Aug. 10, 1937. C. C. GROTNES 2,089,475

MACHINE FOR FORMING BEADS IN METALLIC DRUMS

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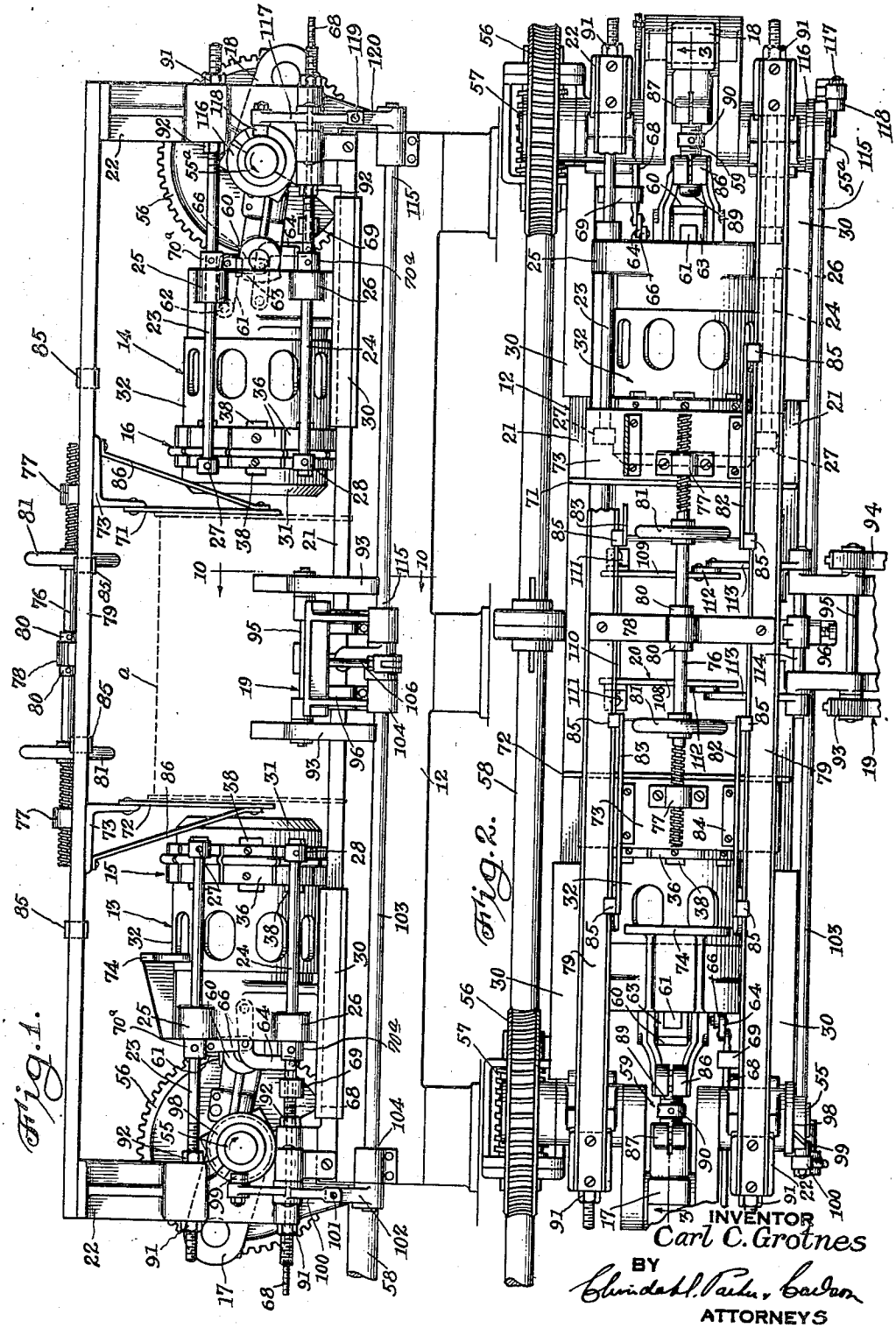


Fig. 1.

Fig. 2.

INVENTOR
Carl C. Grotnes
BY
Glindahl, Parker & Carlson
ATTORNEYS

Aug. 10, 1937. C. C. GROTNES 2,089,475

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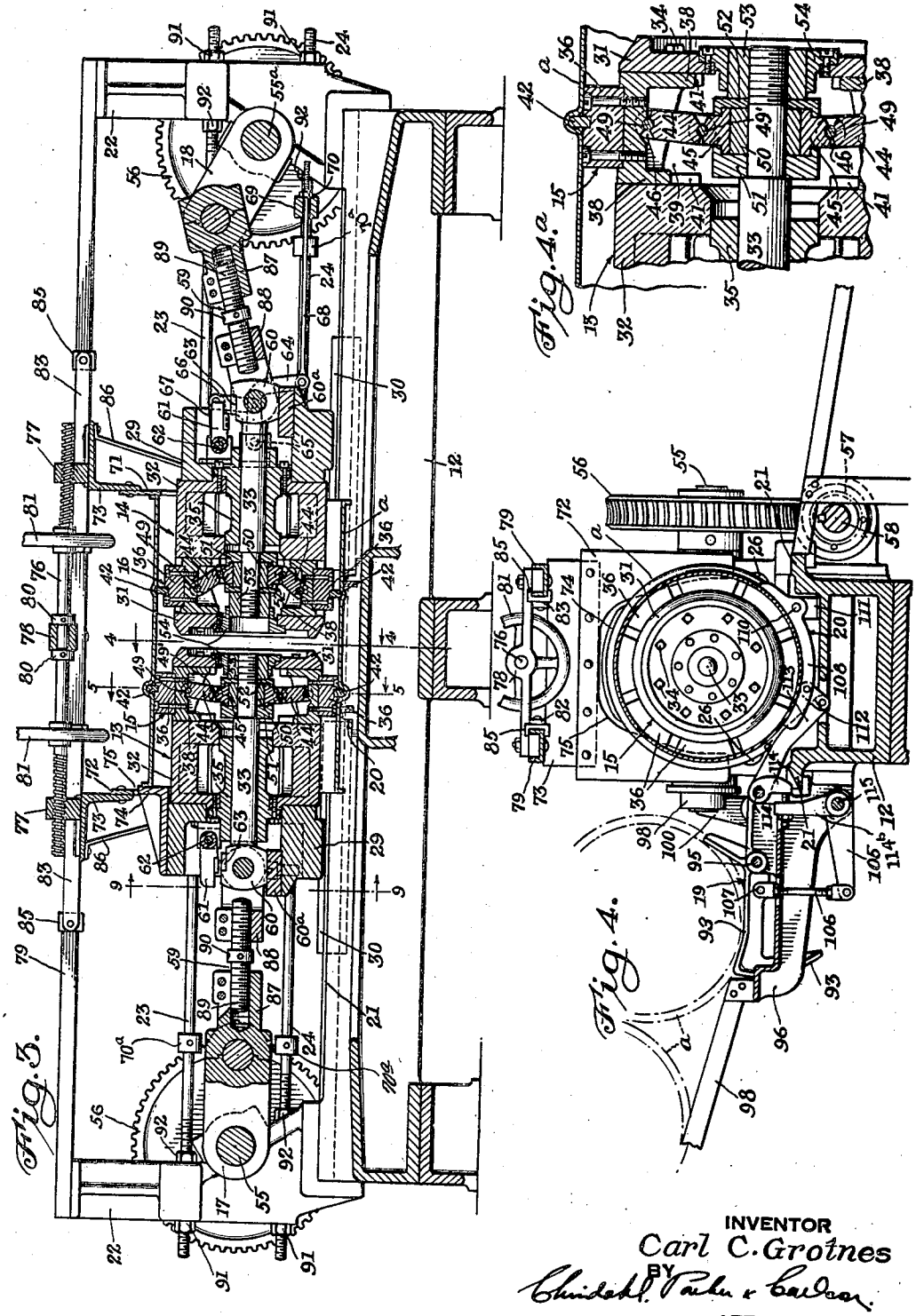


