April 18, 1933. S. W. MATHIAS 1,904,493

TRANSFER MECHANISM

Original Filed Nov. 28, 1927 5 Sheets-Sheet 1

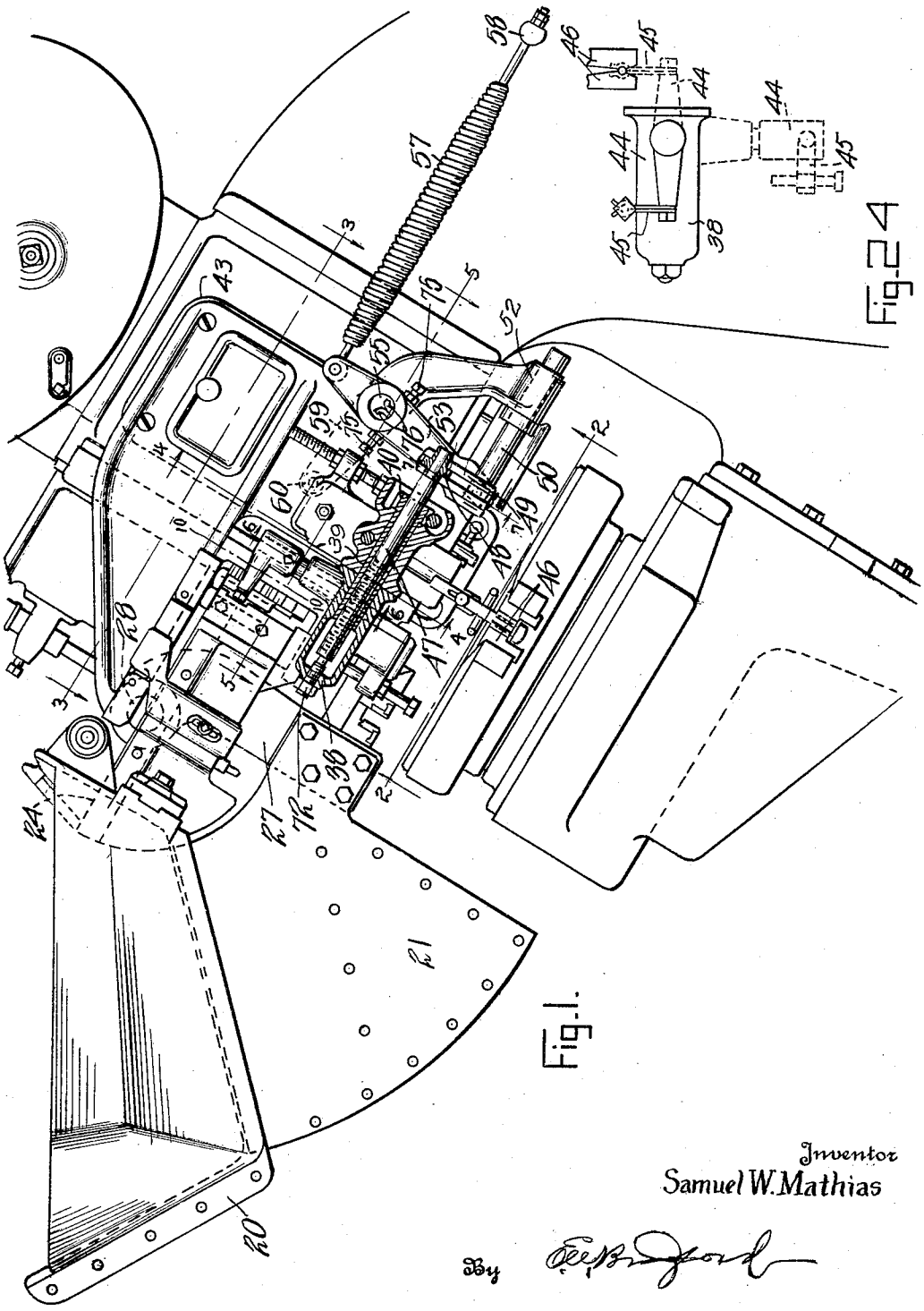


Fig. 1.

Fig. 2.

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April 18, 1933. S. W. MATHIAS 1,904,493

TRANSFER MECHANISM

Original Filed Nov. 28, 1927 5 Sheets-Sheet 2

Fig. 2.

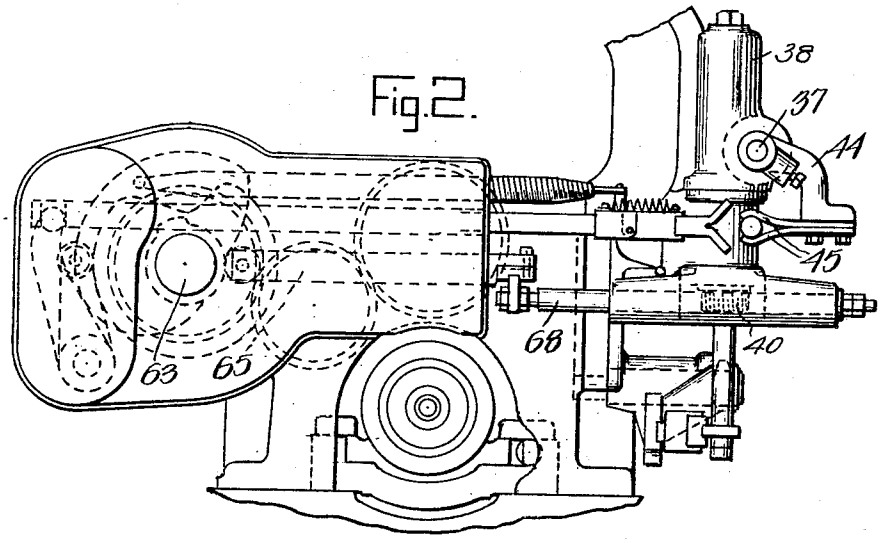


Fig. 3.

