

Dec. 12, 1939.

Z. P. CANDEE

2,183,287

HORIZONTAL REDRAW PRESS

Filed April 24, 1937

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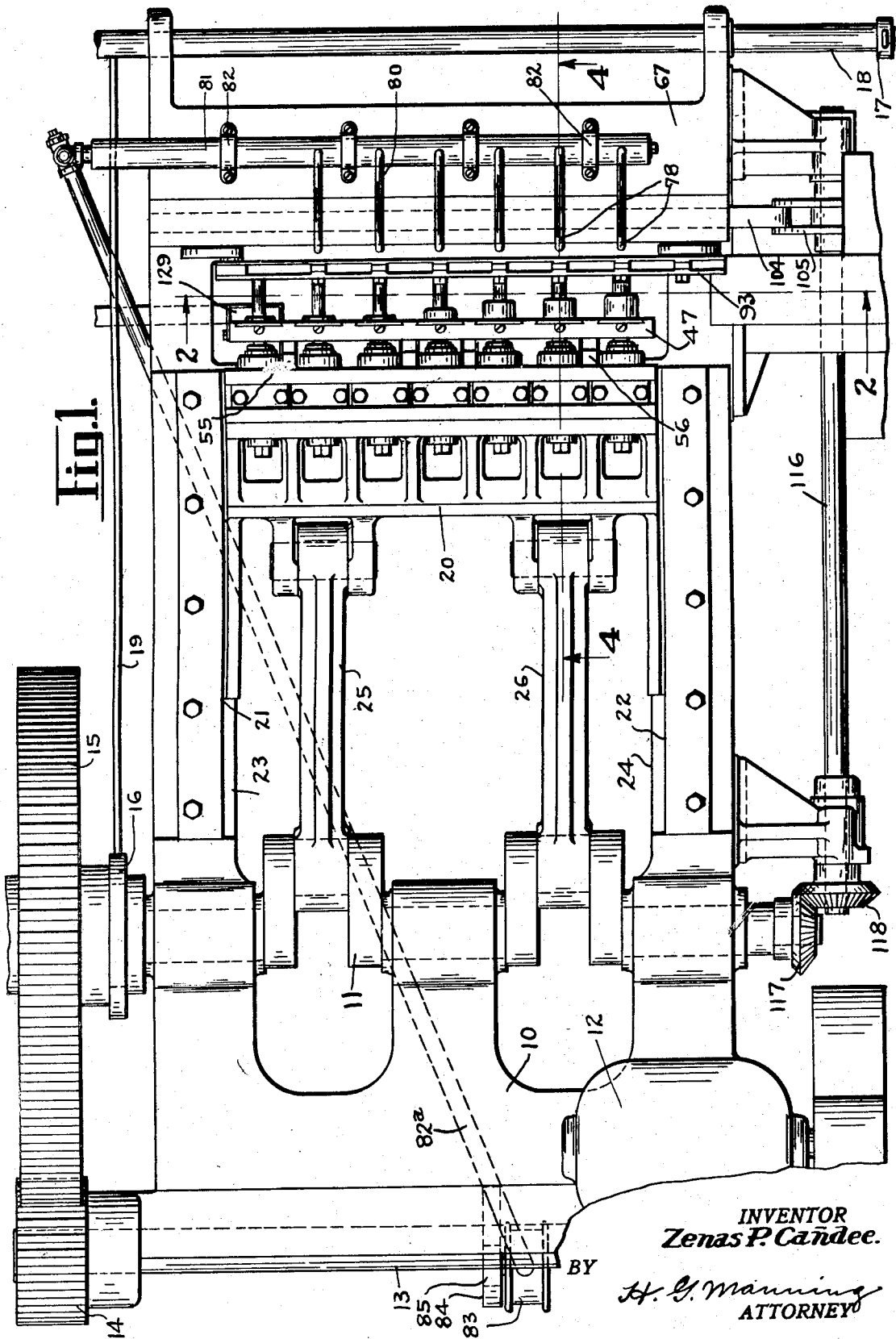


Fig. 1.

