Feb. 10, 1942. R. L. WILCOX ET AL 2,272,592

TRANSFER MECHANISM

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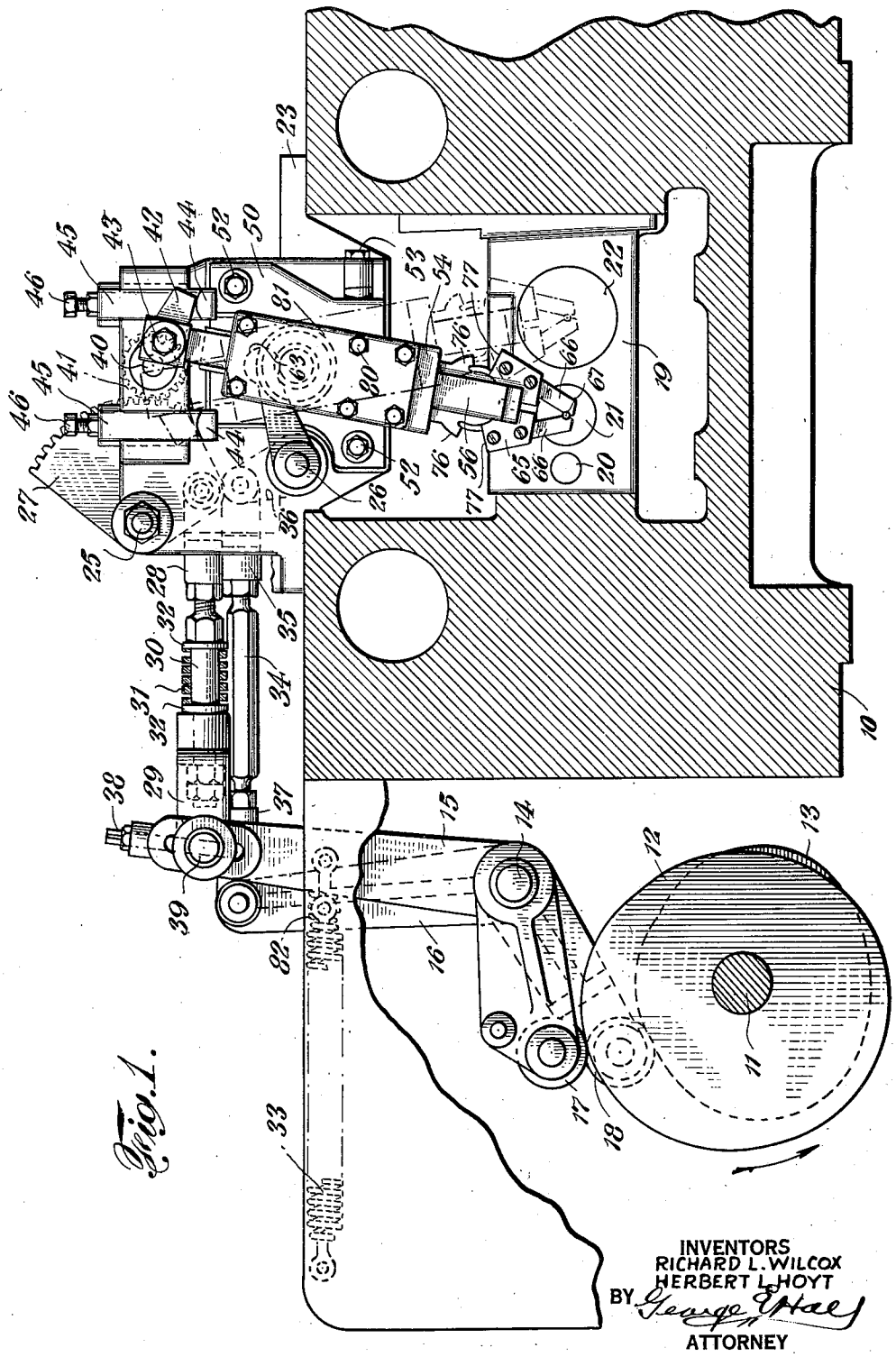


Fig. 1.

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Fig. 2.