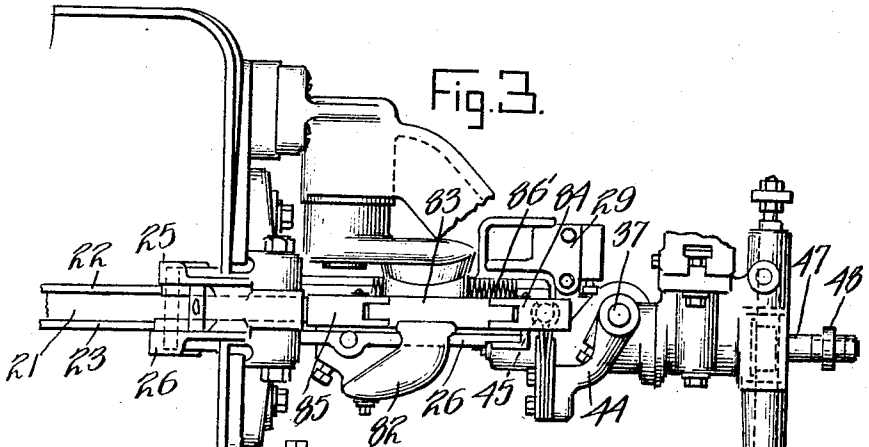
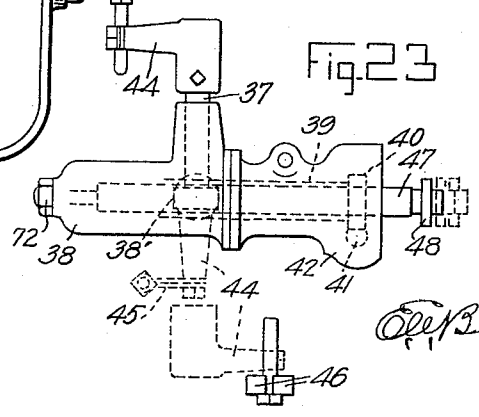


Fig. 23



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April 18, 1933. S. W. MATHIAS 1,904,493

TRANSFER MECHANISM

Original Filed Nov. 28, 1927 5 Sheets-Sheet 3

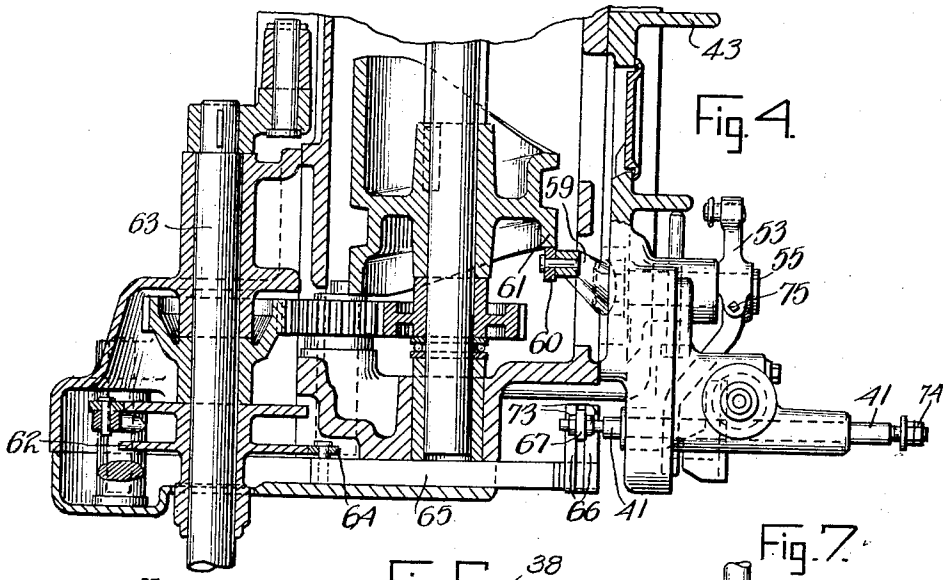


Fig. 4.

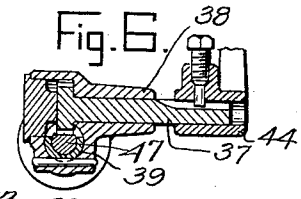


Fig. 6.

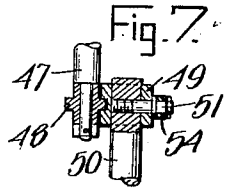


Fig. 7.

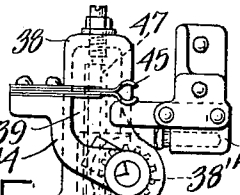


Fig. 5.