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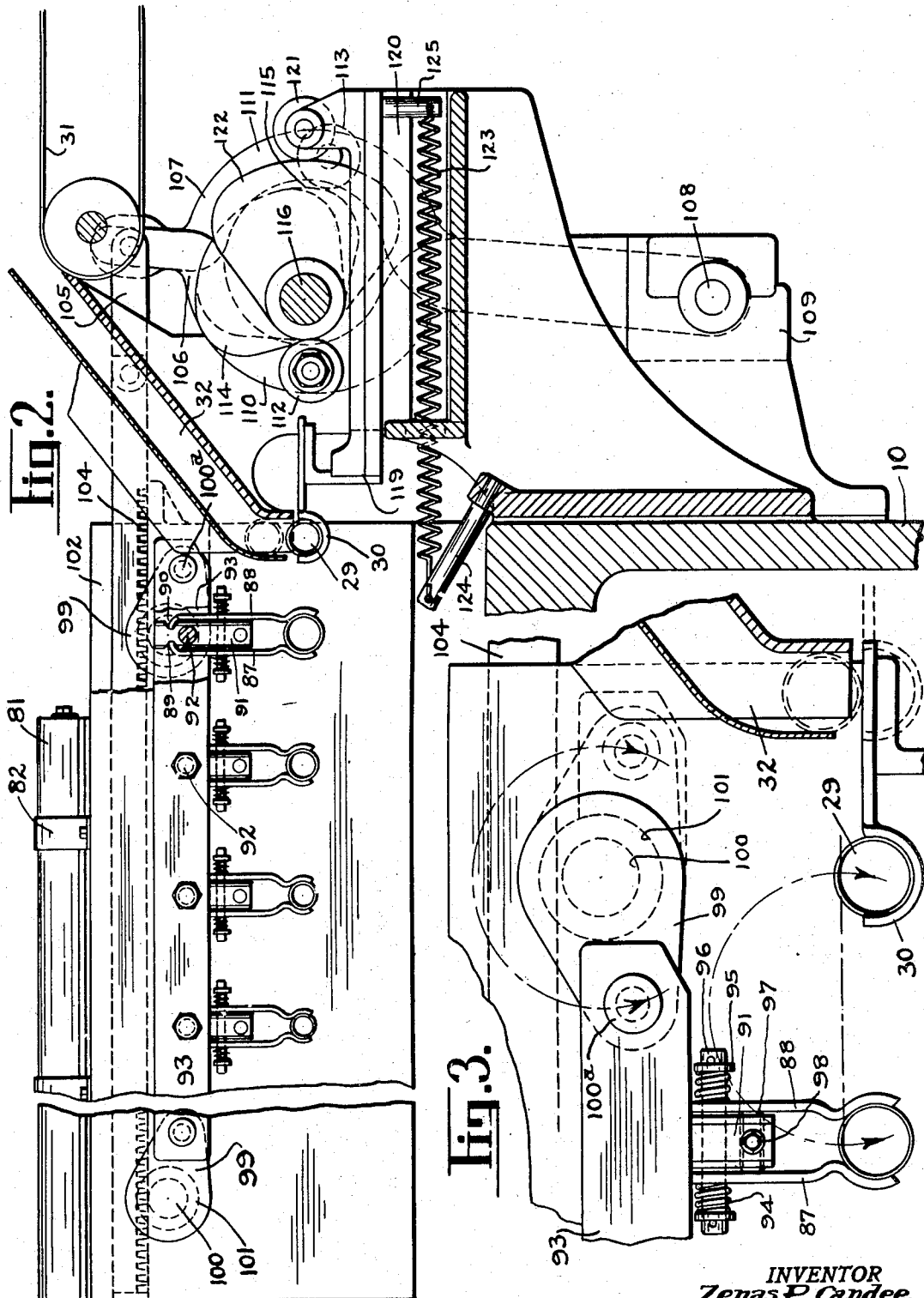
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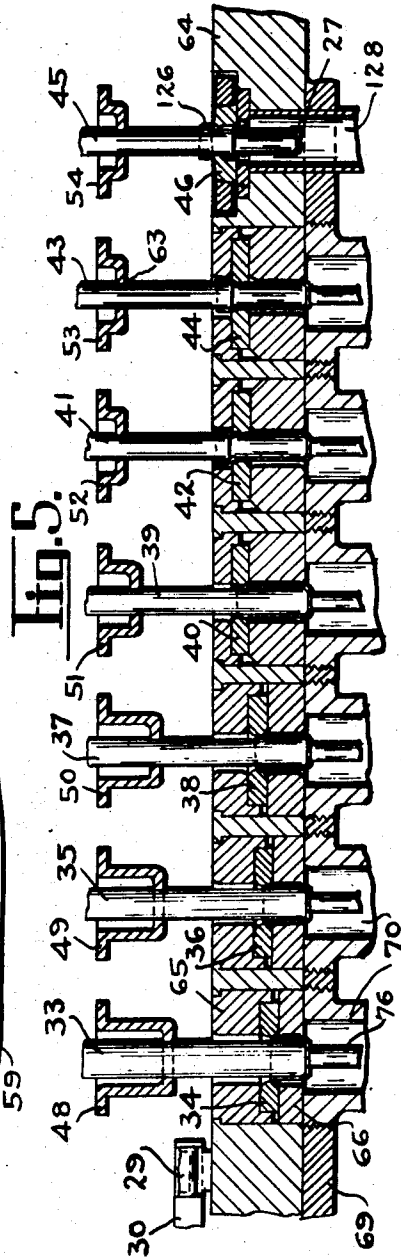
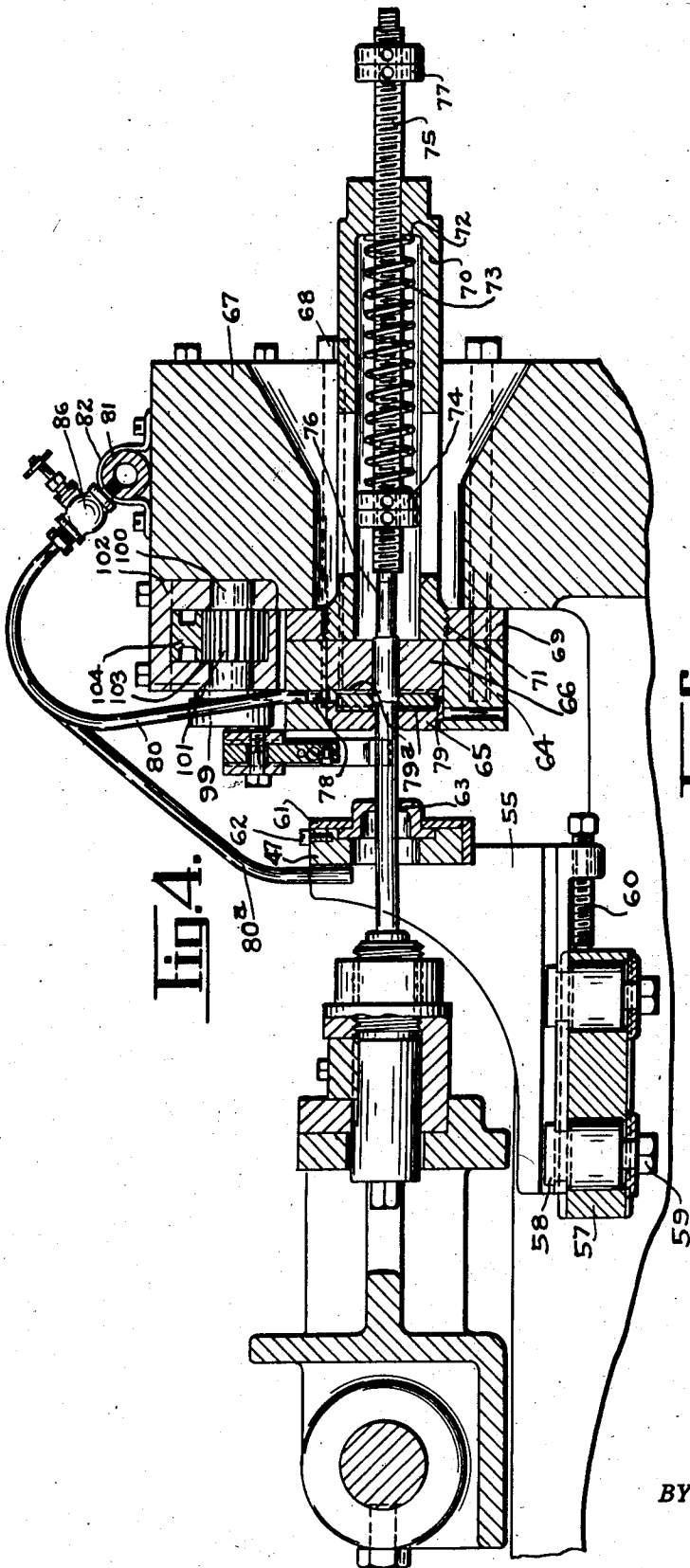
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4 Sheets-Sheet 3