Fig. 3.

Fig. 4.

Fig. 4a.

INVENTOR
Carl C. Grotnes
BY
Chisholm, Parker & Carlson
ATTORNEYS

Aug. 10, 1937. C. C. GROTNES 2,089,475

MACHINE FOR FORMING BEADS IN METALLIC DRUMS

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Fig. 5.

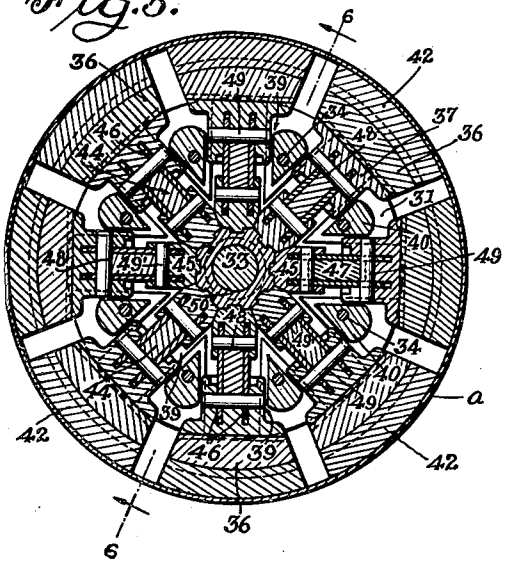


Fig. 6.

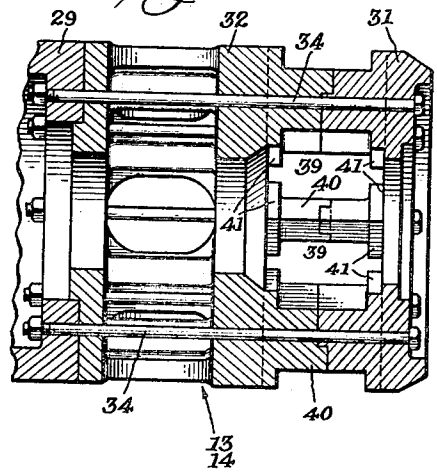


Fig. 7.

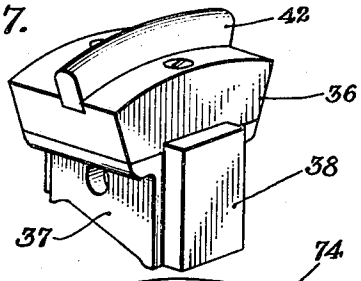


Fig. 8.

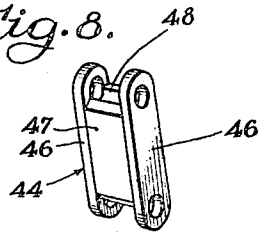
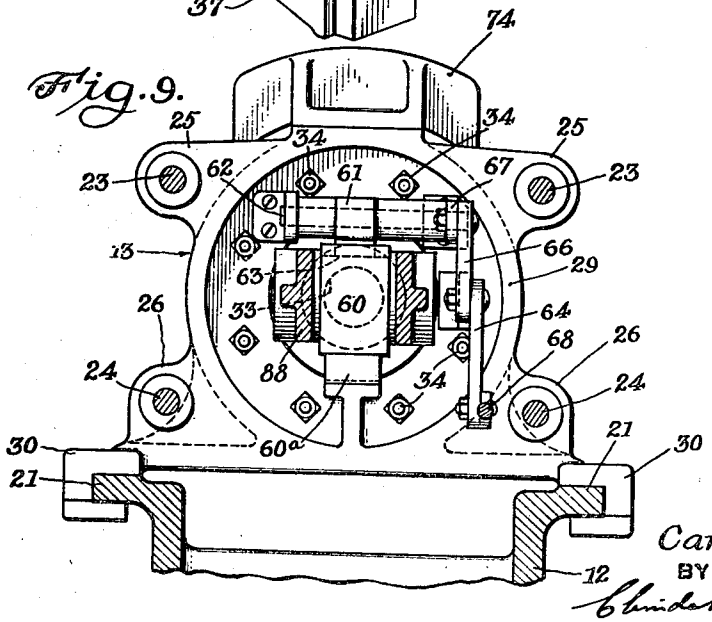


Fig. 9.



INVENTOR
Carl C. Grotnes
BY
Whitehead, Parker, Carlson
ATTORNEYS

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Fig. 10.