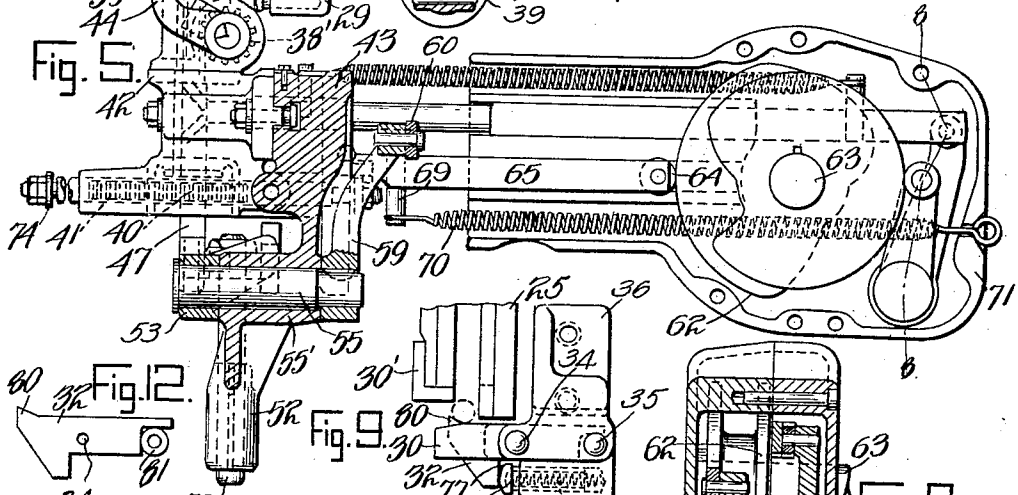


Fig. 12.

Fig. 9.

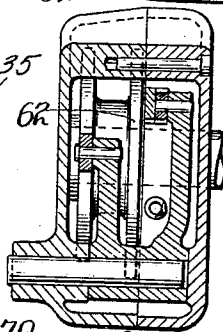


Fig. 8.

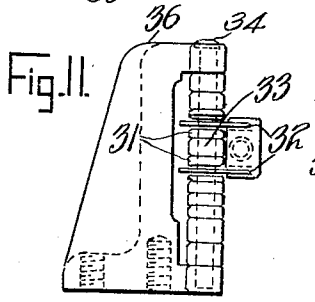


Fig. 11.

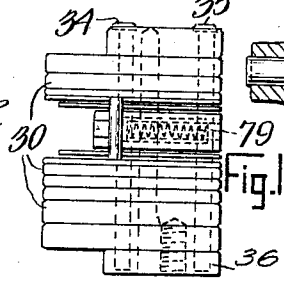


Fig. 10.

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April 18, 1933. S. W. MATHIAS 1,904,493

TRANSFER MECHANISM

Original Filed Nov. 28, 1927 5 Sheets-Sheet 4

Fig. 17.

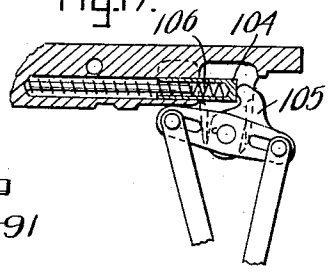


Fig. 19.

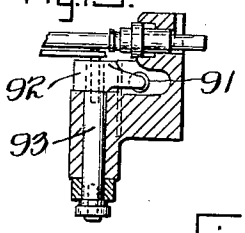


Fig. 18.

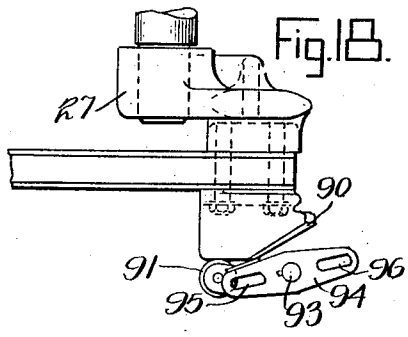
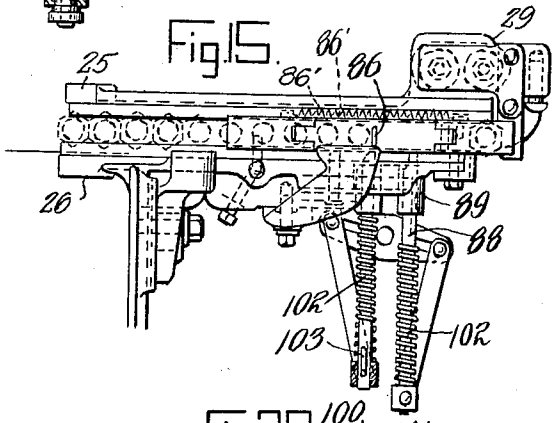


Fig. 15.



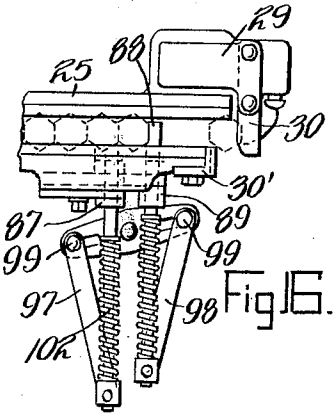


Fig. 16.

Fig. 20.



Fig. 13.

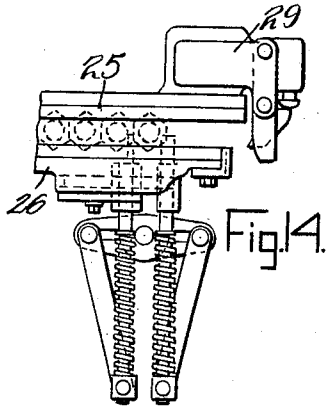


Fig. 14.