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Fig. 6.

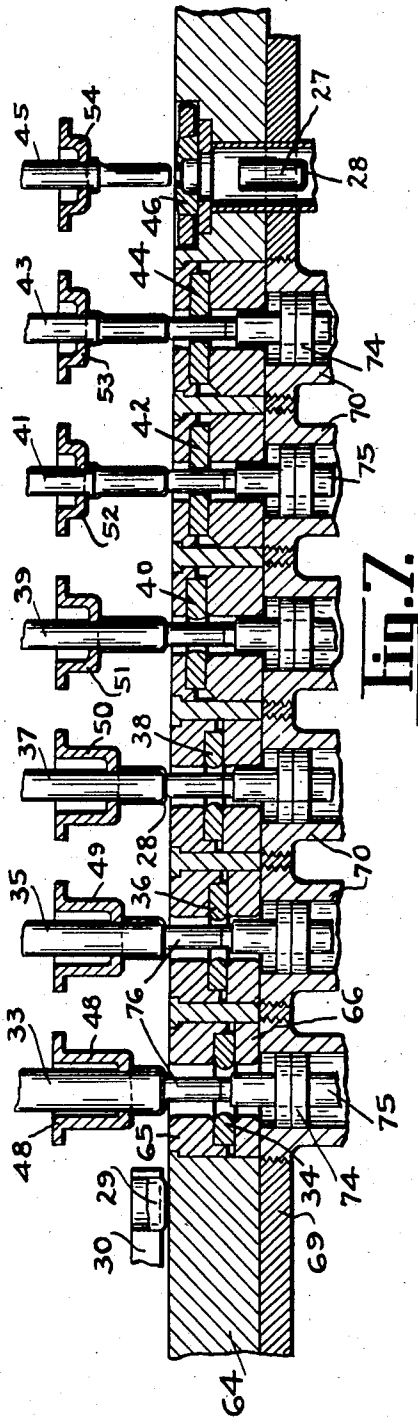
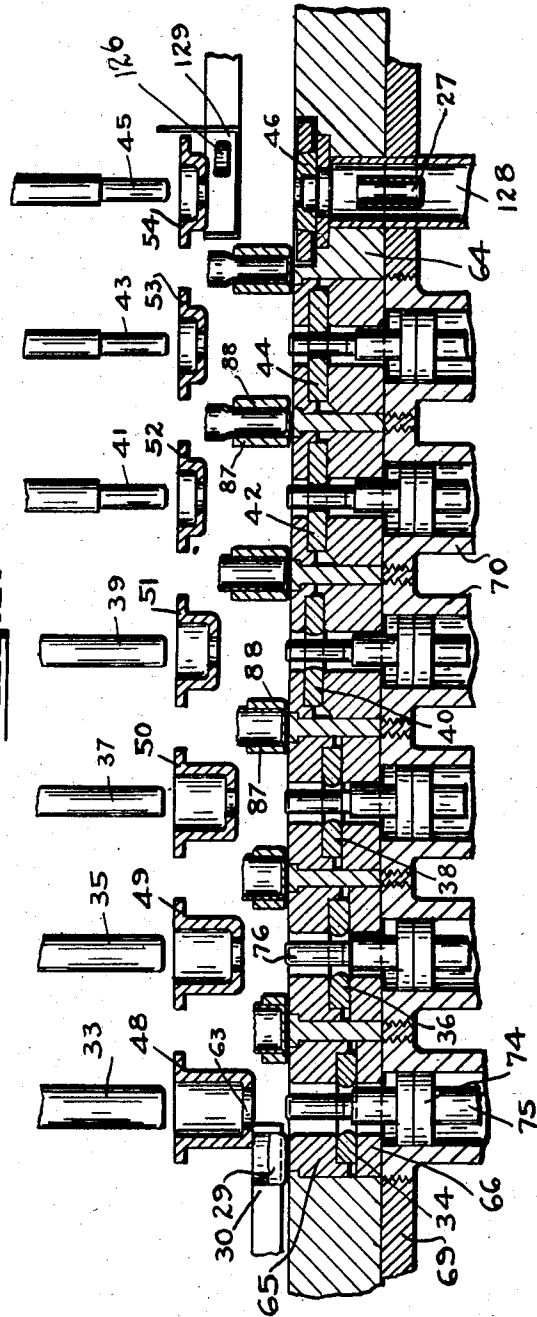


