July 29, 1924. 1,503,038

C. T. DRAPER

STEEL BARREL MAKING

Filed Sept. 13, 1920 7 Sheets-Sheet 1

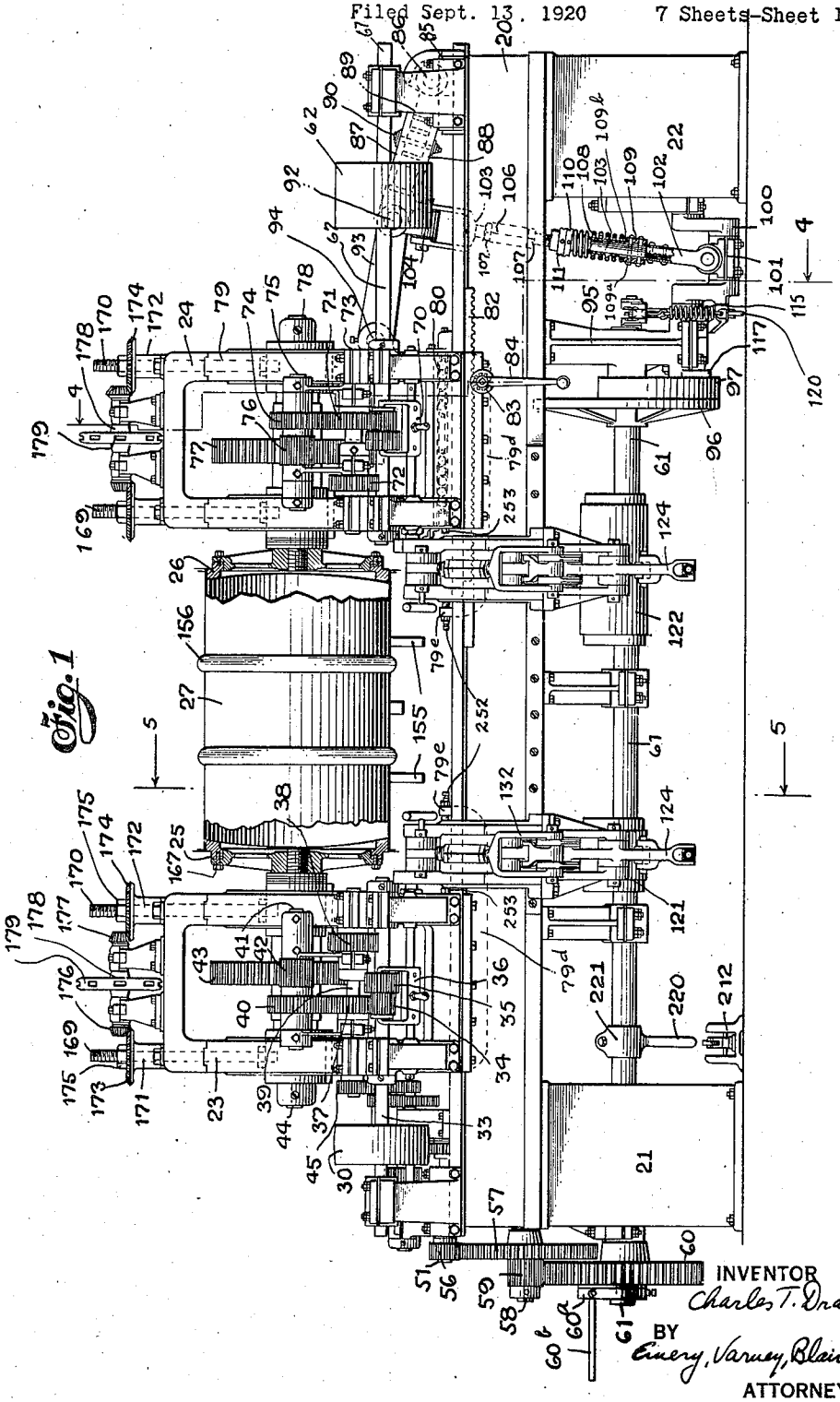


Fig. 1

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July 29, 1924. 1,503,038

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STEEL BARREL MAKING

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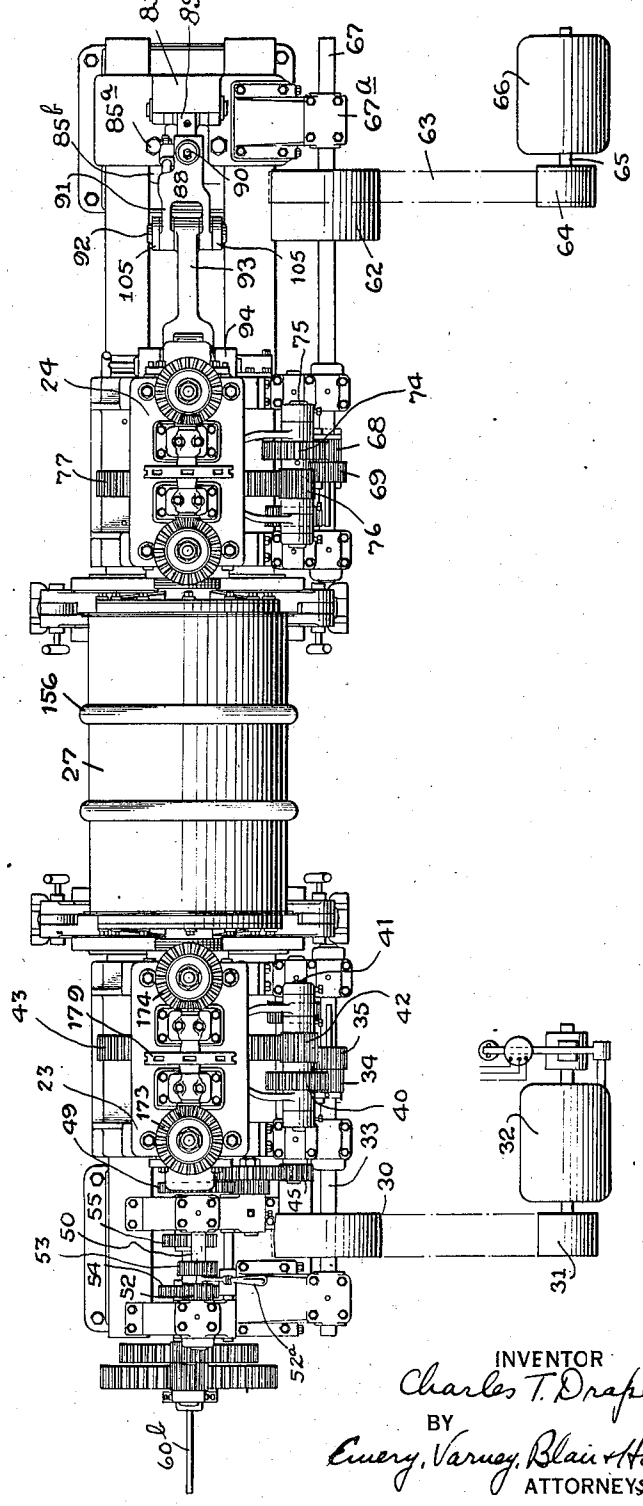


Fig. 2

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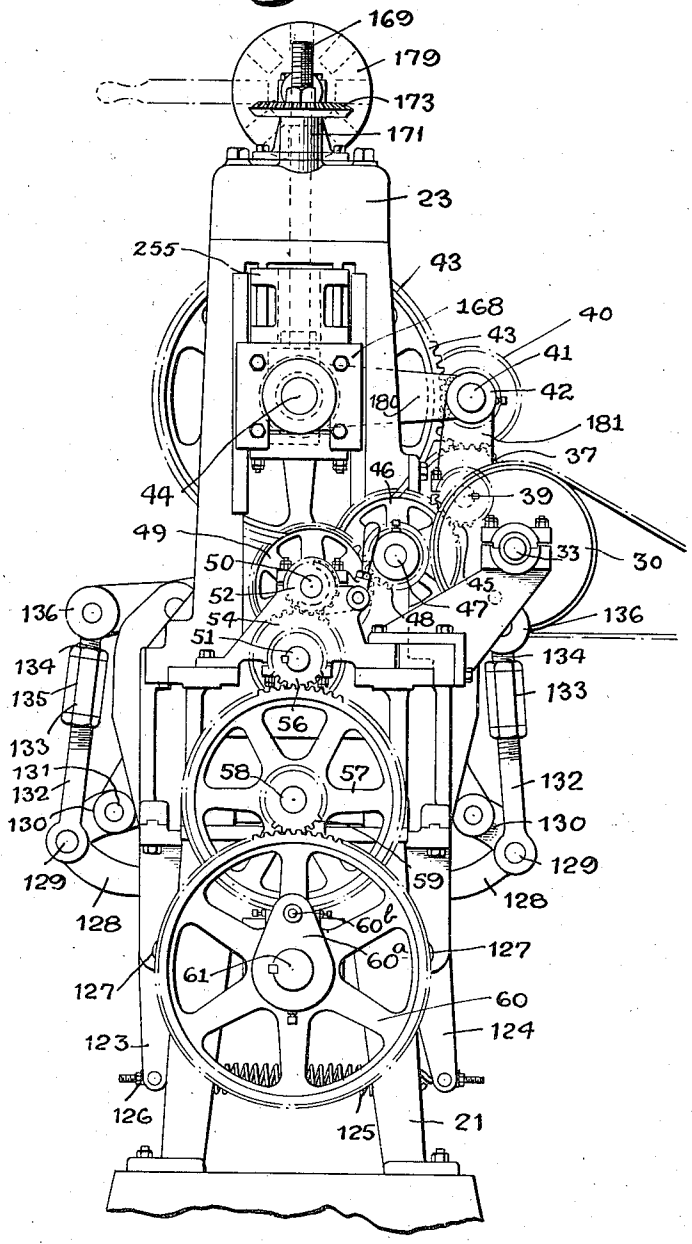
July 29, 1924. 1,503,038

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STEEL BARREL MAKING

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Fig. 3



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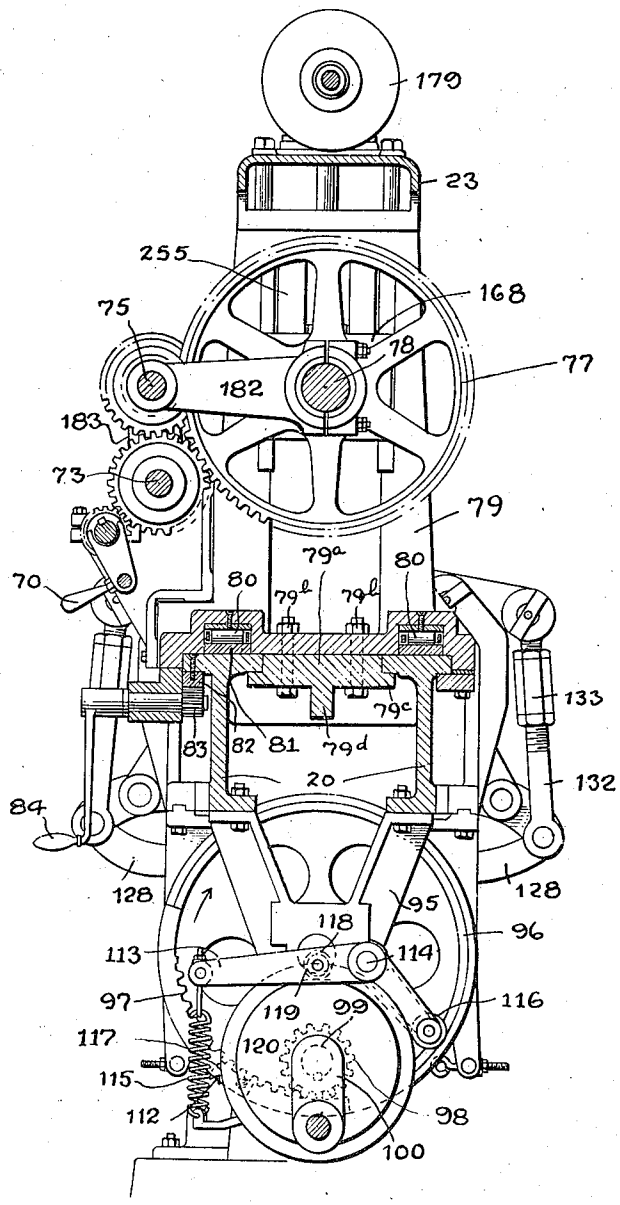
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STEEL BARREL MAKING

Filed Sept. 13, 1920 7 Sheets-Sheet 4

Fig. 4



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C. T. DRAPER

STEEL BARREL MAKING

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Fig. 5

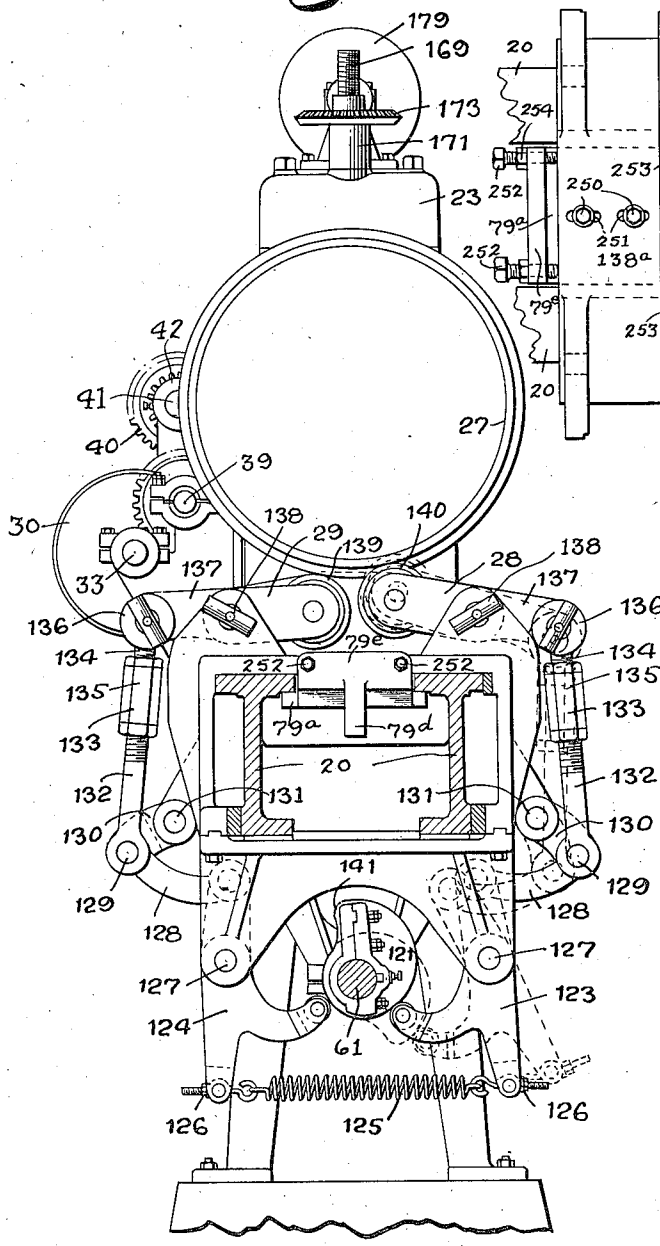
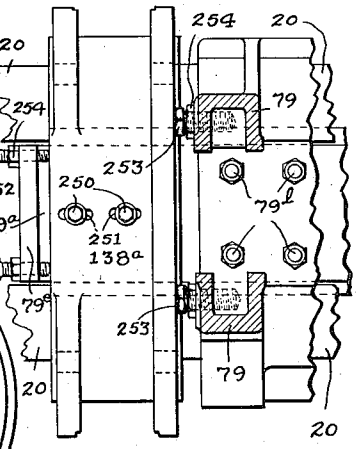