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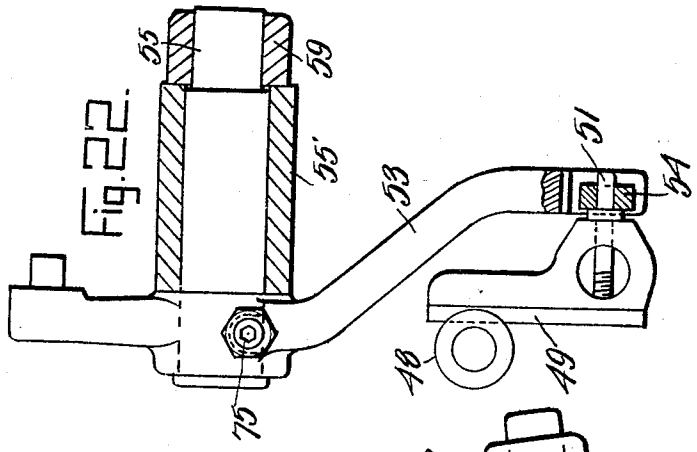
Attorney

April 18, 1933. S. W. MATHIAS 1,904,493

TRANSFER MECHANISM

Original Filed Nov. 28, 1927 5 Sheets-Sheet 5

Fig. 22.



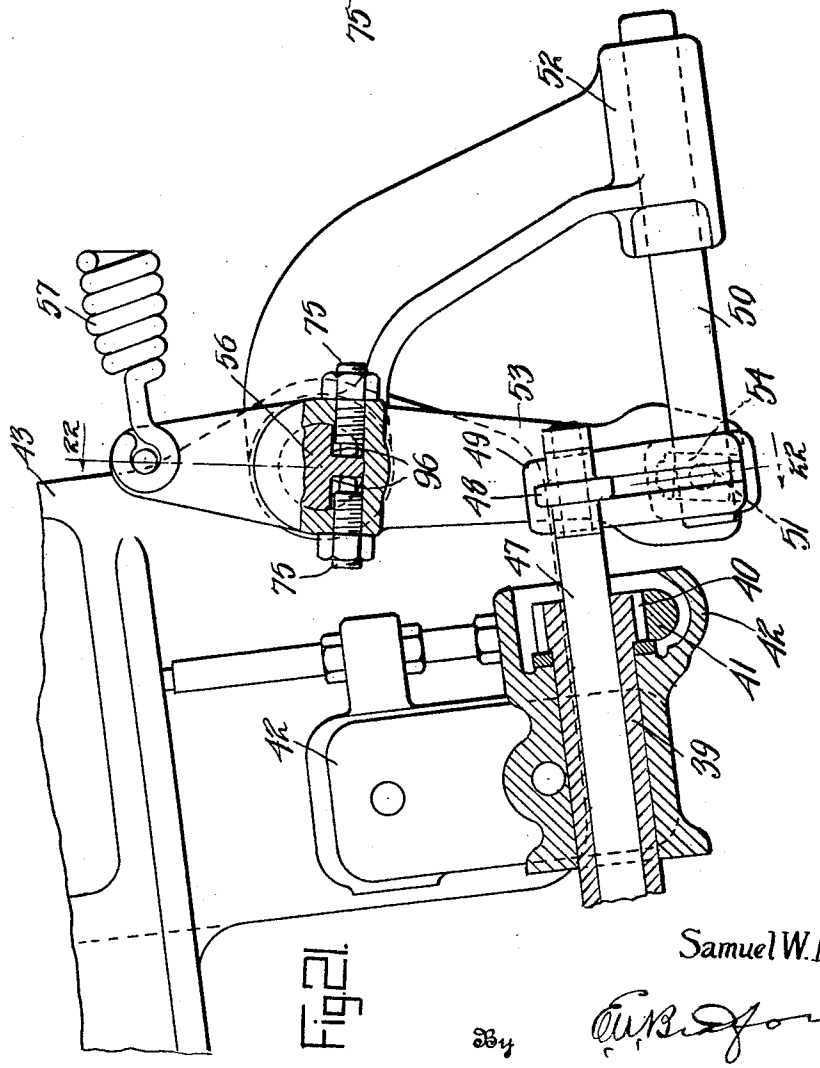


Fig. 21.

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UNITED STATES PATENT OFFICE

SAMUEL W. MATHIAS, OF WAYNESBORO, PENNSYLVANIA, ASSIGNOR TO LANDIS MACHINE COMPANY, OF WAYNESBORO, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

TRANSFER MECHANISM

Original application filed November 28, 1927, Serial No. 236,258. Divided and this application filed July 13, 1929. Serial No. 378,055.

This application is a division of my copending application Serial No. 236,258, filed November 28, 1927, for forming and threading machines, and is for the transfer mechanism shown and described in that application. The invention in this case is concerned primarily with transfer mechanism, that is mechanism for transferring work from a supply hopper or container to a position in which it will be operated on.

An object of the invention is to provide a mechanism of the kind described which will have a wider range of adaptability and a greater degree of accuracy in positioning the work than mechanism of this character heretofore known.