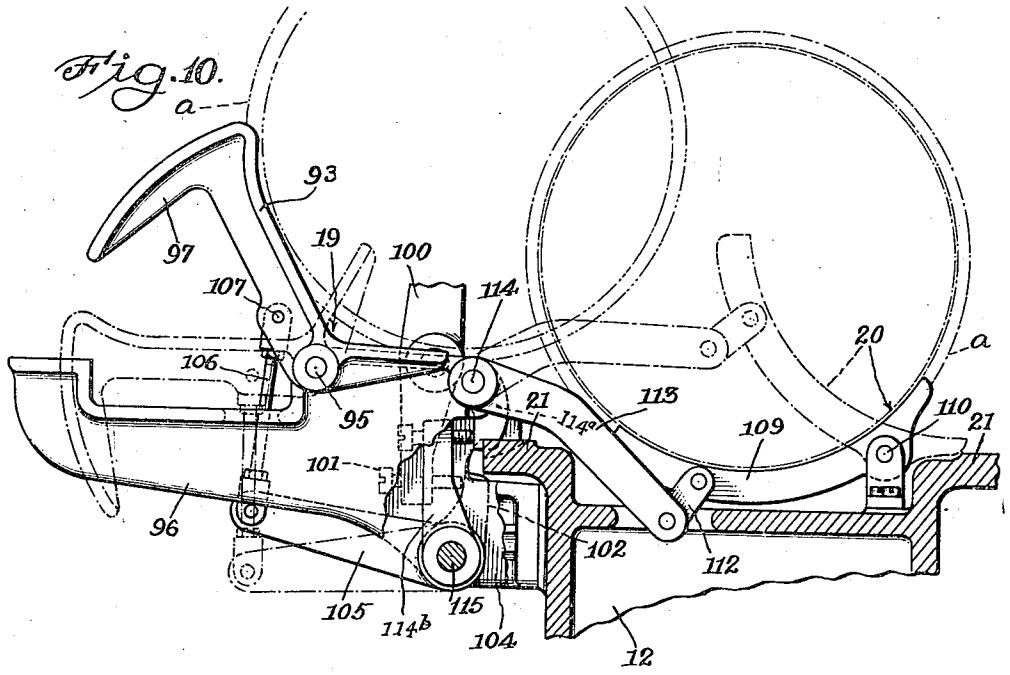
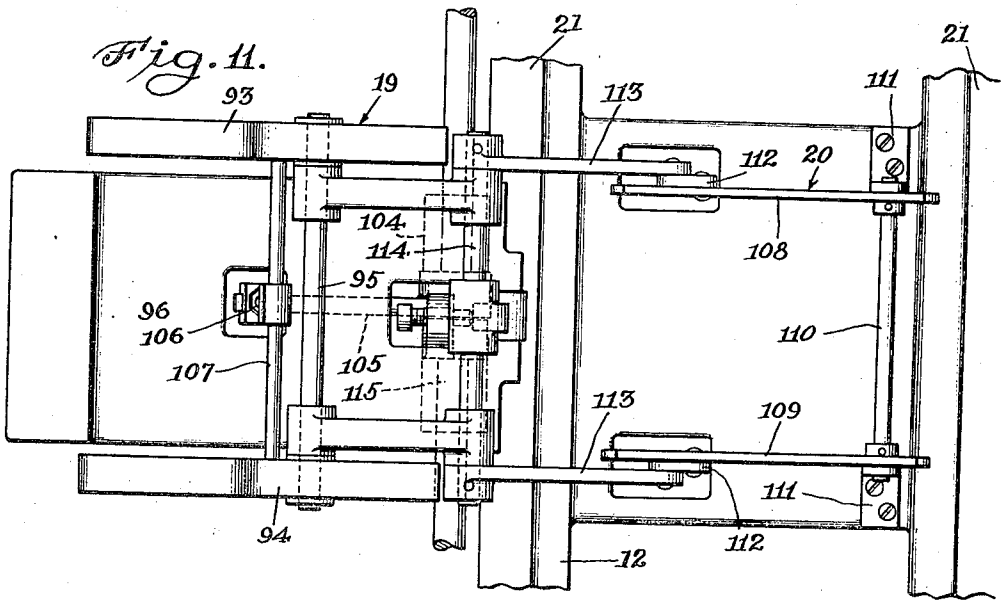


Fig. 11.



INVENTOR
Carl C. Grotnes
BY
Whittlesey, Parker & Carlson.
ATTORNEYS

Patented Aug. 10, 1937 2,089,475

UNITED STATES PATENT OFFICE

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MACHINE FOR FORMING BEADS IN METALLIC DRUMS

Carl C. Grotnes, Park Ridge, Ill.

Application May 1, 1933, Serial No. 668,744

30 Claims. (Cl. 153—73)

The invention pertains to the art of forming beads in the opposite ends of a cylindrical shell or drum such as is used in the manufacture of metal barrels; and the primary object of the invention is to provide an improved machine for forming such beads, to the end that the operation may be performed more effectually and at a lower cost than heretofore.

A further object is to provide for the rapid formation of beads in metallic drums by means of expanding dies operating in a novel manner to permit of a high rate of production.

Still another object is to provide for the formation of two spaced annular beads in a drum during a single operating cycle of the machine, in a manner such as to compensate for the stretching of the metal lengthwise of the drum incident to the bead-forming operation.

Other objects are to provide for the easy and convenient adjustment of the machine to render it possible to operate upon drums of different lengths, or to vary the positions in the drum at which the beads are formed; and to provide for the automatic delivery to the machine of the drums to be operated upon and for the automatic discharge of such drums from the machine.

In the accompanying drawings I have shown a machine of preferred construction whereby the foregoing objects of the invention, together with other and ancillary advantages, are attained.

Figure 1 of the drawings is a side elevational view of the improved machine.

Fig. 2 is a top plan view of the machine, the same being partially fragmentary in character.

Fig. 3 is a longitudinal sectional view through the machine, substantially centrally thereof, the view being taken approximately in the plane of line 3—3 of Fig. 2.

Fig. 4 is a fragmentary transverse sectional view, taken approximately in the plane of line 4—4 of Fig. 3.

Fig. 4a is an enlarged fragmentary sectional view of one of the dies as shown in Fig. 3.

Fig. 5 is a transverse sectional view illustrating the construction of one of the dies, the view being taken approximately in the plane of line 5—5 of Fig. 3 but on a somewhat larger scale.

Fig. 6 is a fragmentary sectional view taken in the plane of line 6—6 of Fig. 5.