Fig. 7.



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HORIZONTAL REDRAW PRESS

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Application April 24, 1937, Serial No. 138,702

14 Claims. (Cl. 113—38)

This invention relates to shell drawing presses, and more particularly to a horizontal multiple punch and die redraw press in which the cooperating punches and dies act in sequence to form a completed product from a preformed cup blank—the product from one punch and die set being automatically transferred to the next succeeding set.

One object of this invention is to provide a multiple redraw press of the above nature in which the products drawn at each station will be pushed out of the dies and stripped from the punches in such a manner that their closed ends will be in horizontal alinement to facilitate the transfer of such products from station to station.

A further object is to provide a redraw press of the above nature in which successively longer products are produced at the various stations by staggered dies disposed on successively higher levels.

Another object is to provide a redraw press of the above nature in which the shells drawn at each station are stripped at predetermined positions by spring means without the necessity of changing the stroke of successive punches or requiring adjustable power-driven knock-out rods.

Another object is to provide a redraw press of the above nature in which all of the punches are carried by a single reciprocating gate member.

Still another object is to provide a redraw press of the above nature having an improved form of rocking product-transfer mechanism whereby the products may be automatically and efficiently transferred from one station to another.

A further object is to provide a redraw press of the above nature having improved lubricating means whereby each of the individual dies and punches will be efficiently lubricated.

A still further object is to provide a redraw press of the above nature which will be relatively simple in construction, inexpensive to manufacture, easy to manipulate, compact, and very efficient and durable in use.

With these and other objects in view there has been illustrated in the accompanying drawings one form in which the invention may be conveniently embodied in practice.

In the drawings:

Fig. 1 is a top plan view of a redraw press embodying the features of this invention.

Fig. 2 is an enlarged view partly in section taken on the line 2—2 of Fig. 1, and showing the feed chute and transfer mechanism.

Fig. 3 is a fragmentary enlarged view of some

of the parts shown in Fig. 2 in another position in the operation of the press, the transfer crank arms being shown at slightly over 180 degrees from the positions of Fig. 2.

Fig. 4 is an enlarged sectional view taken on the line 4—4 of Fig. 1 through a punch, die, stripper and knock-out rod, and associated parts.

Figs. 5, 6 and 7 are horizontal sectional views taken through the die block, and showing the products as they appear during the successive operations of drawing, stripping and transferring.

Referring now to the drawings in which like reference characters indicate like parts throughout the several views, the numeral 10 indicates a main frame in which a crank shaft 11 is journaled. The crank shaft 11 is adapted to be rotated by means of a motor 12 having a driving connection with a cross-shaft 13 having secured thereto a pinion 14 which is in mesh with a large gear 15 rotatably mounted upon one end of the crank shaft 11. The press is controlled by a suitable clutch 16 adapted to be actuated by a handle arm 17 on a shaft 18 connected by a link 19 to the clutch 16, the swinging of said handle arm 17 serving to operably connect the gear 15 with the crank shaft 11. A common gate 20 is connected to all of the punches, and is arranged to reciprocate on and between horizontal ways 21 and 22 provided on the opposite side portions 23 and 24 of the frame 10, respectively. Suitable connecting rods or links 25 and 26 are provided to operably connect the gate 20 with the crank shaft 11.