Fig. 5a



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July 29, 1924. 1,503,038

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STEEL BARREL MAKING

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Fig. 6

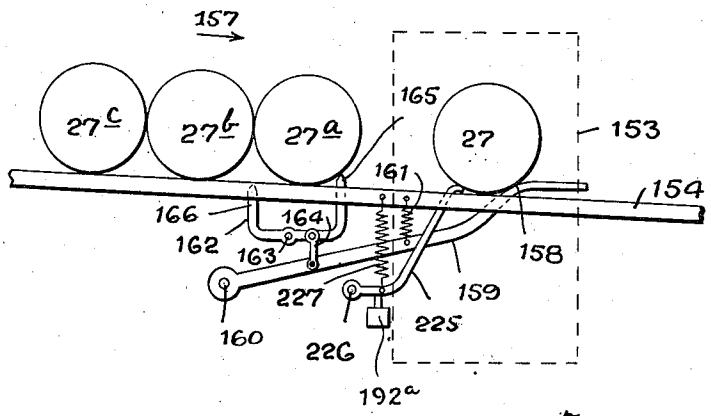


Fig. 8

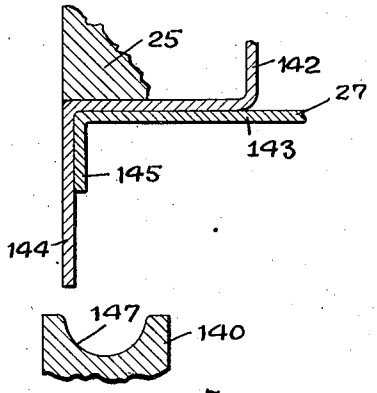


Fig. 9

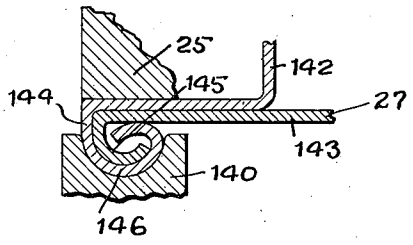


Fig. 10

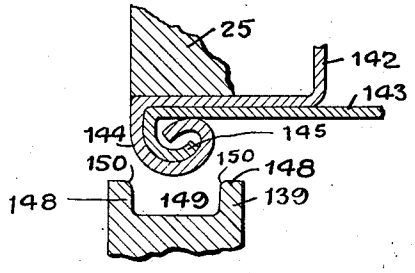
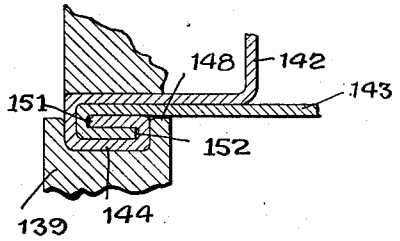


Fig. 11



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July 29, 1924. 1,503,038

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STEEL BARREL MAKING

Filed Sept. 13, 1920 7 Sheets-Sheet 7

Fig. 7

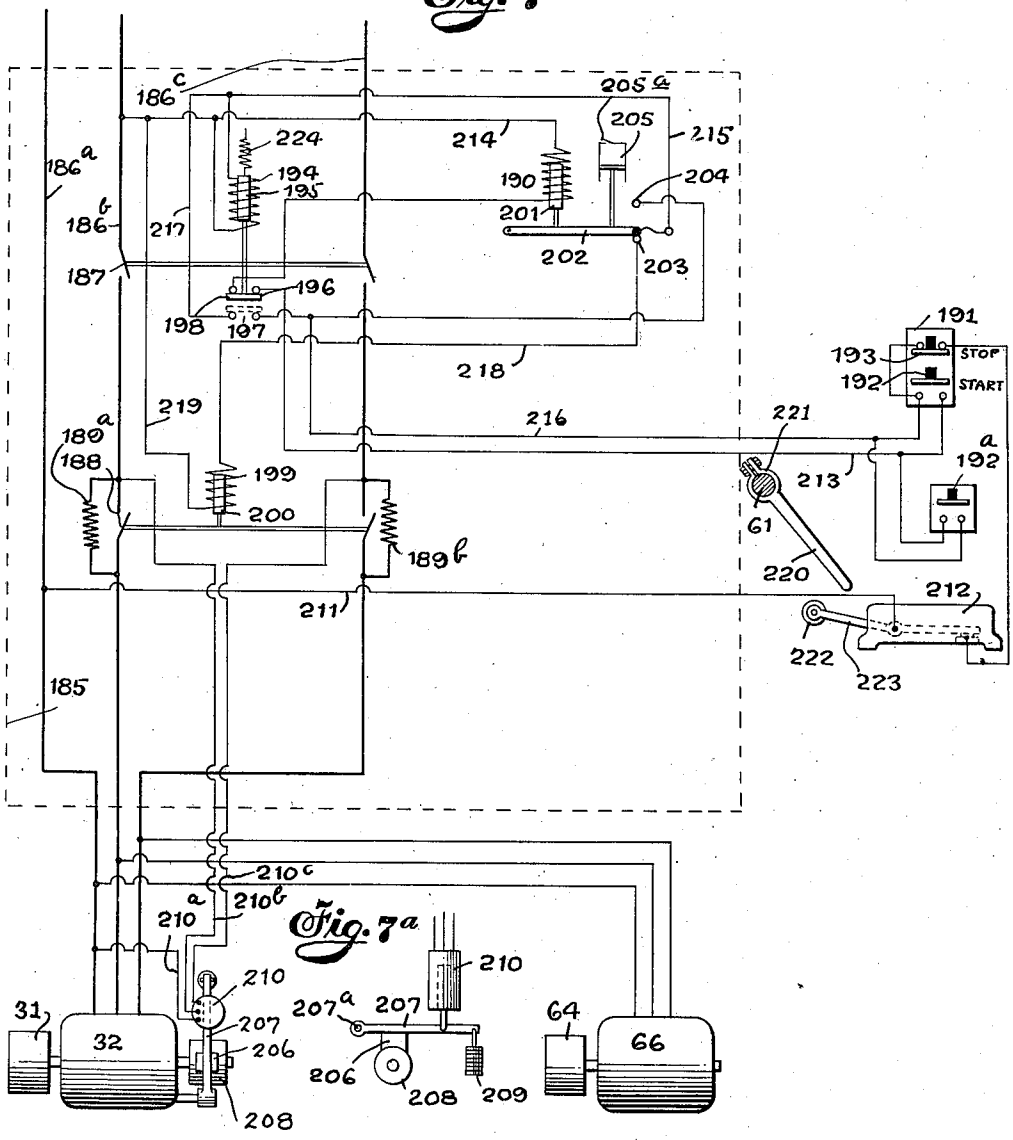


Fig. 7a

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Patented July 29, 1924. 1,503,038

UNITED STATES PATENT OFFICE.

CHARLES T. DRAPER, OF CLEVELAND, OHIO, ASSIGNOR TO THE DRAPER MANUFACTURING COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

STEEL-BARREL MAKING.

Application filed September 13, 1920. Serial No. 409,992.

To all whom it may concern:

Be it known that I, CHARLES T. DRAPER, a citizen of the United States, and a resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented an Improvement in Steel-Barrel Making, of which the following is a specification.

This invention relates to the making of steel barrels and the like. One of the objects thereof is to provide apparatus for making steel barrels and the like, which shall be of practical and simple construction and efficient action. Other objects are to provide an apparatus of the above nature and reliable and effective means for bringing the barrel into and out of position. Another object is to provide apparatus of the type first mentioned which shall be readily adjustable for different sizes of barrels. Another object is to provide efficient mechanism for accurately forming a double seam. Other objects are to provide an apparatus of the type first mentioned which shall be rapid and substantially automatic in many features of its action. Another object is to provide an art, various features of which are adapted for the rapid and convenient making of steel barrels and the like. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangement of parts and in the several steps and relation and order of each of the same to one or more of the other steps, all as will be illustratively described herein and the scope of the applications of which will be indicated in the following claims.

In the accompanying drawings in which is shown one of various possible embodiments of the several mechanical features of this invention,

Figure 1 is a front elevation of this embodiment;

Figure 2 is a plan of the apparatus shown in Figure 1;

Figure 3 is a left-hand end view of the same;

Figure 4 is a section along the line 4—4 of Figure 1 taken in the direction indicated by the arrows;

Figure 5 is a similar section along the line 5—5 of Figure 1;

Figure 5ª is a detailed view in elevation on an enlarged scale showing certain features of the roller lever housing;

Figure 6 is a diagrammatic side elevation of barrel-feeding mechanism;

Figure 7 is a simplified diagram of electric circuits; and Figure 7ª is a diagrammatic representation of the motor brake;

Figures 8, 9, 10 and 11 are sectional views illustrating the successive actions of the rolls in forming a double seam.

Similar reference characters refer to similar parts throughout the several views of the drawings.

As conducive to a clearer understanding of certain broad features of this invention, it may be noted that it deals primarily with the formation of steel barrels or like containers and is directed primarily to the manufacture of these large heavy vessels and to the solution of problems peculiar to such manufacture.

Referring now in detail to Figure 1 of the drawings, there is shown a frame 20 mounted upon the end pedestals 21 and 22. Briefly outlined the parts mounted on this frame comprise what may broadly be termed a head-stock 23 and a tail-stock 24 respectively provided with the rotating chucks 25 and 26 inserted within the ends of the barrel 27 which is gripped between them and rotated thereby. The stock 24 is intermittently withdrawn and adjusted into the position shown as successive barrels 27 are brought into alignment with the chucks and each barrel is acted upon successively by roll mechanism 28 and 29 (Figure 5) to form the end seam.

With this general understanding the several separate although co-acting mechanisms will for the sake of clearness, be successively described.

The head-stock and associated parts.— Referring first to the plan (Figure 2) the pulley 30 is driven by a belt from the pulley 31 of the electric motor 32. Pulley 30 drives the shaft 33 on which are splined gears 34 and 35 which are longitudinally shiftable as a unit by means of the handle 36 (Figure 1). In the position shown, gear 34 meshes with and drives the gear 37 with a predetermined speed reduction. By shifting gears 34 and 35 to the right, the former slides out of mesh with gear 37, and 35 intermeshes with gear 38, thus driving shaft

39 on which 37 and 38 are mounted, at a higher rate of speed.

From the shaft 39 there are two lines of drive. First the gear 37 is continuously in mesh with a gear 40 on an upper shaft 41 provided with a heavy pinion 42. Pinion 42 drives the heavy gear 43 which is fast upon the main shaft or spindle 44 on which the chuck 25 is mounted and by which it is driven.

The second line of drive from the shaft 39 is by means of a pinion 45 which meshes with a gear 46 (Figure 3) on a shaft 47. From shaft 47 the pinion 48 leads the power to a gear 49 on a shaft 50. This shaft drives shaft 51 by speed-change gearing comprising a pair of pinions 52 and 53 (Figure 2) splined to the shaft and longitudinally shiftable as by the handle 52^a. In one position pinion 52 drives a gear 54 upon the shaft 51, whereas when shifted to the right, this connection is broken and the pinion 53 slides into mesh with a gear 55 also on shaft 51. By this means the speed ratio of shafts 50 and 51 is altered.

From shaft 51 a heavy pinion 56 drives a large gear 57 on a stud 58, this latter gear having fast thereto a still heavier pinion 59 driving a heavy gear 60 mounted upon the lower shaft 61 so that it may freely rotate thereon. Adjacent the gear 60 there is keyed to shaft 61 a collar 60^a having an offset through which is inserted a pin or rod 60^b to engage and enter an opening in one spoke of gear 60. In this manner the rotation of gear 60 is transmitted through the rod 60^b and the irregularly-shaped collar 60 to the shaft 61. The rod 60^b is of such cross section that it will be immediately sheared, thus interrupting the transmission of driving power to shaft 61, as soon as the load upon the operating mechanisms of the machine exceeds a certain value. The machine and its several parts are thus effectively safe-guarded against accident or jamming of parts thereof. For example, should the proper movement of the tail stock be interfered with by reason of a barrel being caught diagonally between the chucks 25 and 26, the load on the cam shaft 61 would become excessive, as will be clear from the construction hereinafter described, and the pin or rod 60^b would be sheared off, thus safe-guarding the main driving mechanism and the tail-stock actuating mechanism. After the pin 60^b is once sheared off and the machine ready for further operation the rod is again inserted in the registering openings in the gear 60 and the collar 60^a whereupon the operation may be resumed.

The tail-stock mechanism.—It may at this point be noted that the terms "head-stock" and "tail-stock" are used simply as a convenient means of designation and in a broad sense without limitation to any particular features of the corresponding and broadly analogous parts of a lathe.

Tracing the driving of the tail-stock mechanism, the pulley 62 is provided with a broad face to permit the driving belt 63 to travel over its face, as hereinafter described. This belt is driven from a pulley 64 on the shaft 65 of a motor 66.

Pulley 62 is mounted on a back shaft 67 suitably journaled at the side of the machine. The details of journal boxes, brackets and the like will not be here described as they form in themselves no essential part of the invention. The shaft 67 is provided with a pair of pinions 68 and 69 shiftable as by the handle 70 (Figure 1) in such manner as to mesh either pinion 68 with a gear 71 or, as an alternative, the pinion 69 with a gear 72, both gears 71 and 72 being mounted on shaft 73 which is accordingly driven at a variable speed ratio from the shaft 67. The gear 71 is continually in mesh with a gear 74 on an upper shaft 75 provided with a heavy pinion 76 by which is driven the heavy gear 77 on the main shaft or spindle 78 to which the chuck 26 is secured and by which it is driven.

Mechanism for shifting tail-stock.—As best shown in Figures 1 and 4 of the drawings, the entire tail-stock frame 79 with the parts mounted thereon is movable longitudinally of the machine, being mounted on roller bearings 80 running in suitable raceways 81 on the bed or frame of the machine. That is, with respect to the position of the parts shown in Figure 1 of the drawings, the tail-stock may be moved a substantial distance to the right, carrying with it the chuck 26, and may be returned to the position shown, all without interruption of the drive of the parts.

