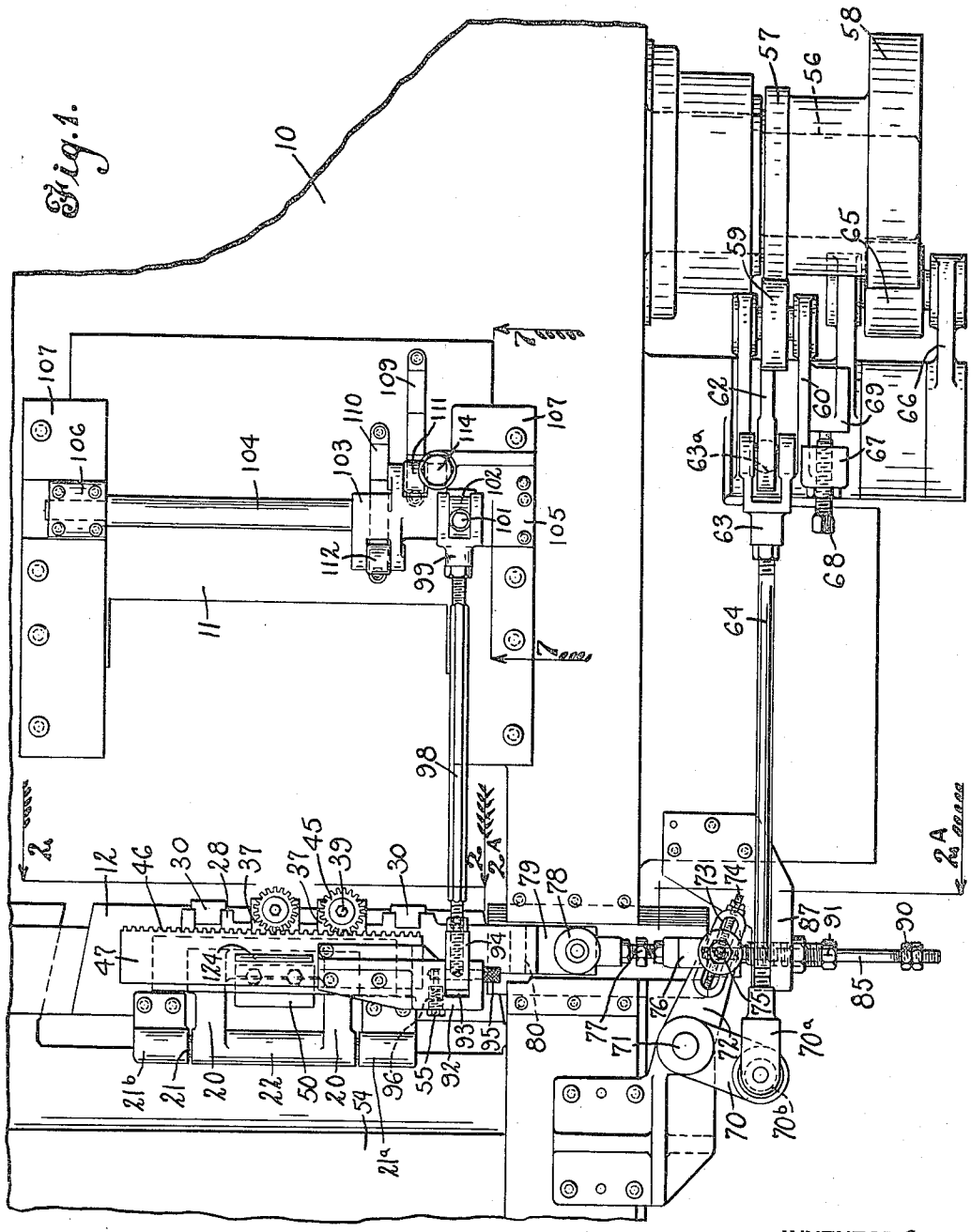
Dec. 27, 1955 J. M. SCHAEFFER ET AL 2,728,267

TRANSFER MECHANISM FOR HEADERS OR LIKE MACHINES

Filed May 21, 1952 8 Sheets-Sheet 1

Fig. 1.



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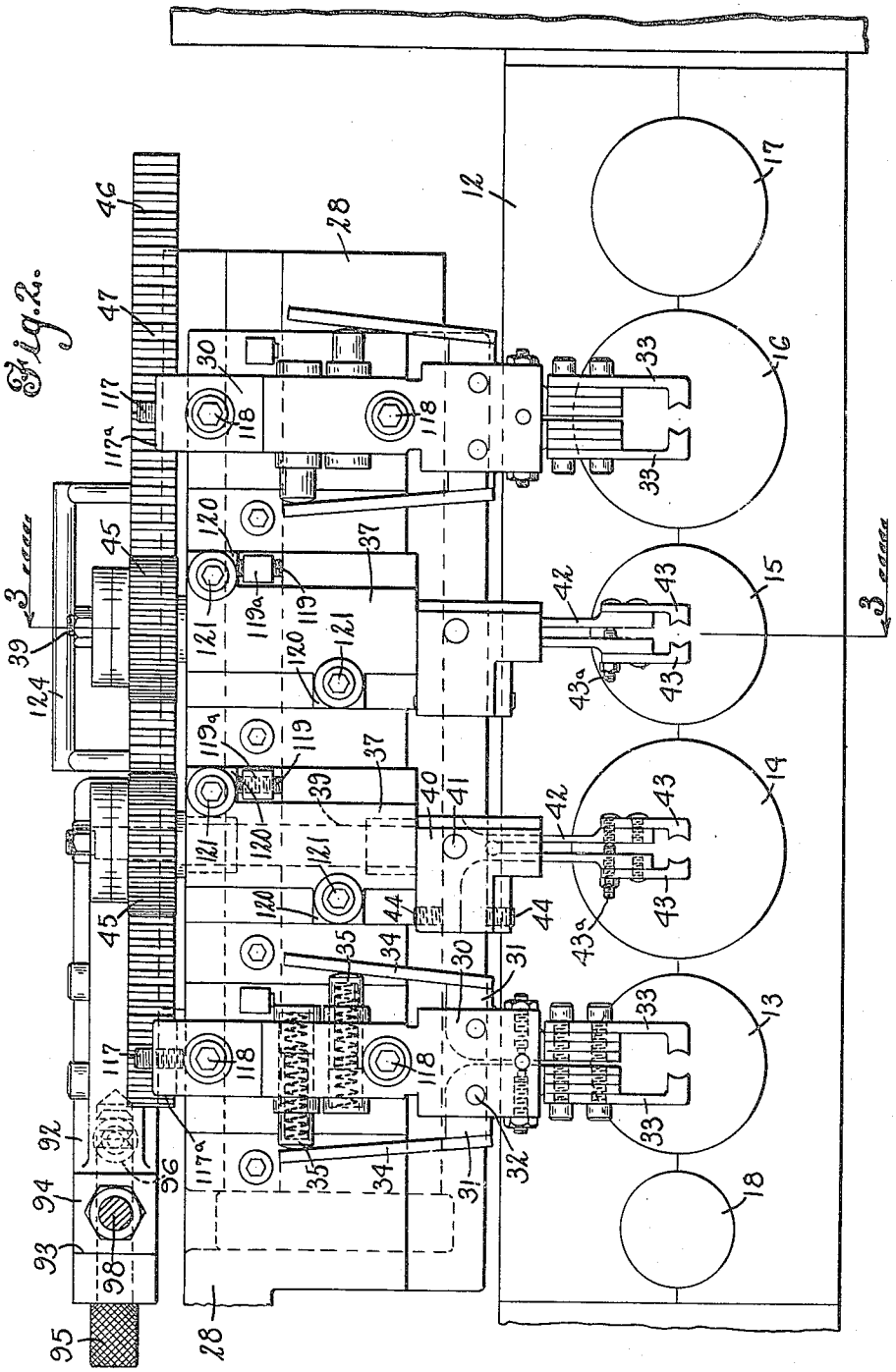
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TRANSFER MECHANISM FOR HEADERS OR LIKE MACHINES

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Fig. 2.