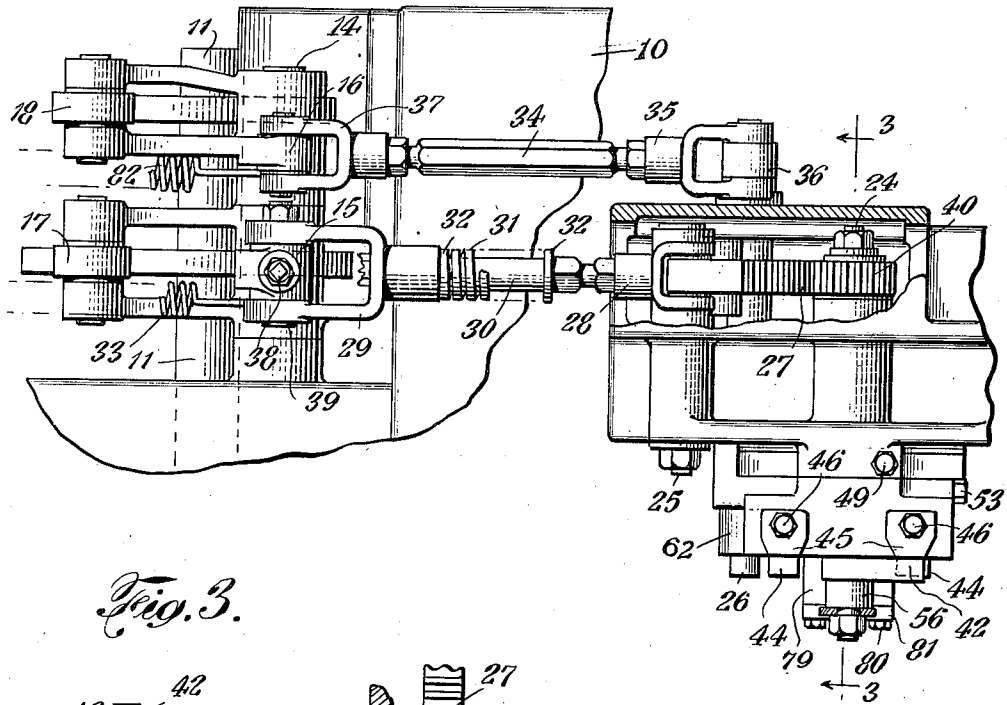


Fig. 3.

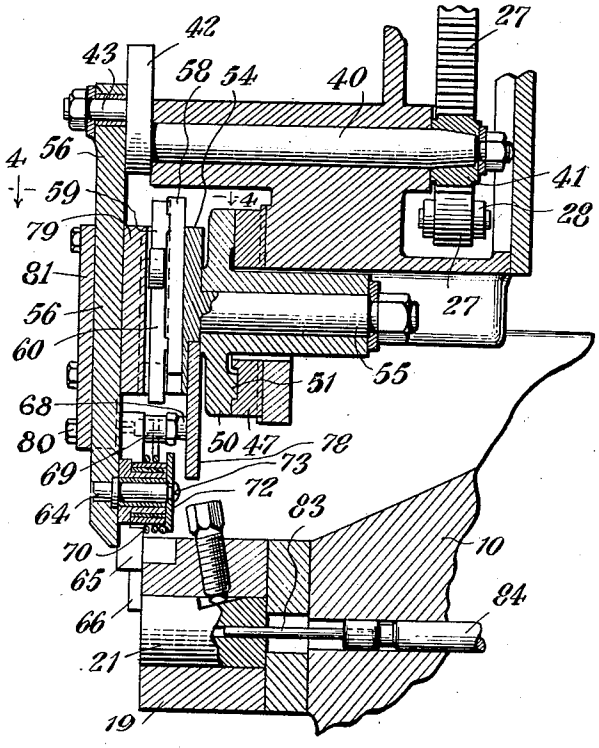
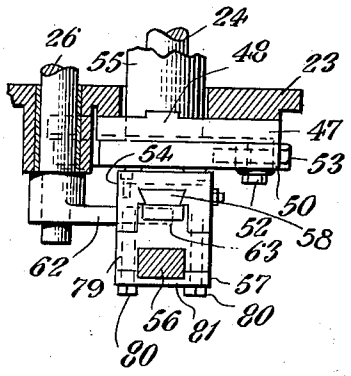


Fig. 4.



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Fig. 7.

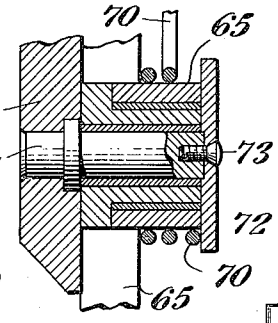


Fig. 5.

