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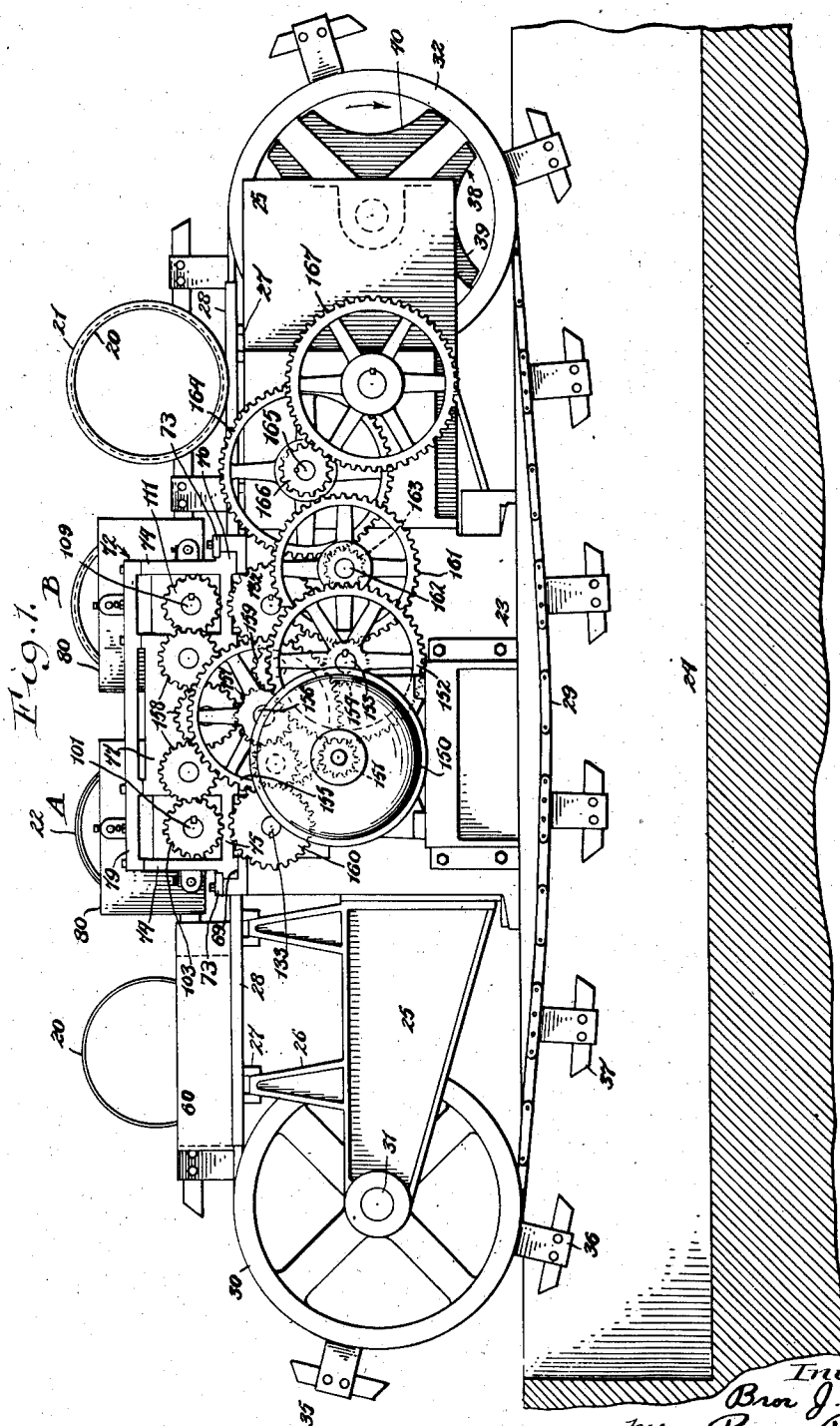
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1,782,994

MACHINE FOR BEADING AND FLANGING METAL BARRELS

Filed May 25, 1929

8 Sheets-Sheet 1



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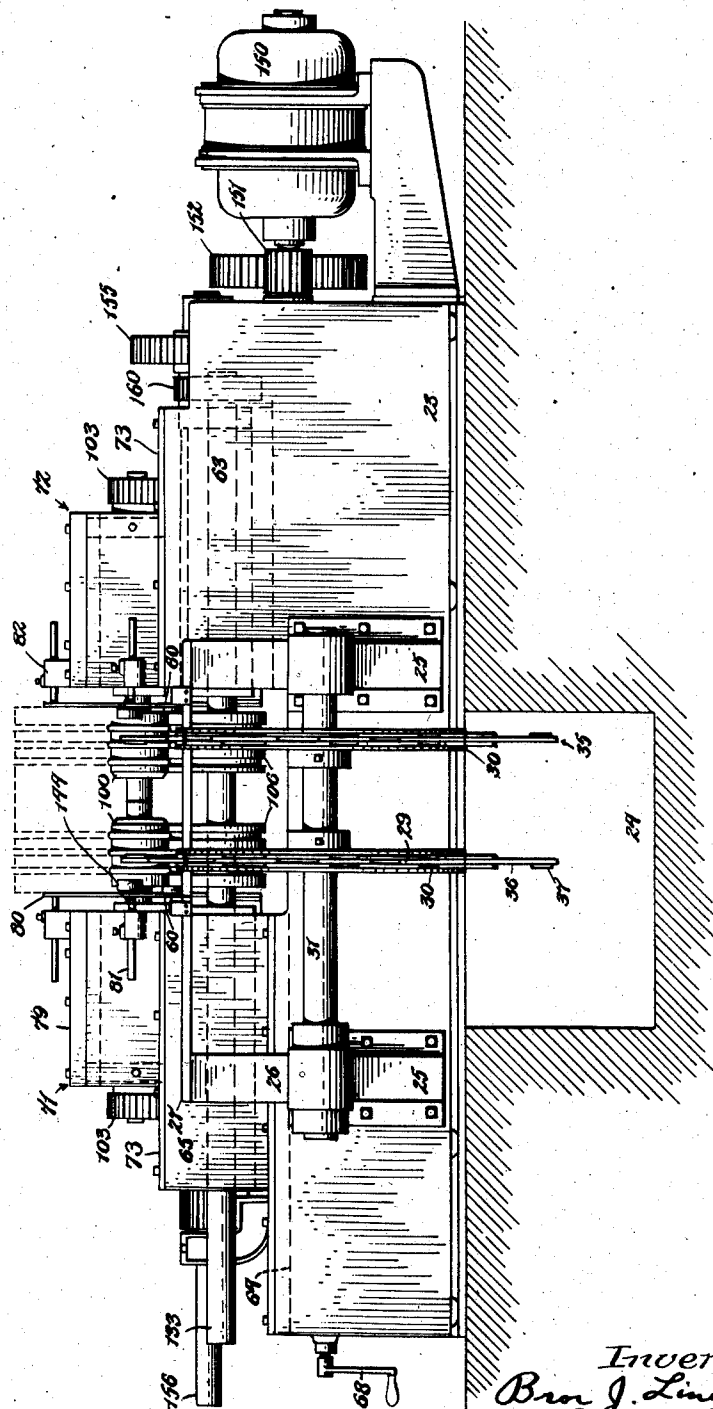
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MACHINE FOR BEADING AND FLANGING METAL BARRELS

Filed May 25, 1929

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Fig. 2



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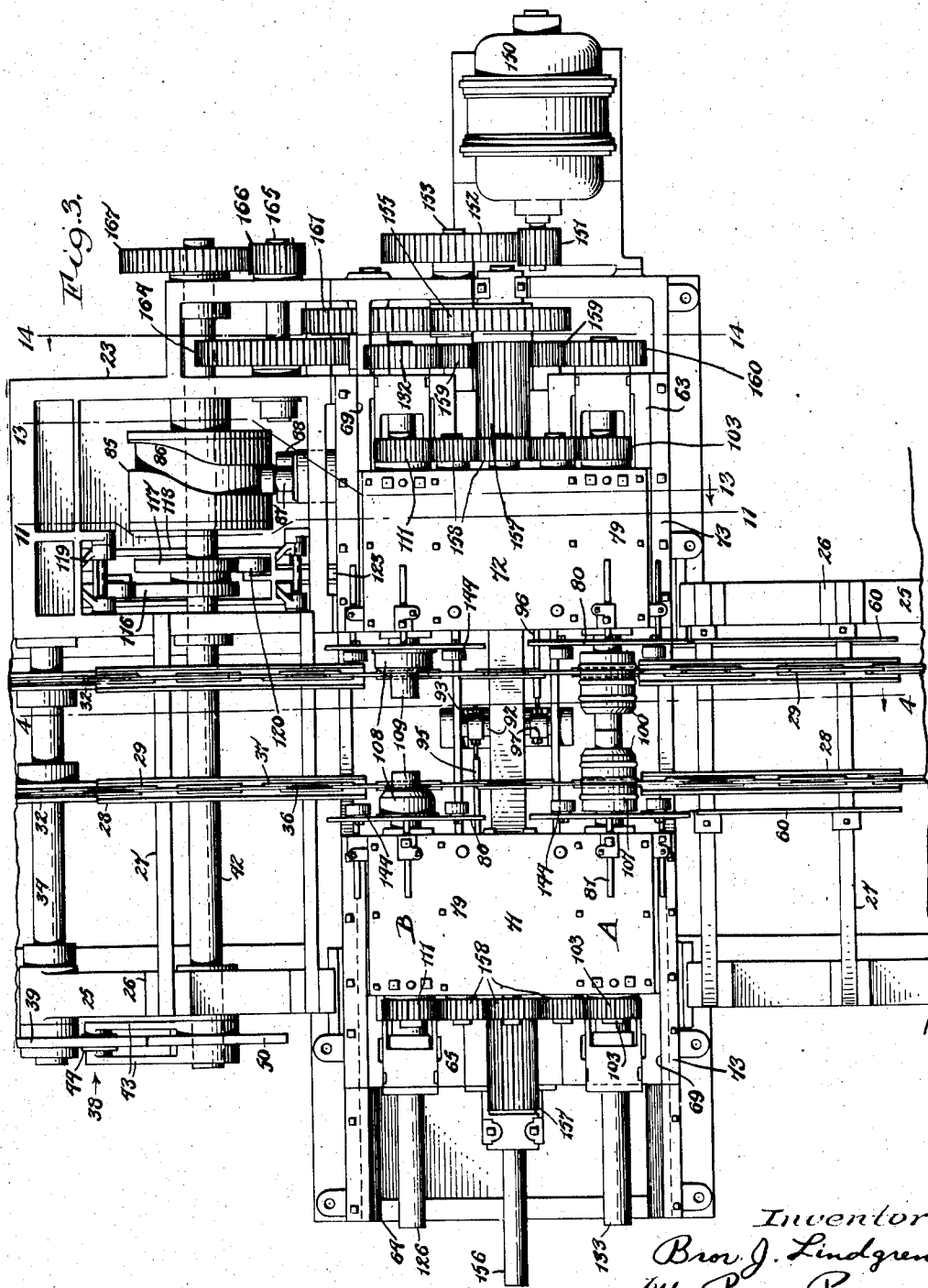
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Filed May 25, 1929

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Nov. 25, 1930.