Fig. 7 is a perspective view of one of the die members.

Fig. 8 is a perspective view of one of a plurality of toggle links employed in actuating the dies.

Fig. 9 is a transverse sectional view on an enlarged scale taken approximately in the plane of line 9—9 of Fig. 3.

Fig. 10 is a fragmentary sectional view taken in the plane of line 10—10 of Fig. 1 and illustrating the means for delivering and discharging the work.

Fig. 11 is a fragmentary plan view of the delivery and discharge mechanism shown in Fig. 10.

In the preferred embodiment of the invention, two inner expanding dies only are employed. These are moved simultaneously from an initial position in opposed spaced relation into operative positions within the opposite ends of a metallic drum and then expanded so as to press the metal of the drum outwardly at points spaced from the ends of the drum, to form two spaced annular beads in the drum. In this operation, one of the dies is moved somewhat in advance of the other die, and as an incident to such advance movement, the drum is properly positioned for the ensuing bead-forming operation. Also, one of the dies is expanded in advance of the other die, so that the two beads, while produced in the same cycle of operation, are formed one in advance of the other in order to compensate for the stretching of the metal incident to the formation of the beads. After the beads are formed, the dies are withdrawn and the beaded drum is discharged from the machine and another drum is moved into operative position.

Referring to Figs. 1 to 4 of the drawings, the machine as constructed for the purpose of carrying out my invention, comprises generally an elongated horizontal bed 12 on which the two heads 13 and 14 are slidably mounted in spaced relation. These heads carry two composite circular expanding dies 15 and 16 and are arranged for movement on the bed into the opposite ends of a drum *a* positioned above the bed, through the operation of an actuating mechanism including two power driven rotary actuating elements in the form of cranks 17 and 18. The drum *a* to be operated upon is delivered into position between the two heads 13 and 14 by means of a rocking receiving cradle 19, and upon the completion of the operation the drum is delivered from the machine by a discharge cradle 20, which also serves to support the drum while it is being operated upon. These cradles are likewise power actuated in proper timed relation to the movements of the heads so that the machine is capable of operating entirely automatically on a series of drums as the same are presented thereto in rapid succession.

The bed 12, which may be of any suitable

character, provides horizontal ways 21 (Fig. 9) on which the heads 13 and 14 may slide into and out of operative positions within the ends of the drum *a*. Stationarily mounted at each end of the bed are two laterally spaced standards 22, and in each of these standards in vertically spaced relation is a pair of horizontal rods 23 and 24. The rods extend through ears 25 and 26 on each side of the head and are provided at their inner ends with stop collars 27 and 28 which serve to limit the extent of inward movement of each head.

Referring now to Figs. 5, 6 and 7, each of the heads 13 and 14 comprises an annular casting or base member 29 having its lower portion constructed to provide gibs 30 (Fig. 9) engaging with the ways 21 in the bed. On the inner side of this base member 29 is mounted a die-supporting and guiding structure constructed for convenience in two sections. As shown in Fig. 6, it comprises a nose-piece 31, also in the form of an annular casting, and an annular peripherally apertured supporting and spacing block 32. The several parts 29, 31 and 32 are rigidly secured together so as to provide a central or axial opening therethrough for the reception of a reciprocatory die-actuating member in the form of a rod 33. For thus securing the parts of the head structure together, tie rods 34 are employed; and within the member 29 is secured a bearing sleeve 35 for the rod 33.

The dies 15 and 16 are each composed of a plurality of die members 36 arranged in the supporting structure of the head in a circular series and supported and guided for radial movements. For this purpose, each of the die members 36 is mounted on a hollow block 37 (Figs. 5 and 7) to opposite sides of which are secured guide plates 38; and the members 31 and 32 of the die-supporting structure are constructed to provide a series of radial openings 39 divided circumferentially by generally wedge-shaped ribs 40, which ribs form the ends of the openings 39. The sides of the openings are formed with guideways 41 (Fig. 6) for receiving the guide plates 38. As shown in Figs. 5 and 7, the outer faces of the die members 36 are arcuate in form and the members are grooved to receive deep-forming ribs 42.

For the purpose of actuating each of the dies, I preferably employ a toggle mechanism which is interposed between the actuating rod 33 and the blocks 37 carrying the die members 36. This toggle mechanism comprises a circular series of toggle links generally designated 44 (Fig. 8). These are pivotally connected at their outer ends to the blocks 37 and at their inner ends to a circular series of pivot blocks 45 mounted on the rod 33, the arrangement being such that in the reciprocation of the rod 33, the die blocks are moved positively both inwardly and outwardly.

In the present instance, each toggle link 44 comprises a pair of links 46 apertured at their opposite ends, and a central pillow block 47 interposed between the links 46 and having its opposite ends constructed to provide socket 48 for engagement by pivot pins 49 and 49′ respectively mounted in the die head 37 and in the blocks 45. By this construction, the pillow blocks 47 of the links withstand the major outward thrust on the die members, but the pivotal connection afforded by the links 46 and pins 49 and 49′ insures the positive contracting movements of the die members.

The pivot blocks 45 are in the present instance, mounted on the rod 33 through the medium of a sleeve 50 (Fig. 3) grooved to receive the blocks which are clamped between two flanged disks 51 and 52, the former engaging with a shoulder on the rod 33, and the latter engaged by a nut 53 on the end of the rod. The nut 53 is cylindrical in form and is slidable in a bushing 54 mounted centrally of the nose section 31 of the head.

The rotary actuating elements or cranks 17 and 18 are mounted (Figs. 1 and 2) on transverse shafts 55 and 55ª which are journalled in the standards 22 at the ends of the bed and equipped at their rear ends with worm wheels 56 meshing with worms 57 on a power driven shaft 58. Each of the cranks in turn is connected to one of the actuating rods 33 by means of a lengthwise adjustable pitman 59, the rod 33 having for this purpose a head 60 to which the inner bifurcated end of the pitman is pivotally connected. The head 60 has a flat underside engaging with a flat plate 60*a* so as to hold the rod 33 against rotation.