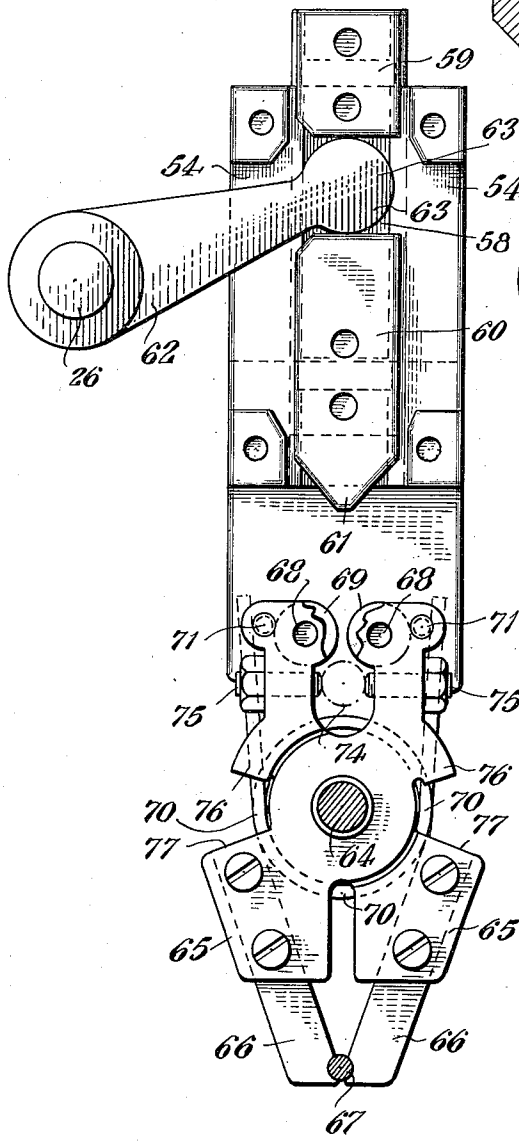
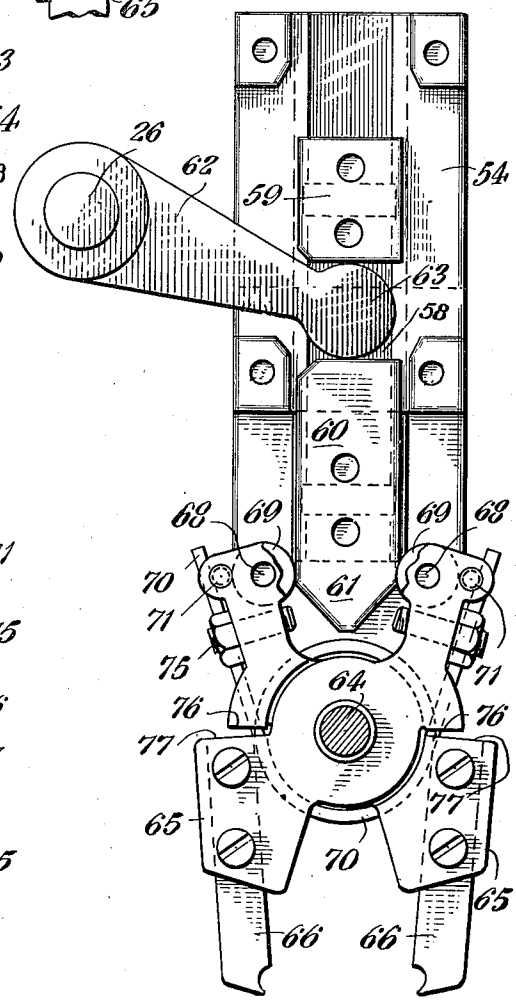


Fig. 6.



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UNITED STATES PATENT OFFICE

2,272,592

TRANSFER MECHANISM

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Application February 12, 1941, Serial No. 378,596

40 Claims. (Cl. 10—12)

This invention relates to transfer mechanism for metal working machinery or the like. It is particularly adapted for use with a header or upsetting machine or the like, having a plurality of dies.

A principal object of this invention is to provide a transfer mechanism that will operate efficiently at such speed as to make possible an increase of the speed of the machine with which it is associated and thereby increase its output, this being in part accomplished by minimizing the number and extent of the moving parts and their operative relation with each other; and further, to so arrange the mechanism that the workpiece to be transferred will be quickly and securely gripped and will be quickly released through the action of positively actuated elements as distinguished from the conventional type of fingers that spring over the workpiece and held it entirely by spring tension, such fingers acting without tendency to misalign the workpiece. This, and other objects of the invention are obtained by providing an oscillating carrier, upon which finger tongs have independent relative movement and are positively actuated to grip and retain the workpiece during transfer and release at a predetermined station, which grip may be made variable in the extent of its pressure upon the workpiece.

Another object accomplished by this invention is to provide for a relative timing of the action of the tong fingers so that the operation of grasping or releasing the blank may be varied at either station or at a point therebetween and such operation accomplished with either an accelerated or a retarded speed.

Other objects of this invention, and its construction and operation, will appear from the following description and accompanying drawings.