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TRANSFER MECHANISM FOR HEADERS OR LIKE MACHINES

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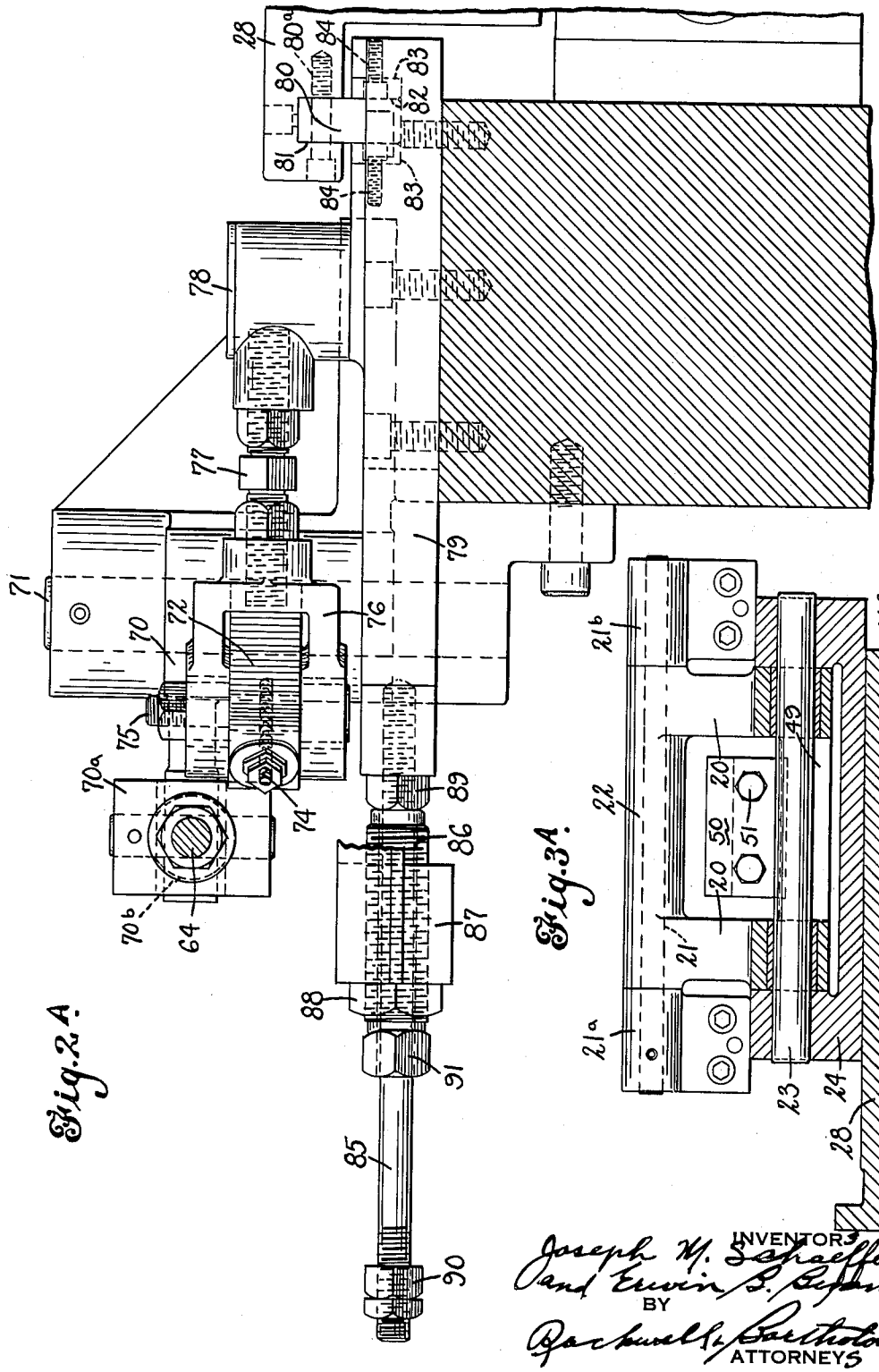


Fig. 2A.

Fig. 3A.

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TRANSFER MECHANISM FOR HEADERS OR LIKE MACHINES

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Fig. 4.

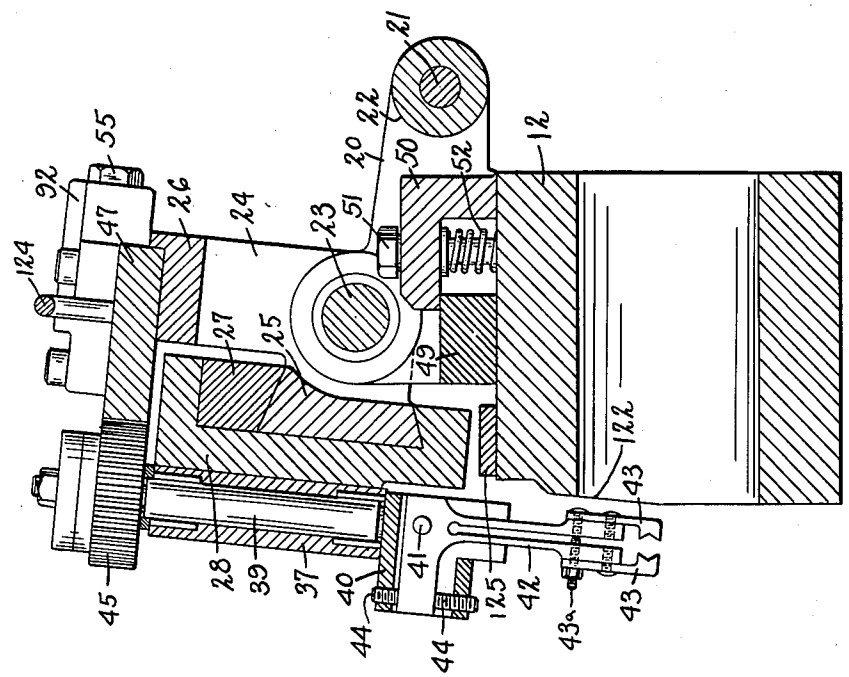
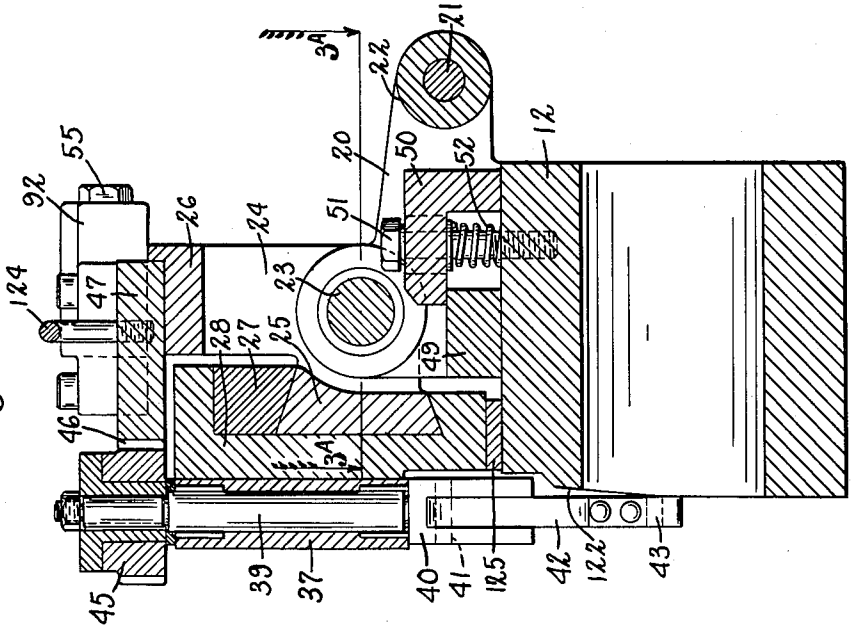