Referring to the accompanying drawings, which are made a part hereof, and on which similar reference characters indicate similar parts,

Figure 1 is a partial right hand side view, showing the transfer mechanism in connection with a supply hopper from which the work is picked up, and a chuck to which it is delivered,

Figure 2 is a section on line 2—2 of Fig. 1, looking in the direction of the arrows,

Figure 3 is a section on line 3—3 of Fig. 1,

Figure 4 is a section substantially on line 4—4 of Fig. 1, with some of the parts removed to show the other parts more clearly,

Figure 5 is a section on line 5—5 of Fig. 1,

Figure 6 is a partial section on line 6—6 of Fig. 1,

Figure 7 is an enlarged partial section on line 7—7 of Fig. 1,

Figure 8 is a section on line 8—8 of Fig. 5,

Figure 9 is a plan view of the work stop unit,

Figure 10 is a view of the stop unit as seen from line 10—10 of Fig. 1,

Figure 11 is a view of Fig. 10 as seen from the left,

Figure 12 is a detail of the bolt retainer latch,

Figure 13 is a partial side view of the supply hopper and the chute, showing work escapement means applied thereto,

Figure 14 is a partial plan view of Fig. 13, showing the escapement mechanism in neutral position,

Figure 15 is a plan view of Fig. 13, showing the escapement mechanism with the stop plunger in position to stop and hold the work,

Figure 16 is a plan view of Fig. 13 showing the escapement in still another position, in which the release plunger is pressed in to hold the work,

Figure 17 is a section on line 17—17 of Fig. 13,

Figure 18 is a partial plan view of Fig. 13 showing the relation of the leaf, the arm and the escapement,

Figure 19 is a sectional end view on line 19—19 of Fig. 13, and

Figure 20 is a detail end view of an escapement plunger shown in Fig. 15,

Figure 21 is an enlarged detail in section showing the operating mechanism for the transfer arm, and

Figure 22 is a section on line 22—22 of Figure 21,

Figure 23, an enlarged view of the transfer arm showing various positions of its movement from work receiving to work positioning position, and

Figure 24, a plan view of the device as shown in Figure 23.

A work supply hopper or container 20 is mounted in any suitable way upon the frame structure of the machine with which the invention is to be applied, or upon any suitable support. A leaf 21 is positioned and operated by suitable mechanism to move vertically in the hopper 20. This leaf is made up of two blades 22 and 23, spaced apart by blocks a distance sufficient to allow the body of the work or bolt to hang between them having its head resting upon the upper edges of the blades. When the leaf is moved to its uppermost position its top edges are even and parallel with the top edge 24 of a chute. When moved to this position the bolts may slide by gravity out of the leaf into the chute. The chute itself is inclined at an angle of about sixty degrees from horizontal. The chute is like-

wise made up of two blades 25 and 26 which are suitably spaced apart and secured to the hopper 20. These blades may be adjusted one toward the other to accommodate bolts of any desired diameter. The leaf 21 is secured to an arm 27. This arm is keyed to a shaft 28 which shaft may be oscillated by any suitable mechanism, not shown in this application but fully described in the co-pending application of which this is a division. The shaft 28 may be any shaft operated by any suitable mechanism so as to raise and lower the leaf in order to lift the bolts out of the hopper so as to deliver them to the chute from which they may slide down to be picked up by devices which will be hereinafter described.

At the lower end of the chute side 25 is fastened a stop unit shown as a whole at 29, this unit being made up of a number of stop blocks 30 of different thicknesses. The unit consists also of two blocks 31, two bolt retainers 32 and a plunger block 33, (Figs. 9, 10, 11 and 12). The stop blocks 30, blocks 31, and plunger block 33 are mounted on two pins 34 and 35 which are carried by a bracket 36 which is bolted to the chute side 25. The bracket 36 is adjustable lengthwise and crosswise on the chute, so as to locate the work in correct relation to a transfer arm later to be described, and to position the retainers 32 to correspond to work of different diameters. The blocks 30 stop the bolts at the lower end of the chute in a position from which they may be picked up. The means for picking up these bolts and transferring them to chucks or other positions in which they may be operated upon by tools of any sort will now be described.

A shaft 37 is mounted in a head 38 which head is pinned to a sleeve 39. Sleeve 39 has a pinion 40 cut on its lower end. This pinion engages a rack 41. The sleeve 39 is supported in a bracket 42 and this bracket is adjustable on and clamped to a main transfer bracket 43. The shaft 37 carries an arm 44 mounted thereon. Fastened to the outer end of the arm 44 is a pair of fingers 45 which pick up the work. These fingers are composed of a pair of springs adjustably mounted on the arm so that they may be adapted to work of any diameter within the range of the machine. The springs are sufficiently rigid to firmly grip the work, but sufficiently elastic to slip over the body of the work when the arm is moved into position to pick up the work. In transferring bolts from the chute to the chuck 46 the arm 44 makes two movements, and during these movements describes arcs which consist substantially of one hundred and eighty degrees, the arcs being in planes at right angles to each other. The first one hundred and eighty degree movement of the arm 44 is secured by means of a rack 47. This rack is provided with the bushing 48 on which is a flange that engages a slot in the head 49 that is attached to a shaft 50 by means of a screw 51 (Fig. 7). The shaft 50 is free to slide in a bearing 52, this bearing being a part of the main transfer bracket 43. The screw 51 engages the lever 53 through the medium of a block 54. The lever 53 is secured to a shaft 55 by two screws 75. The main transfer bracket 43 has a bearing 55′ provided for the shaft 55. On the opposite end of the lever 53 is attached one end of a tension spring 57, the other end of which is attached to a pin 58 secured on the machine with which the device is used. On the end of the shaft 55 opposite from the lever 53 is keyed a lever 59 which carries a roller 60. In the machine above described the roller 60 is engaged by a cam 61 by means of which the lever is swung to rock the shaft 55. Any suitable means for rocking the shaft positively in one direction so that it may be reversely rotated by the spring 57 in the other direction may be provided in place of the cam mentioned above. In the machine above referred to, as the main cam 61 revolves it forces the lever 59 down to rock the shaft 55 which in turn moves the rack 47 to the right and rotates the pinion 38′ through an arc of one hundred and eighty degrees. The second one hundred and eighty degree rotation of the arm 44 is secured by rotation of the sleeve 39. This is done as follows: A cam 62 mounted on a shaft 63 engages a roller 64 carried by a sliding bar 65 to which bar is fastened a head 66. The head 66 is slotted to receive a block 67 fastened to the rack 41. A pin 69 is pressed into the sliding bar 65 to which pin is attached one end of a tension spring 70, the other end of the spring being attached to a cam bracket cover 71.