As is more clearly shown in Figure 4, the tail-stock frame 79 is guided in its movement on the frame member 20 by means of an underslide 79^a securely clamped thereto, as by means of the bolts 79^b, the underslide 79^a being provided with laterally extending guide portions 79^c for contacting with the underside of the frame members 20. The underslide 79^a is also provided with a longitudinally extending reinforcing web 79^d for a purpose to be hereinafter more clearly described, and it will be noted, as shown in Figure 1, that the underslide 79^a is extended in the direction towards the chuck 26. The head stock 23 is provided with a similar underslide which is likewise extended in the direction of the chuck 25. Since the head-stock 23 is stationary and not slidably arranged with the frame members 20, the underslide member 79^a used in connection therewith functions not only as an aligning member for the head-stock but also as a clamping member to secure the head-stock 23 in position.

Means are provided comprising the rack 82 and feed pinion 83, the latter turned as by crank 84 whereby this movement or any desired portion of its full range, may be attained manually; but in the action of the apparatus, it is preferred that this longitudinal movement of the tail-stock shall be automatically brought about.

Clamped to the ways of the frame or bed at the extreme right end (Figures 1 and 2) by means of the bolts 85[a] and the clamping piece 85[b] extending underneath the ways is a bracket 85 to which is pinned at 86 one end of a heavy link 87. This link is built up of the telescopically disposed parts 88 and 89 held together by the cross pin 90. By this means the effective length of the link may be varied by bringing into registry for the pin 90 a succession of holes in one of these members with a corresponding hole in the other. The outer member 88 is forked (as at 91) and provided with a heavy cross pin 92 on which is journaled for oscillating movement a link 93. The free end of link 93 is given a pivotal connection at 94 with the frame 79 of the tail-stock.

It will thus be seen that the links 87 and 93 constitute a heavy toggle which in its fully aligned position shown in Figure 1 of the drawings throws the tail-stock into its adjusted and operative relation to the barrel, whereas if this toggle be flexed or swung upwardly at its center, it will due to its anchorage at 85, draw the entire tail-stock with its associated parts to the right. It will furthermore be noted that the anchorage 85 of the toggle is adjustable longitudinally of the ways and that in changing the position of the anchorage 85, the tail-stock and the chuck 26 are likewise changed in their relation to chuck 25 and that in this manner the chucks may be readily positioned to engage barrels of varying lengths.

The pin 90 joining the telescoping parts 88 and 89 of the link 87 of the toggle is of such cross-section that it will be sheared as soon as the load upon the toggle exceeds the value determined by the cross-section of the pin 90. Should the action of the toggle in moving the tail-stock be interfered with, for example, by reason of a barrel being improperly aligned with the chucks 25 and 26, the pin 90 will be sheared and the toggle-actuating mechanism will be relieved from the excessive load and safeguarded against breakage or injury.

Taking up now the means for flexing or operating the above toggle, the heavy lower shaft 61 is provided adjacent its end hanger 95 with a disk or plate 96, about a portion of the periphery of which there is secured an internal gear sector 97 (Figures 1 and 4). This gear sector is adapted to mesh with a pinion 98 on a short crank shaft 99 provided with the crank 100. Journaled on this crank is a split collar or sleeve 101 to which is pivotally connected a tubular link 102. This link receives a link 103, with which it forms a telescopic connection and which is joined by the universal joint 104 to the knuckle or central pivot pin 92 on the toggle by means of its bifurcated upper end provided with the eyes 105 (Figure 2). A collar 109 is slidably mounted upon the tubular member 102 and is secured to the lower interior end of the link 103 by means of the pins 109[a], suitable slots being provided in the tubular member 102 to accommodate the pins 109[a] and to permit of relative motion between the link 102 and the link 103 with its associated collar 109. A spring 108 is mounted upon the exterior of the tubular link 102 and is compressed between the collar 109 on the link 103 and the collar 110 threaded upon the upper end of the tubular link 102. A secondary collar 111 forms a locking nut to maintain the collar 110 in any desired adjusted position. The effective length of the link as a whole connecting the crank 100 and the pin 92 is adjustable as by means of the threaded sleeve or union 106 provided with locking nuts 107. The spring 108 thus forms a yielding connection between the links 102 and 103, the force applied to one link being transmitted to the other through this spring. This spring thus prevents the possible jamming of the parts operated by the toggle, since the spring will be compressed if the load on the toggle is excessive. It will also be noted, however, that in substantially every position of the crank 100 with respect to the toggle member, the spring 108 will be under compression, and, for example, in the position shown in Figure 1, with the crank 100 in its lowermost position, the spring 108 will constantly apply a downward pull upon the pin 92 of the toggle, thus tending constantly to straighten the toggle out to a greater extent than is accomplished by the crank motion alone. Thus the tail-stock 79 with its chuck 26 and other associated parts will be constantly stressed in the direction towards the barrel 27, so that the tail-stock, chuck 26 and the rollers operating upon that end of the barrel will automatically follow up any shortening in the barrel 27 due to the seaming operations. The spring 108 thus insures the gripping of the barrel between the chucks 25 and 26 with undiminished pressures as the barrel shortens by reason of the flanges of the head and drum being tucked one into the other, as will be more clearly hereinafter described. The flanges of the head and barrel thus at all times are securely held in intimate contact by the pressure constantly exerted by this spring, thus insuring a perfect seam. The spring 108 likewise

permits of the accommodation between the chucks 25 and 26 of barrels varying slightly in length, since the advance motion of the tail-stock in the direction of the barrel is given a capacity of yielding due to this spring.

The degree of pressure exerted by the spring 108 may be adjusted by adjusting the collar 110 on the tubular link 102, by means of which the compression of the spring 108 may be readily varied.

It will thus be seen that as the crank 100 is rotated, each revolution first breaks or flexes the toggle and thereafter returns it to substantially straight-line position, as shown in Figure 1 of the drawings. Especial attention is drawn to the fact that although this extended position of the toggle is referred to as substantially straight-line, it is preferably not brought into a full straight-line position. That is, the axis of the central pivot is not brought, in the preferred construction, into the plane of the axes of the two end pivots, as it is desired that there be a limit to the forward thrust of the toggle at its extended position in order that it may yield if necessary by the action of the spring 108.

The rotation of the crank 100 is intermittent. With the head-stock retracted, that is with the toggle flexed upwardly, the pinion 98 is in mesh with the central portion of the gear sector 97, and assuming the shaft 61 to be stationary, it is locked in this position. When however the gear sector is rotated in the direction indicated by the arrow in Figure 4, the first action on pinion 98 is to turn it through one-half revolution into the position shown in full lines in Figure 4. This swings the crank 100 from its uppermost to its lowermost position and it remains in this position while the barrel 27 is being acted upon. During the latter action, the disk 96 completes its rotation and in the last stage of its revolution the advanced portion of the gear sector inter-meshes with and rotates the pinion 98 throughout another half turn, bringing the crank 100 again into its uppermost position. If the shaft 61 is then stopped, the pinion 98 will rest substantially at the mid portion of the gear sector 97 at about the point indicated by the arrow 112 (Figure 4). In this manner, the tail-stock 24 is again retracted and may be assumed to rest in its retracted position.

In order to hold the parts securely in position after the tail stock 24 has been advanced, there is provided a locking mechanism shown in Figure 4 of the drawings. This comprises a bell crank lever 113 having a pivot shaft 114. One arm of this lever is drawn downwardly as by the spring 115 and the other is provided with a cam roller 116 by which the lever is actuated. This cam roller co-acts with a suitable cam surface 117 carried by the disk 96 which, as such disk rotates, depresses the roller and swings the bell crank lever or rock shaft against the tension of spring 115 prior to engagement of the pinion 98 by the gear sector 97. The spring-depressed retracted arm of the lever 113 is provided with a locking roller 118 adapted to co-act with a notch 119 in a locking disk 120 fast upon the crank shaft 99. Cam roller 116 being released prior to the time that the gear sector 97 passes out of mesh with the gear sector 98, the locking roller 118 is depressed against the periphery of the locking disk and as the chucks 25 and 26 come firmly into position within the chime of the barrel 27, the notch 119 reaches a position under locking roller 118 and the latter snaps downwardly thereinto. This by means of locking disk 120 rigidly holds the parts in the above position until just prior to the engagement of pinion 98 by gear sector 97. At this stage the cam swings the lever 113 to carry locking roller 118 out of its notch or recess and permits proper engagement of pinion 98 with the sector 97, thereby causing the crank shaft 99 to be rotated into the position shown in full lines in the drawings.

It is to be noted that, by the above described mechanism for actuating the tail-stock, there is achieved a highly advantageous action of engagement between the barrel and the chuck 26 carried by the tail-stock; as the chuck 26 approaches the one end of the barrel, the speed of movement of the chuck 26 toward the barrel is gradually decreased to permit a gentle but firm engagement. Undesirable impacts are thus avoided, and, moreover, the rotating chuck 26 is given ample time to fit itself into the end of the barrel. The actuating crank 100 in effect gives the chuck 26 a motion that is substantially simple harmonic, achieving not only the above-mentioned advantages but also high speed of action.

The rolling mechanism.—Thus far there has been described the various means by which the barrel is received, held in position, rotated, and released. The mechanism which specifically acts on the barrel will now be set forth. It is understood that the chucks 25 and 26 enter within the chime or projecting annular end portion of the barrel. These chucks are of heavy construction and not only rapidly rotate the barrel but afford a rigid support for the barrel during any operations which may be performed thereon.

In the specific apparatus set forth there are provided means for forming a double seam between the heads or end members of the barrel and the body or shell. A great number of the features of this invention are not limited to this precise use and are eminently adapted to secure in position a metal

chime hoop about an inner joint which has been previously formed between the heads and body. It is accordingly to be understood that the term "end joint" is used throughout in a broad sense to include not only the joint between the head and body of the barrel but for example the joint between the chime hoop and the barrel itself. It may also be noted that the term "joint" is used in a broad sense to comprehend not necessarily a completed joint but the connection between the parts at any stage even when they are merely brought together for the rolling action. The rolling mechanism herein set forth, however, is adapted for the specific purpose of forming the inner joint or double seam between these parts, the chime hoop or ring being later applied by another similar machine.

Considering now specifically the rolling mechanisms, there are mounted on the shaft 61 a pair of cams 121 and 122. The cam 121 is narrower faced than the cam 122 as the mechanism which it actuates does not travel as a whole with respect to the frame of the machine. The cam 122 however provides a broad face because its associated mechanism is mounted upon the tail stock 24 and as the latter moves toward the right or left it travels therewith, remaining in operative relation to the cam. In a similar way the driving shaft 67 being in fixed relation to the tail stock 24 travels with the latter, sliding in its bearing 67ª (Figure 2) and carrying the broad-faced pulley 62 to the right or left.

In respects other than the above, the mechanisms actuated by the cams 121 and 122 are substantially identical, and accordingly one only will be described.

Referring now to Figure 5 of the drawings, there is shown a pair of levers 123 and 124 provided with cam rollers bearing against the cam 121. The lower ends of these levers are drawn toward one another by the spring 125 adjustable as at 126. These levers are provided with stationary pivots 127 and their upper ends are connected by means of a pair of spaced curved links 128 with movable pivot pins 129. The latter pins are each jointed to a swinging link 130, the other end of which is pivoted to a fixed pivot 131. The pivot pin 129 also has pivoted thereto adjacent its ends a bifurcated end member 132 of a link 133 which comprises this end member and an upper member 134 adjustably connected therewith by means of the internally threaded sleeve or union 135. In this manner the effective length of the entire link 133 may be adjusted to meet varying conditions of use.

Considering briefly the action of the linkage thus far described, as the cam 121 swings outwardly the lower end of one of these levers (123 or 124), the upper end of the lever is swung inwardly, drawing inwardly its pair of curved links 128 and swinging downwardly heavy link 130. The swinging of this link 130 with pivot pin 129 draws downwardly upon the link 133 with a force which increases rapidly and to an extreme degree. There is in effect one form of toggle action as the bifurcated ends of the member 132 swing over the pivot pin 131 and bring the link nearly into alignment with pivots 129 and 131. This position is illustrated in dotted lines at the right hand lower portion of Figure 5 of the drawings.

Links 133 are jointed at their upper ends upon a pair of eyes 136 formed at the outer ends of levers 137. The latter levers are pivoted at 138 and provided at their inner ends with forming rollers 139 and 140. Thus by substantially identical mechanism the roller 139 is swung upwardly and downwardly by the lever 124 and the roller 140 is similarly although not simultaneously actuated by the lever 123, both levers coacting with the cam 121.

Referring more particularly to Fig. 5ª, the pins 138 forming the pivots for the levers 137 at the inner ends of which are mounted the rollers 139 and 140, are mounted in a housing 138ª mounted upon the underslide 79ª and securely clamped thereto as by means of the bolts 250 passing through longitudinally extending slots 251 in the housing 138ª. In order to adjust the position of the rollers 139 and 140 with respect to the flanges of the barrel heads upon which they are to operate, adjusting screws 252 extending through a vertically extending web 79ᵉ on the underslide 79ª are provided to abut against the housing 138ª, and another pair of screws 253 threaded into the tail-stock frame 79 and abutting against the other side of the lever housing are provided to positively lock the roller lever housing in its adjusted position. Suitable locking nuts 254 on the several adjusting screws are provided to maintain the screws in adjusted position after adjustment of the housing with respect to the chuck has been made.

As is more clearly described hereinafter, the rollers 139 and 140 are applied to the flanges of the barrel heads with extreme pressure, this pressure being applied in an upward direction. The re-action in a downward direction is taken up by the pivot pins 138 and transmitted to the roller lever housing 138ª, and in turn transmitted to the underslide 79ª, to which the housing 138ª is securely clamped. The underslide 79ª is clamped to the tail-stock 79 by means of the bolts 79ᵇ, and thus transmits this downward thrust to the tail-stock frame 79 itself, and thus relieves the frame members 20 and

other parts of the machine from the extreme pressures thus exerted. The stresses due to the application of extreme pressures to the barrel heads being thus restricted to the tail-stock frame, are not transmitted to or through the ways on the main frame, and hence permit the free and unrestricted movement of the tail-stock during the rolling or seaming operation. The spring 108 is thus free to move the tail-stock and the roller lever housing 138^a in the direction of the barrel to follow up the shortening of the barrel during the seaming. The underslide 79^a is suitably reinforced as by means of the web 79^d to transmit the stresses to which this head is subjected.

It will be understood that the roller lever housing, associated with the head-stock and with the chuck 25 is similarly adjustably mounted as has been described in connection with the tail-stock 24.

In the position shown in full lines in Figure 5 of the drawings corresponding to that of the parts in Figure 4 of the drawings, it will be seen that the shaft 61 has rotated throughout only a small fraction of a complete revolution from the position in which the tail stock 24 is fully withdrawn. This fraction of a revolution corresponding angularly to one-half the length of the internal gear sector 97, has served to advance the tail stock into operative relation to the barrel and the barrel is at this stage securely seized by the chucks and rapidly rotating. During this movement the cam 121 has to a slight extent swung outwardly the lever 123 and slightly raised the roller 140 which is actuated thereby. Further movement of the cam 121 throws the roller 140 with a high degree of pressure against the joint at the end of the barrel. This pressure is increased, due to the toggle action of the link 133 as hereinbefore described, and is maintained throughout several revolutions of the barrel until the function of this roller has been performed, whereupon the wiper or cam roller of the lever 123 passes over the extremity 141 of cam 121. At this stage spring 125 quickly swings the lower end of the lever 123 to the left and by an action to the reverse of that above described, depresses roller 140 into inoperative position.