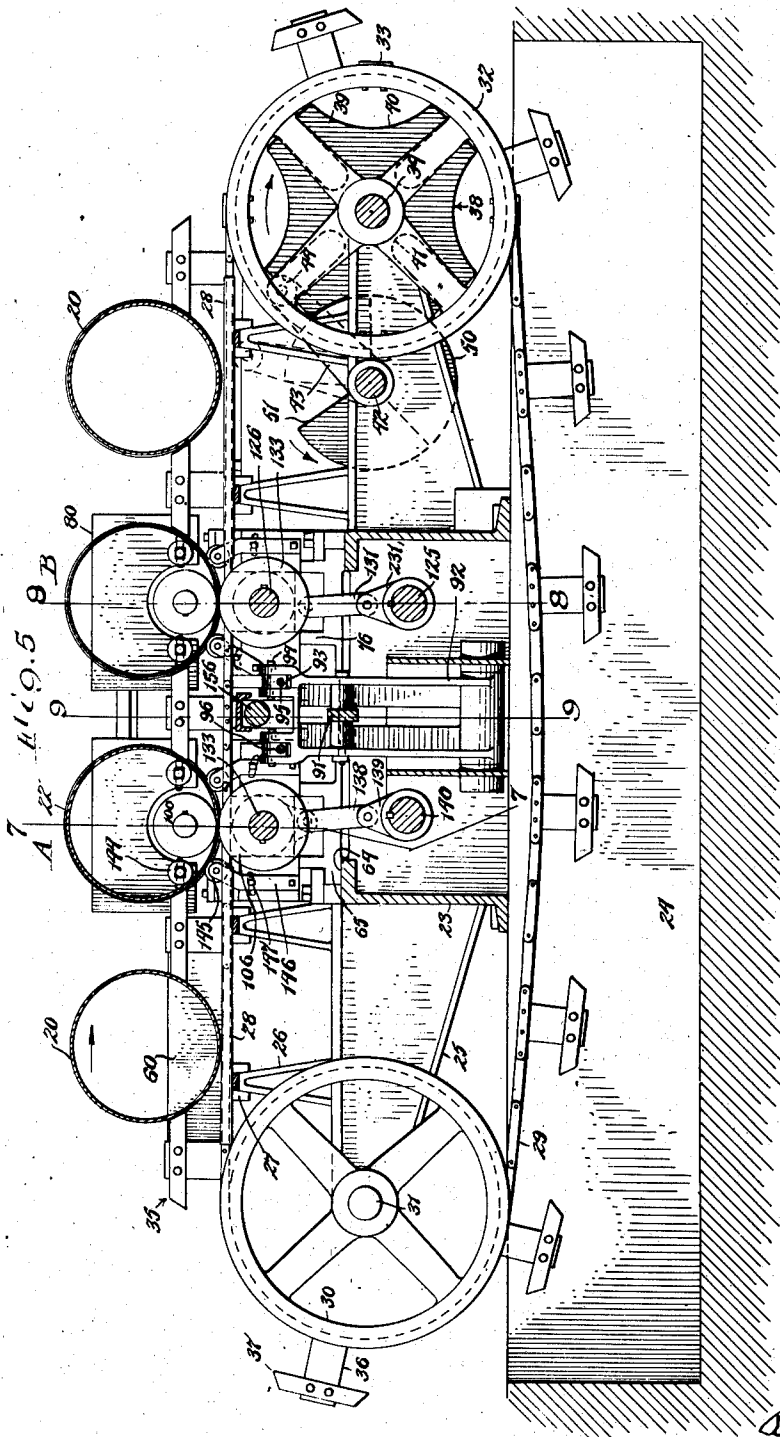
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1,782,994

MACHINE FOR BEADING AND FLANGING METAL BARRELS

Filed May 25, 1929

8 Sheets-Sheet 5



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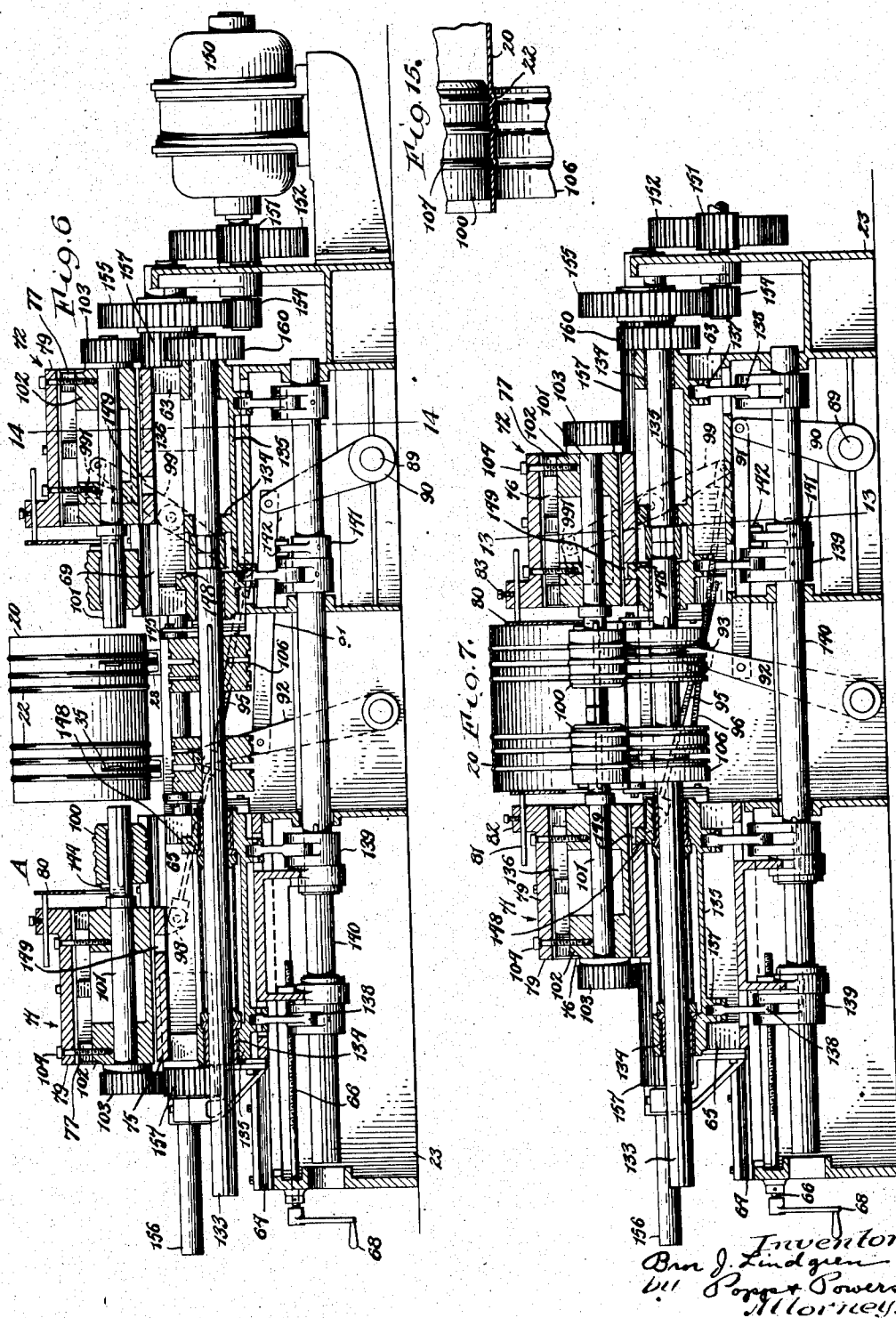
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MACHINE FOR BEADING AND FLANGING METAL BARRELS

Filed May 25, 1929

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Nov. 25, 1930.