In operation the cam shaft 63 continues to rotate, and after the transfer arm 44 has made part of its first one hundred and eighty degree turn a lobe on the cam 62 starts to run away from the roller 64, permitting the tension spring 70 to pull the sliding bar 65 and the rack 41 toward the cam shaft 63 and turning the transfer arm 44 on its second one hundred and eighty degree turn, this latter movement positioning the bolt in the chuck turret where it will be held to be threaded. The contour of the cam 62 is such that the first one hundred and eighty degree turn of the transfer arm 44 is completed before the second one hundred and eighty degree turn is completed. It should be noted moreover that since the final movement of the bolt into the chuck is by means of a spring no injury can be caused to the transfer mechanism if for any reason the bolt cannot enter the chuck. After a bolt is gripped by the chuck, the cam 62 forces the

sliding bar 65 and the rack 41 away from the auxiliary cam shaft 63 which causes the pinion 40 to rotate to pull the transfer fingers 45 off the bolt which has now been gripped by the chucks in the chuck turret, and returning the transfer fingers to their starting point. After this movement is partly completed the lobe on the main cam 61 starts to run away from the roller 60 to permit the spring 57 to come into play to return the fingers 45 to their original position. At the beginning of the first one hundred and eighty degree movement the spring 57 exerts its pressure on the lever 53 and its associated elements. This movement is completed after the second one hundred and eighty degree movement is completed. On the return of the first one hundred and eighty degree movement the transfer fingers pick up the bolt from its position in front of the stop mechanism. Since the means for moving the gripping fingers in position to pick up the work is a resilient element 57, no damage will be done to the transfer mechanism or to the stop mechanism if for any reason an obstruction should be encountered by the transfer finger as it moves to picking up position. The means just described are all concerned with transferring work from the hopper to the chuck. Means are provided also to control the final position of the transfer finger at the end of each one hundred and eighty degree movement. This mechanism will now be described.

The distance that the transfer fingers 45 enter the chute is controlled by limiting the movement of the rack 47 at one end of the return movement of the rack. This is accomplished by providing means by which the end of the rack 47 comes into contact with an adjusting screw 72 in the end of the head 38. The transfer arm 44 with the fingers 45 is squared up with the face of the chute by moving the rack 41 independent of the throw of the cam lobe 62 by means of adjusting nut 73 on each side of the block 67, thereby controlling the position of the transfer fingers 45 at the end of the return movement as the arm moves through the second one hundred and eighty degree arc. The distance that the transfer fingers 45 move into the chucks is controlled by limiting the movement of the rack 41 at the end of the one hundred and eighty degree arc by means of an adjustable stop nut 74 on the rack 41 coming in contact with some suitable abutment on the machine. The transfer arm 44 along with the transfer fingers 45 is squared up with the chuck jaws 46 by moving the rack 47 independent of the throw of the cam lobe 61 by rotating the lever 53 on the shaft 55 by means of adjusting screw 75 in the lever 53. The shaft 55 is provided with pockets 76 to receive the ends of the screws.

The length of the finished work is controlled by the position of the bracket 42 with respect to the top of the chute (Figure 1). As heretofore described, the second one hundred and eighty degree turn of the transfer arm folds the bolt from the chute into the chucks so that the end of the bolt to be threaded points up toward the forming and threading head. The bolt makes a complete half circle, the pivot of which is in the bracket 42. Any adjustment of this bracket toward the chute shortens the arc and the bolt will therefore be located higher up in the chucks, or nearer the working tool. Lowering the bracket 42 lengthens the arc to provide for operating on a longer bolt. The arm 44 which carries the fingers 45 is adjustable on the shaft 37. This adjustment is provided so that the fingers 45 may be set to clear the grips 46 and does not affect the length of the bolt. The bolt retainers 32 pivot on a pin 34 and are provided with a lug 77 which engages a plunger 78 carried by the plunger block 33. The plunger 78 is drilled to receive a compression spring 79, the spring tending normally to keep the curved point 80 on the bolt retainers projecting out beyond the stop block 30 to prevent the work from falling out of the chute while the transfer fingers are delivering a bolt to the chuck. The action of the compression spring 79 on the bolt retainers 32 is limited by the rear end of the bolt retainer 32 coming into contact with the bushing 81 carried on a pin 35. The bolt retainers 32 are spaced apart by the plunger block 33 and two blocks 31 so that the transfer fingers 45 may enter between the bolt retainers and pick up a bolt. The action of the transfer fingers 45 in removing a bolt from the chute forces the bolt retainers 32 back out of the way against the tension of a spring 79 operating to return the bolt retainers to their normal position as the bolt leaves the chute. The bolt retainers 32 may be placed in the bracket 36 at any desired height by varying the position of the blocks 30 in relation to the bolt retainers 32. It should be noted that the blocks 30 are all of a different thickness. This permits the transfer finger to be set to pick the bolt up at any desired place. The width of the opening between bolt retainers 32 can be varied by removing one or both blocks 31 from between bolt retainers 32 and placing the blocks 31 between the stop blocks 30 or at the bottom of the bracket 36, permitting the stop unit to be set for very short work and for very narrow transfer fingers. A bolt retaining plate 30′ is adjustably attached to the end of the chute side 26 which together with the stop unit 29 which is adjustable on the chute, can be set to control the size of the opening at the end of the chute. The retaining plate 30′ is provided

with a notch opposite the bolt retainers 32 to permit the transfer fingers to enter the chute.