Substantially the same cycle of actions is brought about by cam 121 and lever 124; in this case the roller 139 being raised, pressed against the barrel with great force and finally retracted. All of this has been accomplished during one complete revolution of the shaft 61 and it is to be understood that during this time the barrel has been rapidly rotated and each of the rollers 140 and 139 act upon it during a considerable number of its revolutions.

Considering now the specific action of the rollers 140 and 139 in this embodiment of the invention, reference is made particularly to Figures 8 to 11 of the drawings. In Figure 8 of the drawings the barrel 27 is shown with its head 142 fitted within the end of the shell or body 143 and its head flange bent or flanged outwardly as at 144 to a considerably greater extent than the outward flange 145 of the body. Within the chime, the chuck 25 is firmly in position and the roller 140 is shown retracted below the flanges 144 and 145.

In Figure 9 the roller 140 has been gradually forced upwardly, curling up the flanges 144 and 145 into the coil 146. The toggle action forces the roller 140 upwardly with such extreme pressure that its coil is rolled up with great tightness but is of the rounded form shown to fit the concave crest 147 of the roller.

In Figure 10 the roller 140 has been retracted and the roller 139 is shown in position beneath the joint which results from the action of the roller 140. This roller 139 is provided with heavy end walls 148 bounding a rectangular recess 149. As the roller is forced upwardly it not only flattens the joint but its end walls limit the longitudinal extension of the joint as it is flattened. In other words, the end walls 148 slightly rounded as at 150 to prevent cutting the metal, embrace the ends of the joint and as it is flattened, insure that the extreme edges 151 and 152 of the flanges 144 and 145 respectively are held at the bottom of the folds within which they rest, in order to give a perfect type of double seam or double lock joint. It is to be noted that if desired the surfaces of the sheet metal barrel members may be coated at this point prior to the formation of the joint, with some rubbery cement or analogous substance which will lubricate the parts as they are rolled into position and which will seal any possible gaps due to defects in material or prior workmanship.

In this manner there is quickly formed a complete double seam of perfected cross section and which possesses not only fluid-tightness but also mechanical strength of a high degree. It is also to be understood that the joint at the opposite end of the barrel is formed simultaneously in substantially the same way.

Barrel feeding mechanism.—In the description of the machine thus far it has been assumed that the barrel 27 is at the proper time brought into position in substantial registry with the chucks 25 and 26. In so far as many features of my invention are concerned, this may be brought about in any desired manner as by rolling the barrel by hand on a suitable support above the bed of the machine. I prefer however to use apparatus of the nature of that diagrammatically set forth in Figure 6 of the draw-

ings. Referring to this figure the position of the machine in cross section is diagrammatically indicated by the rectangle 153 and a supporting frame is shown at 154, this frame preferably comprising a pair of members 155, as indicated in Figure 1 of the drawings. On these members the succession of barrels 27, 27ª, 27ᵇ, 27ᶜ, etc. are rolled, being prevented from rolling off endways as by means of the rolling hoops 156 formed on the barrels. The barrel 27 assuming that to be the barrel shown in the drawings of the machine, is supported upon the skids or ways 155 which are downwardly inclined in the direction indicated by the arrow 157 in Figure 6 of the drawings. The forward rolling movement of barrel 27 however has been stopped by the rounded portion 158 of a lever 159 which extends upwardly between the supporting members 155. This lever is swung upwardly about its pivot 160 by means of a spring 161, the action of which is limited by any suitable stop. Also acted upon by lever 159 is an escapement lever 162 pivoted as at 163 and connected with the lever 159 by the short link 164. This escapement lever 162 is provided with a pair of stop arms 165 and 166. In the position shown, the stop bar 165 is engaged by and limits the downward rolling movement of the succession of barrels, as shown in Figure 6 of the drawings.

Considering now the action of the barrel feed, when the barrel 27 has reached the position shown, its rolling movement is checked by the portion 158 of the lever 159. In this position it is substantially in alignment with the chucks 25 and 26 although its axis is to a slight extent below the axes of these members. The apparatus hereinbefore described at this stage advances the chuck 26 toward the barrel, this chuck as well as the chuck 25 both being rapidly rotated. As chuck 26 comes opposite the space within the adjacent chime of the barrel, it rolls its way inside this chime, at the same time forcing the opposite chime over chuck 25. As the chucks are thrust within the chimes of the barrel, the latter is lifted slightly up from its supports and rapidly rotated to be acted upon by the rolling mechanism hereinbefore described. Although the barrel when rotated is just out of contact with the supporting means nevertheless it is substantially in operative relation thereto and in a broad sense may be considered as upon the same. When a rolling operation is completed the chuck 26 is withdrawn, drawing the barrel away from chuck 25, and the barrel, rapidly rotating, is released and dropped upon the supports 155 as well as the end of lever 159. Due to the momentum of the rapidly rotating barrel, it climbs up upon the end of lever 159, bringing its weight upon that member and momentarily swinging it downwardly. The barrel 27 thereafter travels downwardly to the right to a succeeding machine or to suitable storage space. The downward swinging of lever 159 however will depress the escapement arm 165 releasing the barrel 27ª, the arm 166 meanwhile holding back the succession of barrels 27ᵇ, 27ᶜ etc. As the arm 159 is swung upwardly by the spring upon barrel 27, passing off its end, the barrel 27ª rolls down into position in the machine and the succession of following barrels is brought up against the stop 165 which has resumed its former position.

In the manner above diagrammatically described the feed of barrels to and discharge of barrels from the machine is automatically brought about.

Adjustments for barrels of different sizes.—Assuming that it is desired to act upon barrels of a size other than that hereinbefore described, the chucks 25 and 26 may be removed and other chucks of a size to fit the barrel to be acted upon, substituted. These chucks are screwed upon the threaded inner ends of the spindles 44 and 78 and may be readily removed and replaced by chucks of different size. It is desired however that the speed ratio of various parts be altered and the axes of the chucks be varied to suit the particular barrel acted upon.

The former result, namely alteration of the speed ratio of rotation of the barrel with respect to the rate of drive of the shaft 61, is brought about by means hereinbefore described. For example, the shifting handles 36 and 70 will vary the rate of rotation of the chucks with a constant rate of rotation of the source of power. A smaller barrel, for example, may be given a higher rate of speed of turn, at its periphery and consequently the total length of joint, is less. Furthermore, the rate of rotation of the shaft 61 may be accelerated with a smaller barrel as a total revolution of this shaft represents a complete action upon a barrel, and a smaller barrel clearly requires less time for such action. This speeding-up of the shaft 61 is brought about by the shiftable gearing controlled by handle 52ª, as hereinbefore described.

Considering now the vertical adjustment of the axes of the chucks or shafts 44 and 78, this is substantially identical with both the head and tail stocks, and accordingly the mechanism will be described with respect to one only. These shafts are mounted in boxes 168 (Figure 3), slidable in vertical ways formed on the frame in which they are mounted. The boxes, two in number for each shaft, are supported by vertical hanger shafts 169 and 170 (Figure 1), the lower ends of which are headed and connected with the boxes. These shafts are threaded as shown in the drawings and respectively pro-

vided with nuts 171 and 172 having formed thereon beveled gears 173 and 174. These nuts or internally threaded sleeves are held against vertical movement by the stop nuts 175, and the gears 173 and 174 are respectively actuated by the beveled pinions 176 and 177 on a cross shaft 178. The cross shaft is actuated for purposes of adjustment by means of a capstan 179, into the recesses of which suitable bars may be inserted.

It will thus be seen that as the capstan 179 is rotated in one or the other direction the nuts 171 and 172 are given opposite directions of rotation; and the shafts 169 and 170 respectively provided with right-hand and left-hand threads, are raised or lowered in accordance with the direction of their rotation. In order to correctly position the chuck spindles at the proper height with respect to the rollers for different diameters of barrels, gauge blocks 255 are inserted between the journal boxes 168 and the upper part of the head and tail-stock frames, as is more clearly shown in Fig. 3. Thus, there are provided different sets of such gauge blocks corresponding to the different adjustments of the chuck spindles to correspond to the various sizes of barrels to be operated upon. The gauge blocks 255 allow the height of the chuck spindles to be readily and positively adjusted and moreover function as compression means to transmit the upward pressures, imposed upon the spindles by reason of the action of the rollers, to the head or tail-stock frame, and thus relieve the threaded shafts 169 and 170 from carrying or transmitting the extreme pressures exerted by the rollers 139 and 140. By this means the bearing boxes 168 may be adjusted to any desired height and the chucks 25 and 26 altered in position. This action is brought about moreover without interruption of the drive as the gearing is maintained in mesh at its proper pitch line throughout any desired range of movement of the chuck shafts. For example, referring to Figure 3 of the drawings and assumthat shaft 44 with the gear 43 moves downwardly, the pinion 42 remains in mesh and simply swings about the axis of the shaft as its bearing is formed in arms 180 which may swing about the axis of the shaft 44. Also the gear 40, which is on the shaft 41 with pinion 42 and accordingly swings therewith, is maintained in mesh with the gear 37 as the shafts 39 and 41 are connected by means of the arms 181 which are adapted to swing about the axis of the shaft 39. Thus as the gear 43 is moved upwardly or downwardly the gearing connection is undisturbed, the swinging arms 180 and 181 permitting the gears to adjust themselves and holding them in mesh at their pitch lines.

By a substantially identical mounting of the shaft 75 by means of arms 182 and 183 (see Fig. 4), the drive is properly maintained to the gear whatever its position within its range of adjustment.

The automatic drive.—For the preferred action of the apparatus hereinbefore described, the machine is driven throughout a complete cycle of operations, that is, a complete revolution of the shaft 61, and certain parts thereof stopped until the barrel acted upon has been discharged and the second barrel fed into proper position. The preferred driving means by which this is brought about are as follows although it is to be understood that the details, particularly in electrical matters, will not be herein set forth as they form no part of the present invention.

In Figure 7 is shown a simplified diagram of the preferred electrical operating and control circuits. In this diagram there are shown the motors 32 and 66 driving respectively the pulleys 30 and 62 of the machine. The motors are preferably of the three-phase induction type and are preferably connected in parallel so that they may be controlled from a single panel represented at 185 and upon which are mounted the remotely controlled main switches. The motors derive their electrical energy from the mains 186^a, 186^b, and 186^c and their circuit is controlled successively by the main 2-pole switch 187 and by an auxiliary switch 188. The main switch 187 serves first to close the circuit to the motor through the starting resistances 189^a and 189^b which resistances are short circuited and cut out of the circuit by the operation of the auxiliary switch 188 which in turn is closed after a time element has elasped of sufficient duration to allow the motors 32 and 66 to have accelerated sufficiently to have full line voltage applied to them. The successive operation of the switches 187 and 188 is controlled in turn by means of the relay 190 whose operation in turn is electrically controlled from a remote point by means of the push button panel 191 located preferably upon the front of the machine and within easy reach of the operator. Upon push button panel 191 are mounted the button 192 for starting the motors and the button 193 for stopping.

Taking up in detail the electrical control it is first to be noted that the several parts as shown in Figure 7 are in their normal positions. The switch 187 is electically operated by the solenoid 194 and its core 195 to which the circuit breaking parts of this switch 187 are mechanically connected. Associated also with core 195 are two pairs of contacts 196 and 197, the former pair being normally closed by means of the contact member 198 connected to and operated by the core 195.

The switch 188 is likewise electro-mag-

netically operated by means of the solenoid 199 and the core 200 to which the circuit breaking members of the switch 188 are shown diagrammatically connected.

Referring now to the relay winding 190, there is associated with it a core 201 mechanically connected to a pivoted member 202 adapted to contact with either of the contacts 203 and 204. The normal position of the member 202 is its lower position when in contact with contact 203. The rate at which the relay winding 190 changes the electrical connection of member 202 from contact 204 to contact 203 is governed by means of the air dash-pot 205. The dash-pot 205 is provided with a check-valve 205[a] which permits of a rapid upward movement of the member 202 but which permits of an adjustable rate of downward movement thereof. Upper contact 204 controls the circuit of coil 194 of the main switch 187 and the lower contact 203 governs the circuit of the coil 199 of the auxiliary switch 188 and the time interval intervening the successive operation of the switches 187 and 188 is governed by properly adjusting the dash-pot 205 to retard the switching over action of relay 190 as is consistent with the proper starting characteristics of motors 32 and 66.

The driving motor 32 is provided with an electrically controlled brake (Figure 7[a]) having a brake shoe 206 mounted upon the lever 207 pivoted at 207[a] and operating upon the brake pulley 208 upon the shaft of motor 32. The braking effect is adjustable by varying the weights 209 suspended from the end of the lever 207 and the release of the brake is accomplished by means of the solenoid 210 connected by the leads 210[a] and by the leads 210[b] and 210[c] connected to points in the main leads 186[b] and 186[c] between the switch 187 and switch 188 so that the solenoid circuit will not be affected by the interposition of the starting resistances 189[a] and 189[b].

When the barrel 27 is rolled into the proper position to be engaged by the chucks 25 and 26 (see Figure 6), it depresses the lever 225 pivoted at 226, against spring 227, thus depressing in turn the push button 192[a]. The circuit of relay winding 190 is thus closed, this circuit extending from main 186[a], through conductor 211 through the limit switch 212 (to be hereinafter more specifically described) through the circuit of push button 192[a], conductor 213, contacts 196 (closed by member 198 in its normal upper position), through winding 190 and through conductor 214 to the main wire 186[b]. Relay 190 quickly draws up its contact member 202 which is electrically connected to the conductor 215 to connect the latter with the upper contact 204 whereby the circuit of solenoid 194 of the main switch 187 is closed from main 186[a], conductor 211, limit switch 212, push button 193, conductor 216, contact 204, conductor 215, solenoid 194 and through conductor 214 to the main 186[b]. Solenoid 194 being thus energized pulls down upon its core 195 to close the main switch 187, thus connecting the motors 32 and 66 to the mains through the starting resistances 189[a] and 189[b]. At the same time the movement of core 195 downwardly opens the circuit of relay 190 at contacts 196, and closes the contacts 197, thus maintaining closed the circuit of coil 194 through conductor 216, contacts 197, coil 194, conductor 214 to main 186[b]. Relay 190 being thus deenergized allows its contact member 202 to move downwardly, its rate of movement being governed by the dash-pot 205 so that after the proper time element has elapsed to allow of sufficient acceleration of the motors 32 and 66, the circuit to the coil 199 of the auxiliary switch 188 is closed by contact 203 as follows: from main 186[a], conductor 211, limit switch 212 through push button 193, conductor 216, contacts 197, (now closed by the downward position of contact member 198), conductor 217, conductor 215, contact 203, conductor 218, coil 199, conductor 219, to main 186[b]. The former circuit of coil 194 is opened by contact 204 by the deenergization of relay 190 but a new circuit, as above described, is established through contacts 197 to maintain the coil 194 energized and the switch 187 closed. The operation of auxiliary switch 188 short circuits the starting resistances 189[a] and 189[b] and thus allows full line voltage to be applied to the motors to bring them up to full speed.