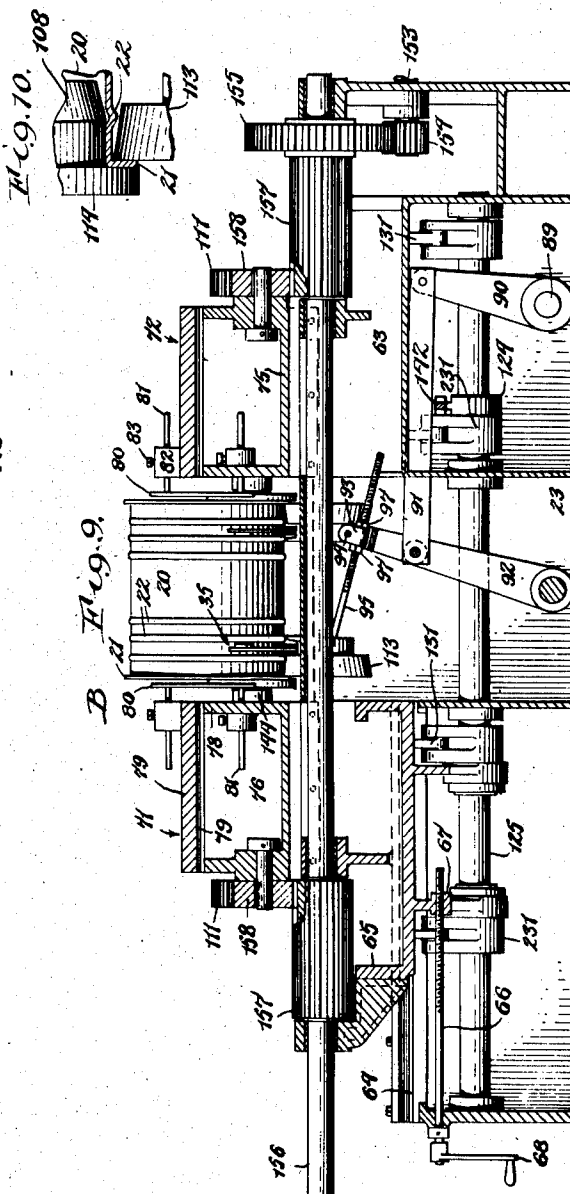
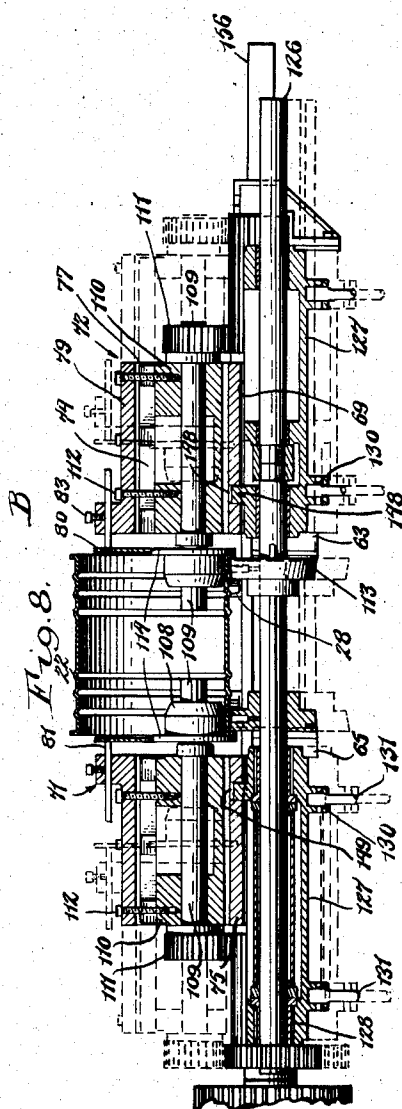
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1,782,994

MACHINE FOR BEADING AND FLANGING METAL BARRELS

Filed May 25, 1929

8 Sheets-Sheet 7



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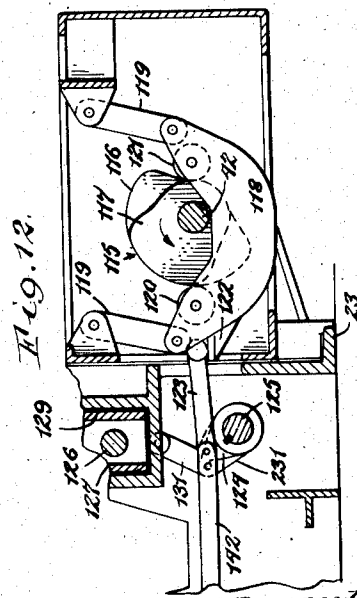
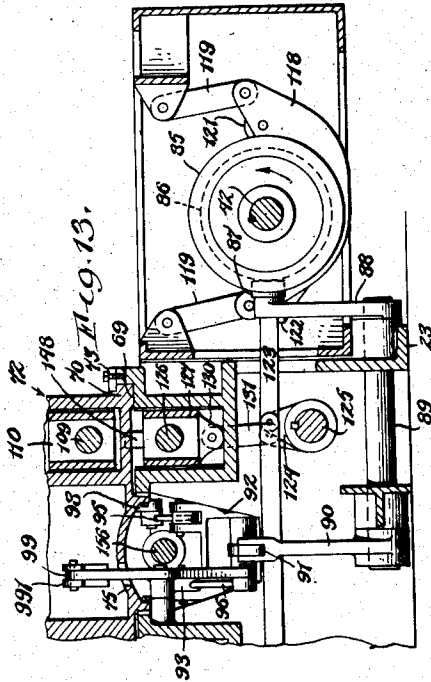
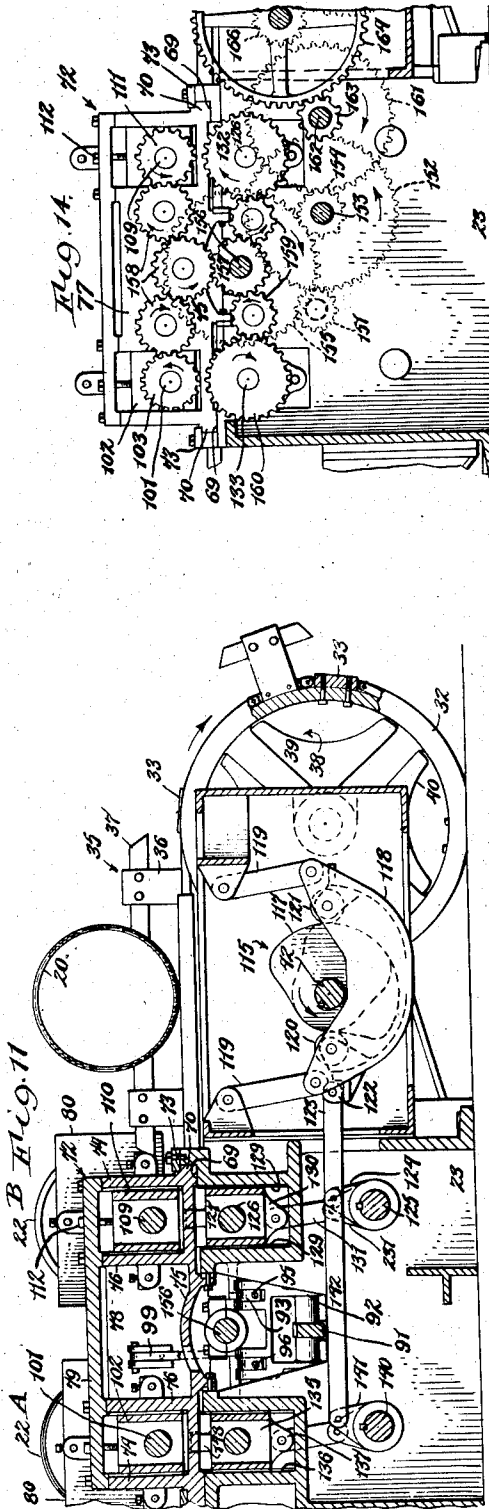
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1,782,994

MACHINE FOR BEADING AND FLANGING METAL BARRELS

Filed May 25, 1929

8 Sheets-Sheet 8



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MACHINE FOR BEADING AND FLANGING METAL BARRELS

Application filed May 25, 1929. Serial No. 365,993.

This invention relates to a machine for beading and flanging metal barrels, and more particularly to a machine for rolling the beads and flanges into sheet metal barrel shells for the purpose of rounding and stiffening the shell and preparing it for the reception of barrel heads.

The principal object of this invention is to provide a simple, durable, and efficient machine which receives, automatically, beads and flanges, and discharges the barrel blanks in a continuous stream, thereby materially reducing the cost of this operation and the number of men required to bead and flange a quantity of barrels.

A further object is to provide such a machine which will bead and flange barrel blanks having substantial variations in length, or which are not square at their ends or which are badly out of round, the barrel blanks, when discharged from the present machine, being of round form, properly beaded intermediate the ends and provided with properly spaced end flanges.

Another object is to provide such a machine in which the barrels are advanced with a step-by-step movement and in which the means for holding the barrels are moved out of the path of the barrel shells during the period in which the advancing mechanism is in operation and in which the barrel holding means are locked in their operative position during the forming operation on the barrel.

Another aim is to so mount and actuate the forming rolls carried by the movable barrel holding mechanism that upon completion of the inward movement of the holding means, the rolls are moved against the barrel shell to form the same.

A still further aim is to provide cam means for reliably maintaining the synchronism of operations of the machine.

Still further purposes are to provide a durable machine which will stand up under the continuous services it is designed to give, which is comparatively simple considering the function which it performs, which is readily adjustable to different sizes of barrels and which operates to flange and bead the barrels uniformly.

Another object is to provide means which readily permit of adjustment of the machine to different sized barrels, and in particular, in which the machine is adapted to barrels of different diameters by the ready substitution of pairs of gears of different ratios.

In the accompanying drawings:

Figure 1 is a side elevation of a machine embodying my invention.

Figure 2 is an end view thereof, viewed from the front or feeding end of the machine.

Figure 3 is a fragmentary top plan view thereof.

Figure 4 is a vertical longitudinal section taken on line 4—4, Fig. 3, and showing the position of the parts while the barrels are being advanced.

Figure 5 is a view similar to Fig. 4 showing the position of the parts while the barrels are being operated on.

Figure 6 is a vertical transverse section, taken through the beading rolls on line 6—6, Fig. 4, and showing the position of the parts while the barrels are being advanced.

Figure 7 is a view similar to Fig. 6 but showing the position of the parts while the barrels are being operated on, this section being taken through the beading rolls on line 7—7, Fig. 5.

Figure 8 is a vertical transverse section through the flanging rolls taken on line 8—8, Fig. 5 and showing the position of the parts while the barrel is being flanged.

Figure 9 is a vertical transverse section taken on line 9—9, Fig. 5 and showing the barrel being operated on by the flanging rolls.

Figure 10 is an enlarged fragmentary view showing the manner in which the flanging rolls turn over the ends of the barrel to provide an outturned flange.

Figure 11 is a fragmentary longitudinal section taken on line 11—11, Fig. 3, showing the cam which moves the beading and flanging rolls toward the barrels, the cam being shown in the position in which it holds the rolls against the barrels.

Figure 12 is a view similar to Fig. 11 but showing the cam in the position in which the forming rolls are retracted.