Fig. 3.



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TRANSFER MECHANISM FOR HEADERS OR LIKE MACHINES

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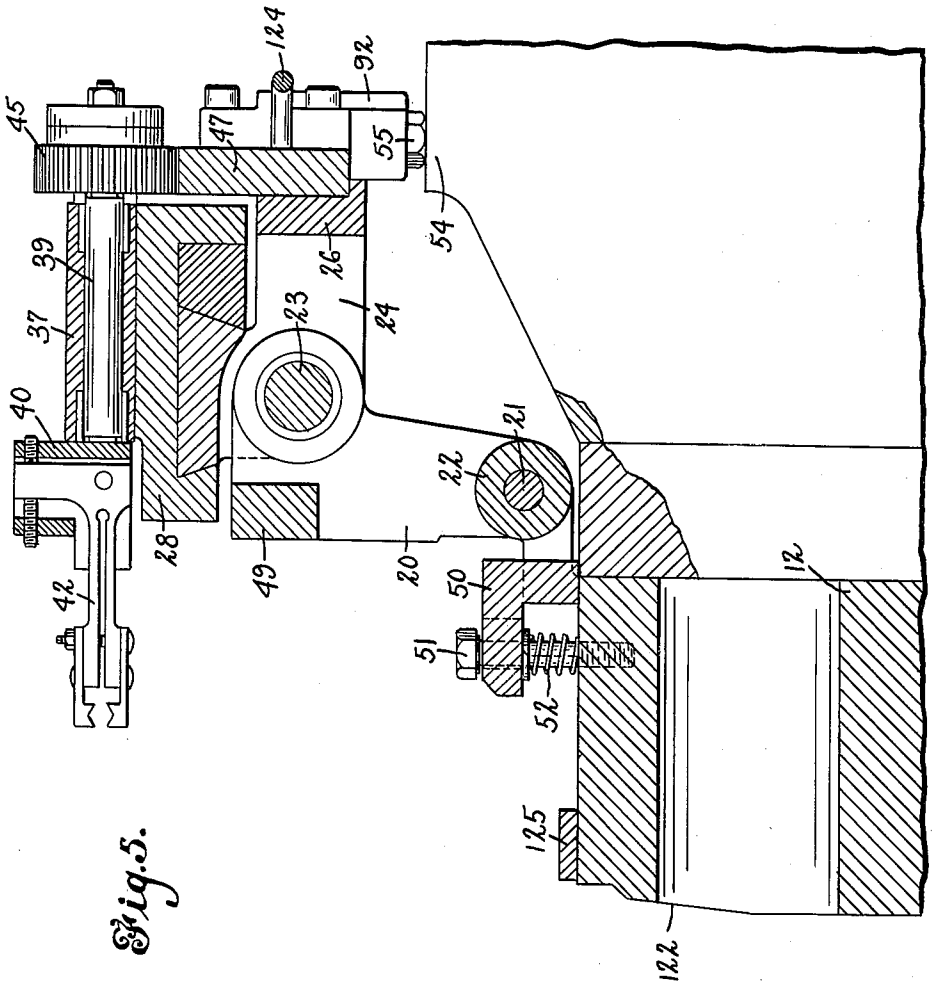


Fig. 5.

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TRANSFER MECHANISM FOR HEADERS OR LIKE MACHINES

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Fig. 7.

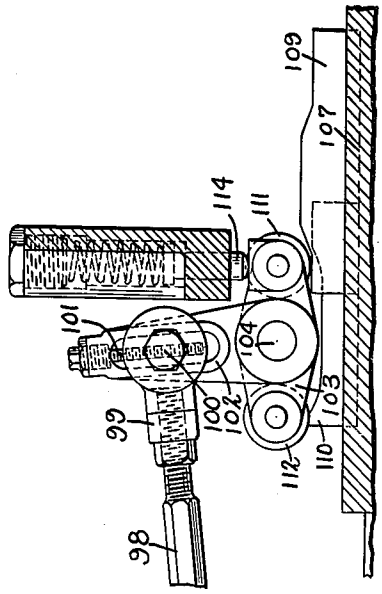


Fig. 8.

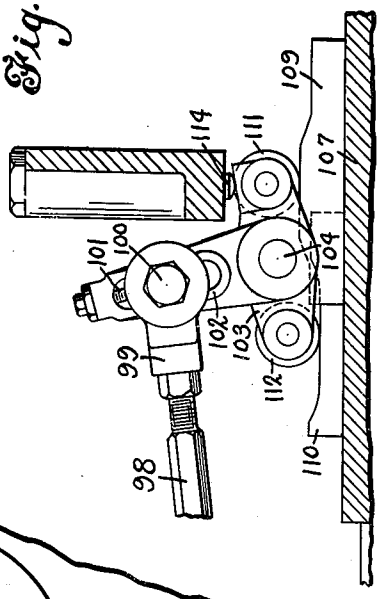
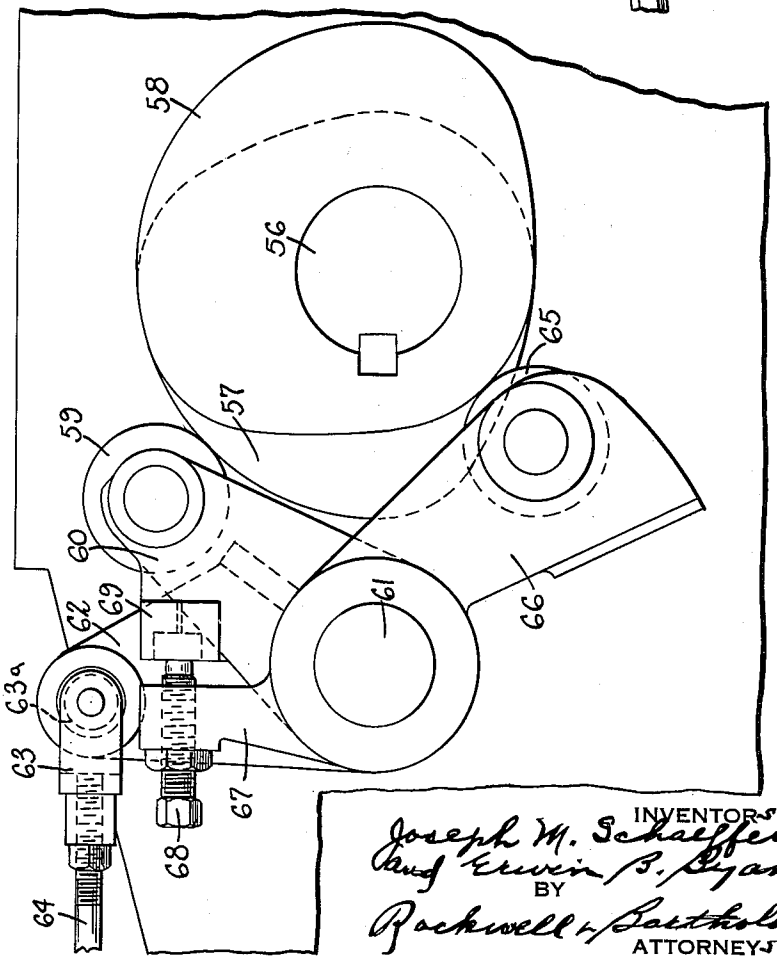