At the moment that main switch 187 is closed, the circuit to the solenoid 210 is likewise closed whereupon the brake shoe 206 is lifted from the brake pulley 208 so that the motor 32 is free to start with its belt load.

As soon as the operation upon the barrel as hereinbefore described has been completed, the circuits of the motors 32 and 66 are automatically opened by means of the finger 220 mounted upon the shaft 61 (Figure 1) by means of the clamped bushing 221 rotating so as to come in contact with the roller 222 of the lever arm 223 of the limit switch 212 positioned underneath the machine. The angular position of the finger 220 with respect to the locking disk 120 (Figure 4) may be adjusted by means of the clamped bushing 221 and is preferably so positioned that it will operate the limit switch 212 which is in the same circuit electrically with the "stop" push button 193, at a time just preceding the moment at which the locking roller 118 is withdrawn from notch 119 in the locking disk 120. The operation of the limit switch 212 is only mo-

mentary, as may also be the operation of push button 193 when manually operated, but is of sufficient duration to open the circuit of coil 194 of the main switch 187, the circuit of this coil being from main 186ª, conductor 211, limit switch 212, push button 193, conductor 216, contacts 197, conductor 217, coil 194, conductor 214 to main 186ᵇ. The coil 194 being deenergized at once opens the main switch 187 by the retractile effort of the spring 224, which, besides opening the main switch 187, also opens the circuit of coil 199 of the auxiliary switch 188 at the lower contacts 197, thus restoring the several parts of the control switches to their normal and initial position.

As soon as the main switch 187 has been opened, the solenoid 210 of the brake is deenergized thereby allowing the weights 209 to operate upon the brake pulley 208 of motor 32 through the brake shoe 206 to bring the motor to a standstill. The point at which it is desired to bring the motor 32 and the parts of the machine to which it is operatively connected to a standstill is such that the tail-stock with its associated chuck 26 is totally withdrawn to release the barrel 27, this point being reached when the crank 100 (Figure 1), is in its upper position and the toggle connected thereto is totally flexed. Hence the finger 220 on the shaft 61 is preferably adjusted to operate the limit switch 212 at such an instant that, by the time the brake has overcome the momentum of the motor 32 and its connected parts of the machine, the chuck 26 will be withdrawn to its furthermost position to the right.

The provision of push button 193 on the push button panel 191 located within easy reach of the operator permits also of the stopping of the driving motors at any instant during the cycle of operation as may be found necessary. Push button 192 on the same panel similarly permits the starting of the driving motors at will as may be desired. The operation of either of these push buttons results electrically in the same effects as the automatic controls described.

By way of brief recapitulation, the barrels are automatically fed to the machine as by the mechanism diagrammatically illustrated in Figure 6. When the barrel is in position, the proper electrical contact is made which may be governed automatically by the movement of the lever 159. This connection being brought about, the tail-stock 24 is quickly advanced into position, the barrel gripped and rotated. With the tail-shock thus acting and yieldingly held in position as hereinbefore described, the two first acting rollers are thrown up against the flanges of the barrel members to perform their functions, then retracted and thereupon the second acting rollers brought into operation to complete the joint and are thereupon withdrawn. Immediately the tail-stock is thrown to the right and the released barrel automatically by its spin carried out of operative relation to the machine and the following barrel automatically thrown into position to be acted upon.

The machine may be driven at high speed, may be rapidly advanced for barrels of different sizes, its rolls may be altered to perform different operations on the barrel, and all of its parts are readily accessible for inspection or if necessary, repair.

Although the operation of the machine as herein described is substantially automatic, nevertheless many of the novel actions herein set forth may be carried on not only by other mechanism but in certain cases manually, and it is to be noted that many of the features of this invention lie in the combinations of steps of action as well as in the means whereby such steps are here shown as rapidly and conveniently carried on.

It is also to be noted that many of the advantages of the features of construction and action herein set forth have not been dealt with in detail as the endeavor has been made to set forth clearly an illustrative embodiment of the invention rather than a full exposition of the advantages resulting from and inherent in the features of the invention itself. It may be noted however that the parts are so arranged that although when a high degree of pressure is required this pressure of an extreme value is attained without shock or undue strain on the parts and without undue load on the source of power. Also the invention meets the practical limitations due to the slight irregularity in the size or form of barrels, without injury to the parts, as for example by the cushioning by spring 108 of the advance of the tail-shock.

It will thus be seen that there is provided an apparatus and an art in which the various objects of this invention are achieved and which are well adapted to meet the conditions of the hardest practical use.

As various possible embodiments might be made of the mechanical features of the above invention and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In apparatus for making steel barrels and the like, in combination, a rotary member adapted to engage one end of a barrel, a rotary member adapted to engage the opposite end of said barrel, a driving shaft, and a series of members adapted when ar-

ranged successively to be operated by said driving shaft to move one of said rotary members toward the other to grip a barrel therebetween, one of said series of members being operatively controlled by said driving shaft and adapted thereby to be placed in operative relation to the remaining members to effect a movement of said rotary member.

2. In apparatus for making steel barrels and the like, in combination, a rotary member adapted to engage one end of a barrel, a rotary member adapted to engage the opposite end of said barrel, a driving shaft, and a series of members adapted when arranged successively to be operated by said driving shaft to move one of said rotary members toward the other to grip a barrel therebetween, one of said series of members being operatively controlled by said driving shaft and adapted thereby to be placed in operative relation to the remaining members to effect a movement of said rotary member, means adapted to roll a joint on a barrel gripped between said rotary members, and means driven from said driving shaft for forcing said rolling means against the joint.

3. In apparatus for making steel barrels and the like, in combination, means adapted to support a barrel in a substantially horizontal position between a pair of rotary members, means rotatably mounting said rotary members for rotation about a relatively fixed axis, power means for driving one of said rotary members to spin said barrel when the latter is gripped therebetween, means adapted to bring said members into operative relation to the ends of said barrel and spin the same, rolling means, and means actuated from said source of power and adapted simultaneously to bring said rolling means into action upon both end portions of said barrel during its spinning motion.

4. In apparatus for making steel barrels and the like, in combination, means adapted to support a barrel in a substantially horizontal position between a pair of rotary members, means rotatably mounting said rotary members for rotation about a relatively fixed axis, a power driven shaft having connections with one of said rotary members to rotate the same, means actuated from said shaft and adapted to bring said members into operative relation to the ends of said barrel and spin the same, and rolling means adapted to act upon the end portions of said barrel during its spinning motion, said rotary members in operative position being respectively fitted within the chime portions of the barrel.

5. In apparatus for making steel barrels and the like, in combination, a rotary member adapted to engage one end of a barrel, a rotary member adapted to engage the opposite end of said barrel, a driving shaft, and a series of members, one of which is yieldable, adapted when arranged successively to be operated by said driving shaft to move one of said rotary members toward the other to grip a barrel therebetween, one of said series of members being operatively movable by said driving shaft and adapted under the control of the latter to be placed in operative relation to the remaining members to effect a movement of said rotary member to yieldably grip a barrel therebetween.

6. In apparatus for making steel barrels and the like, in combination, a pair of rotary members adapted respectively to fit within opposite ends of a barrel and rotate the same, a separate source of power for driving each of said rotary members means adapted simultaneously to roll joints on said barrel at both ends while so rotating and means actuated by one of said sources of power for throwing said joint-rolling means into operative relation to the ends of said barrel.

7. In apparatus for making steel barrels and the like, in combination, a rotary member adapted to engage one end of a barrel, a rotary member adapted to engage the opposite end of said barrel, a driving shaft, and a series of members adapted when arranged successively to be operated by said driving shaft to move one of said rotary members toward the other to grip a barrel therebetween, one of said series of members being operatively controlled by said driving shaft and adapted thereby to be placed in operative relation to the remaining members to effect a movement of said rotary member, means adapted to partially form a joint on said barrel, means adapted to complete the formation of a joint on said barrel, and means driven from said driving shaft for forcing said joint-forming means against the joint of the barrel in the order above set forth.

8. In apparatus for making steel barrels and the like, in combination, a pair of substantially co-axial rotary members, means including a rotatable crank having connection with one of said members and adapted to lessen the axial distance between said members to fit them respectively into the chime portions of the ends of a barrel therebetween, means for intermittently rotating said crank, and means co-acting with one of said members adapted to roll an end joint on the corresponding chime portion of said barrel.

9. In apparatus for making steel barrels and the like, in combination, a main frame, a pair of substantially coaxial rotary members adapted respectively to fit within the opposite ends of a barrel, a standard mounted upon said frame, one of said rotary members being rotatably supported in said stand-

ard, means coacting with one of said rotary members adapted to roll a joint on one end of said barrel, and means supporting said coacting rolling means on said standard adapted thereby to substantially confine the stresses resulting from the coaction between said coacting parts to said standard and to relieve said main frame thereof.

10. In apparatus for making steel barrels and the like, in combination, a main frame, a pair of substantially coaxial rotary members adapted respectively to fit within the opposite ends of a barrel, a pair of standards mounted upon said frame and each rotatably supporting one of said rotary members, separate means coacting with each of said members adapted respectively to roll a joint upon the corresponding end of said barrel, and means supporting each of said coacting rolling means on one of said standards adapted to substantially relieve said main frame from the stresses resulting from reaction between said rolling means and their respective coacting rotary members.

11. In apparatus for making steel barrels and the like, in combination, a main frame, a pair of substantially coaxial rotary members adapted respectively to fit within the opposite ends of a barrel, a standard movably mounted upon said main frame and supporting rotatably one of said rotary members and adapted upon movement in one direction to lessen the axial distance between said members to bring them respectively into operative relation to the ends of a barrel therebetween, means coacting with said axially movable rotary member adapted to roll a joint on the end of said barrel supported upon said rotary member, and means supporting said coacting rolling means on said movable standard to be movable therewith and to relieve said main frame from the reacting stresses between said coacting parts.

12. In apparatus for making steel barrels and the like, in combination, a main frame, a pair of substantially coaxial rotary members adapted respectively to fit within the opposite ends of a barrel, a standard movably mounted upon said main frame and supporting rotatably one of said rotary members and adapted upon movement in one direction to lessen the axial distance between said members to bring them respectively into operative relation to the ends of a barrel therebetween, means coacting with said axially movable rotary member adapted to roll a joint on the end of said barrel supported upon said rotary member, means supporting said coacting rolling means on said movable standard to be movable therewith and to relieve said main frame from the reacting stresses between said coacting parts, and means for relatively adjusting said rolling means and said coacting rotary member in an axial direction.

13. In apparatus for making steel barrels and the like, in combination, a main frame, a pair of substantially coaxial rotary members adapted respectively to fit within the opposite ends of a barrel, a standard mounted upon said frame, one of said rotary members being rotatably supported in said standard, a rolling device movably mounted upon said standard and adapted to coact with the rotary member mounted thereon to roll a joint on one end of said barrel, a power-driven cam adapted to be rotatably supported with respect to said rolling device, and connections between said cam and said rolling device adapted to force said rolling device against said joint and arranged to confine the reactive stresses between said rotary member and said rolling devices to said standard.

14. In apparatus for making steel barrels and the like, in combination, a main frame, a pair of substantially coaxial rotary members adapted respectively to fit within the opposite ends of a barrel, a standard mounted upon said frame, one of said rotary members being rotatably supported in said standard, means coacting with one of said rotary members adapted to roll a joint on one end of said barrel, means supporting said coacting rolling means on said standard adapted thereby to substantially confine the stresses resulting from the coaction between said coacting parts to said standard and to relieve said main frame thereof, and means for relatively adjusting said rolling means and said coacting rotary member in an axial direction.

15. In apparatus for making steel barrels and the like, in combination, a main frame, a pair of substantially coaxial rotary members adapted respectively to fit within the opposite ends of a barrel, a standard mounted upon said frame, one of said rotary members being rotatably supported in said standard, means adapted partially to form a joint, means adapted to complete the formation of a joint, means adapted to urge said joint-forming means into operative relation to said barrel, and means supporting said joint-forming means on said standard adapted thereby to substantially confine the reactive stresses resulting therefrom to said standard.

16. In apparatus for making steel barrels and the like, in combination, means adapted to engage and rotate and then disengage a barrel, said means permitting disengagement of the barrel without stopping the rotary movement thereof, means adapted to roll a joint upon the barrel thus engaged and rotated, and a support adapted to receive a rotating barrel upon disengagement

thereof by said rotating means and permit it to roll out of operative relation from said rotating means by the inherent rotary movement of the barrel.

17. In apparatus for making steel barrels and the like, in combination, means adapted to support a barrel in a substantially horizontal position, means adapted to engage the ends of a barrel thus supported and rotate and then disengage the same, said means being arranged to permit disengagement of the barrel without stopping the rotary movement thereof, means adapted to perform an operation upon the barrel while thus engaged and rotated, and guiding means extending away from the machine upon which said barrel is rolled away by said rotary movement upon being disengaged.

18. In apparatus for making steel barrels and the like, in combination, means adapted to support a plurality of barrels and permit them to roll in succession in a predetermined direction by gravity in a substantially horizontal position, means adapted to terminate said rolling movement at a predetermined point, means adapted to engage the foremost of said succession of barrels by its ends at said point and roll end joints thereon, and means controlled by a barrel discharged from said engaging and rolling means adapted to permit another barrel to roll into position for said operation.

19. In apparatus for making steel barrels and the like, in combination, means adapted to support a barrel and permit it to roll in a predetermined direction by gravity in a substantially horizontal position, means adapted to terminate said rolling movement at a predetermined point, means adapted to engage said barrel by its ends at said point and roll end joints thereon and then to disengage said barrel, and means operative substantially upon the completion of the joint-rolling operation adapted to permit another barrel to roll into position for said operation.

20. In apparatus for making steel barrels and the like, in combination, means adapted to support a barrel and permit it to roll in a predetermined direction by gravity in a substantially horizontal position, means adapted to terminate said rolling movement at a predetermined point, means adapted to engage said barrel by its ends at said point and roll end joints thereon, and means adapted automatically upon said rolling operation being completed to discharge said barrel and permit another barrel to roll into position for said operation, said last means being controlled by the movement of said barrels.

21. In apparatus for making steel barrels and the like, in combination, means adapted to feed an assembled barrel into a predetermined position, means adapted to perform a joint forming operation upon a barrel in said position, and means controlled by the movement of said barrel adapted automatically to set said second-mentioned means in action upon said barrel reaching said position.

22. In apparatus for making steel barrels and the like, in combination, means adapted to support a succession of barrels and permit them to roll in a predetermined direction by gravity, means adapted to engage and rotate the foremost barrel of said succession of barrels when it has arrived at a predetermined point, means adapted to perform an operation upon a barrel thus rotated, means adapted to cause said engaging means to release the barrel, and an escapement mechanism for permitting a succeeding barrel of said succession of barrels to roll into position at said predetermined point.