It is necessary that the work be allowed to drop into the stop mechanism so that only one piece will be picked up at a time. For accomplishing this purpose I provide what will be described throughout as escapement mechanism. This mechanism is as follows:

A bracket 82 carries a top runner 83, to which are hinged runners 84 and 85 which runners are normally held parallel with the top runner 83 by means of a tension spring 86', one end of which is attached to runner 84 and the other end to runner 85. The bracket 82 is adjustably attached to the chute side 26 and can be set to prevent the bolt heads crowding on top of each other. The escapement mechanism about to be described is provided on the hopper chute so as to permit only one piece of work at a time falling to the end of the chute. A stop plunger 86 is carried in a bracket 87, and a release plunger 88 is carried in a bracket 89. These brackets are adjustably attached to the right hand chute 26. Since they are adjustably mounted the plungers 86 and 88 may be set close together for work of a small diameter, or spaced apart to suit work of large diameter. Movement of plungers 86 and 88 in one direction is obtained by means of a cam 90 attached to the arm 27. Cam 90 engages a cam roller 91 which is carried by a lever 92 which lever is keyed to a shaft 93. The shaft 93 has a lever 94 keyed to its opposite end. The lever 94 has elongated slots 95 and 96 to provide for adjustment of two links 97 and 98 that are attached to the lever 94 by means of clamp screws 99. The other ends of the links 97 and 98 are attached to the plungers 86 and 88 respectively by means of pins 100 and a block 101. The ends of the plungers 86 and 88 are slotted at 103 to receive the pins 100, which pins are normally held at the rear end of the slots by the action of springs 102. The springs 102 provide a safety feature in the operation of the escapement unit in case some obstruction should be encountered by the ends of the plungers as they are pressed in between the bolts as the bolts slide down the chute. An arm 105 on the lever 94 engages a plunger 104 which plunger is free to slide in a bore in the right hand chute 26. The plunger 104 is backed up by a compression spring 106. As the leaf 21 and the leaf arm 27 swing down the cam 90 forces the lever 92 in a direction to compress the spring 106 and withdraws the stop plunger 86 and at the same time the release plunger 88 enters the chute. When the stop plunger 86 is withdrawn the work in the chute slides down against the release plunger 88 as shown in Fig. 16. As the leaf arm swings up the cam 90 starts to run away from the roller 91 and the lever 92. The compression spring 106 causes the roller 91 to follow up the cam 90 and withdraw the release plunger 88. At the same time the stop plunger 86 starts to enter the chute, its end going between two pieces of work, as shown in Fig. 14. The stop plunger 86 stops the work above it from sliding down when the release plunger 88 is fully withdrawn, allowing therefore only the one piece of work between the two plungers to slide to the end of the chute, as shown in Fig. 14. The stroke of these plungers is controlled by the position at which the links 97 and 98 are secured in the slots 95 and 96 in the lever 94.

It will be obvious to those skilled in the art that various changes may be made in my device without departing from the spirit of the invention, and I, therefore, do not limit myself to what is shown in the drawings and described in the specification, but only as set forth in the appended claims.

Having thus fully described my said invention, what I claim as new and desire to secure by Letters Patent, is:

1. Means for transferring work from a supply hopper to a chuck or holding device comprising a feeding chute to receive the work, a transfer member for picking up the work from the feeding chute, said transfer member including an arm having work engaging fingers thereon, a sleeve supporting said arm, a stationary support for said sleeve, means for rotating said arm on its axis and through substantially a half revolution, and separate means for rotating said sleeve on its axis through substantially a half revolution whereby the transfer member is moved in two circular paths of 180 degrees each, substantially as set forth.

2. In a machine for pointing and threading work, the combination of a chute to receive the work, and a transfer mechanism for moving the work, from the chute to work holding means, the said transfer mechanism comprising an arm having work engaging fingers thereon, a shaft supporting said arm, means for rotating said shaft on its axis through an arc of 180° and for swinging it in a plane through another arc of 180° the plane of one of these movements being parallel with the top of the chute and the plane of the other movement being at right angles to the top of the chute, substantially as set forth.

3. In a machine for pointing and threading work, the combination of a chute to receive the work and a transfer mechanism for moving the work from the chute to work holding means, the said transfer mechanism comprising means for moving the work through two arcs, the said mechanism operating in its movement to take the work

from the chute to reverse its position and to place it in work holding means, and means adjustable for lengthening and shortening the radius of one of the said arcs, substantially as set forth.

4. In a machine for pointing and threading work, the combination of a chute to receive the work and means for transferring the work from the chute to a work holder, comprising an arm rotatable through 180° and movable in a plane so that any point in the arm describes substantially another 180° arc in the plane, the said arm having mechanism adapted to pick the work up from the chute and to place it in the said work holder, and means for controlling the position of the transfer member at the end of each movement, substantially as set forth.

5. In a machine for pointing and threading work, the combination of a chute to receive the work and a transfer mechanism for receiving the work from the chute and delivering it to work holding means, the said transfer mechanism comprising means movable through two arcs of 180 degrees each, the said arcs lying in planes at right angles to each other, and means for moving said movable means comprising two racks placed at right angles to each other and connected to said movable member, the said racks being moved partly in sequence and partly in combination, substantially as set forth.