Fig. 6.



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TRANSFER MECHANISM FOR HEADERS OR LIKE MACHINES

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Fig. 13.

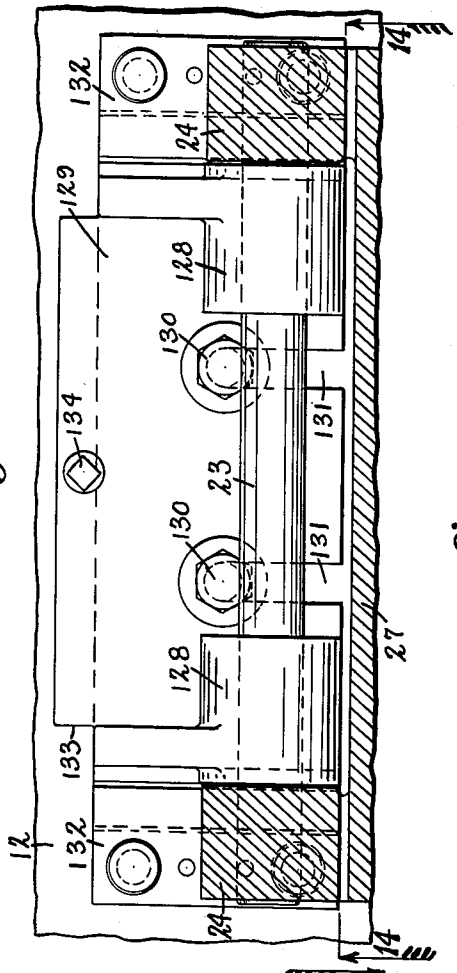


Fig. 14.

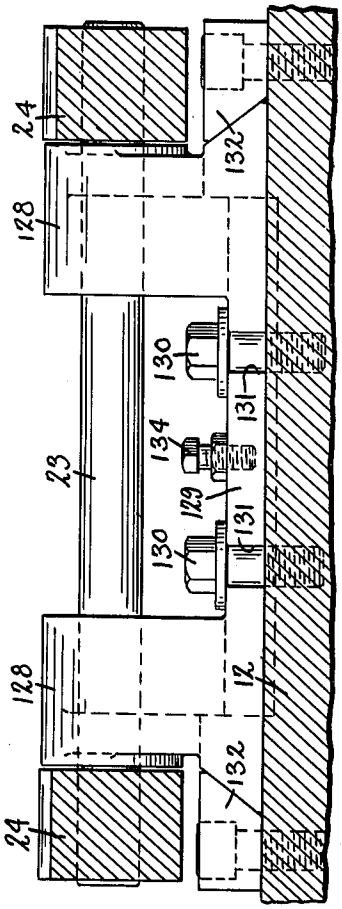
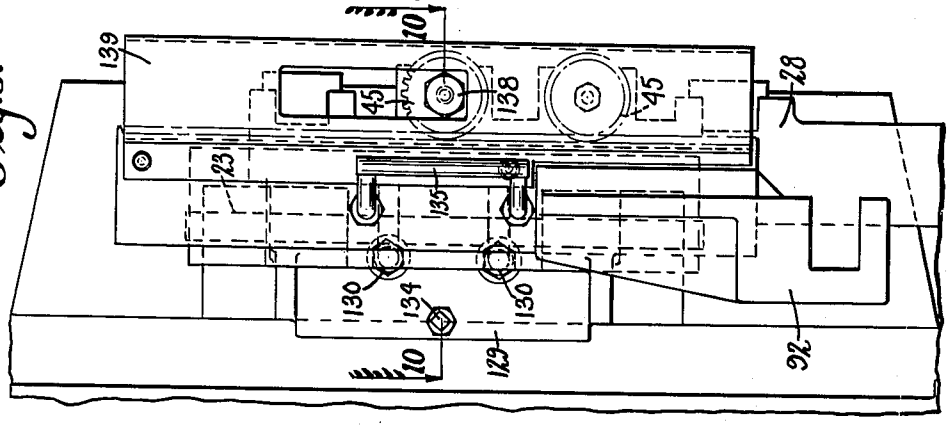


Fig. 9.



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TRANSFER MECHANISM FOR HEADERS OR LIKE MACHINES

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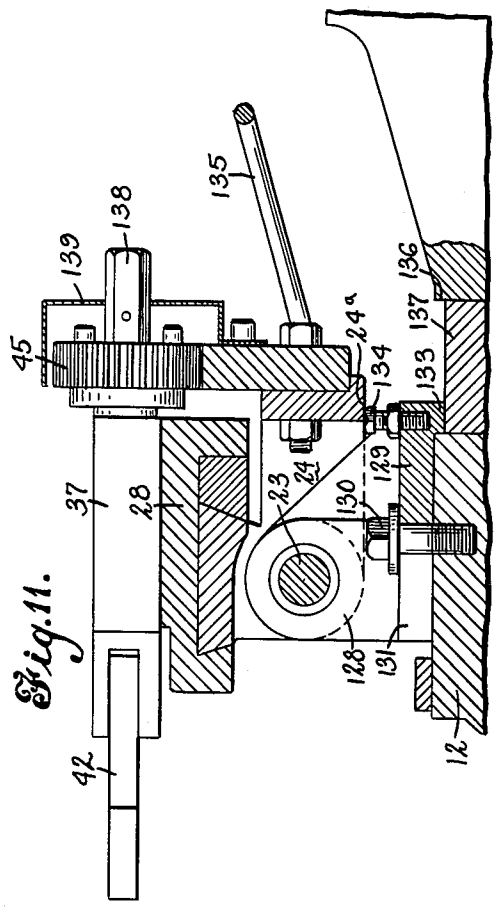


Fig. 11.

