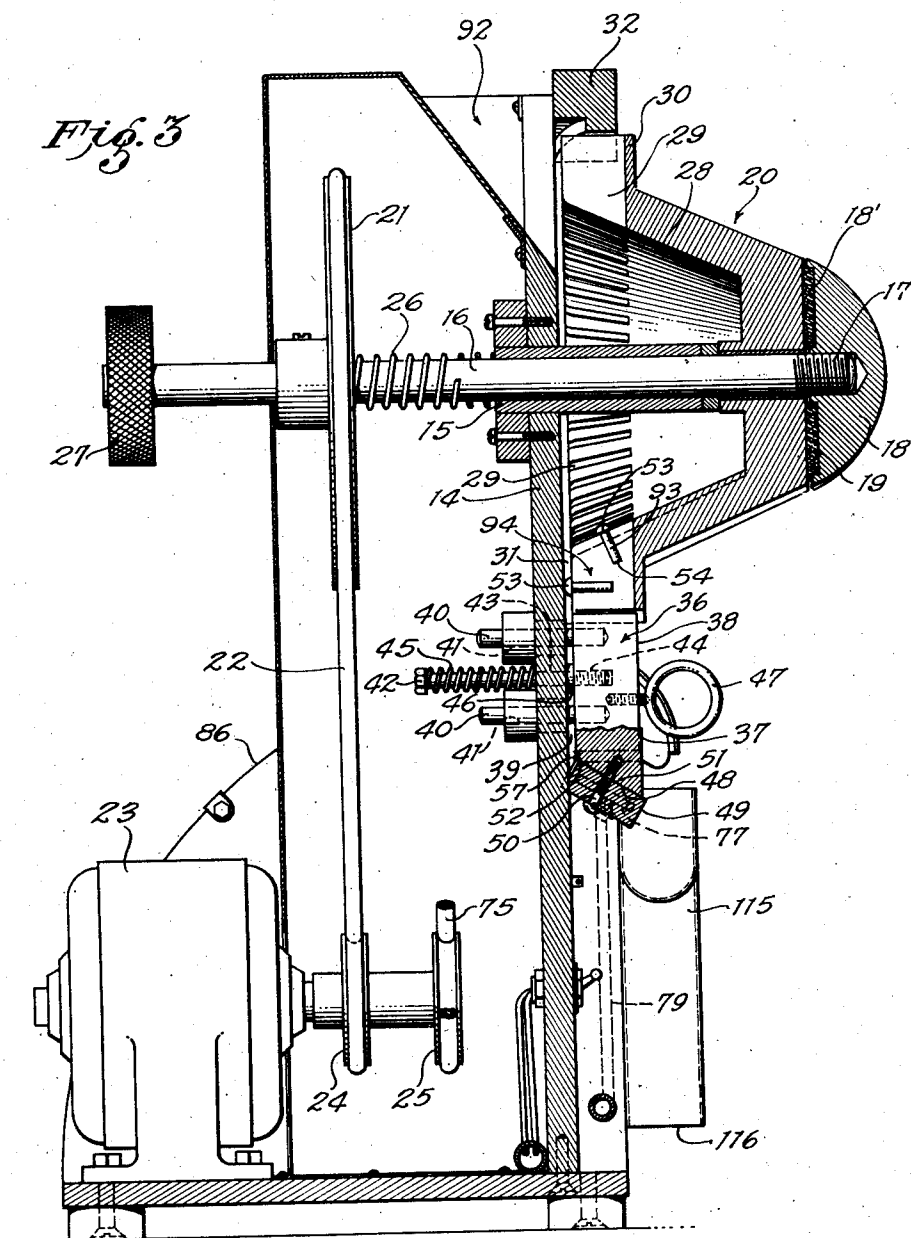
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4 Sheets-Sheet 3