Figure 13 is a fragmentary longitudinal

section taken on line 13—13, Fig. 3 and showing the cam which moves the carriages toward and from the ends of the barrel for centering the same relative to the forming rolls while the same are being operated on.

Figure 14 is a fragmentary longitudinal section taken on line 14—14, Fig. 3 and showing a part of the gear drive.

Figure 15 is an enlarged view showing the manner in which the beading rolls cooperate in beading the barrel.

Similar characters of reference indicate like parts in the several figures of the drawings.

The barrel shell 20 produced by the machine comprises a cylindrical sheet metal open ended body having its opposite ends turned out to provide flanges 21 at its opposite ends, and having a plurality of annular beads 22 rolled out from the sheet metal body to strengthen the barrel. The barrel shell is received as a plain cylindrical body and is successively acted on by cooperating rolls at different stations to bead and flange the barrel.

In the machine shown, the barrel shell is first beaded and then flanged, but it is obvious that these operations can be reversed. It is also obvious that the invention can be practiced in connection with any cylindrical body to be provided with annular deformations.

In its general organization this invention comprises a horizontal conveyer on which the barrels are placed with their axes parallel, a Geneva gear for advancing the barrels to successive similar positions, two horizontally movable carriages arranged on opposite sides of the conveyer and having heads adapted to engage the ends of the barrels to center them relative to the forming rolls, a cam operated in synchronism with the conveyer for moving the carriages together each time the conveyer comes to rest, beading rolls mounted on each carriage and movable axially therewith to enter the opposite ends of the barrel at one of its stations, a second pair of beading rolls mounted under the conveyer and movable transversely into operative relation with said first beading rolls, cam means for moving said last named beading rolls into operative relation with the first named beading rolls after the conveyer has stopped and said heads have been moved inwardly to center the barrels, and a set of flanging rolls mounted and actuated in the same manner as said beading rolls to flange the barrels at another station.

The barrel conveying mechanism

The operating parts of the machine are mounted on a supporting frame 23 which can be of any suitable construction and is arranged over a pit 24.

Projecting longitudinally outward from

the opposite ends of this frame 24 are two pairs of spaced arms 25 which are bolted to the frame 23, as shown in Fig. 2. Each of these arms 25 is formed to provide upwardly extending supports 26 which carry cross bars 27 at their upper ends. These cross bars 27 can be of any suitable form and support two spaced longitudinal channel bars which form tracks 28 for the upper stretch of the conveyer chain 29 and also support the barrels 20 as they are moved along by the upper stretch of the conveyer chain and insure their vertical alinement relative to the forming devices.

The front ends of the conveyer chains 29 pass around a pair of spaced channeled wheels 30 which are secured to a shaft 31 journaled at its ends in the ends of the front supporting arms 25, and the rear ends of these conveyer chains pass around channeled driving wheels 32. To drive the chains positively, each of the driving wheels 32 is provided with removable teeth 33 which engage the links of the conveyer chains and compel each chain to be advanced uniformly. The conveyer driving wheels 32 are mounted on a conveyer drive shaft 34 which is journaled at its opposite ends in the outer ends of the rearwardly extending supporting arms 25.

To move the barrels along the tracks 28 in spaced relation to one another, driving arms or wings 35 are provided which receive the barrels between them and compel the barrels to be intermittently advanced along the tracks 28 in response to the movement of the conveyer chains as hereinafter described. These driving arms are arranged so that the driving arms of one chain are arranged opposite the driving arms of the other chain and each driving arm comprises an outwardly extending arm 36 which is suitably secured at its inner end to a link of the conveyer chain 29 and at its outer end carries a cross arm 37. The ends of the cross arms are preferably inclined so that when they are traversing the upper stretch of the conveyer chain, they form an inclined support for the opposite sides of the barrel shell carried therebetween.

In operation, the operator places each barrel shell 20 on the front end of the conveyer chains 29 in advance of the rising conveying arms 35. These arms move the barrel upwardly onto the tracks 28 along which it is conveyed to the rear end of the machine. As the conveyer arms 35 pass downwardly around the rear driving wheels 32, the finished barrel shells are released and roll from the machine.

An intermittent or step-by-step movement is imparted to the conveyer chain by a Geneva gear 38, this gear being so designed that the step-by-step movement of the conveyer chains brings the barrels carried thereby to successive stations. By this means the forming

devices for successively operating on the barrels can be arranged along the path of the barrels at their stations when the conveyer chain is not moving and by operating these forming devices during the period of non-movement of the conveyer, each barrel will be operated on by the forming devices.

This Geneva gear 38 includes the usual star wheel 39 which is mounted on the conveyer drive shaft 34 and has the usual indented faces 40 and radial slots 41. The star wheel 39 is turned from the main drive shaft 42 by a slotted driving arm 43. This driving arm is arranged to pass along opposite sides of the star wheel 39, as shown in Fig. 3, and carries a roller 44 at its outer end, which roller, on each revolution of the drive shaft 42 enters the next succeeding slot 41 of the star wheel and gives the star wheel a quarter turn. During the period when the star wheel 39 is not in motion, it is held stationary by the engagement of its indented faces 40 with the periphery of a wheel 50 fixed on the main drive shaft 42. This wheel 50 is provided with the usual recess 51 which receives the points of the star wheel 39 and permits the star wheel to be turned by the driving arm 43. The star wheel 39 has four radial slots 41 and consequently it is turned once for every four revolutions of the drive shaft 42 and its associate wheel 50, the star wheel 39 being held stationary during the greater part of the revolution of the drive shaft. By this means, the conveyer chain is advanced step-by-step to move the barrel shells 20 from station to station and during the greater period the barrel shells are at rest and being operated on by the forming devices.

40 *The barrel gaging and centering mechanism*

In order to center each barrel shell properly relative to the conveyer mechanism and in proper relation to the forming rolls which act upon opposite ends of the shell, gaging and centering devices are provided which are preferably constructed as follows:

The preliminary gaging and centering of the barrel shells 20 is effected by two stationary gage plates 60. These gage plates rise from the cross bars 27 and are arranged on opposite sides of the conveyer chains 29 so that in order to pass between these gage plates, the barrel must be placed on the conveyer in centered relation thereto.

On one side of the center of the conveyer, the frame or bed of the machine is formed to provide a fixed pedestal 63, and, as best shown in Fig. 9, on the opposite side of the conveyer, the frame or bed 23 carries a pair of transverse horizontal tracks or rails 64 which support a movable pedestal 65. This movable pedestal is adjustably movable on its rails 64 toward and from the conveyer by means of a screw 66 which, as shown in Fig.

9, turns in a nut 67 formed on the under-side of the movable pedestal 65 and is turned by a crank 68 which is arranged at one side of the bed 23.

Both the fixed pedestal 63 and the movable pedestal 65 are formed to provide a pair of horizontal transverse tracks 69 on which the shoes 70 of a pair of transversely movable carriages 71 and 72 rest, one carriage being arranged at each side of the conveyer. To hold these shoes 70 in engagement with the tracks 67, rails 73 are bolted to the pedestals and overhang the shoes 70 as best shown in Fig. 1.

Each of these carriages 71 and 72 comprises side walls 74, a lower horizontal wall 75, intermediate vertical walls 76 spaced from and extending parallel with the side walls 74, an outer end wall 77 and an inner end wall 78. The upper part of each carriage is covered by a cover plate 79 which is bolted to the ends, side and intermediate walls of the carriage in any suitable manner.

Vertical gaging and centering plates 80 are secured to opposing sides of the carriages 71 and 72 and are adapted to engage the ends of the barrel shells on the conveyer when the carriages are moved together for the purpose of centering the same relative to the forming devices. Each carriage carries two of these gaging plates 80, one being adapted to cooperate in centering the barrel during the beading operation at the beading station and the other cooperating with the barrel during the flanging operation at the flanging station. Each of these gaging plates is secured to a plurality of outwardly extending supporting horizontal rods 81, these rods being slidably received in bosses 82 on the carriage so that the plates are adjustable toward and from each other to permit of the gaging and centering of barrels of different heights. The plates are held in their adjusted position by set screws 83 which are arranged in the bosses 82 and engage the sides of the supporting rods 81.

The means for reciprocating the two carriages 71 and 72 toward and from each other while the conveyer mechanism is at rest is preferably constructed as follows:

As shown in Fig. 3 a cam 85 is mounted on the main drive shaft 42, this cam having a cam groove 86 which is disposed so that its salient and receding portions face in the direction of the length of the drive shaft 42. In this cam groove 86 is arranged a roller 87 which is mounted on the upper end of a rock arm 88. This rock arm, as shown in Fig. 13, is fixed to a rock shaft 89 suitably journaled in the main frame, and at its other end, this rock shaft carries a second rock arm 90. The rock arm 90 is connected by a link 91 with a rock lever 92, which is pivot-

ally mounted at its lower end on the machine frame 23. As best shown in Fig. 9, this rock lever 92 swings transversely of the machine, and is substantially longer than the rock arm 90 which actuates it.

As best shown in Fig. 5, the rock lever 92 is relatively wide and at its upper end carries two swinging members 93 which are mounted on pivot pins 94. One of these swinging members 93 carries a rod 95 which extends in the direction of the carriage 71 and the other swinging member carries a similar rod 96 which extends in the direction of the opposite carriage 72. Each of these rods is threaded at its inner end and is secured to the respective swinging member 93 by means of two nuts 97 which, as best shown in Fig. 9, permit of increasing or decreasing the effective length of the rods to vary the movement of the carriages.

At its outer end, the rod 95 is pivotally secured to an ear 98 projecting downwardly from the lower wall of the carriage 71, and the outer end of the other threaded rod 96 is connected to the lower end of a vertical rock beam 99, as best shown in Fig. 13. This beam is pivoted at its center to the machine frame for transverse swinging movement and at its upper end is connected by a link 991 with the front wall of the carriage 72.