A preferred embodiment of the invention is disclosed in the drawings, but other forms and embodiments may be adopted to obtain the purposes and objects of this invention equally as well as the one herein shown.

In the accompanying drawings, wherein like numerals of reference indicate like parts in the several figures;

Figure 1 is a transverse sectional view of a header, upsetting machine or the like, with this improved transfer mechanism associated therewith;

Figure 2 is a fragmentary plan view thereof;

Figure 3 is a detailed sectional view, the parts in section being taken generally upon line 3—3 of Figure 2;

Figure 4 is a fragmentary plan view of the oscillating member and associated parts, the parts in section being taken generally upon line 4—4 of Figure 3;

Figures 5 and 6 are detailed views of the tong slide, tongs and associated parts; and

Figure 7 is a view of the tong mechanism shown at the lower part of Figure 3 but on an enlarged scale.

Referring to the drawings; the numeral 10 designates a header frame, upsetting machine, or the like; 11 a shaft journaled therein; and 12 and 13 cams fixed thereto.

Journaled upon the stud 14 are the levers 15 and 16. The former has a cam roll 17 in contact with the cam 12 and the latter a cam roll 18 in contact with the cam 13.

Secured in the frame 10, in any preferred manner, is a die block 19, shown herein as having three dies therein, severally designated as 20, 21 and 22, the first being a cut-off die, and the other two are working dies. The workpiece is ejected from the die by a knockout pin 83 moved in one direction by a knockout rod 84 suitably mounted in the frame 10. This die block, the means for holding the same in the frame, the dies themselves, and the knockout mechanism, constitute no part of this present invention.

Secured to the frame, and bridging an opening therein in front of the die block, is a bracket 23, having mounted therein the rock shafts 25 and 26. Fixed on the shaft 25 is a segment gear 27, to which is pivotally connected the yoke 28. A yoke 29 is connected with the lever 15, and between which and the yoke 28 is a connection rod 30, around which, in part, is a spring 31 between the collars 32. This rod 30 is threaded into the yoke 28, and by reason of the nuts thereon, its length may be varied in a well known manner.

Rotation of the cam 12 imparts to the segment gear 27 an oscillating movement through the lever 15 and connection rod 30. A coil spring 33 between a fixed part and the lever 15 holds the cam roll 17 in contact with the cam 12. A similar spring 82 performs the same function for the lever 16, cam roll 18 and cam 13.

The shaft 26 is oscillated from the lever 16 through the rod 34 between the yoke 35 connected with the rock lever 36 on the shaft 26, and a yoke 37 connected with the lever 16.

A screw 38, supported in the end of the lever 15 and threaded in the yoke 29, provides for a

radial variation of the position of the stud 39. By reason thereof the length of the arc, through which the teeth of the segment gear 27 travel, is subject to variation and adjustment.

Journaled in the bracket 23 is a crank shaft 40, having a pinion 41 thereon, the teeth of which mesh into those of the segment gear 27.

Upon the crank cheek of the shaft 40 is a stop arm 42, and fixed therein is a crank pin 43. The extent of rotation of the crank shaft is determined by the contact of the stop arm 42 with the lugs 44 upon the lower end of the stop plates 45. These stop plates are adjustably movable in the bracket 23 by means of the adjusting screws 46 in a well known manner and are positioned upon opposite sides of the center of the shaft 40 and substantially equally distant therefrom.

The compensating spring 31 accommodates the movement of the segment gear 27 as the limit of movement of the crank shaft is determined by the stop arms 42 and stop lugs 44.

Adjustably mounted on the face of bracket 23 is a plate 47 having an intermeshing tongue 48 and groove connection therewith, a screw 49 providing for relative movement of the plate.

Adjustably mounted on the face of plate 47 is a bearing plate 50, having a tongue 51 and groove connection therewith. Relative movement of the bearing plate 50 upon the plate 47 is obtained by the action of the adjustment screw 53. Both the plates 47 and 50 are secured rigidly to the bracket 23 by the screws 52 which pass through holes sufficiently enlarged to provide for the maximum movement of the plates. By this adjustment of the plates both a vertical and a horizontal adjustment on the bracket 23 is obtained, and in their adjusted positions both are secured against movement by the screws 52.

The numeral 54 designates a swivel or rockable head. A shaft 55 thereon is journaled in the plate 50. On this swivel head is a slide block 79, within which a transfer slide 56 is movable and held against disengagement therefrom by the cap 81. The screws 80 secure both the cap 81 to the slide block and the latter to the swivel head. The transfer slide 56 is reciprocated through rotation of the crank shaft 40, and an oscillating movement is imparted to the swivel head 54. The extent of this oscillating movement is variably determined by the engagement of the stop arm 42 and lugs 44 in the manner above described.