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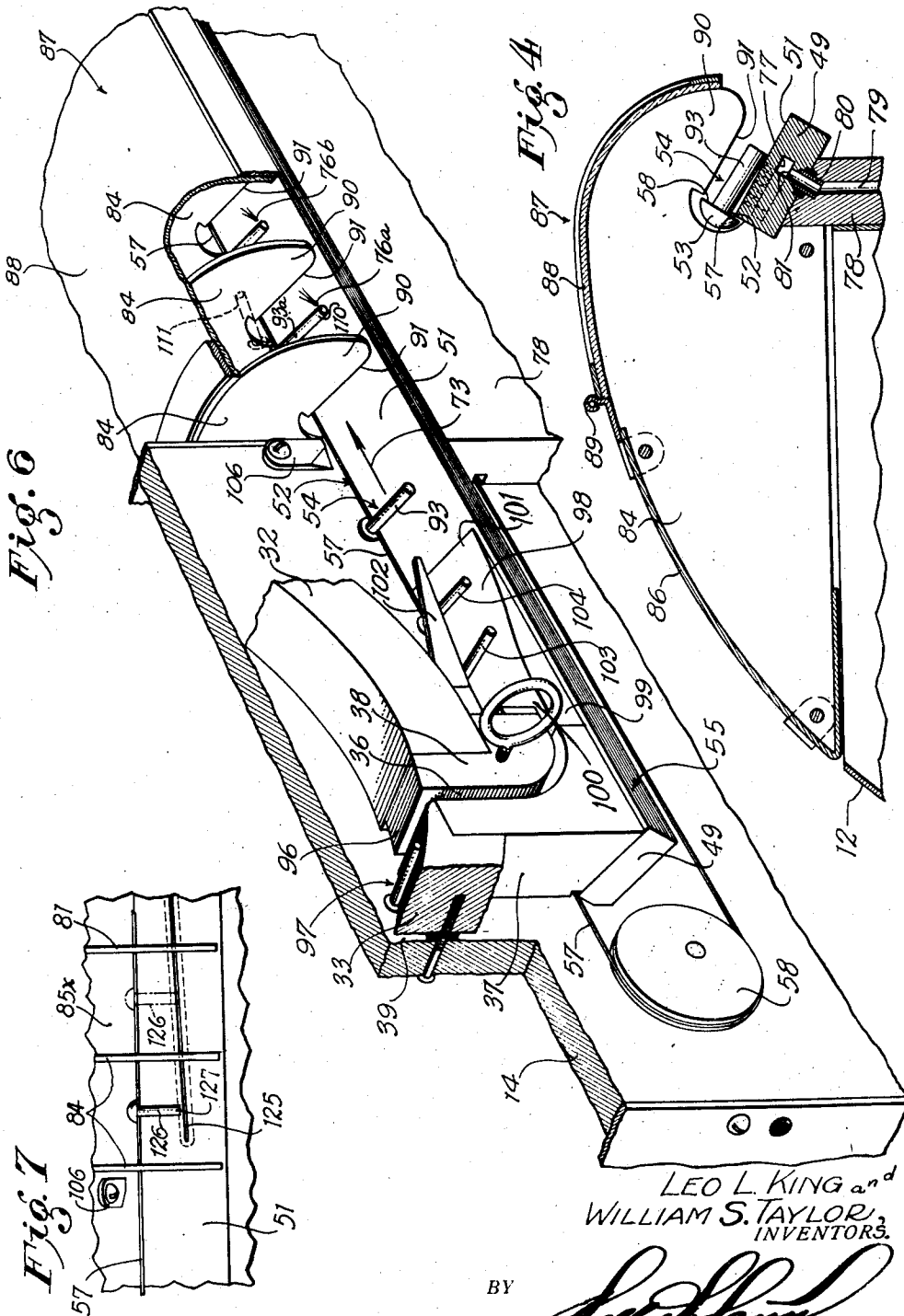
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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

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DEVICE FOR SORTING RIVETS

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7 Claims. (Cl. 209—90)

Our invention relates to means for sorting or segregating articles of like characteristics, with respect to size, and relates in particular to a apparatus for sorting shouldered articles such as rivets.