For the sake of simplicity in construction, the rotary actuating elements or cranks 17 and 18 are utilized both for moving the heads 13 and 14 into and out of their operative positions within the drum and for operating the dies while the heads remain stationary. For this purpose, I employ a disengageable lost-motion connection between the rod 33 and the head, such that the head is moved into its operative position within the drum as determined by the collars 27 and 28 on the rods 23 and 24. Coincidentally with the stoppage of the head by said collars, the connection becomes disengaged to permit movement of the rod 33 independently of the head for the purpose of operating the dies.

The construction provided comprises in each instance a latch device consisting of a latch member 61 fixed on a transverse rod 62 suitably journalled within the annular base member 29 of the head (see Fig. 9) and a latch plate 63 fixed on the head 60 of the rod 33. When the head is in its withdrawn position as shown in Fig. 1, said latch device is engaged to establish a positive driving connection between the head 13 and the rod 33.

When the head is moved into its operative position within the drum, the latch device is disengaged to permit the continued movement of the rod independently of the head structure, by an automatic stop means. This latter means (see Figs. 3 and 9) comprises in the present embodiment, a lever 64 pivoted at 65 (Fig. 3) on an axis fixed with respect to the head, and connected between its end by means of a link 66 with an arm 67 rigid with the rod 62 on the end opposite the latch member 61. The lever 64 is angular in form and the end opposite its pivot 65 is connected to one end of a rod 68 slidable through a stop lug 69 and having on its free end a stop nut 70. The lug 69 is fast upon one of the lower stationary rods 24, and the arrangement is such that in the travel of the head into its operative position within the drum, the rod 68 slides through the lug 69. Substantially coincident with the engagement by the head with the stop collars 27 and 28 which limit the extent of inward travel of the head, the stop nut 70 engages the stationary lug 69 and as a result, the lever 64 is operated to swing the latch member 61 upwardly out of engagement with the latch plate 63, thus disconnecting the latch device. In order that the rod 68 may swing with the lever 64 the aperture in the stop lug 69 is made of relatively large diameter.

During the movement of the dies into the drum, the toggle links 44 occupy an inclined position as shown in the case of the head 14 in Fig. 3. When however, the latch device becomes disen-

gaged so that the actuating rod 33 is moved independently of the head, the toggle links are moved toward a true vertical position and the dies thrust outwardly with great force. Upon the return stroke of the rod 33, independent movement thereof is permitted until the plate 51 engages with the end of the bearing member 35 rigid with the head. Thus, the die blocks are first positively drawn inwardly in a contracting operation, whereupon the continued movement of the rod carries the head outwardly into its initial position. Such movement is preferably positively limited by stop collars 70a on the rods 23 and 24 (Fig. 3). This makes it certain that the latch member 61 will be permitted to drop by gravity into its operative position relative to the latch plate 63, by insuring the necessary relative movement between the actuator 33 and the head.

While in each operating cycle both dies are moved into position and actuated to form their respective beads, I have found that it is advantageous that the dies be actuated differentially, that is to say, in a different timed relation, for the reason that in each bead-forming operation the metal of the drum becomes stretched and if both beads are formed simultaneously, difficulty is experienced in maintaining the drum in its proper position. Accordingly, as illustrated in Fig. 3, the cranks 17 and 18 are so positioned with respect to each other, that the die actuated by the crank 17 performs its bead-forming operation in advance of the die 16, and preferably the die 15 is being contracted while the die 16 is being expanded.

To position the drum which is to be operated upon and to maintain it in position during the withdrawal of the die from the drum, I provide two plates 71 and 72 each mounted on the depending flange of an angular bracket 73 and cut away centrally so as to provide depending arms straddling the respective heads 13 and 14 so as not to interfere with the movements of the latter. Preferably, the advance movement of one of the heads (herein the head 13) is utilized to position the drum preliminary to each bead-forming cycle. Accordingly, the plate 71 of the positioning means is constructed so as to form a stop adapted for engagement by the end of the drum opposite the head 13, as shown clearly in Fig. 3, and on the head 13 is mounted a shoe 74 adapted to engage with the opposite end of the drum in the final portion of the movement of the head 13 into the drum. To permit of movement of the shoe 74 through the plate 72 as shown in Fig. 3, an opening 75 is formed in the plate.

Upon the completion of the bead-forming operation and the consequent withdrawal of the heads from the drum, the latter is held against axial movement in either direction by the ends of the drum engaging with the depending side portions of the two positioning plates 71 and 72.

In order that the plates 71 and 72 may be variously spaced to accommodate drums of different lengths, the angle brackets 73 supporting the plate are secured to the reversely threaded opposite ends of a shaft 76, through the medium of nuts 77 rigid with the brackets. Said shaft (Figs. 1, 2 and 3) is journalled in a cross bar 78 which in turn is supported at its opposite ends by spaced longitudinal bars 79 having their ends mounted upon the end standards 22. The shaft is held against axial movement by collars 80 thereon, and for convenience in operating the shaft, a pair of handwheels 81 are fixed thereto.

It will be observed that by this construction both positioning plates 71 and 72 may be adjusted simultaneously for movement in opposite directions, thereby maintaining a proper relation between the plates and the center of the drum to be operated upon irrespective of the length of the latter.

To guide the brackets 73 and to hold them firmly in their adjusted positions, each of the brackets is provided at opposite ends with two bars 82 and 83 (Figs. 2 and 4). Each bar has an anchoring flange 84 by which it is secured to the upper surface of the bracket near one end thereof, and at its opposite ends carries U-shaped guide clips 85 slidably engaging with the inner edges of the bars 79. Also, brace rods 86 (Fig. 1) are interposed between the lower ends of the straddling side portions of the plates and the outer edges of the brackets 73.

It will be seen that the extent of movement of the heads 13 and 14 may be varied by adjusting the pitmans 59, which for this purpose are each made in two sections 87 and 88 (Fig. 3), connected by a rod 89 having its opposite ends oppositely threaded for engaging internally threaded portions of the sections 87 and 88. To facilitate the adjustment, the rod 89 is provided with a central collar 90.

Inasmuch as the adjustment of the range of travel of the heads 13 and 14 also requires an adjustment of the positions of the stop collars 27 and 28, and of the stops 69 of the latch disengaging mechanisms, means is provided for effecting such adjustments. This is accomplished in the present instance merely by adjusting the rods 23 and 24 in the standards 22. With this in view, the rods 23 and 24 are fastened in their respective standards 22 between nuts 91 and 92 threaded on each of the rods and engaging opposite sides of the standard. It will be observed that inasmuch as the stop collars 27 and 28 and the stop collar 69 for each latch engaging mechanism are all mounted on the rods 23 and 24, it is only necessary to adjust the positions of the latter. This is especially advantageous in that once the proper relation between the collars 27, 28, and the collars 69 is established for any given size of work, this relationship is maintained for all other adjustments to compensate for variations in the length of travel of the heads.