In the swivel head 54 is a tong slide 58, having thereon two blocks 59 and 60 spaced from each other, the latter having a pointed end with converging cam faces 61. This slide acquires a reciprocatory motion within the swivel head 54 through the rock lever 62 fixed on the shaft 26, and having a ball end 63 in the open space between the blocks 59 and 60, and in engagement with both, substantially as shown in Figure 5. Slide 58 has an independent movement in the swivel head 54 derived from the cam 13, lever 16, rod 34, rock lever 35, shaft 26 and rock arm 62. In the transfer slide 56 is a pin 64, which carries the tongs, comprising in part tong jaws 65, to which are secured the gripping fingers 66, recessed or otherwise formed at their lower ends to accommodate a workpiece 67 engaged thereby. While the fingers 66 are herein shown as secured to the tong jaws, obviously they may be integral if desired. These tongs operate in much the same manner as a pair of ordinary shears. The rear end of the tong jaws is upon that side of the pin 64 opposite the finger 66 thereon. In the tail of each of these tong jaws is a stud 68 carrying a cam roll 69. As the slide 58 moves endwise in the swivel head toward the tongs, the cam faces 61 are projected between the cam rolls 69 (Fig. 6) and separate the fingers 66. The tong jaws and the fingers 66 are moved to their closed positions by a wire spring 70 or the like, which encircles the hub of the tongs and bears against the pin 71, fixed in the tong tails. To provide a long bearing for the jaws 65 one tong is journaled for substantially its entire length upon the pin 64 and the other tong is journaled upon the hub of the first tong (Fig. 3). Thus both tongs are provided with relatively long bearings. The tongs and the coil spring 70 are held against axial movement on the pin 64 by a washer 72 secured to the pin by a screw 73 or the like. The proper relative position of the fingers is determined by the set screws 75 which abut against a stud 74 when the fingers 66 are closed. Each tong jaw has a lug 76 which limits the extent of the opening of the fingers 66 by its engagement with a stop face 77 upon the other tong jaw.

On the swivel head 54 is a fixed plate 78 that is engaged by the end of the roll studs 68 to prevent the fingers 66 from moving toward the face of the dies to cause binding as a workpiece is pushed through the fingers 66 into the heading dies.

As the rod 34 is threaded into both yokes 35 and 37 means are thus provided to change the distance between the levers 16 and 36 and thereby vary the relative position of the slide 58.

In operation the fingers 66 close onto a workpiece 67 as it is being ejected from the first die (21). This is accomplished by timing the cam 13 so that the slide 58 is raised and with it the cam plate 60, thus withdrawing the cam faces 61 either in whole or in part from between the cam rolls 69, allowing the tong fingers 66, through the coil spring 70, to close onto the workpiece. Then, through the timing of cam 12, the tong jaws, with the workpiece in the fingers 66, are oscillated from the position wherein the workpiece is in register with the first die to a position wherein the workpiece is in register with the opening in the second die (22) with the fingers 66 still in their closed position, substantially as shown by broken lines in Figure 1. As the punch carried by the gate advances and pushes the workpiece out of the fingers 66 and into the second die, the beveled cam faces 61 are projected between the cam rolls 69. The tong jaws are thus separated and the fingers 66 open in time to clear the advancing punch which will in part pass between the open fingers while the crank shaft 40 is at rest. The fingers are closed by the spring 70, but this closing is controlled by the positively actuated cam mechanism, which predetermines both the time and extent of such closing. This results from the fact that the rolls 69 are in contact with the cam faces 61, and the extent of the closing of the fingers depends upon the extent of withdrawal of the cam. In Figure 6 the fingers are illustrated as fully opened. As the cam is withdrawn the fingers close gradually as the rolls 69, under the action of the coil spring 70, ride against the cam faces 61, until the cam is entirely withdrawn. Thus the extent of movement of the cam and the timing thereof controls both the extent and time of closing of the fingers. The only parts that require quick operation are those connected with the opening of the fingers. These are relatively

light parts. Therefore, the timing for the return oscillation of the fingers **66** to the first die is greatly lengthened, as during the return of fingers **66** they are in their open position (Fig. 6) until about to receive another workpiece as it is ejected from the first die. It is possible, therefore, for the punch cooperating with the first die to be at its extreme forward position adjacent to the face of the die or just beginning to return, at the time the fingers, then open, will straddle the punch and be in a position to close immediately the punch starts to return. Thus it is possible to transfer very short work as well as long work within the range of the machine.