The invention has among its several objects to provide apparatus for sorting articles of the general character described wherein a high degree of accuracy in the sorting operation is maintained; wherein the sorting operation is accomplished by pressure of a fluid; wherein the articles to be sorted are carried along a conveyor and means are provided in different positions along the travel of the conveyor whereby impact will be imparted to articles of different sizes, such impact being of a magnitude to dislodge the articles from the conveyor into suitable receivers or containers; wherein the articles to be sorted are carried into consecutive positions in which a prescribed part of each article will coincide with a fixed point in each position into which it may be brought, and wherein impacting forces are produced in each of the positions in spaced relation to the fixed point to dislodge from the positions and into suitable receivers the articles which are engaged by the impacting forces; wherein the dislodgment of the articles from the conveyor means is accomplished by blasts of fluid which issue from suitably placed jets; wherein the articles to be sorted are conveyed in a substantially reclining position and are dislodged upwardly and laterally into the receivers; wherein shouldered articles, such as rivets, are carried along by a slender conveyor of thread-like character, such as a braided or twisted cable or cord, which engages the shoulders of the articles and moves the articles in such a manner that the shoulders follow a prescribed line in their movement through consecutive positions; and wherein the articles are carried along a wall in such a manner that the shoulders thereof will follow a prescribed line of movement, and wherein the wall has jets spaced along and at decreasing distances from the line of movement.

It is a further object to provide a rivet sorter having a single jet forming nozzle in form of a slot disposed at an angle to the line of travel of the rivets which are to be sorted.

Further objects and advantages of the invention will be brought out in the following part of the specification.

Referring to the drawings which are for illustrative purposes only:

Fig. 1 is a front elevation showing a preferred embodiment of our invention.

Fig. 2 is an enlarged fragmentary elevational view in which certain parts are cross-sectioned on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged cross-section taken as indicated by the line 3—3 of Fig. 1.

Fig. 4 is an enlarged fragmentary cross-section taken on a plane represented by the line 4—4 of Fig. 1.

Fig. 5 is an enlarged fragmentary cross-section taken on a plane indicated by the line 5—5 of Fig. 1.

Fig. 6 is an enlarged fragmentary perspective view of a front portion of the device to illustrate the manner in which the rivets are fed to the conveyor, carried therealong, and finally sorted.

Fig. 7 is a fragmentary diagrammatic view showing a single jet in the practice of the invention.

The embodiment of the invention shown in the drawings includes a feeder 10 and a sorter 11 which receives rivets from the feeder and discharges them into receptacles 12 respectively identified as 12a, 12b, etc., each of which preferably comprises a removable tray or drawer which may be removed rearwardly from the device, as indicated at 13 of Fig. 2, to be emptied. The feeder 10 is carried at the front end of the device by a vertical wall or plate 14, having, as shown in Fig. 3, a tubular bearing 15 which projects forward from the upper portion of the plate 14 and supports a shaft 16 which is threaded at its outer end 17 to receive a drive head 18, the inner face of which head 18 carries a friction drive ring 18' of leather or other fibrous material having suitable frictional characteristics, to engage the front face 19 of a revoluble hopper 20 which is supported on that portion of the shaft 16 between the sleeve bearing 15 and the head 18. In spaced relation to the wall 14 a sheave 21 is fixed on the shaft 16 and the same is driven through a belt 22 from a motor 23 equipped with sheaves 24 and 25. A compression spring 26 is placed on the shaft 16 in a position between the sheave 21 and the sleeve bearing 15, and the force of this spring 26 holds the friction ring 18' in engagement with the face 19 of the hopper 20 to transmit rotation thereto. The spring 26 permits forward movement of the shaft 16 in response to pressure applied to the head 27 mounted at the rear end of the shaft 16, whereby the hopper 20 may be moved forward and away from the plate 14 so that rivets con-

tained within the hopper 20 may be emptied therefrom.

The hopper 20 has a conoidal inner face 28 leading to a complement of radial slots 29 in the lip 30 of the hopper 20 which is spaced from the front face of the plate 14, the space 31 thus formed between the plate 14 and the hopper 20 having a width corresponding to the height of the heads of the rivets being sorted. Arcuate members 32 and 33 are secured to the plate 14 in positions adjacent the periphery of the lip 30 of the hopper 20 as shown in Fig. 1, the arcuate member 33 having an inner face 34 spaced from the lip 30 so as to provide a space 35 to permit passage of the shanks of the rivets, the lower end of which communicates with the vertical upper end of a track or channel 36 formed between blocks 37 and 38 mounted on the plate 14 below the hopper 20 and rearwardly or leftwardly offset from a vertical plane through the axis of rotation of the hopper 20.