It is apparent that each time that the main drive shaft 42 is turned, the cam 85 is rotated and the roller 87 is caused to traverse its cam groove 86. This cam groove imparts a transverse reciprocatory movement to the rock arm 88 which carries the roller 87 and also to the rock arm 90 and rock lever 92 which are operatively connected with the rock arm 88. As the rock lever 92 is moved in the direction of the carriage 71, the rod 95 carried thereby operates to move this carriage outwardly or away from the conveyer and the barrel shells on the conveyer. At the same time, the threaded rod 96 connected to the rock lever 92 is moved inwardly and this movement of the threaded rod 96 moves the lower end of the rock beam 99 inwardly. This movement of the rock beam 99 causes its outer end to swing outwardly and since the outer end of the rock beam 99 is connected to the carriage 72 by the link 991 this carriage is also moved outwardly. It therefore follows that each time the main drive shaft 42 is turned, the two carriages are moved toward and from each other to center the barrels on the conveyer relative to the forming devices. The cam 85 is so formed and timed with relation to the conveyer that the inward movement of the carriages 71 and 72 follows the advance movement of the conveyer and the outward movement of these carriages precedes the next succeeding advance movement of the conveyer. By this means, the centering of the barrel shells by

the carriages and gage plates carried thereby is effected while the barrels are at rest.

The forming mechanism

In the machine shown in the drawings, the barrel shells are provided with the beads 22 at station A while the conveyer is at rest and while the barrel is centered by the first pair of movable gage plates 80 and is provided with the outturned flanges 21 at its opposite ends at station B, while the conveyer is again at rest and the barrel centered between the second pair of movable gage plates 80. It is obvious, however, that this sequence of operations can be reversed and hence this sequence is used for the purpose of illustration only.

Each carriage 71 and 72 carries an upper beading roll 100, these rolls opposing each other and being arranged to enter the opposite ends of the barrel shell while the same is at rest at station A. As best shown in Figs. 6 and 7 each beading roll 100 is keyed on the end of a shaft 101 which shaft is journaled in a vertically adjustable bearing block 102 and is continuously rotated by a pinion 103 fixed to the outer end of the shaft 101. As best shown in Fig. 11, the bearing block 102 which carries the beading roll shaft 101 is guided in vertical ways provided in the outer and intermediate walls 74 and 76 at the front end of the carriage and the vertical adjustment of each bearing block is effected by a pair of screws 104 which extend through the cover plate 79 and support each bearing block.

Co-operating with each of these upper beading rolls 100 is a vertically movable lower beading roll 106 which is also power driven and is moved upwardly against the under side of the rotating beading roll 100 as hereinafter described after the beading rolls 100 have entered the ends of the barrel and thereby corrugate or bead the opposite ends of the shell. For this purpose, each upper beading roll 100 is provided with annular beads or corrugations 107 which cooperate with corresponding channels in each lower roll 106 so that the outwardly projecting beads 22 are provided at opposite ends of the barrel as best shown in Fig. 15.

In a similar manner each carriage carries an upper power driven flanging roll 108, the upper flanging rolls 108 of the two carriages being arranged axially in line and being arranged to enter the opposite ends of the barrel shell 20 while it is at rest at station B and held in a centered position by the second set of movable guide plates 80. In the same manner as the upper beading rolls 100, each upper flanging roll 108 is keyed on the outer end of an upper flanging roll shaft 109, which shaft is journaled in a vertically adjustable bearing block 110 and is continuously rotated by a pinion 111 fixed to the outer end of the

shaft 109. As best shown in Fig. 8, the bearing block 110 which carries each flanging roll shaft 109 is guided in vertical ways provided in the outer and intermediate walls 74 and 76 at the rear end of the carriage and the vertical adjustment of each bearing block 110 is effected by a pair of screws 112 which extend through the cover plate 79 and support each bearing block.

Cooperating with each of the upper continuously rotating flanging rolls 108 is a lower vertically movable flanging roll 113 which is also power driven and moved upwardly against the under side of the rotating upper flanging roll 108 after the flanging rolls 108 have entered the ends of the barrel and thereby flange the opposite ends of the barrel outwardly. For this purpose, as best shown in Fig. 10, each upper flanging roll 108 is provided at its inner end with an annular shoulder 114, and the corresponding lower roll is tapered and is adapted to be moved against the body of the upper flanging roll and in close proximity to the shoulder 114 so that the flange 21 is formed between the opposing faces of the lower flanging roll and the shoulder 114. By reason of the continuous rotation of both flanging rolls, the barrel is turned so that the flange 21 is formed on all sides.

After the carriages 71 and 72 have been moved together by the cam 85, and the upper beading rolls 100 and flanging rolls 108 have entered the barrels, the lower beading rolls 106 and the lower flanging rolls 113 are moved upwardly into cooperating relation to the upper rolls so that the barrels are beaded and flanged and after this operation are retracted prior to the retraction of the carriages. Both the lower beading and flanging rolls are raised at the same time so that while the barrel at station A is being beaded, the barrel at station B is being flanged. This mechanism is preferably constructed as follows:

A cam 115 is mounted on the main drive shaft and is composed of two parts 116 and 117, these two parts being similarly shaped and offset circumferentially relative to one another. Under this cam 115 is mounted a swinging cradle 118 which is supported by a pair of swinging links 119 so that the cradle is capable of reciprocating longitudinally of the machine as best shown in Figs. 11-13. At its front end this cradle carries a roller 120 which traverses the cam part 117, and at its rear end the cradle carries a roller 121 which traverses the cam part 116. The cam parts 116 and 117 are so shaped that both rollers are at all times in contact therewith, i. e. while the roller 120 engages a salient face of the cam part 117, the roller 121 engages a receding face of the cam part 116. By this means the cradle is positively recipro-

cated by the cam both forwardly and backwardly relative to the machine frame.

At its front end the cradle is formed to provide an ear 122 to which is pivotally secured a link 123. The other end of this link is connected with a rock arm 124 fixed to a transverse rock shaft 125. This rock shaft 125, as shown in Fig. 9 is journaled in the machine bed 23 and extends substantially across the entire width of the bed, and is arranged below each of the bearing blocks 110 supporting the lower vertically movable flanging rolls shaft 126 on which the lower vertically movable flanging rolls 113 are fixed.

This lower vertically movable flanging rolls shaft 126 extends the width of the machine and is supported at its ends in vertically movable bearing blocks 127 carrying bearings 128 in which the lower flanging rolls shaft 126 turns. These bearing blocks supporting the lower flanging rolls shaft may be of any suitable construction and are guided in their vertical movement by vertical ways 129 formed on the fixed and movable pedestals 63 and 65 which support the carriages 71 and 72, as shown in Fig. 11. On the under side of each of these vertically movable lower flanging rolls bearing blocks 127 a pair of ears 130 are provided each of which is connected by a link 131 with a rock arm 231 fixed to the rock shaft 125. By this means when the rock shaft 125 is rocked by the rotation of the cam 115, the bearing blocks 127 are raised and lowered so as to move the lower flanging rolls shaft 126 and the lower flanging-rolls carried thereby into and out of operative relation with the upper inwardly movable flanging rolls 108 carried by the carriages 71 and 72. The power for driving the lower flanging rolls 113 is derived from a pinion 132 which is keyed to one end of the lower flanging rolls shaft 126 and is power driven as hereinafter described.

In a similar manner the lower beading rolls 106 are moved vertically into and out of operative relation to the upper inwardly movable beading rolls 100 to bead the barrel shell when it is at rest at station A.

For this purpose the lower vertically movable beading rolls 100 are fixed to a lower beading rolls shaft 133, which, as best shown in Fig. 6, extends the full width of the machine bed. This lower beading rolls shaft is journaled in four bearings 134 which are mounted in a pair of vertically movable bearing blocks 135, one of these bearing blocks 135, being arranged at each side of the machine. These bearing blocks 135 are guided for vertical movement in ways 136 provided at the front end of the fixed and movable pedestals 63 and 65 and each is provided on its under side with a pair of ears 137 to which are pivotally connected links 138. These links are pivotally con-

ected at their lower ends to rock arms 139 which are mounted on a transverse rock shaft 140. At one end this rock shaft has another rock arm 141 secured thereto, and, as best shown in Fig. 11, this rock arm 141 is connected by a link 142 to the rock arm 124 on the rock shaft 125 which raises and lowers the lower flanging rolls.

It is therefore apparent that when the rock shaft 125 is rocked in response to the rotation of the cam 115 to raise and lower the lower flanging rolls 113 into and out of operative relation to the upper flanging rolls 108, the lower beading rolls 106 will likewise be moved into and out of operative relation with the upper inwardly moving beading rolls 100 through the rock arm 124 on the rock shaft 125, link 142, rock arm 141, rock shaft 140, rock arms 139 on the rock shaft 140 the links 138 which connect the rock arms 139 with the bearing blocks 135 supporting the lower beading rolls shaft 133. By this means both the lower vertically movable beading rolls 106 and the lower vertically movable flanging rolls 113 are simultaneously moved up into operative relation with the corresponding upper rolls, this movement occurring after the carriages 71 and 72 have moved inwardly and carried the upper rolls to their operative positions, and the conveyer has brought the barrel shells to stations A and B in proper position to be beaded and flanged, respectively.

In order to insure the barrel blanks being properly positioned at stations A and B while they are being beaded and flanged and also to round the same if they are badly out of round, adjustable retaining rollers are provided which engage the inside and outside of each barrel at each station and are preferably constructed as follows:

Each of the vertical plates 80 which center the barrel shells on the conveyer preparatory to their being formed with beads and flanges carries a pair of adjustable rollers 144 which project inwardly toward the conveyer and are mounted in any suitable manner so as to be adjustable toward and from the upper forming rolls carried by the carriages 71 and 72. As best shown in Fig. 5, when the barrel shells are moved to the stations A and B by the conveyer, and the carriages 71 and 72 move inwardly, the supporting rollers 144 carried by the centering plates 80 enter the barrel shell and are arranged along the inner wall of the shell so as to hold the barrel in proper position while it is being formed by the forming rolls and also serve to round up the barrels while they are being turned. By mounting each of the rollers 144 so that each is adjustably movable toward and from the forming roll with which it is associated, the rollers 144 can be adapted to be used in connection with barrels of varying diameters.