Stations

The particular press illustrated is provided with seven sets of cooperating punches and dies, and the final product formed thereby is a shell 27 having a closed end 28, as shown at the right of Figs. 6 and 7. The blank or cup 29 from which the shell 27 is produced is shown at the left of Figs. 6 and 7. As herein shown, the cups 29 are delivered into the press by a carrier 30, into which said cups are fed by an endless belt 31 and an inclined chute 32. The carrier 30 is shown in Figs. 2 and 6 in position to receive a cup 29 from the chute 32—this position constituting the first station. Spaced from the chute 32 is a first draw punch 33 with its cooperating die 34 which constitutes the second station. Similarly, a second cooperating draw punch 35 and die 36 constitute the third station, a third cooperating draw punch 37 and die 38 the fourth station, a fourth cooperating punch 39 and die 40 the fifth station, a first draw and shoulder punch 41 and die 42 constitute the sixth station, a second draw and

shoulder punch 43 and die 44 constitute the seventh station, and a cut-off punch 45 and die 46 the eighth station.

Strippers

As best shown in Fig. 1, provision is made of a stripper bar 47 having cup-shaped stripper collars 48, 49, 50, 51, 52, 53 and 54 secured thereto, said bar 47 being carried between vertical standards 55 and 56 (Fig. 4), which are adjustably connected to the frame 10 by a horizontal cross-bar 57 (see Fig. 4). The standards 55 and 56 are attached to the bar 57 by means of T-clamps 58 and bolts 59 after the stripper bar 47 has first been adjusted by means of an adjusting screw 60. Each of the stripper collars 48-54, inclusive, is held in place on the stripper bar 47 by a series of plates 61 and screws 62, and said collars are provided with central openings 63 concentric with the respective punches which are adapted to pass therethrough.

The dies 34, 36, 38, 40, 42 and 44 are mounted in laterally spaced-apart relation in a horizontal die carrying block 64, said dies being held between pairs of clamping and spacing blocks 65 and 66, each pair being of the proper thickness to locate the respective dies in the desired predetermined staggered positions.

The die block 64 extends across the press and is suitably secured to an end portion 67 of the frame 10, as by bolts 68. Each pair of clamping and spacing blocks 65 and 66 is held in place by a single plate 69 which also extends across the press and is clamped between the die block 64 and the end frame 67 by the bolts 68.

The plate 69 is provided with a plurality of elongated spring enclosing and knock-out rod guiding sleeves 70 (see Fig. 4), each having a threaded portion 71 at one end screwed into a suitable threaded opening in the plate 69 in such a manner as to be concentric with each of the die openings. Each of the sleeves 70 is provided with an internal shoulder 72 against which one end of a compression spring 73 abuts,—the other end of the spring 73 acting against a tapped collar 74 adjustable upon a threaded knock-out rod 75 which extends through the guiding sleeve 70.

Each of the knock-out rods 75 is provided with a forward reduced extension 76 adapted to engage the closed end 28 of the product being ejected, and said rods are constantly urged in a direction to force said products out of the respective dies. Each of the rods 75 has an adjustable collar 77 screwed upon the rear protruding end thereof, whereby the forward movement of the knock-out rod 75 will be limited by the abutment of the collar 77 against the rear end of the guiding sleeve 70.

Lubricant supply mechanism

The die block 64 is provided with a plurality of oil passages 78 leading from its upper surface into the spaces occupied by each of the dies, and the clamping and spacing blocks 65 and 66 are so spaced apart as to provide an annular lubricant groove 79 about the respective die. Suitable radial grooves 79a are also formed in the blocks 65 and 66 to conduct the lubricant from the annular space 79 to both faces of the dies.

In order to distribute lubricant simultaneously to all of the dies, a plurality of supply tubes 80 are provided to connect each oil passage 78 with a common lubricant manifold pipe 81, herein shown secured upon the end frame 67 by straps 82. The manifold pipe 81 is supplied with lubri-

cant through a pipe connection 82a from a lubricant pump 83 driven by pulleys 84 and a belt 85 from the cross shaft 13. A plurality of stop cocks 86 (see Fig. 4) may be employed, if desired, to control the flow of lubricant to the various supply tubes 80. Lubricant may also be supplied from the same manifold pipe 81, if desired, to the horizontal punches by a plurality of pipes 80a, as shown in Fig. 4.

Transfer mechanism

The product drawn at each station of the press will preferably be transferred to the next adjacent station by means of the mechanism shown in Figs. 2 and 3. This mechanism includes a series of pairs of yieldable shell-gripping fingers 87 and 88 shaped at their lower ends to fit the curvature of the periphery of the products at the respective stations. The fingers 87 and 88 are provided with inturned upper edges which are fulcrumed in grooves 89 and 90 formed in a depending block 91 secured, as by a bolt 92, to an elongated cross-bar 93. The fingers 87 and 88 are urged toward each other by a pair of opposed compression coil springs 94, each of which is pressed against the respective fingers 87 and 88 and washers 95 secured on rods 96 extending through the fingers 87 and 88 and the block 91. Each pair of shell-gripping fingers 87 and 88 are limited in their closing movements by a pair of adjustable screws 97 which are threadingly engaged in the blocks 91 and adapted to be clamped in their adjusted position by a cap screw 98 arranged at right-angles thereto.