In order that the machine may operate automatically upon a succession of drums without necessitating manual control or the attendance of an operator, means is provided as first above indicated for delivering drums to the machine and for discharging the same from the machine. As to the delivery of drums to the machine, this is accomplished by the receiving cradle generally designated 19. As shown in Figs. 4, 10 and 11, this cradle comprises a pair of arms 93 and 94 mounted on the ends of a shaft 95 which in turn is mounted on a forwardly extending frame member 96, the arms 93 and 94 being disposed on opposite sides of the member 96. The arms 93 and 94 have portions extending in opposite directions from their pivotal axes and at an angle to each other so as to form in effect a cradle for receiving the drums delivered thereto. Also as shown particularly in Fig. 10, the outer ends of these arms 93 and 94 are provided with transverse portions 97 which, when the cradle is operated into a position to deliver a drum to the machine, constitute stops for engaging and retaining the next drum in the series. As shown in Fig. 4, drums may be delivered to the cradle

by means of inclined rails 98 supported on the forward end of the frame member 96.

It will thus be observed that the cradle 19 is adapted to be rocked from the position shown in Fig. 4 to that shown in Fig. 10. In the former position, the inner ends of the arms 93 and 94 serve to prevent the drum in position on the cradle from being delivered to the machine; and when the cradle has been rocked to the position shown in Fig. 10, the portions 97 on the arms restrain the next succeeding drum during the delivery of the preceding drum to the machine. As a result, the drums may be by proper operation of the cradle, delivered one at a time to the machine.

Preferably the cradle 19 is power actuated in timed relation to the bead-forming operation. This is accomplished in the present instance by means of a cam 98 of the open-faced type mounted on the forward end of the crank shaft 55 and operatively connected with the cradle. Such connection comprises as shown, a cam follower 99 mounted on the upper end of a lever 100 (Fig. 1) suitably supported between its ends on one of the standards 22. The lower end of said lever 100 carries a screw 101 (Fig. 10) in bearing engagement with an arm 102 rigid with a shaft 103. The latter is suitably journalled in brackets 104 on the bed, and centrally of the bed the shaft carries a crank arm 105 connected by a lengthwise adjustable link 106 with a cross rod 107 extending between the cradle arms 93 and 94. The parts are so proportioned that in the movement of the heads 13 and 14 to their withdrawn or inoperative positions (Fig. 1), the cradle 19 is swung into the position shown in Fig. 10, so that the drum supported thereon is delivered into position between the two dies 15 and 16. Thereupon the cradle is restored to the receiving position shown in Fig. 4, and a new drum positioned thereon for subsequent delivery to the machine in the succeeding operating cycle.

Upon being delivered to the machine in position between the two dies, the drum comes to rest upon the cradle 20 which supports the drum in position for the entry of the two dies, and upon the completion of the bead-forming operation, discharges the drum from the machine. This cradle 20 consists of two spaced arms 108 and 109 (Figs. 10 and 11) generally arcuate in form and pivoted near one end on a rod 110 carried by supporting brackets 111 rising from the bed 12. As shown in Fig. 10, the pivotal axis of the arms 108 and 109 is disposed adjacent the rear edge of the bed, and the arms extend forwardly therefrom for pivotal connection by means of links 112 with lever arms 113 fast on a rock shaft 114. The latter is suitably journalled near the forward edge of the bed and carries a short depending arm 114a arranged for actuation by an arm 114b on an actuator shaft 115. This shaft 115 is mounted on the forward side of the bed and extends to a point adjacent the actuating mechanism for the head 14 for operation by an open-faced cam 116 on the crank shaft 55a. Operation of the shaft 115 by the cam is accomplished in a manner similar to that above described for the shaft 103, that is to say, through a lever 117 having at one end a follower 118 engaging with the cam and at its other end a screw 119 engaging an arm 120 fast on the shaft 115.

The operation of the cradle 20 is of course, timed with respect to the movements of the two heads 13 and 14 and consequently with respect to the receiving cradle 19. Thus, in the retracting movements of the heads, as the latter emerge from the ends of the drum, the cradle 20 is actuated into the position shown in broken lines in Fig. 10 so as to eject the completed drum, and is restored to its supporting position just as the receiving cradle is rocked into the full line position (Fig. 10) to deliver a new drum to the machine.

Summarizing the operation of the machine, let it be assumed that the discharging and delivery mechanism has operated to eject a finished drum from the machine and to permit a new drum to roll into position upon the cradle 20, with the next succeeding drum to be operated upon supported in the receiving cradle 19 as shown in Fig. 4. In this relation of the parts, the heads 13 and 14 have been withdrawn into their inactive positions. Then, as shown in Fig. 1, the crank 17 for the head 13 moving in a clockwise direction, advances the head 13 to carry its die 15 into the left-hand end of the drum. Shortly thereafter, the crank 18 becomes operative,—this crank being rotated in a counter clockwise direction,—to move the head 14 and its die 16 into the opposite end of the drum. In such positioning movements of the heads 13 and 14, each of the latch members 61 is engaged by its latch plate 63 so that the heads are moved inwardly in the operations of the cranks. Since the head 13 is moving slightly in advance of the head 14, this head serves to move the drum against the positioning plate 71 by the engagement of the shoe 74 thereon with the left-hand end of the drum.

Approximately simultaneously with the engagement by the drum with the positioning plate 71, the latch 61 for the head 13 is disengaged from its plate 63 by the operation of the lever 64 actuated as an incident to the engagement of the nut 70 on the stop rod 68 with the stationary stop lug 69; and further inward movement of the head is prevented by the stop collars 27 and 28. Similarly, as the other head 14 reaches its predetermined position within the drum, its latch device is operated to disconnect the head proper from its actuating mechanism.