The blocks 37 and 38 are adjustably secured in spaced relation to the face of the plate 14 so that a space 39 corresponding in width to the space 31 will be provided between the backs of the blocks 37 and 38 and the face of the plate 14 to accommodate the heads of rivets, the shanks of which pass down through the track 36. The block 38 is movably supported so that it may be pulled out from the position in which it is shown in Fig. 3, so that any rivets which have become lodged in the track 36 may be readily removed therefrom. A pair of rods 40 project from the back of the block 38 and are slidable in openings 41 in the plate 14. A screw 42 passes through an opening 43 in the plate 14 and has threaded engagement 44 with the block 38 so that the force of a compression spring 45 exerted against the head of the screw 42 will be transmitted to the block 38 to pull the same into its operative position relative to the plate 14, as determined by a spacing washer 46. An eye 47 is secured to the front of the block 38 to provide an engageable means whereby the block 38 may be pulled forward from the operative position thereof.

As shown in Fig. 3, the block 37 has a sloping lower face 48 to engage the front end of the upper face of a wall member 49, which, in the preferred practice of the invention, comprises a rectangular bar extending in a general horizontal direction; that is to say, although it is preferably horizontal in its lengthwise extension, the bar need not be truly horizontal but may have some longitudinal slope for the reason that conveyor means are provided to control the movement of the rivets therealong, as will be hereinafter described. The block 37 may be secured to the member 49 by screw means 50.

The member 49 is disposed in such position that its upper face 51 slopes away from a corner or edge 52 which is spaced a distance from the face of the plate 14 to provide a clearance for the heads 53 of rivets 54 when such heads 53 are in overhanging relation to the edge 52 as shown in Figs. 1 and 4. To carry the rivets along the member 49 from the front end 55 to the rear end 56 thereof, we provide a conveyor consisting of a slender cable 57, which is carried over sheaves 58 and 59 in such position that the upper run of the cable 57 will extend along the edge 52 of the member 49 to engage the shoulder or radial face 58 of the rivet head 53 and that part of the rivet shank which joins the head 53. The cable 57 may be of any suitable material,

but we have found a waxed silk thread to be preferable since its frictional characteristics are such that it will readily transport the rivets along the upper face 51 of the member 49.

Both sheaves 58 and 59 have adjustment relative to the member 49. The front sheave 58 is carried on a shaft 61 which extends through an eccentric bearing sleeve 62 carried in an opening 63 in the plate 14 and having a locking screw 64 to secure it in a desired position of adjustment. The sheave 59 is carried on a shaft 65 which turns in an eccentric bearing sleeve or bushing 66, mounted in an opening 67 at the upper end of an arm 68 which is supported by means of a pivot 69 carried by bracket 70, a screw 71 being provided to swing the arm 68 away from the end of the member 49 so that movement of the sheave 59 may place tension in the cable 57. The eccentric sleeve 66 is secured in a selected position of adjustment by a set screw 72. To motivate the upper run of the cable 57 in the forward direction indicated by the arrow 73 of Fig. 2, the sheave 58 is driven in clockwise direction by a belt connection with the sheave 25 of the motor 23, there being a sheave 74 fixed on the shaft 61 and being connected to the sheave 25 by a belt 75. A spring 76 disposed between the sheave 74 and the bearing sleeve 62 holds the sheave 58 against the front end of the bearing 62.

Spaced along the upper face 51 of the wall member 49, in positions cooperating with the trays 12a, 12b, etc., for the sorted rivets, are jet openings 76, individually identified at 76a, 76b, etc.; these jet openings 76 are consecutively spaced at progressively decreased distances from the edge 52 and the cable 57 extending parallel thereto, so that these jet openings 76 lie along a line which converges toward the upper run of the cable or conveyor 57. The inner ends of the jet openings 76 communicate with a passage 77 in the wall member 49 for delivering to the jet openings a fluid, such as air, under suitable pressure. The member 49 is secured to the upper edge of a vertical plate 78 which extends to the right of the plate 14, such plate 78 having a vertical fluid passage 79 which connects through a sealing nipple 80 with an opening 81 which leads to the passage 77. The lower end of the passage 79 connects through a drilled opening 79a in the plate 78 with an air delivery pipe 81a which may be connected through a valve 82 with an air hose 83 or other source of fluid pressure.