23. In apparatus for making steel barrels and the like, in combination, means adapted to support a barrel and permit it to roll in a predetermined direction by gravity in a substantially horizontal position, means adapted to terminate said rolling movement at a predetermined point, means adapted to engage said barrel by its ends at said point and roll end joints thereon, and means controlled by a movement of said barrel adapted automatically to set said last means in action upon said barrel reaching said predetermined point.

24. In apparatus for making steel barrels and the like, in combination, means adapted to support a barrel and permit it to roll in a predetermined direction by gravity in a substantially horizontal position to a predetermined point, means automatically set in action by movement of said barrel adapted to engage and rotate said barrel upon its reaching said point, means adapted to roll an end joint upon the barrel thus rotated, and a support upon which said barrel is rolled by said rotary movement on being disengaged.

25. In apparatus for making steel barrels and the like, in combination barrel-supporting means, a pair of substantially co-axial rotary members respectively adapted to engage an end of a barrel upon said supporting means, means adapted to drive said rotary members, and means adapted to vary the position of the axis of said members with respect to said supporting means while maintaining the axis parallel to the axis of a barrel on said supporting means and maintain connection with said driving means.

26. In apparatus for making steel barrels

and the like, in combination, a rotary member adapted to engage one end of a barrel, a rotary member adapted to engage the opposite end of said barrel, a driving shaft, and a series of members adapted when arranged successively to be operated by said driving shaft to move one of said rotary members toward the other to grip a barrel therebetween, one of said series of members being operatively controlled by said driving shaft and adapted thereby to be placed in operative relation to the remaining members to effect a movement of said rotary member, and means adapted to vary the movement of said movable rotary member to accommodate barrels of different length.

27. In apparatus for making steel barrels and the like, in combination, barrel-supporting means, a pair of aligned shafts the axis of which is closely adjacent the axis of a barrel upon said supporting means, a pair of removable members respectively secured to and driven from said shafts respectively adapted to engage opposite ends of said barrel and rotate the same, and means for independently varying the distance between the axis of each of said shafts and said supporting means.

28. In apparatus for making steel barrels and the like, in combination, barrel-supporting means, a pair of aligned shafts the axis of which is substantially coincident with the axis of a barrel upon said supporting means, a pair of removable members respectively secured to and driven from said shafts respectively adapted to engage opposite ends of said barrel and rotate the same, means adapted to vary the distance between the axes of said shafts and said supporting means, driving means, and means connecting said driving means to said shafts in the various positions in which said shafts may be used.

29. In apparatus for making steel barrels and the like, in combination, means adapted to engage and rotate a barrel, means adapted to perform a joint-rolling operation on said barrel, means adapted to adjust said rotating means to accommodate barrels of different diameters, means for making a relative adjustment between said rotating means and the locus of operation of said joint-rolling means, driving means operatively related to said rotating means, and means adapted to vary the speed of said rotating means with respect to that of said driving means.

30. In apparatus for making steel barrels and the like, in combination, supporting means for a barrel, a rotary member mounted to engage one end of a barrel upon said supporting means and rotate the same about a substantially horizontal axis, a shaft on which said rotary member is mounted, a driving shaft, means adapted to vary the distance between the axis of said first shaft and said supporting means, and gearing interposed between said driving shaft and said first shaft adapted to maintain connection therebetween in all positions to which said first shaft is adjusted.

31. In apparatus for making steel barrels and the like, in combination, supporting means for a barrel, a rotary member mounted to engage one end of a barrel upon said supporting member and rotate the same about a substantially horizontal axis, a shaft on which said rotary member is mounted, a driving shaft, means adapted to vary the distance between the axis of said first shaft and said supporting means, and gearing interposed between said driving shaft and said first shaft adapted to maintain connection therebetween in all positions to which said first shaft is adjusted, said gearing comprising change gears whereby the relative speeds of said shafts may be varied.

32. In apparatus for making steel barrels and the like, in combination, supporting means, a pair of substantially aligned horizontal shafts above said supporting means, a pair of members respectively at the ends of said shafts and respectively adapted to fit within adjacent ends of a barrel therebetween, means adapted to permit removal and replacement of said members with respect to said shafts, and means adapted to raise and lower said shafts independently of one another and with respect to said supporting means.

33. In apparatus for making steel barrels and the like, in combination, means adapted to rotate a barrel, a rolling device adapted to co-act with an end joint upon a barrel thus rotated, and means adapted to force said device against said joint with a pressure which automatically increases as the action of the rolling device progresses.

34. In apparatus for making steel barrels and the like, in combination, a rotary member adapted to engage one end of a barrel, a rotary member adapted to engage the opposite end of said barrel, a driving shaft, means adapted to be driven from said driving shaft and arranged to move one of said rotary members into operative relation to the other to permit a barrel to be gripped therebetween, then to permit said rotary member to remain at rest during an interval of time, and then to move said rotary member out of operative relation to the other and hold it out of operative relation for another interval of time, means for rolling a joint on said barrel and operative during said first-mentioned interval of time, and means under the control of said driving shaft arranged to disrupt the connection between said shaft and said movable rotary member during one of said intervals of time.

35. In apparatus for making steel barrels and the like, in combination, means adapted to rotate a barrel, a rolling device adapted to act upon an end joint of a barrel thus rotated, a pair of links respectively connected with said rolling device and a stationary support and jointed one to another, and means adapted to throw said links into substantially aligned position and by such action force said rolling device against said joint.

36. In apparatus for making steel barrels and the like, in combination, means adapted to rotate a barrel, a rolling device adapted to act upon an end joint of a barrel thus rotated, a pair of links respectively connected with said rolling device and a stationary support and jointed one to another, a source of power, and means actuated from said source of power adapted to throw said links toward aligned position and force said rolling device against said barrel by such action.

37. In apparatus for making steel barrels and the like, in combination, means adapted to engage and rotate a barrel, means adapted partially to form a joint, means adapted to complete the formation of a joint, and means adapted automatically to urge said joint-forming means successively into operative relation to a barrel rotated by said rotating means, said last mentioned means acting to force said joint-completing means against the joint with a pressure which increases as its action progresses, thereby adapted to bring the surfaces of the joint into fluid-tight relation.

38. In apparatus for making steel barrels and the like, in combination, a device adapted partially to form a joint in a barrel, a device adapted to complete the formation of a joint in a barrel, and means adapted automatically to throw said devices substantially into operative relation to the barrel in the order above set forth, said last mentioned means acting to force said joint-completing device against the joint with a pressure which increases as its action progresses, thereby adapted to bring the surfaces of the joint into fluid-tight relation.

39. In apparatus for making steel barrels and the like, in combination, a device adapted partially to form a joint in a barrel, a device adapted to complete the formation of a joint in a barrel, and means adapted automatically to throw said devices substantially into operative relation to the barrel in the order above set forth, each device being actuated with a pressure which increases as its action progresses.

40. In apparatus for making steel barrels and the like, in combination, a pair of devices adapted to perform succeeding operations in the formation of a joint on a barrel, and means adapted automatically to bring said devices into operative relation to a joint upon a barrel in the order in which they are adapted to act and each with a pressure which increases as its action progresses.

41. In apparatus for making steel barrels and the like, in combination, a member adapted to fit within the chime of a barrel, a pair of rolling devices mounted to move into a position opposite said member and perform successive operations in the formation of a chime joint on said barrel, and means adapted to rotate said member and automatically and successively throw said rolling devices into operative relation to said barrel each with a pressure which increases as its action progresses.

42. In apparatus for making steel barrels and the like, in combination, a main frame, a pair of substantially coaxial rotary members adapted respectively to fit within the opposite ends of a barrel, a standard mounted upon said frame, one of said rotary members being rotatably supported in said standard, a device adapted partially to form a joint on said barrel, a device adapted to complete the formation of said joint, means independently mounting said two devices upon said standard, and means adapted automatically to throw said devices substantially into operative relation to the barrel in the order above set forth.

43. In apparatus for making steel barrels and the like, in combination, a main frame, a pair of substantially coaxial rotary members adapted respectively to engage the opposite ends of a barrel, a standard movably mounted upon said main frame and supporting rotatably one of said rotary members and adapted upon movement in one direction to lessen the axial distance between said members to bring them respectively into operative relation to the ends of a barrel therebetween, means mounted upon said standard and movable therewith for coaction with said axially movable rotary member adapted to roll a joint on the end of said barrel supported upon said rotary member, a source of power, means actuated from said source of power adapted to throw said rolling means into operative relation to said barrel, and operative connections between said source of power and said actuating means adapted to permit operation of said rolling means from said source of power throughout the range of movement of said standard.

44. In apparatus for making steel barrels and the like, in combination, a member adapted to fit within the chime of a barrel and rotate therewith, a rolling device adapted to co-act with a joint upon a chime thus positioned, means adapted to move said member and said rolling device simultane-

ously in an axial direction to bring them into operative relation to the chime of a barrel, a source of power for rotating said member, and connections therebetween and said member for maintaining driving connection throughout the axial movement of said member.

45. In apparatus for making steel barrels and the like, in combination, a member adapted to fit within the chime of a barrel and rotate therewith, a rolling device adapted to co-act with a joint upon a chime thus positioned, and means adapted to move said member and said rolling device simultaneously in an axial direction to bring them into operative relation to the chime of a barrel, said means comprising a carriage upon which said member and said device are mounted, together with means for reciprocating said carriage.

46. In apparatus for making steel barerls and the like, in combination, a rotary member adapted to engage one end of a barrel, means rotatably supporting said rotary member for rotation about a fixed axis, a rotary member adapted to engage the opposite end of said barrel, supporting means upon which said second rotary member is mounted for rotation about an axis substantially aligned with the axis of said first rotary member, and means comprising a toggle connected with said supporting means and adapted to urge the same toward the barrel as the toggle is brought toward straight-line position.

47. In apparatus for making steel barrels and the like, in combination, a rotary member adapted to engage one end of a barrel, means rotatably supporting said rotary member for rotation about a fixed axis, a rotary member adapted to engage the opposite end of said barrel, supporting means upon which said second rotary member is mounted for rotation about an axis substantially aligned with the axis of said first rotary member, and means comprising a toggle connected with said supporting means and adapted to urge the same toward the barrel as the toggle is brought toward straight-line position, said last means also comprising a yieldable member through which power is exerted to urge said supporting means toward the barrel.

48. In apparatus for making steel barrels and the like, in combination, a pair of members between which a barrel is gripped at its ends, means rotatably supporting said members for rotation about a fixed axis, means comprising a toggle adapted to urge one of said members toward the other, and means whereby the relative spacing of said members may be adjusted without varying the angle between the members of said toggle.

49. In apparatus for making steel barrels and the like, in combination, a pair of members between which a barrel is gripped at its ends, means rotatably supporting said members for rotation about a fixed axis, means comprising a toggle adapted to urge one of said members toward the other, and adjustable means by which one end of said toggle is secured whereby barrels of different length may be accommodated without affecting the toggle action.

50. In apparatus for making steel barrels and the like, in combination, a pair of members respectively adapted to engage an end of a barrel, means adapted to rotate said members, and means adapted to force said members together into engagement with the barrel, and a device adapted to permit one of said members to yield to accommodate inequalities in length of barrels positioned between said members.

51. In apparatus for making steel barrels and the like, in combination, a pair of members respectively adapted to engage an end of a barrel positioned therebetween, means adapted to force one of said members toward the other to grip a barrel therebetween, and means adapted to lock said members in gripping position.

52. In apparatus for making steel barrels and the like, in combination, a pair of rotary members respectively adapted to engage the ends of a barrel positioned therebetween, intermittently actuated means adapted to reciprocate one of said members in an axial direction, and means adapted to lock said reciprocating means with the corresponding member in its advanced position.

53. In apparatus for making steel barrels and the like, in combination, a member adapted to engage one end of a barrel and rotate therewith, a shaft, means actuated from said shaft adapted to reciprocate said member in an axial direction, a pinion connected with said shaft, and a gear sector adapted intermittently to engage and rotate said pinion.

54. In apparatus for making steel barrels and the like, in combination, a member adapted to engage one end of a barrel and rotate therewith, a shaft, means actuated from said shaft adapted to reciprocate said member in an axial direction, a pinion connected with said shaft, a gear sector adapted intermittently to engage and rotate said pinion, and locking means adapted to lock said shaft with said first member in its advanced position.

55. In apparatus for making steel barrels and the like, in combination, a rotary member adapted to engage one end of a barrel, a link connected at one end with said rotary member, a second link jointed to said first link and having its remaining end substantially fixed, and means including a yieldable member adapted to vary the angular rela-

tion of said links and force said first member toward said barrel as said links are brought toward aligned position.

56. In apparatus for making steel barrels and the like, in combination, a pair of members adapted to engage opposite ends of a barrel and rotate the same, means adapted to co-act with said members in rolling joints upon said barrels, a rotary member through which said rolling means are forced into operative position, and means adapted upon the load on said rotary member becoming excessive to yield and disconnect said rotary member from its driving means.

57. In apparatus for making steel barrels and the like, in combination, a member adapted to engage an end of a barrel and rotate the same, means adapted to move said rotary member axially toward and away from said barrel, a rotary member adapted to actuate said last-mentioned means, driving means for said rotary member, and means adapted upon the load upon said rotary member becoming excessive to disconnect it from said driving means.

58. In apparatus for making steel barrels and the like, in combination, a chime supporting member, a roller adapted to co-act therewith in forming a joint on a barrel, means adapted to rotate one of said members with respect to the other to bring said roller into engagement with said joint entirely about the barrel, a standard upon which said member and said roller are supported and adapted thereby to confine the reactive stresses between said member and said roller to said standard, and means adapted to move said standard with said member and said roller in an axial direction to bring them into operative relation to the chime of a barrel, said last means comprising a yieldable device whereby the engagement with the barrel is cushioned.

59. In apparatus for making steel barrels and the like, in combination, a chime supporting member, a roller adapted to co-act therewith in forming a joint on a barrel, means adapted to rotate one of said members with respect to the other to bring said roller into engagement with said joint entirely about the barrel, means adapted to move said member and said roller in an axial direction to bring them into operative relation to the chime of a barrel, said means being arranged automatically to decrease the speed of movement of said member and said roller as the latter approach the barrel, and means adapted to vary said movement to accommodate barrels of different lengths.

60. In apparatus for making steel barrels and the like, in combination, a chime supporting member, a roller adapted to co-act therewith in forming a joint on a barrel, means adapted to rotate one of said members with respect to the other to bring said roller into engagement with said joint entirely about the barrel, means adapted to move said member and said roller in an axial direction to bring them into operative relation to the chime of a barrel, and means adapted to lock said member and said roller in their advanced position.

61. In apparatus for making steel barrels and the like, in combination, a rotary member adapted to engage one end of a barrel, a rotary member adapted to engage the opposite end of said barrel, supporting means upon which said second rotary member is mounted, yieldable means comprising a toggle connected with said supporting means and adapted to urge the same toward the barrel as the toggle is brought toward straight-line position, and means adapted to lock said supporting means in its advanced position.