Each end of the transfer cross-bar 93 is connected to the outer ends of a pair of crank arms 99 located at the ends of said bar and mounted upon the end of shafts 100 carrying spur gears 101. The shafts 100 (see Figs. 2 and 4) are journaled in a cross-bar 102 secured to the end frame 67, the spur gears 101 being disposed in a slot 103 in said cross-bar. A reciprocating rack 104 is slidably mounted in the slot 103 with its teeth in mesh with the teeth of the two gears 101, whereby the reciprocation of said rack 104 will intermittently rock the gears 101 and swing the bar 93, and the sets of fingers 87 and 88 carried thereby, in a semi-circular path from the position shown in Fig. 2 to that shown in Fig. 3, said bar 93 always remaining parallel to the die blocks 64. By means of this construction, it will be seen that the products will be transferred simultaneously from station to station.

The rack 104 is actuated to slide in the slot 103 of the cross-bar 102 by means of a link 105 connecting it at one end to a swingable arm herein illustrated as comprising a pair of superposed hook-shaped members 106 and 107 (see Fig. 2) secured together at both ends, and having their lower ends pivoted at 108 to a bracket 109 mounted on the frame 10. The members 106 and 107 are outwardly bowed as at 110 and 111 respectively, and each bowed portion is provided with a cam roller 112 and 113. A rotating plate cam 114 acts against the roller 112 to swing the members 106 and 107 back and forth, thus causing the rack 104 to rock the gears 101 for causing the transfer fingers 87 and 88 and the products held thereby to move to the left through an arc indicated by the dotted line in Fig. 3. A similar rotating plate cam 115 acts against the roller 113 to return the respective parts to the right to their original positions. The cams 114 and 115 are adapted to actuate the transfer fingers 87 and 88 rapidly between successive strokes of the punch-

es, as will be hereinafter more fully described. The cams 114 and 115 are secured to a side shaft 116 which extends toward the crank shaft 11, said shaft 116 being operably connected to said crank shaft by means of bevel gears 117 and 118, one of which is connected to each of said shafts 116 and 11, respectively.

The reciprocating feed carrier 30 is carried by a slide 119 which is guided upon a bracket 120 secured to the frame 10. The slide 119 serves to transfer the blanks successively from the first station (the feed chute 30), as shown in Fig. 2, to the second station shown in Fig. 3, into position to be operated on by the punch 33 to force it through the first die 34. The slide 119 is provided with a cam roller 121 which is urged into engagement with a rotating cam 122 by a spring 123. One end of the spring 123 is fastened to a post 124 secured to the bracket 120, while the other end of said spring is connected to a lug 125 depending from said bracket 120. The cam 122 is rigidly secured upon the side shaft 116 and is adapted to move the feed carrier 30 back and forth in synchronism with the movements of the transfer fingers 87 and 88 as described above.

One advantage of the present invention is that while the punches all have the same stroke, the length of the products produced by each set of punches and dies may increase from station to station.

A further advantage is that due to the staggered or stepped arrangement of the dies, all of the blanks, when ejected from the various dies, will have their closed ends 28 disposed approximately in alignment at the same instant as determined by the cams. All of the pairs of transfer fingers 87 and 88 may thus be located on the same level for moving the products simultaneously from station to station,—a far simpler construction than would be the case if the transfer fingers were located on various levels.

A further advantage of this novel arrangement is that the transfer fingers will be permitted to carry stepped shell blanks as well as shell blanks of uniform diameter,—the blanks being clamped by said fingers while they are being stripped from the punches just after the enlarged portions of the blanks have passed above the line of clamping.

A still further advantage of the present invention is that by arranging the punches horizontally with the transfer mechanism above them, any mutilated or torn shells, clippings, etc., will be allowed to fall free of the tools, and thus avoid the possibility of injury thereto.

In order to insure that such conditions will result, the dies are made relatively thin in thickness and must be disposed in the die block in a laterally staggered or stepped relation, as shown in Figs. 5, 6 and 7. Moreover, in order to insure proper stripping of the products from the punches, the stripper collars 48—54, inclusive, must be of different heights. It will be understood that in all instances, the distance from the face of each stripper collar (48—54 inclusive) to the open end of the product at the end of each drawing operation (Fig. 5) will be substantially the same so that after the drawn products have been ejected and stripped, the closed ends of all of the products will lie in alignment and be spaced from the die block 64, as clearly shown in Fig. 6. The fingers 87 and 88 will thus be permitted to grip the shells at each station and move them along the face of the die block in unison. It will also be understood that by staggering or stepping the dies as herein disclosed, it is possible to employ

a multiple punch arrangement without requiring individual adjustment of the stroke of each punch and the use of the usual complicated mechanism for this purpose. As clearly shown in Fig. 6, the open ends of each of said shells after ejection will be held against the respective stripper collars by the springs 73 until all of the punches have been withdrawn from said shells.

Fig. 5 illustrates the disposition of the punches and products at the end of the punching stroke. As therein shown, the feed carrier 30 is at that time holding a new cup 29 ready for the next operation of the press, and the cut-off punch 45 and die 46 has sheared the shoulder portion 126 from the product 27 of the last draw, by the shoulder punch 43 and die 44. The completed shell 27 is herein shown as being forced out through a tubular chute 128, and the cut-off shoulder portion 126 as falling into a scrap chute 129 (see Figs. 1 and 7).

Fig. 6 illustrates the disposition of the punches and products while the former are being retracted by the gate 20, and the latter are being ejected by the knock-out rods 75. It will be noted that the closed ends 28 of all of the products are in alignment and lie adjacent the face of the die bar 64 in position to be grasped by the six pairs of transfer fingers 87 and 88.