In spaced consecutive order, corresponding to the longitudinal spacing of the jet openings 76, and of the receivers or trays 12, vertical walls 84 are disposed normal to the far side of the wall member 49 and above the opening of the trays 12, so as to define spaces 85a, 85b, etc., through which rivets being sorted may be moved from the conveyor 57 and the supporting wall 49 to the trays 12. As shown in Figs. 1, 2, and 4, the rearward portions of these walls 84 are covered by a metal plate 86, and as shown in Figs. 1 and 4, a front cover member 87 is provided which is comprised essentially of a sheet of transparent material 88 such as Plexiglas, the rear edge of the cover 87 being connected by means of a hinge 89 to the forward edge of the plate 86. As best shown in Fig. 4, the front portions 90 of the partition walls 84 project over the upper face 51 of the wall 49 and are relieved or cut away as shown at 91 to provide passage for the heads 54 and the shanks of the rivets 54.

The operation of the device is as follows: The rivets, which have been previously sorted as to diameter, are fed into the hopper 20 through an entrance opening 92, and are tumbled within the hopper 20 so that the shanks 93 of the rivets will eventually find their way into the slots 29 of the hopper, as shown in Fig. 3. These rivets will then pass down through the slots 29 as indicated at 94, the heads of such rivets at this time passing down through the space 31. As the hopper 20 rotates in a clockwise direction, as indicated in Fig. 1, some of the rivets which pass down through the slots 29 will reach a position wherein the shanks thereof will ride along the inner face of the arcuate member 32 until the shoulder 96 at the upper end of the block 38 is passed, at which time the shanks of the rivets may pass down through the channel 36, or may be carried over into the space 35 between the periphery of the hopper 20 and the inner face 34 of the arcuate member 33, as indicated at 97 in Fig. 1, from which space 35 the rivets can pass back to the channel 36.

As the rivets reach the lower end of the channel 36, they will be engaged by the conveyor 57 and will be carried to the right across the upper face 98 of a block 99 which is secured on the upper face 51 of the member 49 adjacent the lower end of the block 37, as shown in Figs. 1 and 6. The left portion 100 of the face 98 is substantially horizontal, but the face 98 is provided with a clockwise twist so that the right end 101 thereof merges with the sloping upper face 51 of the member 49. A hold-down or guard finger 102 is secured to the block 38 in a position to project out over the shanks of the rivets as they are carried across the face 98, as shown at 103 and 104 in Fig. 6. Each rivet which engages the cable 57 is carried along toward the first of the jet openings, but before it enters the first space 85a it passes a guide 106 having a sloping face 107 which assures that the shoulder of each rivet head will be brought into engagement with the conveyor 57. Accordingly, the heads of the rivets will be caused to follow the line defined by the conveyor 57 as they travel through the path of movement along which the jet openings 76 are spaced. If the shank of a rivet is of such length, as shown at 93a in Fig. 6, that the plain end 110 thereof passes over the first jet opening 76a, the blast of fluid issuing from such jet opening will impact the shank adjacent the plain end 110 of the rivet and will impel the rivet upwardly and rearwardly, as indicated by dotted line 111, through the first space 85a into the first receiver or tray 12a. If the shank of the rivet thus carried along by the conveyor 57 is shorter than the dimension defined by the distance between the opening 76a and the conveyor 57, such rivet will be carried along through the consecutive spaces 85a, 85b, etc., until it reaches a position wherein the blast from another jet 76 will impact its shank and cause it to be dislodged from the upper surface 51 of the member 49 and the conveyor 57 into a tray 12. Owing to the converging relation of the conveyor 57 and the line of jet openings 76, the longest rivet for which provision is made will be moved into the first tray 12a and the shortest rivet will be dislodged into the last tray 12n. Any rivet which may not be toppled by the action of a fluid jet into a tray 12, but which instead may fall from the front edge of the wall 49, will be caught in a dump chute 115 having a lower opening 116 below which a box may be placed 75

to collect these rivets which from time to time may be fed back into the hopper 20.

The angle of slope α of the face 51 may be varied, but we find that for ordinary purposes this angle may be about 30°. The air pressure employed may be varied for different diameters and weights of rivets; for relatively small rivets, however, an air pressure varying between 40 and 60 pounds per square inch is found suitable.