The barrel shell while being formed at each

station A and B is also supported exteriorly by supporting and guiding rollers 145. As best shown in Figs. 4 and 5, a pair of these rollers 145 is provided for each pair of forming rolls, each pair of rollers being arranged at opposite sides of the lower forming roll with which it is associated, and each roller being mounted at the upper end of an adjustable swinging arm 146. Each of these swinging arms 146 is pivotally secured at its lower end to a part of the vertically movable bearing blocks 127, 135 which carry the lower vertically movable forming rolls shafts 126, 133, so that when the lower forming rolls are moved upwardly to their operative positions, the rollers 145 are likewise moved up to engage the outside of the barrel shell as shown in Fig. 5, and thereby hold the barrel shells against the inside rollers 144 and positively hold the barrel shell in proper position for the forming operation and round up the barrel shells. Each of the arms 146 is secured intermediate its ends to its support by a slot and bolt connection indicated at 147 so that the arms 146 can be adjustably moved toward and from the forming rolls and hence adapt the positioning rollers carried thereby to barrel shells of different diameters.

It is apparent that while the barrel shells are being operated on by the beading and flanging rolls, the carriages 71 and 72 which carry the upper flanging rolls must be held against outward movement since if they move outwardly, or have any movement, the upper forming rolls move out of position and operate imperfectly in beading or flanging the barrel. Special means for locking the carriages in their inner or operative position are therefore provided, which, when the carriages 71 and 72 and forming rolls have been moved to their operative positions, positively lock the carriages 71 and 72 in this position. These means are preferably constructed as follows:

Formed on the upper side of each of the vertically moving bearing blocks 127 and 135 which respectively carry the lower flanging rolls shaft 126 and the lower beading rolls shaft 133 and are moved upwardly each time the carriages 71 and 72 are moved inwardly and outwardly, is a latch 148. This latch is in the form of a rectangular metal block or lug formed on the upper side of the bearing blocks 127 and 135. When these bearing blocks move upwardly and the carriages 71 and 72 move inwardly, these lugs or latches enter openings or slots 149 provided in the lower wall 75 of the carriages 71 and 72, and consequently after the carriages have been moved toward one another and after the bearing blocks 127 and 135 have been raised to elevate the lower forming rolls and the lower forming rolls shafts to their operative positions the interlocking engagement of the lugs 148 in the slots 149 positively prevents in-

ward or outward movement of the carriages and firmly holds the upper forming rolls carried by the carriages in their operative positions.

The driving mechanism

The means for insuring the synchronous operation of the mechanisms just described is preferably so arranged that the synchronism can be varied to suit barrel shells of different diameters, and is preferably constructed as follows:

The numeral 150 represents an electric motor which is suitably mounted at one side of the bed or frame 23 of the machine and carries a driving pinion 151 which drives a gear wheel 152. This gear wheel 152 is keyed to a shaft 153 which is suitably journaled in the machine frame and has keyed thereto a pinion 154. This pinion 154, as best shown in Fig. 14, meshes with a gear 155 which gear 155 is fast to a shaft 156. This shaft is journaled in bearings carried by the fixed and movable pedestals 63 and 65 and extends across the machine, the opposite ends of this shaft carrying elongated pinions 157, as best shown in Fig. 9. Each carriage 71 and 72 carries three idlers 158, the idlers on the carriage 71 connecting the elongated pinion 157 and the pinions 103 and 111, which last named pinions are respectively mounted on the upper beading roll shaft 101 and the upper flanging roll shaft 109 of the carriage 71 and rotate the beading and flanging rolls. In a similar manner, the idlers 158 on the carriage 72 connect the elongated driving pinion 157 with the pinion 103 on the upper beading roll shaft 101 of this carriage, and with the upper flanging roll shaft 109, thereby rotating the beading and flanging rolls carried by this carriage 72. It will be observed that by reason of the elongation of the pinions 157, 157, when the carriages 71 and 72 are reciprocated toward and from one another, the idlers 158 are always in engagement therewith and hence the beading and flanging rolls are continuously rotated.

A pair of idlers 159 also meshes with the elongated pinions 157 at each side of the machine, one of these idlers connecting one of the elongated pinions 157 with the gear 132 mounted on the end of the lower vertically movable flanging rolls shaft 126, and the other idler 159 connecting this elongated pinion 157 with the gear 160 mounted on the end of the lower vertically movable beading rolls shaft 133. The vertical movement of the lower forming rolls shafts 126 and 133 to their operative and inoperative positions is relatively slight and does not disturb the connection of the driving gears carried thereby with the motor.

The power for driving the main drive shaft 42 which actuates the cams which move the carriages back and forth and also the

lower forming rolls up and down and also the Geneva gear drive for the conveyer is arranged as follows:

Also meshing with the driving pinion 154 is a gear 161 which is fast to a shaft 162 carrying a pinion 163. This pinion 163 meshes with a gear 164 which is mounted on a shaft 165. On the outer end of the shaft 165 is keyed a small pinion 166 which meshes with a large gear 167 keyed to the outer end of the main drive shaft 42. It is therefore apparent that the main drive shaft is in direct and continuous connection with the motor 150 through a train of gears, and hence is continuously rotated.

It will be observed that the gear 167 on the end of the main drive shaft 42 and the pinion 166 which drives the same are both accessible from the exterior of the machine and can be readily removed. Since the motor 150 continuously rotates the flanging and beading rolls through another train of gears, and since the drive shaft 42 controls the speed with which the conveyer is advanced and the forming rolls moved to and from their operative positions, it is apparent that by varying the speed of the driving shaft 42 that the machine can be varied to operate properly on different sizes of barrel shells, it being undesirable to rotate the barrel shells by the forming rolls more than one complete revolution of the barrel shell. For example, with the barrels as shown the rotation of the beading and flanging rolls turns the barrels one complete revolution and the beading and flanging rolls are then withdrawn and the conveyer advanced. If a barrel shell twice the circumference were being beaded or flanged, the beading or flanging rolls would bead or flange half the barrel shell and then the beading and flanging rolls withdrawn and the barrel advanced. It is obvious that to remedy this defect it is necessary to slow up the speed or timing of the main drive shaft so as to permit of the larger barrel shell being completely beaded or flanged before the forming devices are withdrawn. This can be accomplished by replacing the gear 167 on the drive shaft 42 and its driving pinion 166 by a gear and pinion having the proper ratio to effect the desired timing of the main drive shaft.

Operation

The operation of the beading and flanging machine is summarized as follows:

The barrel shell 20, in the form of a straight sided cylindrical metal body is placed on the conveyer 29 at the feeding or front end of the machine, the shell being placed transversely and on the conveyer arms or flights 35 rising on the wheel 30, as shown in Fig. 1. The barrel shells are so fed in a continuous stream, a barrel shell being arranged between each of the conveyer arms or flights 35 on the upper or feeding stretch of the conveyer.

The motor 150, having been energized thereupon drives the main shaft 42 through the train of gears comprising the pinion 151 on the motor shaft, gear 152, pinion 154, gear 161, pinion 163, gear 164 and interchangeable pinion and gear 166 and 167. The main drive shaft 42 drives the Geneva gear 38 at the opposite side of the machine, the main drive shaft 42 turning the driving arm 43 four times to every revolution of the driven or star wheel 39 of the Geneva gear. The star wheel 39 of the Geneva gear is carried by the conveyer drive shaft 34 on which the driving wheels 32 of the two conveyer chains 29 which carry the barrel shells 20 along their upper stretches by means of the wings or flights 35. This Geneva gear drives the conveyer chains 29 with a step-by-step motion, the steps being such as to bring each barrel shell to rest first at the station A and then at the station B.

While the machine is in operation, the motor 150 also rotates the upper forming rolls comprising the upper beading rolls 100 and the upper flanging rolls 108 carried by the carriages 71 and 72, and also the lower beading rolls 106 and the lower flanging rolls 113 cooperating with the upper rolls. The upper beading and flanging rolls are driven through a train of gears comprising the pinion 151 on the motor shaft, gear 152, pinion 154, gear 155, elongated pinions 157, 157 mounted at opposite ends of the shaft 156, the two trains of idlers 158 at opposite sides of the machine on the carriages 71 and 72, and the two pairs of pinions 103 and 111 which are respectively secured to the upper beading roll shafts 101 and the upper flanging roll shafts 109, the beading rolls 100 and the flanging rolls 108 being mounted at the inner ends of these shafts. The lower beading and flanging rolls 106 and 113 are also continuously driven through a train of gears comprising the pinion 151 on the motor shaft, gear 152, pinion 154, gear 155, elongated pinion 157, pair of idlers 159, and pinions 160 and 132 mounted on the ends of the lower beading rolls shaft 133 and lower flanging rolls shaft 126 which carry the lower beading rolls 106 and the lower flanging rolls 113, respectively. The upper and lower forming rolls are rotated in opposite directions at the same speed so that when the opposite ends of the barrels are disposed between either the beading or flanging rolls, the same is rotated and beaded and flanged.

In order to center the barrel shells 20 on the conveyer and also move the upper beading and flanging rolls 100 and 108 to their operative positions, the carriages 71 and 72 which carry the centering plates 80 are moved together in the following manner:

The cam wheel 85 on the main drive shaft 42 rocks the arm 88 transversely of the machine, this movement of the rock arm rocking the rock shaft 89, rock arm 90, link 91

and rock arm 92. The movement of the rock arm 92 reciprocates the carriage 71 through the direct connection of the adjustable rod 95, and at the same time moves the carriage 72 in the opposite direction through the rod 96, rock beam 99 and link 991 which link is directly connected with the carriage 72. By means of the rock beam 99 the carriage 72 is moved in the opposite direction to the carriage 71, i. e., the carriages are moved toward and from one another.

After the carriages 71 and 72 carrying the upper forming rolls have been moved together, the lower forming rolls are moved up into operative relation to the upper forming rolls in the following manner:

The cam 115 on the main drive shaft 42 rocks the cradle 118 longitudinally of the machine, this movement, through the links 123 and 142 rocking the rock arms 141 and 124 and the rock shafts 140 and 125. The rocking movement of the rock shaft 140 rocks the arms 139 carried thereby and raises and lowers the links 138 which connect these last named rock arms with the bearing blocks 135 supporting the lower beading rolls shaft 133 and thereby moves the lower beading rolls 106 into and out of operative relation with the upper beading rolls 100. In a similar manner, the rocking of the rock shaft 125 moves the lower flanging rolls 113 into and out of operative relation with the upper flanging rolls 108 through the rock arms 126 on the rock shaft 125, and the links 130 which connect these rock arms with the vertically movable bearing blocks 127 which carry the lower flanging rolls shaft 126.