62. In apparatus for making steel barrels and the like, in combination, a pair of rotary members adapted to engage a barrel positioned therebetween and rotate the same, a power driven shaft, and means driven from said shaft adapted in recurring sequence to move one of said rotary members into operative relation to the other to engage a barrel positioned therebetween and then to move said rotary member away from the other to release said barrel, said means including a device adapted periodically to connect and disconnect said movable rotary member from said last-mentioned means.

63. In apparatus for making steel barrels and the like, in combination, a pair of substantially coaxial rotary members adapted to engage the end of a barrel and rotate the same; means for driving one of said rotary members; means adapted to lessen the axial distance between said members to bring them respectively into operative relation to the ends of a barrel therebetween, said means including a toggle mechanism adapted upon approaching straight-line relation to lessen the axial distance between said members, a crank for flexing said toggle mechanism, power means adapted upon actuation to swing said crank only throughout a sufficient angle to cause said crank to flex said toggle mechanism; and rolling means adapted to act upon an end portion of said barrel as the latter is rotated.

64. In apparatus for making steel barrels and the like, in combination, a pair of substantially coaxial rotary members adapted to engage the end of a barrel and rotate the same; means for driving one of said rotary members; means adapted to move one of said members toward the other to cause said members to engage a barrel therebetween, said means including a toggle mechanism adapted upon approaching straight-line relation to move said one member toward the other, a crank for flexing said toggle mecha-

nism, power means adapted upon actuation to swing said crank only throughout a sufficient angle to cause said crank to flex said toggle mechanism, and a yieldable member interposed between said power means and said movable member; and rolling means adapted to act upon the barrel to form a joint therein as the barrel is gripped and rotated between said rotary members.

65. In apparatus for making steel barrels and the like, in combination, a pair of substantially coaxial rotary members adapted to engage the end of a barrel and rotate the same; means for driving one of said rotary members; means adapted to lessen the axial distance between said members to bring them respectively into operative relation to the ends of a barrel therebetween, said means including a toggle mechanism adapted upon approaching straight-line relation to lessen the axial distance between said members, a crank for flexing said toggle mechanism, power means adapted upon actuation to swing said crank only throughout a sufficient angle to cause said crank to flex said toggle mechanism; means for holding said crank in the position into which it is swung by said power means; and rolling means adapted to form a joint in said barrel as the latter is rotated.

66. In apparatus for making steel barrels and the like, in combination, a pair of rotary members relatively movable to engage a barrel positioned therebetween and rotate the same, rolling means adapted to be thrown into engagement with a barrel thus rotated, means adapted upon being set in operation automatically to move said rotary members together, throw said rolling means into action, withdraw said rolling means, and move apart said rotary members and means controlled by the movement of a barrel for setting said last-mentioned means in operation.

67. In apparatus for making steel barrels and the like, in combination, means adapted to engage and rotate a barrel, means adapted to roll a joint upon a barrel thus rotated, power-driven means adapted upon being set in actuation automatically to cause said barrel to be engaged, to throw said rolling means into action, to withdraw said rolling means, and to disengage said barrel, and means controlled by the parts thus actuated adapted automatically to disconnect power therefrom upon said cycle of operations being completed.

68. In apparatus for making steel barrels and the like, in combination, means adapted to engage and rotate a barrel, means adapted to roll a joint upon a barrel thus rotated, means adapted upon being set in actuation automatically to cause said barrel to be engaged, to throw said rolling means into action, to withdraw said rolling means, and to disengage said barrel, means controlled by the parts thus actuated adapted automatically to disconnect power therefrom upon said cycle of operations being completed, and means adapted to advance the time of action of said last means.

69. In apparatus for making steel barrels and the like, in combination, means adapted to engage and rotate a barrel, means adapted to roll a joint upon a barrel thus rotated, power-driven means adapted upon being set in actuation automatically to cause said barrel to be engaged, to throw said rolling means into action, to withdraw said rolling means, and to disengage said barrel, and means controlled by the parts thus actuated adapted automatically to disconnect power therefrom upon said cycle of operations being completed and to apply a braking action to reduce the effect of the momentum of the parts.

70. In apparatus for making steel barrels and the like, in combination, means adapted to engage and rotate a barrel, means adapted to roll a joint upon a barrel thus rotated, means adapted upon being set in actuation automatically to cause said barrel to be engaged, to throw said rolling means into action, to withdraw said rolling means, and to disengage said barrel, means controlled by the parts thus actuated adapted automatically to disconnect power therefrom upon said cycle of operations being completed and to apply a braking action to reduce the effect of the momentum of the parts, and means adapted to advance the time of action of said last-mentioned means.

71. In apparatus for making steel barrels and the like, in combination, a pair of substantially coaxial rotary members adapted to engage the end of a barrel and rotate the same; means for driving one of said rotary members; means adapted to lessen the axial distance between said members to bring them respectively into operative relation to the ends of a barrel therebetween, said means including a toggle mechanism adapted upon approaching straight-line relation to lessen the axial distance between said members, a crank for flexing said toggle mechanism, power means adapted upon actuation to swing said crank only throughout a sufficient angle to cause said crank to flex said toggle mechanism, means adapted to permit adjustment at will of the ultimate axial distance between said members upon the lessening thereof but operative without affecting the connections between said power means and said toggle mechanism; and rolling means adapted to form a joint on said barrel as the latter is rotated.

72. In apparatus for making steel barrels and the like, in combination, means adapted to rotate a barrel, a rolling device adapted to act upon an end joint of a barrel thus rotated, a pair of links respectively con-

nected with said rolling device and a stationary support and jointed one to another, means adapted to throw said links into substantially aligned position and by such action force said rolling device against said joint, and means for making said last-mentioned means substantially inoperative and automatically effective upon a substantial completion of the operation of said rolling device.

73. In apparatus for making steel barrels and the like, in combination, means adapted to rotate a barrel, a rolling device adapted to act upon an end joint of a barrel thus rotated, a pair of links respectively connected with said rolling device and a stationary support and jointed one to another, power actuated means adapted to throw said links into substantially aligned position and by such action force said rolling device against said joint, and means for cutting off the power from said power actuated means and adapted to be operated upon a substantial completion of the operation of said rolling device.

74. In apparatus for making steel barrels and the like, in combination, means adapted to rotate a barrel, a rolling device adapted to act upon an end joint of a barrel thus rotated, a pair of links respectively connected with said rolling device and a stationary support and jointed one to another, rotatable means adapted to throw said links into substantially aligned position and by such action force said rolling device against said joint, and automatic means for halting the rotation of said rotary means upon a substantial completion of the operation of said rolling device.

75. In apparatus for making steel barrels and the like, in combination, means adapted to rotate a barrel, a rolling device adapted to act upon an end joint of a barrel thus rotated, a pair of links respectively connected with said rolling device and a stationary support and jointed one to another, rotatable means adapted to throw said links into substantially aligned position and by such action force said rolling device against said joint, a member rotated with said rotatable means, and a member positioned in the path of movement of said last-mentioned member and adapted, upon actuation by said last-mentioned member, to effect a halting in the rotation of said rotatable means.

76. In apparatus for making steel barrels and the like, in combination, means adapted to rotate a barrel, a rolling device adapted to act upon an end joint of a barrel thus rotated, a pair of links respectively connected with said rolling device and a stationary support and jointed one to another, a movable cam arranged to throw said links into substantially aligned position and by such action force said rolling device against said joint, and means responsive to a predetermined movement of said cam to cut off the power from said cam.

77. In apparatus for making steel barrels and the like, in combination, means adapted to rotate a barrel, a rolling device adapted to act upon an end joint of a barrel thus rotated, a pair of links respectively connected with said rolling device and a stationary support and jointed one to another, a rotatable cam arranged to throw said links into substantially aligned position and by such action force said rolling device against said joint, a source of energy for effecting rotation of said cam, and means responsive to a predetermined rotation of said cam to cut off said source of energy.

78. In apparatus for making steel barrels and the like, in combination, means adapted to support a barrel and permit it to roll in a predetermined direction by gravity, means adapted to terminate said rolling movement at a predetermined point, a pair of members supported for rotation about a fixed axis, and automatically actuated means adapted to force said members respectively within the chimes of said barrel when it has reached said predetermined point and rotate the same.

79. In apparatus for making steel barrels and the like, in combination, a member adapted to fit within the chime of a barrel, a pair of rolling devices mounted to move into a position opposite said member and perform successive operations in the formation of a chime joint on said barrel, toggle means for actuating each device and adapted upon approaching straight-line relation to force a device against said joint, cam means adapted to throw said toggle means into approaching straight-line relation but in succession, power means for actuating said cam means, and automatic means adapted upon the completion of the operation of both of said rolling devices to cut off said power means.

80. In apparatus for making steel barrels and the like, in combination, a pair of rotary members respectively adapted to fit within the chime portions of the ends of a barrel, and means co-acting with each of said rotary members adapted to roll a joint in the corresponding chime portion by pressure toward the corresponding rotary member and automatically increase its pressure against said joint as the rolling progresses.

81. In apparatus for making steel barrels and the like, in combination, a pair of rotary members adapted respectively to engage opposite ends of a barrel and rotate the same, and means adapted simultaneously to roll joints on said barrel at both ends with a progressively increasing pressure while so rotating.

82. In apparatus for making steel barrels

and the like, in combination, a member adapted to fit within the chime of a barrel and rotate therewith, a rolling device adapted to coact with a joint upon a chime thus positioned, means adapted to move said member and said rolling device simultaneously in an axial direction to bring them into operative relation to the chime of a barrel, a power driven shaft extending in the general direction in which said member and said rolling device are moved, and means actuated by said shaft for forcing said rolling device into operative relation to said joint including operative connections adapted to permit actuation of said rolling device throughout the range of travel of said device.

83. In apparatus for making steel barrels and the like, in combination, a member adapted to fit within the chime of a barrel and rotate therewith, a rolling device adapted to coact with a joint upon a chime thus positioned, means adapted to move said member and said rolling device simultaneously in an axial direction to bring them into operative relation to the chime of a barrel, and means for throwing said rolling device into operative relation to the chime to form a joint, said means including a power driven shaft extending in the general direction of movement of said member and said device, a cam driven by said shaft, and connections adapted to permit actuation of said rolling device throughout the range of travel of said member and said device.

84. In apparatus for making steel barrels and the like, in combination, a member adapted to fit within the chime of a barrel, a pair of rolling devices mounted to move into a position opposite said member and perform successive operations in the formation of a chime joint on said barrel, toggle means for actuating each device and adapted upon approaching straight-line relation to force a device against said joint, cam means adapted to throw said toggle means into approaching straight-line relation but in succession, means for rotatably mounting said cam means, power means for rotating said cam means, and means responsive to a predetermined rotary movement of said cam means to make said power means ineffective.

85. In apparatus for making steel barrels and the like, in combination, a pair of rotary members adapted respectively to fit within the chimes at the ends of a barrel, means adapted to move one of said rotary members toward and away from the barrel in an axial direction, and means adapted to lock said last rotary member in its advanced position against receding movement.

86. In apparatus for making steel barrels and the like, in combination, a main frame, a pair of substantially coaxial rotary members adapted respectively to engage the opposite ends of a barrel and rotate the same, a standard mounted upon said frame, one of said rotary members being rotatably supported in said standard, means coacting with one of said rotary members adapted to roll a joint on one end of said barrel, means supporting said coacting rolling means on said standard and adapted thereby to relieve said main frame from the reacting stresses therebetween, and means for yieldably urging one rotary member toward the other.

87. In apparatus for making steel barrels and the like, in combination, means adapted to support a barrel and permit it to roll in a predetermined direction by gravity in a substantially horizontal position, means adapted to terminate said rolling movement at a predetermined point, and means adapted to engage said barrel by its ends at said point and roll end joints thereon, said last-mentioned means being set into action by the movement of a barrel with respect to said predetermined point.

88. In apparatus for making steel barrels and the like, in combination, means adapted to support a barrel, a member adapted to engage a chime of said barrel, a roller member adapted to co-act with said first member in forming a joint on the barrel, means adapted to rotate one of said members with respect to the other to bring said roller member into engagement with said joint entirely about the barrel, means adapted to move said members together in an axial direction to bring them into operative relation to the chime of a barrel upon said supporting means, and means adapted to adjust the position of said first member to vary the distance between its axis and said supporting means.

89. In apparatus for making steel barrels and the like, in combination, a pair of members adapted to engage opposite ends of a barrel and rotate the barrel about a fixed axis, a rolling device adapted to coact with one of said members in forming a joint on the barrel, means adapted to move one of said members toward and away from the other, means adapted to vary the actuation of said movable member to accommodate barrels of different lengths, and means adapted to vary the position of the axes of both of said members relative to the locus of operation of said rolling device to accommodate barrels of different diameters.

90. In apparatus for making steel barrels and the like, in combination, a main frame, a pair of substantially coaxial rotary members adapted respectively to engage the opposite ends of a barrel, a standard movably mounted upon said main frame and supporting rotatably one of said rotary members and adapted upon movement in one

direction to lessen the axial distance between said members to bring them respectively into operative relation to the ends of a barrel therebetween, means coacting with said axially movable rotary member adapted to roll a joint on the end of said barrel supported upon said rotary member, means supporting said coacting rolling means on said movable standard to be movable therewith and to relieve said main frame from the reacting stresses between said coacting parts, and means for yieldably urging one of said rotary members toward the other with the barrel gripped therebetween.

91. In apparatus for making steel barrels and the like, in combination, a main frame, a pair of substantially coaxial rotary members adapted respectively to engage the opposite ends of a barrel, a standard movably mounted upon said main frame and supporting rotatably one of said rotary members and adapted upon movement in one direction to lessen the axial distance between said members to bring them respectively into operative relation to the ends of a barrel therebetween, means coacting with said axially movable rotary member adapted to roll a joint on the end of said barrel supported upon said rotary member, means supporting said coacting rolling means on said movable standard to be movable therewith and to relieve said main frame from the reacting stresses between said coacting parts, and means for yieldably urging said standard in the direction toward the other rotary member when said barrel is gripped between said rotary members.

92. In apparatus for making steel barrels and the like, in combination, means adapted to support a barrel and convey it to a predetermined point, means adapted to engage and rotate said barrel when it has arrived at said predetermined point, said last-mentioned means being controlled by said barrel upon the latter arriving at said predetermined point, means for performing an operation upon a barrel thus rotated, and means for conveying said barrel away from said engaging and operating means upon being disengaged.

93. In apparatus for making steel barrels and the like, in combination, a pair of members respectively adapted each to engage an end of a barrel, means adapted to rotate said members, means for performing an operation upon said barrel, means adapted to force said members together into engagement with the barrel, and a device adapted to permit one of said members to yield and to approach the other of said members to compensate for any decrease in the length of said barrel resulting from the action of said operating means.

94. In apparatus for making steel barrels and the like, in combination, a member adapted to fit within the chime of a barrel and rotate therewith, a rolling device adapted to coact with a joint upon a chime thus positioned, and means for adjusting the position of said rolling device in an axial direction relative to said member.