The multiplicity of jet openings 76 may be interconnected so as to form a single jet in the form of a slot 125, Fig. 7, cut in the wall 51 so as to converge relative to the conveyor 57. When the conveyor 57 carries a rivet, such as the rivet 126 along the wall 51, the end 127 of the rivet will be brought over the slot 125 at some point in its travel along the wall 51, and the jet of air issuing from the slot 125 will throw the rivet 126 over into a compartment 85x.

We claim as our invention:

1. In a device for sorting rivets, the combination of: means operative to move the rivets along a defined path of movement so that the heads thereof will follow a prescribed line and so that the shanks of said rivets will extend at an angle to said line; and a jet disposed along said path of movement and at a prescribed distance from said path of movement to deliver a blast of air against the end of the shank of those of said rivets having a shank length at least as great as said prescribed distance to displace them from said path of movement.

2. In a device for sorting articles of the character described having shoulders, wherein a jet means has the dual function of gauging and motivating an article, the combination of: a conveyor for moving said articles along a path of movement with the shoulder engaging a linear portion of said conveyor and lying in a transverse relation to said linear portion; and jet means spaced along said path of movement and in consecutive order being spaced at decreasing distances from said linear portion, said jet means being positioned and operative to issue fluid blasts to displace from said path of movement those of said articles which are engaged by said blasts.

3. In a device for sorting rivets, the combination of: a supporting wall having an edge which extends in a general horizontal direction and the upper face of which wall slopes down away from said edge; means for feeding rivets to one end of said wall; means operative to carry said rivets toward the other end of said wall with the shoulders thereof overhanging said edge and with the shanks thereof lying on said upper face, there being jet means spaced along said wall and converging toward said edge, said jet means being adapted to deliver fluid blasts to engage the end portions of said rivets and dislodge the same from said wall, in accordance with the length thereof; and means to receive the rivets of different lengths which have been so dislodged from said wall.

4. In a device for sorting rivets, the combination of: a supporting wall having an edge which extends in a general horizontal direction and the upper face of which wall slopes down away from said edge; means for feeding rivets to one end of said wall; a relatively slender conveyor operative to carry said rivets toward the other end of said wall with the shoulders thereof overhanging said edge and with the shanks thereof lying on said upper face, there being jet means spaced along said wall and converging toward

said edge, said jet means being adapted to deliver fluid blasts to engage the end portions of said rivets and dislodge the same from said wall, in accordance with the length thereof; and means to receive the rivets of different lengths which have been so dislodged from said wall.

5 5. In a device for sorting rivets, the combination of: a relatively slender conveyor to engage the shoulders of said rivets and to carry said rivets along a path of movement; a wall along said conveyor to support the shanks of said rivets, there being jet means spaced along said wall in converging relation to said conveyor, said jet means being adapted to deliver fluid blasts to engage the end portions of said rivets and dislodge the same from said wall, in accordance with the length thereof; and means to receive the rivets of different lengths which have been so dislodged from said wall.

6. In a device for sorting rivets, the combination of: a relatively slender conveyor extending in a general horizontal direction and being operative to engage the shoulders of said rivets and carry the same along a path of movement agreeing in direction with the conveyor; a feeder operative to feed the rivets to the conveyor at the front end of said path of movement; a wall extending along said conveyor and having a top face sloping downward from said conveyor, to support the shanks of said rivets, said wall having jet openings spaced along said path of movement, said jet openings being disposed along a

line converging toward the rear end of said conveyor; means to deliver fluid to said jet openings so as to cause blasts of fluid to issue from said openings to dislodge rivets from said wall and said conveyor; and receptacles placed along said conveyor in positions corresponding to the positions of said jet openings to receive the rivets which have been dislodged by said blasts.

7. In a device for sorting rivets, the combination of: a supporting wall having an edge which extends in a general horizontal direction and the upper face of which wall slopes down away from said edge; means for feeding rivets to one end of said wall; a thread-like member extending along said edge in a position to carry said rivets toward the other end of said wall with the shoulders thereof over-hanging said edge and with the shanks thereof lying on said upper face, there being jet means spaced along said wall and converging toward said edge, said jet means being adapted to deliver fluid blasts to engage the end portions of said rivets and dislodge the same from said wall, in accordance with the length thereof; wheels at the ends of said supporting wall to movably support said thread-like member; adjustment means operative to vary the tension in said thread-like member; means for driving at least one of said wheels; and means to receive the rivets of different lengths which have been so dislodged from said wall.

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