6. In a machine for forming and threading work, the combination of a supply hopper, a work chute, an escapement mechanism, a stop unit and a transfer arm, the said transfer arm being movable through two arcs of 180 degrees each, the said arcs lying in planes at right angles to each other, the movement of the transfer arm through the two arcs operating to invert the work and to place it in work holding means so that its axis will lie in the same plane in which it was positioned in the chute, substantially as set forth.

7. In a machine for forming and threading work in combination with a feeding chute, a bracket, a transfer arm pivotally mounted on the bracket, means for moving the transfer device through two 180° arcs at right angles to each other, work engaging fingers secured on the said transfer device, and means for adjusting the said bracket vertically with respect to the feeding chute to position the said fingers at a predetermined position when they have been moved to the extremities of the two arcs, substantially as set forth.

8. In a machine for forming and threading work, a bracket mounted upon said machine, said bracket having means for adjusting it vertically of the machine, a transfer arm on said bracket, work engaging fingers on said arm, means for swinging the arm in two paths in planes at right angles to each other and through arcs of 180°, said adjustable means controlling the vertical position of the fingers at the limit of the two arcs, substantially as set forth.

9. In a threading and forming machine a work transfer device comprising an arm having fingers thereon cooperating with escapement devices for receiving the work, means for rotating the arm through a half revolution, means operating simultaneously with the rotation of the arm for moving it to describe a plane, the movement comprising a substantial half revolution, the work moving from the escapement means to its final position through an irregular curve which is the equivalent of rotating the arm through 180° on its axis and rotating it to describe a plane through another 180° in a plane perpendicular to the first named plane, substantially as set forth.

10. In a machine for pointing and threading work, the combination of a hopper, of a chute to receive the work from the hopper, said chute comprising a pair of spaced bars and a stop for the work, a transfer mechanism for moving the work from the chute to work holding means, the said transfer mechanism comprising a member movable in two arcs of 180 degrees each, the plane of part of one of these movements being parallel with the top edges of said bars and the plane of part of the other movement being at right angles to the top edges of said bars, substantially as set forth.

11. In a machine for pointing and threading work, the combination of a hopper, of a chute to receive the work from the hopper, said chute comprising a pair of spaced bars and a stop for the work, a transfer mechanism for moving the work from the chute to work holding means, the said transfer mechanism comprising means for moving the work through two arcs, the plane of part of one of the movements being parallel to the top edges of said bars, the said transfer mechanism operating in its movement to take the work from the chute, reverse the work with respect to the chute and place it in the work holding means, substantially as set forth.

12. In a machine for pointing and threading work, the combination of a hopper, of a chute to receive the work from the hopper, the said chute comprising a pair of spaced bars and a stop for the work, a transfer mechanism for moving the work from the chute to work holding means, the said transfer mechanism comprising means for moving the work through two arcs and operating in its movement to take the work from the chute, reverse its position and place the work in the work holding means, adjustable means on said transfer mechanism for positioning said work in said work hold-

er comprising an adjustment for lengthening and shortening the radius of one of said arcs, substantially as set forth.

13. In a machine for pointing and threading work, the combination of a hopper, of a chute to receive the work from the hopper, the said chute comprising a pair of spaced bars and a stop for the work, a transfer mechanism for moving the work from the chute to work holding means, the said transfer mechanism comprising means for moving the work through two arcs and operating in its movement to take the work from the chute, reverse its position and place the work in the work holding means, and means for controlling the length of the work comprising adjustable means for lengthening and shortening the radius of one of said arcs, substantially as set forth.

14. In a machine for pointing and threading work, the combination of a hopper, of a chute to receive the work from the hopper, means for transferring the work from the chute to a work holder comprising a member movable in two arcs, the said member having mechanism adapted to pick the work from the chute and place it in the work holding means, and means for independently adjusting the position of the transfer member in two planes in relation to said chute and work holder, substantially as set forth.

15. In a machine for forming and threading work, the combination of a supply hopper, a work chute and escapement mechanism, a stop unit and a transfer mechanism for transferring the work from the chute to work holding means, the said transfer mechanism being movable through two arcs of 180 degrees each, said arcs lying in planes at right angles to each other, the movement of transfer mechanism being effected by two racks placed at right angles to each other, and operably connected to said transfer mechanism substantially as set forth.

16. In combination a work chute, work escapement mechanism, work gripping mechanism, a transfer arm having gripping fingers thereon, yielding means for moving the gripping fingers into work receiving and into work releasing positions, unyielding mechanism for moving the gripping fingers away from work receiving position and away from the work gripping mechanism, and means for adjusting the center of movement of the said arm to control the position of the work gripping mechanism with respect to the tools which operate on the work and thereby determine the length of the finished work, substantially as set forth.

17. In a machine for forming and threading work in combination a feeding chute, a transfer device, work escapement and work stop means, the said transfer device comprising two members, each of which moves in an arc at right angles to the other and each having means for adjusting the position of the members at the ends of the arcs for controlling the final position of the work, substantially as set forth.

18. In a machine for forming and threading work in combination a feeding chute, a transfer device, work escapement and work stop means, the said transfer device comprising two members, each of which moves in an arc at right angles to the other and each having means for adjusting the position of the members at the ends of the arcs for controlling the final position of the work, the transfer device and its mounting being adjustable vertically as a unit in order to control the final position of the work with respect to operating tools to control the length of the finished work, substantially as set forth.

In witness whereof, I have hereunto set my hand at Waynesboro, Pennsylvania, this 5th day of July, A. D. nineteen hundred and twenty-nine.

SAMUEL W. MATHIAS.