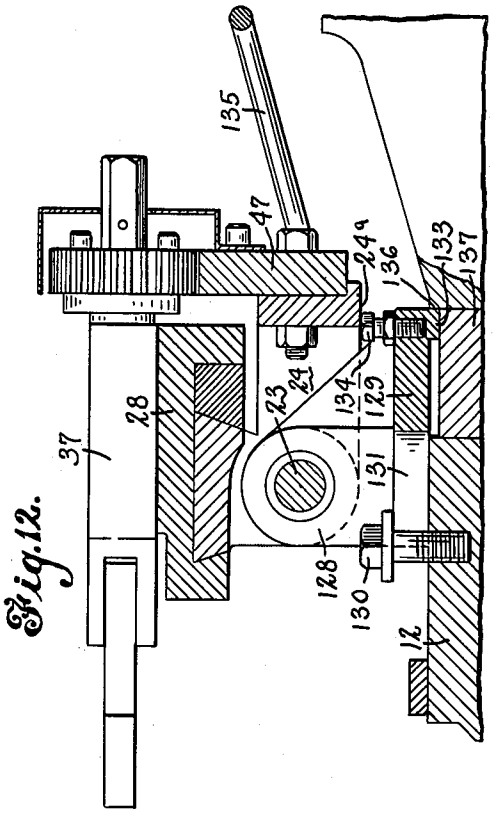


Fig. 12.

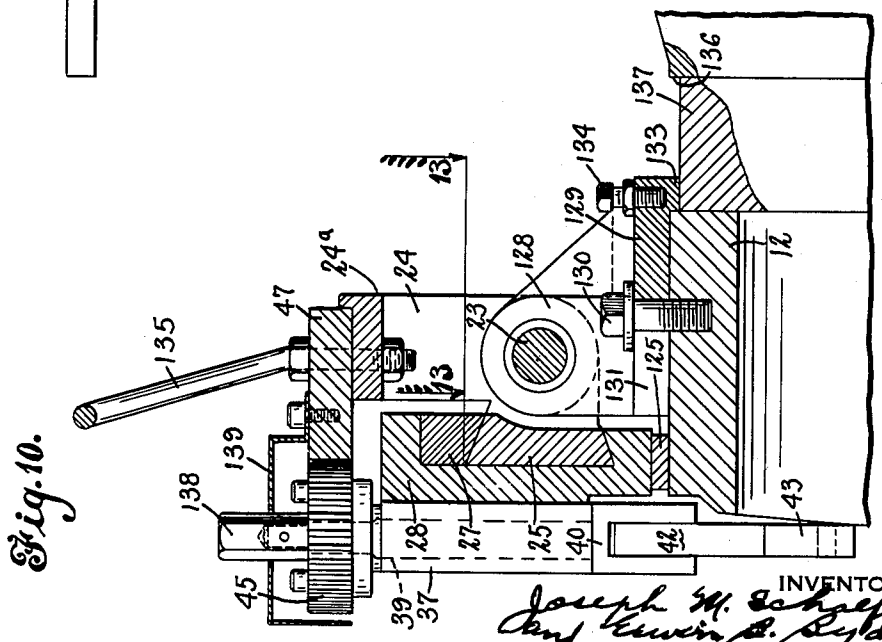


Fig. 10.

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United States Patent Office

2,728,267

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2,728,267

TRANSFER MECHANISM FOR HEADERS OR LIKE MACHINES

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Application May 21, 1952, Serial No. 289,085

8 Claims. (Cl. 10—12)

This invention relates to a transfer mechanism for machines such as nut or bolt-forming machines or headers, and more particularly to means for transferring the workpiece from one station to another in machines of this character having several operating stations where the workpiece is operated upon by a die and punch at each station in a progressive manner. The invention may be employed either in a multi-station machine where a number of tools operate successively upon the workpiece or in a two station machine where the workpiece is merely conveyed from the first station to the second.

In such devices as nut-forming machines, for example, it is necessary to have the transfer mechanism convey the work from one station to the next and accurately center the work over the die at the station to which it is transferred so that the blank may be correctly located axially of the opening in the die to prevent breakage of, or undue wear upon, the tools. Also in connection with some classes of work it is desirable that the workpiece be rotated or turned face for face, through an angle of 180 degrees between one station and the next, and one feature of the present invention is the provision of transfer mechanism which will reverse the work piece in this manner during its travel from one station to another and at the same time correctly align it with the die opening at the station at which the work is received.

In a multi-station machine it may be desirable to transfer the work between certain stations without rotation thereof but to rotate or turn the work end for end between other stations. It is contemplated by the present invention to provide mechanism by which either type of transfer mechanism may be provided selectively at any or all of the several stations, that is to say, by a relatively simple substitution of parts, the transfer mechanism may be adapted to rotate the workpiece between any two adjacent stations, where rotation is desired, and to effect a transfer of the workpiece without rotation between other stations.

One object of the present invention is to provide a blank transfer mechanism for heading, up-setting, or like machines to transfer a blank from one station to a succeeding station, which mechanism would be efficient in operation and durable in use.

A further object of the invention is to provide a blank transfer mechanism for machines of the character described whereby the work is transferred from one station to the next and accurately aligned with the die opening at the station to which it is transferred.

Still another object of the invention is to provide a blank transfer mechanism for machines in which a workpiece is operated upon by tools at successive stations, the mechanism being arranged to transfer the blank from one station to the next and during such transfer rotate the workpiece through an angle of 180 degrees so as to turn it end for end with relation to the operating tools.

Still another object of the invention is to provide blank transfer mechanism of the character described, the mechanism being so constructed and mounted that the work-gripping transfer fingers may be moved outwardly from the face of the die to provide clearance for the rotation of the fingers in their travel from one station to a succeeding station.

A still further object of the invention is to provide a transfer mechanism which will transfer a blank or workpiece from one station to another and reverse the workpiece during such travel while maintaining the blank in substantially the same plane as the axes of the dies.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

Fig. 1 is a top plan view of a portion of a nut or bolt-fabricating machine embodying our invention;

Fig. 2 is a sectional view on line 2—2 of Fig. 1 looking toward the die block;

Fig. 2A is a sectional view on line 2A—2A of Fig. 1;

Fig. 3 is a sectional view on line 3—3 of Fig. 2;

Fig. 3A is a sectional view on line 3A—3A of Fig. 3;

Fig. 4 is a view similar to Fig. 3 showing another position of the parts;

Fig. 5 is a view similar to Fig. 4 showing the transfer mechanism moved to an inoperative position to provide access to the tools;

Fig. 6 is a side elevational view showing the cam mechanism for effecting movements of the transfer devices;

Figs. 7 and 8 are elevational views partly in section of the cam mechanism for tipping the slide which carries the transfer fingers;

Fig. 9 is a top plan view of a modified form of transfer mechanism;

Fig. 10 is a sectional view on line 10—10 of Fig. 9;

Fig. 11 is a view similar to Fig. 10 showing the transfer mechanism tilted to an out-of-the-way position;

Fig. 12 is a view similar to Fig. 11 but showing the transfer mechanism in a rearward position with respect to that shown in Fig. 11;

Fig. 13 is a sectional view on line 13—13 of Fig. 10; and

Fig. 14 is a sectional view on line 14—14 of Fig. 13.

To illustrate a preferred embodiment of our invention we have shown in the drawings a nut-forming machine comprising a frame 10 upon which is mounted a gate 11 designed to carry the fabricating tools (not shown) and also designed to be reciprocated in the usual manner.

The die block is shown at 12, this block carrying a plurality of dies (Fig. 2) 13, 14, 15, 16 and 17, these dies representing different stations in the fabrication of the work. As the workpiece is usually a blank cut from a length of stock, a cut-off station is provided at 18, the work being carried from this station to the first fabricating die 13 in the usual manner.