95. In apparatus for making steel barrels and the like, in combination, a member adapted to fit within the chime of a barrel and rotate therewith, a rolling device adapted to coact with said member in forming a joint upon a chime thus positioned, means adapted to move said member and said rolling device simultaneously in an inward direction to bring them into operative relation to the chime of said barrel, and means for adjusting said rolling device in an axial direction with respect to said member.

96. In apparatus for making steel barrels and the like, in combination, a rotary member adapted to engage one end of a barrel, supporting means for said rotary member, means comprising a toggle having one link connected to said supporting means and the other link anchored for forcing said member towards said barrel as said links are brought toward an aligned position, and means for varying the angular relation of the links of said toggle comprising a crank and a connecting rod between said crank and the knuckle of said toggle.

97. In apparatus for making steel barrels and the like, in combination, a rotary member adapted to engage one end of a barrel, a link connected at one end with said rotary member, a second link joined to said first link and having its remaining end substantially fixed, means adapted to vary the angular relation of said links and force said first member towards said barrel as said links are brought toward aligned position, said means comprising a crank and a connecting rod between said crank and the junction of said links, and means for intermittently rotating said crank throughout a complete cycle comprising a pinion connected with said crank and a constantly rotated gear sector cooperating with said pinion.

98. In apparatus for making steel barrels and the like, in combination, barrel-supporting means, a pair of substantially co-axial rotary members respectively adapted each to engage an end of a barrel upon said supporting means, means adapted to drive said rotary members, and means comprising removable gauge blocks for varying the position of the axis of said members with respect to said supporting means, while maintaining connection with said driving means.

99. In apparatus for making steel barrels and the like, in combination, a pair of members respectively adapted each to engage an end of a barrel, means to rotate said members, means adapted to force said members together into engagement with the bar-

rel, reciprocating means for actuating said forcing means, and means adapted upon the load upon said forcing means becoming excessive to disconnect it from said reciprocating means.

100. In apparatus for making steel barrels and the like, in combination, a pair of members between which a barrel is gripped at its ends, means comprising a toggle adapted to urge one of said members toward the other, driving means for flexing said toggle, and means forming part of said toggle adapted upon the load upon said toggle becoming excessive to yield and to relieve said toggle and said flexing means from said excessive load.

101. In apparatus for making steel barrels and the like, in combination, a pair of members between which a barrel is gripped at its ends, means comprising a toggle adapted to urge one of said members toward the other, one of the links of said toggle being composed of two members, a pin for connecting said two members of said link, and means for flexing said toggle, said two members being adapted to shear said pin upon the load upon said toggle and flexing means becoming excessive.

102. In apparatus for making steel barrels and the like, in combination, a member adapted to fit within the chime of a barrel, a pair of independently mounted rolling devices mounted to move into a position opposite said member and perform successive operations in the formation of a chime joint on said barrel, means adapted to rotate said member, and a single cam for automatically and successively throwing said rolling devices into operative relation to said barrel.

103. In apparatus for making steel barrels and the like, in combination, a member adapted to fit within the chime of a barrel, a rolling device mounted in a pivotally mounted arm adapted to form a chime joint on said barrel, means adapted to rotate said member a rotary member, and connections between said rotary member and said arm adapted to throw said rolling device into operative relation to said barrel.

104. In apparatus for making steel barrels and the like, in combination, means adapted to support a barrel between a pair of members, means including a pinion and a gear sector co-operating therewith adapted to lessen or to increase the distance between said members respectively to bring said members within adjacent chime portions on said barrel thereby to grip said barrel or to release said barrel, means coacting with said members during the gripping action thereof adapted respectively to roll a joint upon corresponding chime portions of said barrel, and a single cam shaft for controlling the successive operation of said two last mentioned means.

105. In apparatus for making steel barrels and the like, in combination, means adapted to support a barrel and permit it to roll in a predetermined direction by gravity in a substantially horizontal position, means adapted to terminate said rolling movement at a predetermined point, means adapted to engage said barrel by its ends at said predetermined point and roll end joints thereon, and electrical means for controlling the actuation of said last-mentioned means and including a control circuit adapted to be closed by said barrel upon said barrel reaching said predetermined point.

106. In apparatus for making steel barrels and the like, in combination, a pair of rotary members respectively adapted to engage the ends of a barrel positioned therebetween, means mounting one of said members to permit it to move toward and away from the barrel, electrically actuated means for moving said movable rotary member toward or away from the other, means coacting with one of said members adapted to roll an end joint on said barrel, and means automatically operative to open the circuit of said electrically actuated means upon the completion of the joint-rolling action of said last-mentioned means and upon a movement of said rotary member by said electrically actuated means away from the other.

107. In apparatus for making steel barrels and the like, in combination, a pair of rotary members respectively adapted to engage the ends of a barrel positioned therebetween, means mounting one of said members to permit it to move toward and away from the barrel, a separate source of power for driving each of said rotary members, a pair of rolling devices respectively adapted to coact with said rotary members in rolling a joint on said barrel, a shaft driven from one of said sources of power, and means driven from said shaft adapted to throw said rolling devices into operative relation to the respective ends of said barrel.

108. In apparatus for making steel barrels and the like, in combination, a pair of rotary members respectively adapted to engage the ends of a barrel positioned therebetween, means mounting one of said members to permit it to move toward and away from the barrel, a separate source of power for driving each of said rotary members, a pair of rolling devices respectively adapted to coact with said rotary members in rolling a joint on said barrel, a shaft driven from one of said sources of power, and means driven from said shaft adapted to move said movable rotary member toward and away from the barrel.

109. In apparatus for making steel bar-

rels and the like, in combination, means adapted to rotate a barrel, a rolling device adapted to coact with an end joint upon a barrel thus rotated, a source of power, and connections between said source of power and said rolling device including an arm adapted to force said rolling device against said joint, said arm being of adjustable length thereby to permit predetermination at will of the locus of operation of said rolling device.

110. In apparatus for making steel barrels and the like, in combination, means adapted to rotate a barrel, a rolling device adapted to coact with an end joint upon a barrel thus rotated, a pair of links respectively connected with said rolling device and a stationary support and jointed one to another, and means adapted to throw said links into substantially aligned position and by such action force said rolling device against said joint, one of said links being of adjustable length.

111. In apparatus for making steel barrels and the like, in combination, a main frame, a pair of rotary members adapted to respectively engage opposite ends of a barrel and rotate the same, a standard mounted upon said main frame and rotatably supporting one of said rotatable members, a rolling device adapted to coact with said last-mentioned rotary member to form an end joint of a barrel thus rotated, a pair of links respectively connected with said rolling device and said standard and jointed one to the other, and means adapted to throw said links into substantially aligned position and by such action force said rolling device against said joint.

112. In apparatus for making steel barrels and the like, in combination, a main frame, a pair of rotary members adapted respectively to engage opposite ends of a barrel and rotate the same, a standard movably mounted upon said main frame and rotatably supporting one of said members and thereby adapted to bring said members by an approaching axial movement into operative relation to the ends of said barrel, a rolling device adapted to coact with said rotary member supported on said standard to form an end joint of a barrel thus rotated, a pair of links respectively connected with said rolling device and said movable standard and jointed one to another, and means adapted to throw said links into substantially aligned position and by such action force said rolling device against said joint.

113. In apparatus for making steel barrels and the like, in combination, a main frame, a pair of rotary members adapted respectively to engage opposite ends of a barrel and rotate the same, a standard movably mounted upon said main frame and rotatably supporting one of said members and thereby adapted to bring said members by an approaching axial movement into operative relation to the ends of said barrel, a rolling device adapted to coact with said rotary member supported on said standard to form an end joint of a barrel thus rotated, a pair of links respectively connected with said rolling device and said movable standard and jointed one to another, a power driven shaft, and connections therebetween and said links adapted to throw said links into substantially aligned position and by such action force said rolling device against said joint, said connections including means adapted to permit operation of said links from said shaft throughout the range of travel of said standard.

114. In apparatus for making steel barrels and the like, in combination, a pair of rotary members adapted respectively to engage opposite ends of a barrel and rotate therewith, a rolling device adapted to coact with one of said members to form a joint upon a barrel thus positioned, means adapted to move one of said members and said rolling device toward or away from the other member to accommodate therebetween barrels of different lengths, and means including a broad-faced cam extending in the general direction of movement of said rolling device adapted to throw said rolling device into coaction with said coacting rotary member.

115. In apparatus for making steel barrels and the like, in combination, a pair of substantially coaxial members respectively adapted to engage an end of a barrel, means adapted to drive one of said rotary members to spin said barrel, a rolling device adapted to coact with one of said members in forming a joint on said barrel, and means comprising removable gauge blocks for varying and predetermining the position of the axis of said members with respect to the locus of operation of said rolling device while maintaining connection with said driving means.

116. In apparatus for making steel barrels and the like, in combination, a pair of substantially coaxial members respectively adapted to engage an end of a barrel, means adapted to drive one of said rotary members to spin said barrel, a rolling device adapted to coact with one of said members and forming a joint on said barrel, manually controlled means for adjusting the position of the axis of said members with respect to the locus of operation of said rolling device, and gauge blocks for predetermining the position into which the axis is adjusted by said last-mentioned means.

117. In apparatus for making steel barrels and the like, in combination, a pair of rotary members adapted to engage a barrel

positioned therebetween and rotate the same, means adapted normally to move one of said rotary members toward the other to engage a barrel positioned therebetween and thereupon to move said member away from the other to release a barrel, in recurring sequence, rolling means adapted to be thrown into engagement with a barrel while engaged by said rotary members, and automatic means for halting said movable member after the movements thereof in the above order have taken place.

118. In apparatus for making steel barrels and the like, in combination, a pair of rotary members adapted to engage a barrel positioned therebetween and rotate the same, means adapted normally to move one of said rotary members toward the other to engage a barrel positioned therebetween and thereupon to move said member away from the other to release a barrel, in recurring sequence, rolling means adapted to be thrown into engagement with a barrel while engaged by said rotary members, and electrical means automatically actuated upon a substantial completion of the rolling operation of said rolling means for halting said movable member after the movements thereof in the above order have taken place.

119. In apparatus for making steel barrels and the like, in combination, a pair of members between which a barrel is gripped at its ends, means comprising a toggle adapted to urge one of said members toward the other, and power-actuated means for flexing said toggle, said means including a yieldable member to permit said members to accommodate inequalities in length of barrels positioned therebetween.

120. In apparatus for making steel barrels and the like, in combination, a pair of members between which a barrel is gripped at its ends, means comprising a toggle adapted to urge one of said members toward the other, an intermittently operated crank, and connections therebetween and said toggle for flexing said toggle, said connections including a yieldable member.

121. In apparatus for making steel barrels and the like, in combination, a pair of members respectively adapted to engage an end of a barrel, means including a crank for moving one of said members toward the other, and means for intermittently operating said crank, said means including a gear operatively connected to said crank, a gear sector coacting therewith, and means for locking said gear in position after disengagement thereof by said gear sector.

122. In apparatus for making steel barrels and the like, in combination, a pair of rotary members adapted to engage a barrel positioned therebetween and rotate the same, means adapted normally to move one of said rotary members toward the other to engage a barrel positioned therebetween and thereupon to move said member away from the other to release a barrel, in recurring sequence, rolling means adapted to be thrown into engagement with a barrel while engaged by said rotary members, electrical means automatically actuated upon a substantial completion of the rolling operation of said rolling means for halting said movable member after the movements thereof in the above order have taken place, and means controlled by a subsequent barrel when positioned to be engaged by said rotary members adapted to affect said electrical means to permit a recurrence of said successive movements of one of said members to take place.

123. In apparatus for making steel barrels and the like, in combination, a member adapted to fit within the chime of a barrel and rotate therewith, means adapted to coact with said member and partially to form a joint in a barrel, a second device adapted to coact with said member and to complete the formation of a joint in a barrel, and means adapted automatically to throw said devices substantially into operative relation to the barrel in the order above set forth, said means comprising a single cam and separate connections between said devices and said cam adapted each to be successively actuated by said cam.

124. In apparatus for making steel barrels and the like, in combination, a main frame, a pair of substantially coaxially rotary members adapted respectively to engage the opposite ends of a barrel, a standard movably mounted upon said main frame and supporting rotatably one of said rotary members and adapted upon movement in one direction to lessen the axial distance between said members to bring them respectively into operative relation to the ends of a barrel therebetween, means mounted upon said standard and movable therewith for coaction with said axially movable rotary member adapted to roll a joint on the end of said barrel, driving means, means actuated from said driving means adapted to throw said rolling means into operative relation to said barrel, and operative connections between said driving means, said actuated means and rotary member supported by said standard, adapted to permit operation of said rolling means and the driving of said rotary member throughout the range of movement of said standard.

125. In apparatus for making steel barrels and the like, in combination, a pair of members respectively adapted to engage an end of a barrel and rotate the same, and means for reciprocating one of said members in an axial direction, said means including a driven toothed member and a second toothed member connected to said

barrel engaging member, said toothed members being arranged to be alternately placed in mesh and out of mesh, and means for releasably holding said second toothed member when out of mesh with the other toothed member and in position for teeth-intermeshing engagement with the other member as said two toothed members are subsequently brought into mesh.

126. In apparatus for making steel barrels and the like, in combination, a pair of members respectively adapted to engage an end of a barrel and rotate the same, and means for reciprocating one of said members in an axial direction, said means including a crank operatively connected to said member and means for intermittently giving said crank a throw of substantially 180°.

127. In apparatus for making steel barrels and the like, in combination, a pair of members respectively adapted to engage an end of a barrel and rotate the same, and means for reciprocating one of said members in an axial direction, said means including a rotatably mounted gear, mechanism connected between said movable member and said gear adapted to convert the rotary motion of said gear into motion of translation, gear-driving means, and means for periodically connecting and disconnecting said gear to said gear-driving means.

128. In apparatus for making steel barrels and the like, in combination, a pair of members respectively adapted to engage an end of a barrel and rotate the same, and means for reciprocating one of said members in an axial direction, said means including a rotatably mounted gear, mechanism connected between said movable member and said gear adapted to convert the rotary motion of said gear into motion of translation, a gear sector coacting with said gear, means for locking said gear in position after disengagement thereof by said gear sector, and means responsive to the movement of said gear sector for unlocking said gear prior to engagement of the gear sector with the gear.

129. In apparatus for making steel barrels and the like, in combination, a pair of rotary members adapted to engage a barrel positioned therebetween and rotate the same, means adapted normally to move one of said rotary members toward the other to engage a barrel positioned therebetween and thereupon to move said member away from the other to release the barrel, rolling means adapted to be thrown into engagement with a barrel while engaged by said rotary members, means automatically actuated upon a substantial completion of the rolling operation of said rolling means for halting said movable member after the movements thereof in the above order have taken place, and means controlled by the movement of a subsequent barrel into position to be engaged by said rotary members adapted to initiate the movements of said movable member in the order above set forth.

In testimony whereof, I have signed my name to this specification this seventh day of September 1920.

CHARLES T. DRAPER.