Upon the disengagement of the respective latch devices, the actuating rods 33 continue their inward movements to expand the dies 15 and 16 through the operation of the toggle links 44. In view however, of the advance position of the crank arm 17 with respect to the crank arm 18, the die 15 is expanded so as to complete its bead-forming operation just as the die 16 of the head 14 commences its expanding operation. Accordingly, the arrangement is such that the die 15 is being contracted while the die 16 is being expanded.

At the end of each die-contracting operation, the collars 51 on the actuating rods 33 move into engagement with the inner ends of the bearing sleeves 35, whereupon the heads are withdrawn to their outermost positions. In this operation, the latch devices 61, 63 re-engage by the action of gravity for the succeeding operating cycle.

In the withdrawal of the dies 15 and 16 from the drum, the latter is held in position between the plates 71 and 72, and as soon as the dies have cleared from the drum, the cradle 20 is operated to eject the completed drum and then to return to its receiving position just as the cradle 19 is operated to permit a new drum to roll into position onto the cradle 20. Movement onto the cradle 19 of the next drum to be operated upon,

is restrained by the arms 97 thereof until the cradle is restored to its receiving position.

I have found that by the construction and mode of operation above set forth, it is possible to operate upon drums in rapid succession producing therein accurately formed beads in a much shorter time than has heretofore been possible. Of primary importance in the attainment of this result is the operation of the two expanding dies in such timed relation as to cause the beads to be formed successively or substantially so. Another feature of importance is the use of toggle mechanisms for actuating the dies such that the dies are moved positively in both directions, thus avoiding any difficulty on account of the presence of scale the accumulation of which within the dies would seriously interfere with the retracting movements thereof by means of springs or the like. Also, it will be observed that the construction employed is simplified by the use of a single actuating mechanism in the case of each die for accomplishing the positioning movement of the die as well as for the expanding and contracting operations. Finally, the machine is susceptible of ready adjustment to accommodate drums of varying lengths or to vary the positions of the beads to be formed.

I claim as my invention:

1. A bead-forming machine having a bed, two expanding dies, heads slidably supported on said bed and carrying said dies for movement into and out of the opposite ends of a metallic drum, each of said dies including a plurality of radially movable die members and each of said heads having a base portion and a supporting and guiding structure for said die members, an actuating mechanism for each head including a reciprocatory actuator disposed axially of the head and toggle links pivotally connecting said die members with said actuator, means mechanically connecting said actuating mechanisms, and power actuated means operating through said connecting means for reciprocating said actuators in timed relation.

2. A machine of the character described, having two circular expanding dies mounted for movement in opposite directions into and out of the ends of a metallic drum, a stop adapted for engagement by the drum to determine the operative position thereof, and mechanisms for actuating the dies to move them into the opposite ends of the drum and including means for operating the dies to expand them into engagement with the drum, one of said mechanisms being operative as an incident to the movement of the dies into the drum to position the latter against said stop.

3. A machine of the character described, having two circular expanding dies mounted for movement in opposite directions into and out of the ends of a metallic drum, a stop adapted for engagement by the drum to determine the operative position thereof, and mechanisms for actuating the dies to move them into the opposite ends of the drum and including means for operating the dies to expand them into engagement with the drum, one of said mechanisms being operative to move one of the said dies in advance of the other die, and means operative in such advance movement of said one die to position the drum against said stop.

4. A bead-forming machine having a bed, two expanding dies, heads slidably supported on said bed and carrying said dies for movement into and out of the opposite ends of a metallic drum, and a single actuating mechanism for each head and die including an actuator having an automatically disengageable connection with the head.

5. A machine of the character described, having an expanding and contracting die, a movably supported head carrying said die, and a single actuating mechanism including an actuator having a disengageable connection with the head to move it and operatively connected with said die to operate it relative to the head upon the disengagement of said connection.

6. A machine of the character described, having an expanding and contracting die, a slidably supported head carrying said die, and a single actuating mechanism including a reciprocatory actuator having a disengageable lost-motion connection with said head, and means operable in the movement of the actuator relative to the head to operate said die.

7. A machine of the character described, having an expanding and contracting die, a movably supported head carrying said die, and a single actuating mechanism including a reciprocatory actuator operatively associated with said die, a latch connection between said actuator and the head, and means operable automatically in the movement of the head through said latch connection to disengage the latch whereby to render said actuator operative as to said die.

8. A machine of the character described, having an expanding and contracting die, a movable head carrying said die, and a single actuating mechanism including a power driven actuator, means connecting said actuator with said head to impart a predetermined movement thereto, means operable at a predetermined point in such movement of the head to render said connecting means ineffective, and means operable in the movement of said actuator relative to the head to operate said die.

9. A machine of the character described, having an expanding and contracting die, a movably supported head carrying said die, and a single actuating mechanism including a power driven actuator operatively connected with said die, means providing a disengageable connection between said actuator and the head operative in the movement of the said actuator to move said head, a stop for limiting movement of the head by said actuator, and means operative substantially as the head engages said stop to disengage said connection.

10. A machine of the character described, having an expanding and contracting die, a movable head carrying said die, and a single actuating mechanism including a power driven actuator operatively connecting with said die, means providing a disengageable connection between said actuator and the head operative in the movement of the said actuator to move said head, a stop for limiting movement of the head by said actuator, means including a second stop operative as the head engages the first mentioned stop to disengage said connection, and means common to both of said stops for adjusting positions thereof.

11. A machine of the character described, having an expanding and contracting die, a movable head carrying said die, and a single actuating mechanism including a power driven actuator operatively connected with said die, means providing a disengageable connection between said actuator and the head operative in the movement of the said actuator to move said head, a stop for limiting movement of the head by

said actuator, means including a second stop operative as the head engages the first mentioned stop to disengage said connection, and an adjustable supporting member for both of said stops.

12. A machine of the character described, having an expanding and contracting die, a movable head carrying said die, and a single actuating mechanism including a power driven actuator operatively connected with said die, means providing a disengageable connection between said actuator and the head operative in the movement of the said actuator to move said head, a stop for limiting movement of the head by said actuator, and means including a second stop and a lever actuated thereby in the movement of the head to disengage said connection as the first mentioned stop becomes effective to interrupt the movement of the head.

13. A bead-forming machine having an elongated bed, a pair of heads movably mounted on said bed and each carrying an expanding die, a swingable support on said bed between said heads adapted to receive a drum to be operated upon, means for actuating said heads to carry said dies into and out of the opposite ends of said drum and including means for actuating said dies, and means operable upon the withdrawal of the heads from the drum to discharge the same from the machine.