The invention particularly relates to the mechanism for transferring the blanks from one of the fabricating stations to the next, this mechanism being shown more particularly in Figs. 2 to 5 of the drawings. As shown, for example, in Figs. 3, 3A and 4, forwardly extending arms 20 are provided upon a bracket 22 pivotally carried by a shaft 21 secured to a fixed part of the machine such as the die block by bearings 21^a and 21^b so that these arms which are connected by the member 22 may swing from the position shown in Fig. 3 to that shown in Fig. 5.

Mounted in the arms 20 is a transversely extending shaft 23 upon which is pivoted a support or carrier 24 for the finger-holding slide. This carrier includes a forwardly projecting dovetail 25 which extends transversely across the machine, and also a transversely extending supporting member 26.

Slidably mounted upon the dovetail 25 and held in place by the gib 27 is a slide 28 designed to support a

plurality of transfer fingers, as shown more especially in Figs. 3 and 3A. In certain instances it is desired that these transfer fingers rotate through an arc of 180 degrees during their movement between adjacent stations in order to reverse the workpiece and in other cases it is desired that the workpiece be transferred from one station to the adjacent station without being turned or reversed.

The transfer fingers in the latter case are those shown at stations 13 and 16 of Fig. 2. A block 30 is mounted upon the face of the carrier slide and finger holders 31 are pivoted at 32 at each side of this block, these holders carrying cooperating fingers 33 at their lower ends. Secured to each of the holders 31 is an upwardly extending arm 34, which arm is urged outwardly at the top by spring-pressed plungers 35 mounted in the block 30. These plungers tend to urge the fingers 33 toward each other so as to grip the work when it is forced between them. A similar transfer finger mechanism is provided at the die 16, as shown in Fig. 2, the parts being designated by like reference characters.

The transfer mechanisms shown opposite stations 14 and 15 of Fig. 2 are designed to reverse the blanks or rotate them through 180 degrees when they are transferred from one station to the next. In this instance a block 37 is mounted upon the face of the slide 28 (Figs. 3 and 4) which block is a sleeve-like member, and rotatably mounted therewithin is a shaft 39, this shaft carrying at its lower end a finger holder 40 within which is pivotally mounted at 41 a slotted finger bar 42 to which the cooperating fingers 43 are secured. The finger bar 42 may be adjusted about the pivot 41 by means of the adjusting screws 44, and the resilience of the arms of the finger bar 42 permits the fingers 43 to be spread apart slightly to receive the work therebetween. As stated, the shaft 39, being rotatable in the member 37, will permit rotation of the fingers during their travel between stations. In Fig. 4 the transfer fingers are shown in a position 90 degrees from that shown in Fig. 3, which will be one half of the rotation normally given to the fingers during their passage from one station to the next.

Upon the upper ends of the shafts 39 are secured or keyed pinions 45, the teeth of which pinions are designed to mesh with the teeth 46 of a rack bar 47 extending transversely of the machine and carried by the member 26, which, as has been stated, is a part of the pivoted frame 24 which also supports the slide 28. It will be seen, therefore, that regardless of the movement of the member 24 about its pivot 23 or about the pivot 21 of the arms 20, the rack member 47 and the slide 28 will always be maintained in their relative positions so that the teeth of the pinions 45 and rack member will always be in engagement. As will be hereinafter explained, movement of the slide transversely of the die block or laterally, as shown in Fig. 2, will not only cause the transfer fingers to be moved from one station to the next, but will effect rotation of those transfer fingers which are secured to the shafts 39 and effect reversal of the blanks carried thereby.

It will, of course, be understood that if desired the transfer fingers at any or all of the stations may be provided upon rotatable shafts carrying pinions to mesh with the rack 47 so that the blanks may be reversed at any selected station and likewise be transferred without reversal wherever desired. To this end, as shown in Fig. 2, the rack member 47 extends substantially throughout the length of the die block so that the blank-reversing mechanism may be provided at any of the stations.

It is desirable to so construct the transfer finger mechanism that it may be moved to an out-of-the-way position so as to provide access to the tools and dies and to the transfer fingers themselves when necessary to replace or adjust them. In the present instance this is effected by supporting the transfer mechanism upon the arms 20 which are pivoted upon the transversely extending shaft 21. These arms 20 are connected by a bar 49, Figs. 3 and 4, and an L-shaped clamping member 50 is held in place by bolts 51 to exert a clamping action on the member 49 and hold the brackets 20 in place during the operation of the machine. The bolts 51 pass through elongated slots in the clamping member 50 so that when the bolts are loosened the member may be moved rearwardly to be disengaged from the bar 49 and permit the entire transfer mechanism to be swung upwardly and rearwardly from the position shown in Fig. 4 to that shown in Fig. 5. A spring 52 surrounds the bolt 51 below the clamping member 50 so that the latter will be urged upwardly out of engagement with the member 49 when the bolt is backed off. When in the position shown in Fig. 5, the transfer mechanism is supported from a portion of the frame of the machine 54 by resting upon the head of the screw 55.

The slide 28 which carries the transfer fingers is reciprocated in timed relation with the movement of the gate 11 toward and from the dies, and this is accomplished from the main shaft 56 (Fig. 6) which operates the gate. Secured to this shaft are cams 57 and 58, the periphery of the cam 57 being engaged by a cam follower 59 rotatably mounted in a cradle 60 pivoted on a short shaft 61. Secured to the cradle 60 is an arm 62 to which a clevis 63 is connected by a universal joint 63a secured to a rod 64.

The periphery of the cam 58 is engaged by a cam follower or roller 65 rotatably mounted in a cradle 66 also pivoted upon the shaft 61, the cradle being provided with an upwardly extending arm 67 which carries an adjusting screw 68, the end of this screw bearing against a block 69 secured to the cradle 60. From this construction it will be apparent that the cam 57 will serve to move the roller or cam follower 59 in a counter-clockwise direction about the shaft 61, as shown in Fig. 6, so as to move the rod or link 64 to the left while the cam 58 through the arm 67 and adjusting screw 68 tends to move the cradle 60 in a clockwise direction and move the link 64 toward the right. The peripheries of the cams are complemental so that the rollers or followers are maintained upon their peripheries.

The link 64 is connected at its rear end to one arm 70 (Fig. 1) of a bell crank lever pivoted at 71 on the frame, this connection comprising a clevis 70a and a universal joint 70b. The other arm 72 of this lever is provided with a slot 73 through which passes an adjusting screw 74. This screw is threadedly connected with a pin 75 (Fig. 2A) secured in a clevis 76, which clevis is connected by a turn buckle 77 to a sleeve 78 pivotally secured to a bar 79 slidably mounted on the frame. The bar 79 is connected with the slide 28 by a connecting block 80 received in a slot 81 in the slide 28 and in a slot 82 in the bar 79. Wear plates 83 are secured in the slot 82 by screws 84 and the block 80 engages these plates. A screw 80a secures the block to the slide 28.

With this construction it will be apparent that as the rod or link 64 is reciprocated longitudinally of the bed of the machine, the slide bar 79 and slide 28 will be reciprocated transversely of the bed of the machine by the bell crank lever 70, 72. The throw of the slide member may be adjusted by the screw 74 in order that the travel will be the exact distance between two adjacent stations, while the setting of the slide or the starting position may be adjusted by means of the turn buckle 77 in order that the transfer fingers may be positioned directly opposite the die openings at the ends of the travel of the slide.