As the lower bearing blocks 127 and 135 are moved upwardly by the cam 115 as just described, the locking lugs 148 carried thereby enter the openings 149 in the carriages 71 and 72 which have been moved inwardly and positively hold these carriages against either inward and outward movement, thereby insuring the maintenance of the position of the upper forming rolls to properly bead and flange the barrel shells.

The movement of this mechanism is so synchronized that the Geneva gear 38 first advances the conveyer, the cam 85 then moves the carriages 71 and 72 together to center the barrel shells so on the conveyer and also bring the upper beading rolls 100 and the upper flanging rolls 108 to their operative positions, the cam 115 then moves the lower beading rolls 106 and lower flanging rolls 113 into operative relation to the upper beading and flanging rolls, respectively, the cam 115 then lowers the lower beading rolls 106 and the lower flanging rolls to their inoperative positions, the cam 85 then withdraws the carriages 71 and 72 outwardly and the Geneva gear 38 advances the conveyer another step. By this means the barrel shells 20 are successive-

ly beaded and flanged as they are carried along by the conveyer.

The machine is adjustable to different sizes of barrel shells by means of the various adjustments described, and the synchronization of the forming rolls to the advancing and controlling mechanism is varied by the simple substitution of gears of the ratio to produce the desired result for the gear 167 and pinion 166.

The barrels are also held in proper relation to both the beading and flanging rolls by the adjustable rollers 144 and 145 which engage both the inside and the outside of each end of each barrel being beaded or flanged and also serve to round up the barrel shell as it is turned and insure a perfectly round beaded and flanged product.

As a whole this invention provides a barrel beading and flanging machine which is comparatively simple considering the function which it performs, it operates reliably and efficiently to properly bead and flange barrel shells fed in a continuous stream, it requires no attention beyond the feeding and removing of the barrel blanks, it will properly bead and flange barrel shells regardless of substantial variations in the same, it is easily adjustable to different sizes of barrels and is not liable to get out of order under constant use.

I claim as my invention:

1. In a machine of the character described, two forming rolls, means for moving said rolls relative to one another, an endless conveyer belt adapted to receive barrel shells, step-by-step means moving said belt to bring the barrel shells successively into position between said rolls, a second pair of forming rolls arranged on the opposite side of said barrel from said first mentioned rolls, and means synchronized with said step-by-step means for moving said last named pair of rolls toward said first named pair of rolls to form that portion of the barrel shell disposed therebetween.

2. In a machine of the character described, a pair of cooperating forming rolls, an endless conveyer belt adapted to receive barrel shells, step-by-step means moving said belt to bring the barrel shells successively into position between said rolls, means synchronized with said step-by-step means for moving one of said rolls axially into operative relation to said barrel and means for moving the other forming roll laterally toward said axially movable forming roll thereby to form that portion of the barrel disposed between said rolls.

3. In a machine of the character described, a conveyer for conveying a barrel shell side-wise, a carriage arranged at each side of the path of the barrel shells, means for moving said carriages toward and from one another, a forming roll carried by each of said car-

riages, said rolls being adapted to enter the ends of said barrel shells upon inward movement of said carriages, a second pair of forming rolls mounted below the path of said barrel shells and means for moving said last named forming rolls laterally toward the forming rolls carried by said carriages upon the completion of the inward movement of said carriages.

4. In a machine of the character described, a conveyer for conveying barrel shells side-wise, a carriage arranged at each side of the path of the barrel shells, means for moving said carriages toward and from one another, a shaft journaled in each carriage and extending parallel to its line of movement, forming rolls carried at the opposing ends of said shafts and adapted to enter the ends of said barrel shells upon inward movement of said carriages, a pinion carried by each shaft, a relatively long continuously rotating gear mounted adjacent each of said carriages and meshing with said pinion whereby in all positions of said carriages said forming rolls are rotated, a second pair of forming rolls mounted below the path of said barrels, and means for moving said last named forming rolls laterally toward the forming rolls carried by said carriages upon completion of the inward movement of said carriages.

5. In a machine of the character described, a conveyer for conveying barrel shells side-wise, a pair of carriages arranged at opposite sides of the path of the barrel shells, means for moving said carriages toward and from one another, a bearing block carried by each of said carriages, a shaft journaled in said bearing block and extending parallel to the line of movement of said carriage, forming rolls carried at the opposing ends of said shafts, and adapted to enter the ends of said barrel shells upon inward movement of said carriages, means for adjusting the position of each bearing block relative to its carriage, a second pair of forming rolls mounted below the path of said barrels, means for moving said last named forming rolls laterally toward the forming rolls carried by said shafts upon completion of the inward movement of said carriages and means for rotating one of said forming rolls to revolve the barrel shell.

6. In a machine of the character described, a conveyer for conveying barrel shells side-wise and in spaced relation, a carriage arranged at each side of the path of said barrel shells, means for moving said carriages toward and from one another, a centering member carried at the opposing sides of each of said carriages and adapted to engage the ends of the barrel shells to center the same, a pair of rollers carried by each of said centering members and adapted to enter the ends of the barrel shells to limit the lateral movement of said barrel shells and round up said barrel shells, a forming roll carried by each of said

carriages, said forming rolls being adapted to enter the ends of said barrels upon inward movement of said carriages, a second pair of forming rolls mounted below the path of said barrels, and means for moving said last named forming rolls laterally toward the forming rolls carried by said carriages upon the completion of the inward movement of said carriages.

7. In a machine of the character described, a conveyer for conveying barrel shells side-wise and in spaced relation, a carriage arranged at each side of the path of said barrel shells, means for moving said carriages toward and from one another, a centering member carried at the opposing sides of each of said carriages and adapted to engage the ends of the barrel shells to center the same, a freely rotatable roller carried by each of said centering members and adapted to enter the ends of said barrel shells upon inward movement of said carriages, a forming roll carried by each of said carriages, said forming rolls being adapted to enter the ends of said barrel shells upon inward movement of said carriages, a second pair of forming rolls mounted below the path of said barrels, means for moving said last named forming rolls laterally toward and from the forming rolls carried by said carriages upon the completion of the inward movement of said carriages to deform the parts of the barrel shell interposed between said rolls, and a second freely rotatable roller movable with said laterally movable forming roll, said last named roller being arranged to move into cooperative relation to said first named roller to hold the barrel shells in proper position and round up said barrel shells.

8. In a machine of the character described, a conveyer for conveying barrel shells side-wise and in spaced relation, a carriage arranged at each side of the path of said barrel shells, means for moving said carriages toward and from one another, a centering member carried at the opposing sides of each of said carriages and adapted to engage the ends of the barrel shells to center the same, a pair of freely rotatable rollers carried by each of said centering members, said rollers being adapted to enter the ends of said barrel shells upon inward movement of said carriages, a forming roll carried by each of said carriages intermediate said rollers, said forming rolls being adapted to enter the ends of said barrel shells upon inward movement of said carriages, a second pair of forming rolls mounted below the path of said barrels, means for moving said last named forming rolls laterally toward and from the forming rolls carried by said carriages upon the completion of the inward movement of said carriages to deform the parts of the barrel shell interposed between said rolls, a second pair of freely rotatable rollers movable with said lat-

erally movable forming rolls and arranged on opposite sides thereof, said last named rollers being arranged to move into cooperative relation to said first named pair of rollers to hold the barrel shells in proper position and to round up said barrel shells.

9. In a machine of the character described, a conveyer for conveying barrel shells side-wise, a carriage arranged at each side of the path of the barrel shells, means for moving said carriages toward and from one another, a forming roll carried by each of said carriages, said rolls being adapted to enter the ends of said barrel shells upon inward movement of said carriages, a second pair of forming rolls mounted below the path of said barrel shells, and means for moving said last named forming rolls laterally toward the forming rolls carried by said carriages upon the completion of the inward movement of said carriages, plates carried at the opposing sides of said carriages and adapted to engage the ends of the barrel shells to center the same and means for adjustably moving said plates toward and from said carriages.

10. In a machine of the character described, a conveyer for conveying barrel shells side-wise, a carriage arranged at one side of the path of the barrel shells, means for moving said carriage toward and from said conveyer, a forming device carried by said carriage and adapted to act on the barrel shells on said conveyer upon completion of the movement thereof toward said conveyer, latch means for holding said carriage against movement upon the completion of the movement thereof toward said conveyer and means for releasing said latching means upon completion of the forming operation on said barrel shell.

11. In a machine of the character described, a conveyer for conveying barrel shells side-wise, a carriage arranged at one side of the path of the barrel shells on said conveyer, means for moving said carriage toward and from said conveyer, a forming roll carried by said carriage and adapted to enter the barrel shells upon movement of said carriage toward said conveyer, a second forming roll mounted below the path of said barrels, means for moving said last named forming roll toward the forming roll carried by said carriage upon the completion of the movement of said carriage toward said conveyer, a latch for engaging said carriage and holding it against movement and means operatively connecting said laterally movable forming roll actuating means and said latch whereby upon movement of said last named roll toward the roll carried by said carriage said latch is moved to latch said carriage and upon reverse movement of said laterally movable roll said carriage is released.

12. In a machine of the character described, a conveyer for conveying barrel

shells sidewise, a pair of carriages mounted on opposite sides of the path of the barrel shells on said conveyer, means for moving said carriages toward and from one another, a forming roll carried by each of said carriages and adapted to enter the ends of the barrel shells upon inward movement of said carriages, a pair of forming rolls mounted below said conveyer, a bearing block rotatably supporting each of said last named forming rolls, and means for moving said bearing blocks vertically upon completion of the inward movement of said carriages to move said last named forming rolls into operative relation to the forming rolls on said carriages, each of said bearing blocks being arranged below one of the carriages and a cooperating latch and shoulder provided on each of said bearing blocks and carriages whereby upon upward movement of said bearing blocks, said carriage is latched against movement.