Fig. 7 illustrates the punches in full retracted position, at which time the transfer fingers 87 and 88 will have completed half of their movement of transferring the products from station to station. The carrier 30 is also shown with its movement toward the second station position to present another cup 29 to the first punch 33 partly completed.

Operation

In operation, a series of blanks or cups 29 will be placed successively upon the belt 31, from which they will gravitate down the chute 32 and fall upon the carrier 30. While the punches remain in retracted position, the crank shaft 11 and the cams 122 and 114 will operate upon the feed slide 119 and the reciprocating rack 104 to move the carrier 30 to the left, as viewed in Fig. 2; and at the same time all of the pairs of transfer fingers 87 and 88 will move downwardly over the products at the respective stations. The cam 114 causes the pairs of fingers 87 and 88 to move downwardly into spring-snap engagement with the products after they are stripped from the punches,—the products being securely held in such positions by the springs 73. The cam 115 will then act upon the rack 104 to swing the fingers in a semi-circular arc with the products carried thereby, into alignment with the next succeeding station, depositing said products at said station before the next stroke of the punches commences. As will be noted by reference to Fig. 3, the path followed by the products while they are being transferred in this manner from one station to another will be somewhat more than 180 degrees, thus obtaining the advantage of a substantial vertical movement of the fingers 87 and 88 at each station, whereby the fingers in one instance may spring-snap over the products, and in the other, spring-snap away from the same. If desired, the action of the mechanism may be so timed that the gripping transfer fingers will not be withdrawn from the shells until a short time after the punches have entered said shells on the next succeeding punching stroke, but before any movement of the shells has taken place.

When the next stroke of the punches takes place, the products will be engaged thereby and forced through the dies the desired amount, and the knock-out rods 75 will be pressed inwardly against the springs 73, compressing the same, as shown in Fig. 5. The closed ends 28 of each product will be carried by each punch a sufficient amount through and beyond the respective die to completely draw the product, the staggering of the dies permitting the products to be drawn to the lengths desired. During the retraction of the punches, the knock-out rods 75 will follow the shells out of the dies horizontally under influence of the springs 73, forcing the products backwardly until said knock-out rods reach the limit of their movement as controlled by the stop collars 77 abutting the outer ends of the sleeves 70. The open ends of the products will then engage the respective stripper collars 48—54, as shown in Fig. 6. Continued movement of the gate 20 will strip all of the punches from said products, so that they may be transferred to the next stations, as shown in Fig. 7.

A further advantage of the present invention is that by maintaining the punches at a low temperature, the shells are cooled between the successive draws, thus reducing the amount of hardening which will take place during the passage of the shells through the machine.

While the present invention has been described as a horizontal redraw press, it will be understood that it is within the scope of the invention to employ the same construction herein disclosed in a redraw press arranged in a vertical or any other desired position.

While there has been disclosed in this specification one form in which the invention may be embodied, it is to be understood that this form is shown for the purpose of illustration only, and that the invention is not to be limited to the specific disclosure, but may be modified and embodied in various other forms without departing from its spirit. In short, the invention includes all of the modifications and embodiments coming within the scope of the following claims.

Having thus fully described the invention, what is claimed as new, and for which it is desired to secure Letters Patent, is:

1. In a multiple redraw press, a die block having a plurality of staggered dies, the front faces of said dies being offset inwardly at varying distances from the front face of said die block, a plurality of strippers staggered in the same relation as said dies, means to eject the products drawn in each die, a plurality of pairs of cooperating fingers adapted to simultaneously grip the products ejected from each die, means to cause said fingers to grip said products during the stripping action, and means to move all of said pairs of fingers in a semi-circular arc in a single plane from a position in front of one die to a position in front of the next succeeding die.

2. In a multiple redraw press, a plurality of spaced-apart parallel punches arranged in a row, a gate for reciprocating all of said punches in unison, a die carrying block, a plurality of dies in alignment with the axes of said punches, a plurality of pairs of spring-pressed cooperating fingers to resiliently grip the products formed in each die, and a cross-bar carrying all of said pairs of fingers and swingable in an arc of substantially 180 degrees from a position in front of one die to a position in front of the next succeeding die, crank arms pivotally connected

to said cross-bar, and pinion and rack means for rocking said crank arm to swing said cross-bar.

3. In a multiple redraw press, a plurality of sets of cooperating punches and dies adapted to operate successively upon tubular blanks fed to said press, a cross-bar carrying a plurality of pairs of gripping jaws arranged to swing parallel to itself in an arc of substantially 180 degrees to transfer said blanks from station to station, spaced-apart rotatably-mounted pinions, a pair of crank arms pivotally connected to said cross-bar and pinions, a rack for driving said pinions, and rack operated means for swinging said bar back and forth between successive drawing operations.

4. In a multiple redraw press, a plurality of sets of cooperating punches and dies, a cross-bar, means to swing said cross-bar parallel to itself in an arc of substantially 180 degrees, a plurality of spaced blocks mounted on said bar at right-angles thereto, a plurality of inwardly spring-pressed gripping fingers connected to said blocks for resiliently holding the products drawn in said dies while transferring them from station to station.