The foregoing description is directed solely toward the construction illustrated, and it is to be understood that the privilege of resorting to all mechanical changes to which the device is suitable is reserved, the invention being defined and limited only by the scope of the appended claims.

What is claimed is:

1. In a transfer mechanism; an oscillating member for transferring a workpiece from one station to another; tongs pivotally mounted between the ends thereof about a common center and carried by the oscillating member; and means associated with the oscillating member movable therewith and relatively thereto, that enter the space between the tail portions of the tongs and separate the tongs.

2. In a transfer mechanism, plural working tools; an oscillating member movable about a center between said tools; tongs carried thereby for transferring a workpiece from one tool to another tool; and means independently and positively movable in opposite directions upon the oscillating member for separating the tongs.

3. In a mechanism for transferring a workpiece from one station to another; an oscillating member; a reciprocating member slidable on the oscillating member; tongs pivotally mounted on the reciprocating member about a common center; and means on the reciprocating member movable into and out of engagement with the tongs for separating the gripping ends thereof.

4. In a transfer mechanism; an oscillating member for transferring a workpiece from one station to another; tongs carried thereby; reciprocating means carried by the oscillating member for separating the tongs; and a rock member journaled in a fixed part and operatively connected with said reciprocating means for imparting positive movement thereto in opposite directions.

5. In a transfer mechanism; a rockable head member; a carrying member thereon; tongs movably mounted upon the carrying member; means for moving the carrying member relatively to the head member and thereby actuating the head member; and independent means for actuating the tongs.

6. In a transfer mechanism; a rockable head member; a reciprocating carrying member thereon; tongs movably mounted upon the carrying member; means to reciprocate the carrying member relatively to the head member and thereby actuating the head member; and independent means for actuating the tongs.

7. In a transfer mechanism; a rockable head member; a carrying member slidable thereon; tongs movably mounted upon the carrying member; crank actuated means for moving the carrying member relatively to the head member; and independent means for actuating the tongs.

8. In a transfer mechanism; a head member; a carrying member thereon; tongs pivotally mounted upon the carrying member; means for moving the carrying member relatively to the head member and whereby the latter is caused to oscillate; a cam member movable with the carrying member; independent means for moving the cam member relatively to the carrying member and thereby separating said tongs.

9. In a transfer mechanism; a rockable head member; a carrying member on and having a reciprocatory movement in respect to the head member; tongs pivotally mounted upon the carrying member; a cam member on and having a reciprocatory movement in respect to the head member; and independent means for positively moving the cam member into and out of the path of the tongs and whereby the tongs will be positively separated by the cam member when traveling in one direction.

10. In a transfer mechanism; a rockable head member; a carrying member on and having a reciprocatory movement in respect to the head member; tongs pivotally mounted upon the carrying member; a cam member on and having a reciprocatory movement in respect to the head member; and independent means for positively moving the cam member into and out of the path of the tongs and whereby the tongs will be separated when the cam member is moved in one direction; and other means for closing the tongs when the cam member is moved in the other direction.

11. In a transfer mechanism; a rockable head member; a carrying member on and having a reciprocatory movement in respect to the head member; tongs pivotally mounted upon the carrying member; a cam member on and having a reciprocatory movement in respect to the head member and independent means for positively moving the cam member into and out of the path of the tongs and whereby the tongs will be separated when the cam member is moved in one direction; and spring means acting directly on the tongs for closing the tongs when the cam member is moved in the other direction.

12. In a transfer mechanism; a rockable head member; a reciprocating carrying member thereon; tongs movable mounted upon the carrying member; a rock member for moving the carrying member relatively to the head member and actuating the head member; adjustable stop members for limiting the movement of the rock member; and independent means for actuating the tongs.

13. In a transfer mechanism; a rockable head member; a carrying member thereon; tongs movably mounted upon the carrying member; means for moving the carrying member relatively to the head member; independent means for actuating the tongs; and means to variably time the means for actuating the tongs relative to the means for varying the movement of the carrying member.

14. In a transfer mechanism; a head member; a carrying member thereon; tongs movably mounted upon the carrying member that cross each other at the point of support; means for moving the carrying member relatively to the head member; and independent means for actuating the tongs that is projected between the tail ends thereof and thereby separates the gripping ends thereof.

15. In a transfer mechanism; a rockable head member; a carrying member thereon; tongs mov-

ably mounted upon the carrying member; means for moving the carrying member relatively to the head member and to actuate the head member; independent cam means for separating the tongs; and stop means to predetermine the relative position of the tongs and thereby predetermining the relative position of the tongs with respect to the carrying member.