To prevent overtravel of the slide, a rod 85 is secured to the end of the bar 79, which rod slides freely through a sleeve 86 threadedly mounted in a bracket 87 fixed to the frame of the machine. A lock nut 88 threaded upon the sleeve 86 serves to hold the latter in any adjusted position. Stop nuts 89 and 90 are mounted upon the rod 85, the nut 89 being adapted to abut the end of the sleeve 86, as shown in Fig. 2A, while the nut 90, at the other

end of the stroke of the slide, is adapted to engage the head 91 of the sleeve 86, when the slide is at the inner end of its stroke.

The operative position of the transfer fingers is shown in Fig. 3 of the drawings, and it will be seen that they lie close to the face of the die block containing the working dies. As the transfer fingers, or at least some of them, are rotated in their travel from one die station to the next, it is necessary to move these fingers away from the die so as to provide clearance for their rotation without striking the die or the face of the die block. In the preesnt instance this is effected by moving the fingers in a direction substantially directly away from the die block or in the direction of the axes of the dies.

As has already been stated, the support 24 is pivoted upon the shaft 23 so that it is permitted pivotal motion about this pivot. As the support 24 carries the rack 47 together with the slide 28 and the transfer mechanism carried thereby, this entire mechanism will be tilted as a unit about the pivot shaft 23 from the position shown in Fig. 3 to that shown in Fig. 4. This movement does not interfere with the transverse movement of the slide 28 or the engagement of the gears 45 with the teeth of the rack 47, and the tilting movement is effected in timed relation to the travel of the tool-carrying gate so that the fingers will be tilted at the proper time in order to give necessary clearance for their rotary or reversing movement.

The mechanism by which this movement is effected includes a bracket 92 (Fig. 1) secured to the rack bar 47. This bracket is provided with a slot 93 within which is received a block 94, this block being pivoted upon the pin 95 inserted through openings in the bracket 92. The pin 95 is held in place by a spring-pressed plunger 96, the spring being compressed by the screw 55. Adjustably threaded in the pivoted block 94 is a rod or link 98, the other end of this rod being threaded into a clevis 99.

The clevis 99 is pivoted upon a bearing pin 100 through which is threaded an adjusting screw 101 set in a slotted arm 102 of a lever 103 (Figs. 1 and 7). The lever 103 is pivotally mounted upon a pin or shaft 104 secured in stationary bearings 105 and 106 on gate caps 107. These caps are upon a fixed part of the machine so that the shaft 104 is stationary and the lever 103 together with the upstanding arm 102 rocks thereon. It will be understood that the screw 101 extends into the slot in the arm 102 so that the distance of the pivot pin 100 from the pin 104 may be adjusted to adjust the stroke of the link 98.

Mounted upon the movable gate 11 are a pair of complementary cams 109 and 110, the upper surfaces of which are adapted to be engaged by the follower rollers 111 and 112 respectively, these rollers being rotatably mounted in the lever 103, one upon each side of the pivot pin 104. The cam 109 is provided with a high dwell at its intermediate portion and is depressed at each end so that the rear end of the lever 103 which carries the follower 111 will be permitted to drop slightly at each end of the stroke of the gate and will be raised about its pivot 104 to the intermediate portion of the stroke of the gate. The cam 110 is complementally formed so that the other end of the lever which carries the follower 112 will be raised at each end of the stroke of the gate and permitted to lower at the intermediate portion of the stroke. A spring-pressed plunger 114, mounted upon a fixed part of the frame as the bearing 105, maintains the roll 111 in engagement with the surface of the cam 109 so that it would return this rocking mechanism to a position adjacent the plane of the dies without the action of the cam 110 and roller 112. The latter, however, are provided to act as a safety in case of breakage of the spring. It will be seen that for each cycle of the gate comprising a forward return movement there are two complete in-and-out movements of the rocker mechanism so that the transfer fingers are rocked away from the face of the die at the beginning of their movement to transfer a blank from one station to the next and are again moved away from the face of the die at the beginning of the return movement to the original station in order to permit clearance for the rotation of these fingers. It will, of course, be understood that the fingers are rotated in one direction when the transfer of a blank is effected and in the other direction when the fingers are returned to their original stations to receive another blank.

As shown more especially in Fig. 3A the slide 28 is provided with mortises 116 on its front face in which are disposed the rear edges of the finger-carrying blocks 30 and 37 so that these members are adjustably mounted on the slide. Adjustment of the blocks 30 is obtained by means of set screws 117 mounted in extensions 117a of the blocks and bearing against the slide. The block is locked in place by means of the cap screws 118.

Similarly, each of the finger-carrying blocks 37 is adjusted by means of a set screw 119 threaded through a poppet 119a secured to the face of the slide 28, and engaging one of two lateral lugs 120 on each block 37. These blocks are fastened by cap screws 121 passing through the lugs 120 and into the face of the slide.

It is believed that the operation of the machine will be apparent from the foregoing description. As is usual the gate 11 is reciprocated from the main shaft 56 which also actuates the cams 57 and 58. These cams serve to reciprocate the slide 28 in timed relation to the movements of the gate so that the blanks will be received in the gripping fingers and transferred from one station to the next succeeding station. At whatever stations desired, the gripping fingers may be rotatably mounted, as indicated opposite stations 14 and 15, so that as the blanks are transferred from one station to another, they will be reversed in position and the punch face of the blank at one station becomes the die face of the blank at the next station. The cam members 109 and 110 mounted upon the gate 11 will effect the tilting of the transfer mechanism from the position shown in Fig. 3 against the dies to the position shown in Fig. 4 away from the dies so as to give clearance for the rotation of the fingers between stations. When the transfer fingers arrive at the next station with the blank, the cams will return the fingers to the position shown in Fig. 3.

As shown at 122 on Figs. 3 and 4, the face of the die block is cut back or beveled slightly to lie substantially at the angle to which the carrier slide is tilted in order to give sufficient clearance for the rotation of the fingers.

Provision is also made for tilting the entire transfer mechanism to the position shown in Fig. 5, and for this purpose a handle 124 is provided to be grasped by the operator to effect the tilting movement. In this position the transfer mechanism rests upon a part of the frame 54 and gives access to the tools and transfer fingers for any desired adjustment. It is understood that before the transfer mechanism is tilted to this position the connecting block 94 has been disconnected by the removal of its fastening element 95 so as to disconnect the link 98 from the support 26. The block 80 swings out of the slot 81. When the transfer mechanism is in its forward or operative position, the carrier slide rests upon a bearing plate 125 shown in Figs. 3 and 4, this plate in turn resting upon the die block.

In Figs. 10 to 14 of the drawings, we have shown a modified form of our invention, the modification residing particularly in the manner in which the transfer mechanism is mounted upon the frame of the machine.

In this form of our invention the transfer mechanism comprises the slide 28, the dovetail 25, and the bracket 24 pivoted upon the pin or shaft 23 as before. The gripping fingers with their associated mechanism including the mechanism for rotating the fingers is the same as has already been described. In this instance, however, the pin 23 is mounted in bearings 128 carried by a bracket

129 resting upon the die block and held in place by screws 130 passing through slots 131 of the bracket 129 in order to provide forward and rear adjustment for the bracket. The bracket 129 is held between ways or gibs 132 (Fig. 14) bolted to the frame so that it will be restrained from lateral movement but permitted to slide toward and from the face of the die block. The bracket is provided at its rear end with an extension 133 to abut against the die block so as to square the bracket in place.