5. In a multiple redraw press, a plurality of sets of cooperating punches and dies, a cross-bar, means to swing said cross-bar parallel to itself in an arc of substantially 180 degrees, a plurality of spaced blocks mounted on said cross-bar and extending at right-angles thereto, a plurality of spring holding cross-rods, one carried by each block, spaced from said bar, a plurality of pairs of gripping fingers straddling said rods, and a spring carried by each cross-rod to engage each finger, said fingers being fulcrumed in the opposite sides of said blocks for resiliently holding the products drawn in said dies while transferring them from station to station.

6. In a multiple redraw press, a plurality of sets of cooperating punches and dies, a cross-bar, means to swing said cross-bar parallel to itself in an arc of substantially 180 degrees, a plurality of spaced blocks mounted on said cross-bar and extending at right-angles thereto, a plurality of inwardly spring-pressed gripping fingers connected to said blocks for resiliently holding the products drawn in said dies while transferring them from station to station, and adjustable stop means mounted in said blocks for limiting the inward movements of said fingers.

7. In a multiple redraw press, a plurality of sets of cooperating punches and dies, a cross-bar, means to swing said cross-bar parallel to itself in an arc of substantially 180 degrees, a plurality of spaced blocks mounted on said cross-bar and extending at right-angles thereto, a plurality of inwardly spring-pressed gripping fingers connected to said blocks for resiliently holding the products drawn in said dies while transferring them from station to station, adjustable stop means mounted in said blocks for limiting the inward movements of said fingers, and set screws in said blocks for locking said stop means in adjusted positions.

8. In a multiple redraw press, a plurality of sets of cooperating punches and dies, a cross-bar, means to swing said cross-bar parallel to itself in an arc of substantially 180 degrees, a plurality of spaced blocks mounted on said cross-bar and extending at right-angles thereto, a plurality of inwardly spring-pressed gripping fingers connected to said blocks for resiliently holding the products drawn in said dies while transferring them from station to station, and

adjustable stop screws mounted in said blocks for limiting the inward movements of said fingers.

9. In a multiple punch press, a plurality of horizontally reciprocable punches, dies cooperating with said punches, the faces of said dies being vertically disposed and each having an opening to be entered by said punches, a die block, die clamping blocks in said die block and each arranged to provide an annular space about the die clamped thereby, a radial groove provided in each die clamping block in connection with the annular space about the die and leading therefrom to the punch entering the opening in the die, and means to force lubricant into the spaces about said dies to lubricate the dies and punches.

10. In a multiple punch press, a plurality of horizontally reciprocable punches, dies cooperating with said punches, the faces of said dies being vertically disposed and each having an opening to be entered by said punches, a die block, die clamping blocks in said die block and each arranged to provide an annular space about the die clamped thereby, a radial groove provided in each of said die clamping blocks in connection with the annular space about the die and leading therefrom to the punch entering the opening in the die, and means to force lubricant into the spaces about said dies to lubricate the dies and punches, an outlet opening formed in said die block below said dies to permit the lubricant to exhaust downwardly from the space about the same and flush dirt and chips therefrom.

11. In a multiple redraw press, a plurality of cooperating punches and dies arranged in a row disposed in a horizontal plane across the press and adapted to operate in succession upon tubular blanks fed to said press, a transverse die-carrying block, means clamped to said block for holding the individual dies offset at varying distances from the face of said block comprising a plurality of pairs of spaced die clamping blocks embracing said dies and providing an annular space about each of said dies, a common plate member for supporting all of said pairs of die clamping blocks, each of said die clamping blocks having a radial groove in its face abutting the die held therebetween in connection with the aforesaid annular space about said die, and means to supply lubricant to the annular spaces between said die clamping blocks and to the radial grooves in the face of said dies.

12. In a multiple redraw press, a plurality of cooperating punches and dies arranged in a row disposed in a horizontal plane across the press and adapted to operate in succession upon tubular blanks fed to said press, a transverse die-carrying block, means clamped to said block for holding the individual dies offset at varying distances from the face of said block comprising a plurality of pairs of spaced die clamping blocks embracing said dies and providing an annular space about each of said dies, a common plate member for supporting all of said pairs of die clamping blocks, each of said die clamping blocks having a radial groove in its face abutting the die held therebetween in connection with the aforesaid annular space about said die, a manifold connected to a source of lubricant supply under pressure, and a plurality of tubes connected to said manifold for directing lubricant individually to the annular spaces about and the radial grooves in the face of each of said dies.

13. In a multiple redraw press, a reciprocating gate, a plurality of punches mounted in said gate and arranged in a row, the free ends of said punches being substantially in the same plane, a plurality of dies for cooperating with said punches and arranged in a row, the operating faces of said dies being stepped in respect to said plane, a plurality of strippers, one for each of said corresponding punches and dies, said strippers being stepped in substantially the same relationship as the operating faces of the corresponding dies, so that the distance between the operating face of each die and its corresponding stripper will be substantially uniform.

14. In a multiple redraw press, a plurality of reciprocating punches having the same strokes arranged in a row, the free ends of said punches being substantially in the same plane, a plurality of dies for cooperating with said punches and arranged in a row, the operating faces of said dies being stepped in respect to said plane, a plurality of strippers, one for each of said corresponding punches and dies, said strippers being stepped in substantially the same relationship as the operating faces of the corresponding dies, so that the distance between the operating face of each die and its corresponding stripper will be substantially uniform.

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