14. A machine of the character set forth, comprising in combination, an elongated horizontal bed, bead-forming means mounted on the bed and including a pair of heads, means for moving said heads to carry said bead-forming means into and out of operative relation to the opposite ends of a drum positioned between the heads, a pair of positioning members for the drum, means for supporting said members in spaced relation so as to receive a drum between them, and a single manually operable means for moving both of said members toward or from each other.

15. A machine of the character set forth, comprising in combination, an elongated horizontal bed, bead-forming means mounted on the bed and including a pair of heads, means for moving said heads to carry said bead-forming means into and out of operative relation to the opposite ends of a drum positioned between the heads, a pair of positioning members for the drum, means for supporting said members in spaced relation so as to receive a drum between them, and a single manually operable means for moving both of said members toward or from each other including a supporting bracket for each of said members, a shaft having oppositely threaded ends in screw threaded engagement with said brackets, and means for supporting said shaft against axial movement.

16. A machine of the character set forth, having in combination, two bead-forming dies, heads carrying said dies and mounted for movement toward and from each other, a movable support adapted to receive and position a drum to be operated upon by said dies, actuating mechanisms for the heads including means for moving the heads into and out of the drums and means for operating said dies, and means operated by one of said mechanisms for moving said support in a predetermined timed relation to the movements of the heads.

17. A machine of the character described, having in combination, two bead-forming dies, heads carrying said dies and mounted for movement toward and from each other, a movable support operable to deliver a drum into position between said dies, an actuating mechanism for each head and die, and means operated by one of said mechanisms for actuating said movable support.

18. A machine of the character described, having in combination, two bead-forming dies mounted for movement into and out of the opposite ends of a drum positioned therebetween, power driven means for positioning and operating said dies, a receiving cradle operable to deliver a drum into position between the dies, a discharge cradle operable to deliver a completed drum from said position between the dies, and means actuated by said power driven means for operating said cradles in a predetermined timed relation to the positioning movements of the dies.

19. A machine of the character described, having in combination, two bead-forming dies, a movable support for delivering a drum to be operated upon into position between said dies, a second movable support operable to discharge the completed drum from such position, and a power driven mechanism for actuating said dies and said supports in a predetermined order.

20. In a machine of the character set forth, the combination of bead-forming means, means for supporting a drum in position to be operated upon by said bead-forming means, and drum-feeding means comprising a pivotally mounted cradle, an intermittently driven actuator, and means operable by said actuator for swinging said cradle from a drum receiving position to a drum delivering position and vice versa.

21. In a machine of the character set forth, the combination of bead-forming means, means for supporting a drum in position to be operated upon by said bead-forming means, and drum-feeding means comprising a pivotally mounted cradle, a runway leading to said cradle, an intermittently driven actuator, and means operable by said actuator for swinging said cradle from a drum receiving position to a drum delivering position and vice versa, said cradle having a part operative in the drum delivering position thereof to restrain movement of a second drum on said runway onto the cradle.

22. In a machine of the character set forth, the combination of a bead-forming means, a movable drum support comprising a pivotally mounted cradle, actuating mechanism for the bead-forming means including a constantly driven shaft, a rock shaft operatively connected with said cradle to operate it, and cam means operable in the rotation of said shaft to actuate said rock shaft intermittently.

23. In a machine of the character described, the combination of two bead-forming means, a drum-feeding and discharging device comprising two movable supports, one for receiving and delivering a drum to the machine, and the other for discharging the drum from the machine, actuating mechanism for the bead-forming means including two constantly driven shafts, and means actuated intermittently by said two shafts for operating the two feed devices respectively in a predetermined order.

24. A bead-forming machine having a bed, a head movably mounted on said bed, a bead-forming means carried by said head, a cradle mounted on said bed adapted to receive a drum to be operated upon, means for actuating said head to carry said bead-forming means into and out of one end of the drum, and means operable upon the withdrawal of the bead-form-

ing means from the drum to actuate said cradle to discharge the drum from the machine.

25. A bead-forming machine having in combination, bead-forming means, a reciprocable head carrying said bead-forming means, a movable support for delivering a drum to be operated upon into position opposite said bead-forming means, a second movable support retaining the drum during the bead-forming operation and operable to discharge the completed drum, and power driven mechanism for actuating said bead-forming means and said supports in a predetermined order.

26. A machine of the character described, having in combination, a bead-forming means mounted for movement into and out of the end of a drum positioned on the machine, power driven means for positioning and operating said means, a receiving cradle operable to deliver a drum into position on the machine, a discharge cradle operable to deliver a completed drum from said machine, and means actuated by said power driven means for operating said cradles in a predetermined timed relation to the positioning movements of the bead-forming means.

27. In a machine for forming spaced beads in cylindrical metal shells, in combination, a pair of expansible bead forming dies positionable within a shell, a toggle mechanism individual to each die and operable to expand the same, and means for operating said toggle mechanisms in succession comprising actuating means arranged for reciprocatory movement axially of the dies, and a power driven rotating shaft for reciprocating said actuating means.

28. In a machine for forming spaced beads in cylindrical metal shells, in combination, a pair of bead forming dies positionable within a shell, each of said dies including a plurality of die elements arranged in a circular series, means for actuating the dies comprising a sleeve member individual to each die disposed substantially axially of the die for movement relative thereto, said sleeves having operative connections with the respective die elements for operating the dies incident to the movements of the sleeves, and means for moving said sleeves in succession comprising a rotatable shaft and mechanical means operatively connecting said shaft and said sleeves.

29. In a machine of the character described, in combination, a pair of radially expansible annular dies, actuating means for each die including an actuating member arranged for movement axially of the die and operative to actuate the die in response to such movement, and means for moving said members successively comprising, a shaft, means for rotating said shaft, and means operatively connecting said shaft with said members.

30. In a machine for forming spaced beads in cylindrical metal shells, in combination, a pair of expanding and contracting dies positionable in a shell, actuating means for each die including an actuating element arranged for reciprocation axially of the die and having associated therewith a toggle mechanism operable in the reciprocation of the element to positively expand and contract the die, and means for operating said die actuating means successively comprising a power driven rotary member and means operative in the rotation of said member for reciprocating said elements in timed relation.

CARL C. GROTNES.