16. In a transfer mechanism; a rockable head member; a reciprocating member thereon and operably associated therewith; tongs movably mounted upon the reciprocating member; a gear actuated rock member; an operative connection between the reciprocating member and rock member whereby movement is transmitted to the latter from the former and also to the head member to actuate it; and means for actuating the tongs.

17. In combination with a header, upsetting machine or the like; a die block; plural dies in the die block; a bracket secured to the header adjacent to the die block; and oscillating mechanism on the bracket for transferring a workpiece from one die to another die, consisting in part of a head member and a slide mounted to reciprocate on the head member; tongs carried by the slide; tong separating means on the slide movable therewith and thereon for separating the tongs; and means operatively mounted in said bracket and having connection with the tong separating means for actuating the same, said oscillating mechanism, tongs and tong separating means being mounted on the bracket and assembled with the header, upsetting machine or the like, as a unit.

18. In a transfer mechanism; a movable part; a pair of tong jaws mounted to rotate about a common center upon the movable part, said tong jaws crossing each other at said common center and having parts upon opposite sides thereof; a second movable part; and means upon the second movable part for engaging and moving between that portion of the tong jaws upon one side of said common center, and thereby separating the gripping ends of said tong jaws.

19. In mechanism for transferring a workpiece from one station to another station, comprising in part plural plates adjustable relatively to each other; an oscillating member on one of the plates; a carrier member movable on the oscillating member; pivotally mounted tongs on the carrier member; and an independently actuated tong separating member on the carrying member.

20. In mechanism of the character described; a fixed plate; a carrier member movable opposite the face thereof; pivotally mounted tong jaws on the carrier member, each having a part thereon which moves adjacent to the fixed plate and holds the tong jaws against movement parallel with the axis of their pivot mountings.

21. In a transfer mechanism; a carrier member; a stud carried thereby; a pair of tong jaws pivotally connected therewith, each tong jaw having a hub thereon, the hub of one tong jaw being journaled on said stud and providing a journal on which the hub of the other tong jaw is journaled.

22. In a transfer mechanism; a carrier member; a stud carried thereby; a pair of tong jaws pivotally connected therewith, each tong jaw having a hub thereon, the hub of one tong jaw being journaled on said stud and providing a journal on which the hub of the other tong jaw is journaled; a resilient member centered about said stud, the opposite ends of which apply pressure to the tail ends of the tong jaws to move the gripping ends thereof toward each other.

23. In a transfer mechanism; a carrier member; a stud carried thereby; a pair of tong jaws pivotally connected therewith, each tong jaw having a hub thereon, the hub of one tong jaw being journaled on said stud and providing a journal on which the hub of the other tong jaw is journaled; a member fixed in the carrier member between the tong jaws; and an adjustable member on each tong jaw which abuts against the fixed member and whereby one position of the tong jaws relative to the carrier member may be determined.

24. In mechanism having fabricating dies, a transfer mechanism for carrying a workpiece from one die to another die, comprising in part a carrier member, a pair of tong jaws pivotally mounted thereon, an independent member projected between the tail portions of the tong jaws, whereby the gripping ends of the tong jaws are moved away from each other; a plate spaced from the tong jaws, and means to prevent rocking of the tong jaws upon their mounting as a workpiece is being projected therebetween from a fabricating die, comprising a member connected with the tong jaws that travels in contact with said plate during the movement of the carrier member.

25. In mechanism for transferring a workpiece from one station to another, having pivotally mounted gripping jaws, with tail portions upon one side of the pivot mounting, to hold a workpiece during transit; and positive means projected into the open space between the said tail portions that limits the extent of the opening of the gripping jaws while beween the tail portions.

26. In mechanism for transferring a workpiece from one station to another, having gripping jaws to hold a workpiece during transit; and means for moving the gripping jaws as a unit at variable speeds during the travel thereof from one station to another.

27. In a work transfer mechanism; a reciprocable first member; a second member journaled on a stationary part and adapted to be rocked by the first member when the first member is reciprocated; a pair of tongs pivotally mounted on the first member; a third member on the second member and slidable relatively to the first member to move the gripping ends of the tong jaws, both said first member and third member being mounted and movable substantially parallel with each other and adjacent to the head portion of the second member; and means upon a fixed part separately actuated to impart movement to the third member.

28. In a work transfer mechanism; a reciprocable first member; a second member journaled on a stationary part and adapted to be rocked by the first member when the first member is reciprocated; a pair of tongs pivotally mounted on the first member; a third member on the second member and slidable relative to the first member to separate the gripping ends of the tong jaws, both said first member and third member being mounted and movable substantially parallel with each other and adjacent to the head portion of the second member; and means upon a fixed part separately actuated to impart movement to the third member, said means comprising in part a rock shaft journaled out of the path of movement of the said mem-

bers; and means for imparting movement to the rock shaft.