13. In a machine of the character described, a pair of forming devices adapted to engage the inner and outer sides of a barrel shell, an endless conveyer belt adapted to receive barrel shells, step-by-step means moving said belt to bring the barrel shells successively into position between said rolls, and cam means synchronized with said step-by-step means for positively moving said forming devices into and out of operative relation with one another.

14. In a machine of the character described, a conveyer for conveying barrel shells sidewise, a pair of cooperating forming devices arranged alongside of the path of the barrel shells on said conveyer, a cam shaft, means for driving said cam shaft, a cam mounted on said cam shaft and adapted to move one of said forming devices to its operative position, a second cam mounted on said cam shaft and moving the other forming device to its operative position, and means operatively connecting said cam shaft and said conveyer, whereby upon continuous rotary movement of said cam shaft, a step-by-step movement is imparted to said conveyer.

15. In a machine of the character described, a conveyer for conveying barrel shells, a pair of cooperating forming devices arranged along the path of the barrel shells on said conveyer, a cam shaft, means for continuously turning said cam shaft, means for advancing said conveyer step-by-step through motion derived from said cam shaft, cam means carried by said cam shaft, and means for moving said forming devices into and out of operative relation to a barrel on said conveyer through motion derived from said cam means, said cam means being adapted to move said forming devices into operative relation to said barrel on completion of a forward step of said conveyer and being adapted to withdraw said forming devices immediately preceding

ceding the next forward step of said conveyer.

16. In a machine of the character described, an endless conveyer for conveying barrel shells, forming devices arranged along the path of the barrel shells on said conveyer, a cam shaft journaled transversely to said conveyer, means for continuously turning said cam shaft, a Geneva gear between said cam shaft and said conveyer, said Geneva gear including a drive wheel on said cam shaft and a star wheel driving said conveyer whereby upon each rotation of said cam shaft said star wheel and conveyer are advanced a predetermined distance and held at rest a definite length of time, cam means carried by said cam shaft and adapted to move said forming devices into and out of operative relation with a barrel carried by said conveyer, said cam means being adapted to move said forming devices into and out of operative relation to said barrel during the period of rest of the conveyer.

17. In a machine of the character described, a conveyer for conveying barrel shells sidewise, a longitudinally movable forming roll arranged at one side of said conveyer and adapted to enter the barrel shells, a laterally movable forming roll arranged adjacent said conveyer and movable toward said longitudinally movable forming roll to engage the wall of the barrel shells therebetween, means for rotating at least one of said forming rolls to revolve the barrel shell, means for advancing said conveyer to place the barrel shells successively in operative relation to said forming rolls, and means synchronized with said conveyer advancing mechanism to thereafter move said longitudinally movable forming roll to its operative position and thereafter move said laterally movable forming roll into its operative position.

18. In a machine of the character described, an endless conveyer for conveying barrel shells sidewise, a longitudinally movable forming roll arranged at one side of said conveyer and adapted to enter the barrel shells, a laterally movable forming roll arranged adjacent said conveyer and movable toward and from said longitudinally movable forming roll to engage the wall of the barrel shell arranged therebetween, means for rotating at least one of said forming rolls to revolve the barrel, means for advancing the conveyer step-by-step to successively position each barrel relative to said forming rolls and means synchronized with said conveyer advancing mechanism to move successively said longitudinally movable forming roll to its operative position, move said laterally movable forming roll to its operative position, withdraw said laterally movable forming roll and withdraw the longitudinally movable forming roll before the conveyer is again advanced.

19. In a machine of the character described, a cam shaft, means for driving said cam shaft, an endless conveyer for conveying barrel shells sidewise, means for imparting a step-by-step movement to said conveyer through motion derived from said cam shaft, a longitudinally movable forming roll arranged at one side of said conveyer and adapted to enter the barrel shells thereon, a cam on said cam shaft for moving said forming roll into and out of operative position, a laterally movable forming roll arranged adjacent said conveyer and movable toward and from said longitudinally movable forming roll to engage the wall of the barrel shell therebetween, a second cam on said cam shaft for moving said laterally movable forming roll into and out of its operative position, and means for rotating at least one of said forming rolls to revolve the barrel shell, said cam being arranged to move successively said longitudinally movable forming roll to its operative position, move said laterally movable forming roll to its operative position, withdraw said laterally movable forming roll, to withdraw said longitudinally movable forming roll during each period that the conveyer is at rest.

20. In a machine of the character described, a conveyer for advancing barrel shells, a pair of forming rolls movable into operative relation to the barrel shells on said conveyer, means for advancing said conveyer step-by-step to position successively said barrel shells relative to said forming rolls, means synchronized with said conveyer advancing means to move said forming rolls into and out of operative positions while said conveyer is at rest, means for continuously rotating said forming rolls to revolve the barrel shell therebetween and means for varying the relative speed of said rolls and said means for moving said rolls into and out of their operative positions.

21. In a machine of the character described, a motor, a shaft driven by said motor, a conveyer for advancing barrel shells sidewise, a pair of forming rolls arranged adjacent said conveyer, means for advancing said conveyer step-by-step through motion derived from said shaft to position the barrel shells successively relative to said forming rolls, means actuated through motion derived from said shaft for moving said forming rolls into and out of operative relation to said positioned barrel shell while said conveyer is at rest, means actuated by said motor to rotate at least one of said forming rolls and revolve the barrel therebetween, and means for varying the relative speed of said last named means and said shaft.

22. In a machine of the character described, a cam shaft, a motor, a train of gears between said motor and said cam shaft, two of the gears of said train of gears

being removable to permit of varying the speed at which said cam shaft is driven by the substitution of other gears of different ratios, an endless conveyer adapted to convey barrel shells sidewise, means for imparting a step-by-step motion to said conveyer, a forming roll movable longitudinally into the barrel shells on said conveyer, a cam on said cam shaft, means actuated by said cam for moving said forming roll into one of the barrels on said conveyer when said conveyer is at rest, a laterally movable forming roll movable toward and from said longitudinally movable forming roll, a second cam on said cam shaft, means for moving said laterally movable forming roll toward said longitudinally movable forming roll after said longitudinally movable forming roll is moved to its operative position, and a train of gears for continuously rotating at least one of said forming rolls through motion derived from said motor.

23. In a machine of the character described, a conveyer for advancing barrel shells sidewise, a cam shaft, means for driving said cam shaft, means for advancing said conveyer step-by-step through motion derived from said cam shaft, a longitudinally movable forming roll arranged at each side of said conveyer, means actuated by said cam shaft for moving said forming rolls into the opposite ends of a barrel shell on said conveyer while said conveyer is at rest, a laterally movable forming rolls shaft arranged below said longitudinally movable forming rolls, a pair of lower forming rolls mounted on said lower forming rolls shaft and movable into operative relation to said longitudinally movable forming rolls, means for continuously rotating at least one pair of said forming rolls, and means for moving said lower forming rolls toward and from said longitudinally movable forming rolls comprising a vertically movable bearing block supporting said lower forming rolls shaft, a cam on said cam shaft and means operatively connecting said cam and said bearing block to raise and lower said bearing block.

24. In a machine of the character described, a conveyer for advancing barrel shells sidewise, a cam shaft, means for driving said cam shaft, means for advancing said conveyer step-by-step through motion derived from said cam shaft, a longitudinally movable forming roll arranged at each side of said conveyer, means actuated by said cam shaft for moving said forming rolls into the opposite ends of a barrel shell on said conveyer while said conveyer is at rest, a laterally movable forming rolls shaft arranged below said longitudinally movable forming rolls, a pair of lower forming rolls mounted on said lower forming rolls shaft and movable into operative relation to said

longitudinally movable forming rolls, means for continuously rotating at least one pair of said forming rolls and means for moving said lower forming rolls toward and from said longitudinally movable forming rolls comprising a vertically movable bearing block supporting said lower forming rolls shaft, a rock shaft arranged adjacent said bearing block, a rock arm on said rock shaft, means operatively connecting said rock arm and said bearing block, a cam on said cam shaft and means operatively connecting said cam and said rock shaft. 70

25. In a machine of the character described, a conveyer for advancing barrel shells sidewise, a cam shaft, means for driving said cam shaft, means for advancing said conveyer step-by-step through motion derived from said cam shaft, a longitudinally movable forming roll arranged at each side of said conveyer, means actuated by said cam shaft for moving said forming rolls into the opposite ends of a barrel shell on said conveyer while said conveyer is at rest, a laterally movable forming rolls shaft arranged below said longitudinally movable forming rolls, a pair of lower forming rolls mounted on said lower forming rolls shaft and movable into operative relation to said longitudinally movable forming rolls, means for continuously rotating at least one pair of said forming rolls, and means for moving said lower forming rolls toward and from said longitudinally movable forming rolls comprising a vertically movable bearing block supporting said lower forming rolls shaft, a rock shaft arranged adjacent said bearing block, a rock arm on said rock shaft, means operatively connecting said rock arm and said bearing block, a cam on said cam shaft, a cradle embracing said cam, rollers carried by said cradle and engaging said cam whereby the rotary movement of said cam rocks said cradle and a link operatively connecting said cradle and rock shaft. 80 85 90 95 100 105 110

26. In a machine of the character described, a conveyer for conveying barrel shells sidewise, a pair of carriages mounted at opposite sides of said conveyer and movable toward and from said conveyer, a cam shaft, means for driving said cam shaft, means for advancing said conveyer step-by-step through motion derived from said cam shaft, a forming roll carried by each carriage and adapted to enter a barrel shell in said conveyer when said carriages are moved inwardly, a second pair of forming rolls arranged below said forming rolls on said carriage, means for moving said lower forming rolls laterally toward said forming rolls on said carriage through motion derived from said cam shaft and means for moving said carriages toward and from said conveyer comprising a rock arm arranged below said conveyer, means connecting said rock arm 115 120 125 130

and each of said carriages whereby upon movement of said rock arm in one direction said carriages are moved together and vice versa, a cam on said cam shaft and means for actuating said rock arm through motion derived from said cam.

In testimony whereof I hereby affix my signature.

BROR J. LINDGREN.