An adjustable supporting screw 134 is provided adjacent the rear edge of the bracket 129 to permit the member 24a of the support 24 to rest thereon when the transfer mechanism is tilted rearwardly about the pivot 23 as shown in Fig. 11. The transfer mechanism will in this position give sufficient clearance for checking the dies and making minor adjustments.

In order to secure greater clearance for a complete change of tools, for example, the operator may loosen the screws 130 and by grasping the handle 135 may pull the bracket 129 and the entire transfer mechanism from the position shown in Fig. 11 to that shown in Fig. 12 wherein the extension 133 abuts a part 136 of the frame. The bracket will be held in place by the extension 133 which rests upon the backing plate 137. This provides clear access to the die pocket.

Also, as shown in Figs. 9 to 12, a long nut 138 may be secured to the upper end of one of the shafts 39 above the pinion 45. This nut extends through a slot in a cover 139 provided for the rack and pinion mechanism. It will be understood that this nut 138 may be employed also with that form of our invention shown in Figs. 1 to 8.

The provision of the nut 138 enables an operator by the use of a wrench thereon to turn the pinion 45 and thus move it along the rack bar 47 so as to move the slide 28 when the mechanism is in the position shown in Figs. 11 and 12. It will be remembered that the slide 28 is disconnected at this time from the operating mechanism so that the slide may be moved regardless of the position of the mechanism normally employed for reciprocating the slide. This will enable the operator to align the block 80 with the slide 79 and also to set the transfer in the delivery position in front of the dies by rotating the gear 45 against the rack bar 47.

In this operative position of the transfer mechanism, as shown in Fig. 10, the latter rests upon a plate 125 as before. In machines of large size power mechanism may be employed to swing the transfer mechanism to its inoperative position.

While we have shown and described some preferred embodiments of our invention, it will be understood that it is not to be limited to all of the details shown, but is capable of modification and variation within the spirit of the invention and within the scope of the claims.

What we claim is:

1. An apparatus for making metal blanks or the like comprising a frame, a die bed on the frame provided with a die face having therein a plurality of aligned die stations at which the blank is processed progressively, the axes of which stations are in a substantially horizontal plane, transfer means for transferring the blank from one station to another including a pair of work-gripping fingers, a slide in which said fingers are mounted to rotate about an axis substantially at the center line of the fingers, means for moving the slide to effect a translatory movement of said fingers across the face of the die, means for rotating said fingers about said axis to reverse the blanks carried thereby, and power-actuated means for swinging said fingers about an axis parallel to the line of stations during said translatory movement and in timed relation to their rotation to move said fingers away from the die face.

2. An apparatus for making metal blanks or the like comprising a frame, a die bed on the frame provided with a die face having therein a plurality of aligned die stations at which the blank is processed progressively, the axes of which stations are in a substantially horizontal plane, transfer means for transferring the blank from one station to another including a pair of work-gripping fingers, a slide in which said fingers are mounted to rotate about an axis substantially at the center line of the fingers, means for moving the slide to effect a translatory movement of said fingers across the face of the die, means for rotating said fingers about said axis during said translatory movement to reverse the blanks carried thereby, and power actuated means for swinging said fingers about an axis parallel to the line of stations prior to the rotation of the fingers to enable said fingers to clear the die face.

3. An apparatus for making metal blanks or the like comprising a frame, a die bed on the frame provided with a die face having therein a plurality of aligned die stations at which the blank is processed progressively, the axes of which stations are in a substantially horizontal plane, transfer means for transferring the blank from one station to another including a pair of work-gripping fingers, a slide in which said fingers are mounted to rotate about an axis substantially at the center line of the fingers, means for moving the slide to effect a translatory movement of said fingers across the face of the die, means for rotating said fingers about said axis during said translatory movement to reverse the blanks carried thereby, power actuated means for swinging said fingers about an axis parallel to the line of stations prior to the rotation of the fingers to enable said fingers to clear the die face, and means to return said fingers to their original positions adjacent the die face after completion of the rotation of the fingers.

4. An apparatus for making metal blanks or the like comprising a frame, a die bed on the frame providing a plurality of die stations at which the blank is processed progressively, transfer means for transferring the blank from one station to another comprising a slide member, work-gripping fingers carried by said member, means mounting said fingers on the slide member for rotating movement about an axis substantially at the center line of the fingers, means for rotating said fingers by the reciprocation of the slide member, means for reciprocating the slide member, a carrier upon which the slide member is reciprocably mounted, means pivotally mounting said carrier on the frame, a gate member mounted for movement toward and from the die stations and means actuated by movement of the gate for swinging the carrier about its pivot in timed relation to the reciprocation of the slide to enable the fingers to clear the die bed during their rotation.

5. An apparatus for making metal blanks or the like comprising a frame, means on the frame providing a plurality of die stations at which the blank is processed progressively, transfer means for transferring the blank from one station to another including work-gripping fingers, means for mounting said fingers for pivotal movement about an axis extending transversely of the axes of the dies, said fingers being mounted for rotating movement about an axis substantially at the center line of the fingers, a gate member mounted for movement toward and from the die stations, means actuated by movement of the gate for swinging said fingers away from the dies about said transverse axis, means for thereafter effecting a translatory movement of said fingers across the face of the dies from one station to the next, means for rotating said fingers by a translatory movement thereof, and means also actuated by movement of the gate for thereafter swinging said fingers toward the dies about said transverse axis.

6. An apparatus for making metal blanks or the like comprising a frame, a die bed on the frame provided with a die face having therein a plurality of aligned die stations at which the blank is processed progressively, the axes of which stations are in a substantially horizontal plane, transfer means for transferring the blank from one station to another including a pair of work-gripping fin-

gers, a slide in which said fingers are mounted to rotate about an axis substantially at the center line of the fingers, means for moving the slide to effect a translatory movement of said fingers across the face of the die, means for rotating said fingers about said axis to reverse the blanks carried thereby, a gate member mounted for movement toward and from the die stations, and means actuated by movement of the gate for swinging said fingers about an axis substantially parallel to the line of stations in timed relation to their rotation to move said fingers away from the die frame.

7. An apparatus for making metal blanks or the like comprising a frame, a die bed on the frame having a vertically disposed die face provided with a plurality of aligned die stations, a gate member movable toward and from the die face, a carrier pivotally mounted on the die bed for movement about a horizontal axis substantially parallel to the line of die stations, a slide reciprocably mounted on the carrier for horizontal movement across the die bed, a plurality of transfer fingers rotatably mounted on the slide to rotate about an axis substantially at the center line of the fingers, means for reciprocating the slide and thereby rotating said fingers, and means actuated by movement of the gate member to move said carrier about its pivot to swing the fingers away from the die face.

8. An apparatus for making metal blanks or the like comprising a frame, a die bed on the frame having a vertically disposed die face provided with a plurality of aligned die stations, a gate member movable toward and from the die face, a carrier pivotally mounted on the die bed for movement about a horizontal axis substantially parallel to the line of die stations, a slide reciprocably mounted on the carrier for horizontal movement across the die bed, a plurality of transfer fingers rotatably mounted on the slide to rotate about an axis substantially at the center line of the fingers, means for reciprocating the slide and thereby rotating said fingers, means actuated by movement of the gate member to move said carrier about its pivot to swing the fingers away from the die face, said means comprising cam means on the gate, and a link actuated by said cam means and connected to the carrier.

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