29. In a work transfer mechanism in accordance with claim 28 having companion rock arms, one being fixed on the rock shaft, an adjustable connection between the rock arms, and a cam for actuating the rock arms.

30. In a work transfer mechanism in accordance with claim 28, having means for varying the extent of movement of the rock shaft and whereby the extent of the movement of the third member is determined.

31. In a work transfer mechanism in accordance with claim 28, having means for varying the extent of the relative timing of the rock shaft, and whereby the extent and timing of the third member in relation to the tong jaws is determined.

32. In a work transfer mechanism; a bracket; a plate adjustably mounted thereon; a bearing plate adjustably mounted upon said plate; a head member journaled in the bearing plate; a slide block fixed to the head member; a transfer slide movable in the slide block; a shaft having a crank thereon which is connected with the transfer slide, and whereby a reciprocatory movement is imparted to the transfer slide and an oscillating movement to the head member; tong jaws pivotally mounted on the transfer slide, the tail ends of the tong jaws being spaced from each other and the opposite ends adapted to grip a workpiece; a cam slide movably mounted in the head member having a cam portion, positioned to be moved into and out of the open space between the tail ends of the tong jaws; and independently operated means positioned laterally to the head member for moving the cam slide and projecting the cam thereon in between the tail ends of the tong jaws.

33. In a work transfer mechanism; a reciprocable first member; a second member journaled on a stationary part and adapted to be rocked thereby when the first member is reciprocated; means to impart reciprocatory movement to the first member, comprising in part a shaft, a crank on the shaft, a pinion on the shaft, a segment gear, the teeth of which mesh into those of the pinion; a rock member for moving the segment gear about its axis; and an adjustable connection between the rock member and segment gear, whereby the extent of movement of the latter may be varied and thereby vary the length of reciprocation of the first member; tong jaws mounted upon the first member; and a third member on the second member and slidable relatively thereto to separate the gripping ends of the tong jaws.

34. In a work transfer mechanism; a lengthwise reciprocable first member; a second member journaled on a stationary part at a point between the ends of the first member and adapted to be rocked thereby when the first member is reciprocated; tong jaws pivoted on and carried by the first member; a third member movably mounted on the second member and slidable relatively to the first member to move the gripping ends of said tong jaws away from each other; adjustable means to limit the extent of movement of the gripping ends of the tong jaws; and means on a fixed part and separately actuated to impart a sliding movement to the third member.

35. In a work transfer mechanism; a lengthwise reciprocable first member; means to reciprocate the first member; adjustable means to vary the extent of such reciprocation; a rockable second member journaled on a stationary part at a point between the ends of the first member and adapted to be rocked thereby when the first member is reciprocated; tong jaws pivoted on and carried by the first member; a third member on the second member and slidable relatively to the first member to move the gripping ends of the tong jaws away from each other; adjustable means to limit the extent of movement of the gripping ends of the tong jaws; means on a fixed part and separately actuated to impart a sliding movement to the third member; and adjustable means acting on the third member to vary the extent of movement of the third member.

36. In a work transfer mechanism; a cooperating pair of tong jaws operable about a common center and adapted to engage a workpiece between the opposing ends thereof at one side of the common center, each tong jaw having a portion extending beyond the common center to its other side; spring means to bias the tong jaws relatively to each other in one direction; and means movable toward and away from said common center, to be disposed between the extended portions of the tong jaws, to move the tong jaws relatively to each other in the other direction.

37. In a work transfer mechanism, in accordance with claim 36, having means to pivot the tong jaws and the jaw moving means for simultaneous rocking movement, and common means to reciprocate the tong jaws and to simultaneously rock the tong jaws and the tong jaw moving means about said pivot means.

38. In mechanism for transferring a workpiece from one station to another; a carrying member; movably mounted gripping jaws thereon to hold a workpiece during transit; positive means engaging the jaws to open the same; and resilient means for closing the jaws, the extent of closing and timing thereof being controlled in part by said positive means.

39. In a transfer mechanism; a carrying member; tongs mounted upon the carrying member; yielding means for closing the tongs; and tong engaging means, movably mounted on the carrying members for opening the tongs, that in part control the closing of the tongs under the tension of the yielding means.

40. In a transfer mechanism; a carrying member; tongs pivotally mounted upon the carrying member; a cam member on the carrying member; means for moving the cam member on the carrying member into and out of the path of the tongs and whereby the tongs will be separated when the cam member is moved in one direction; and other means for closing the tongs when the cam member is moved in the opposite direction, the closing of the tongs being in part controlled by the cam member.

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