G. R. LAWRENCE.

MACHINE FOR CIRCLING METAL BLANKS.

APPLICATION FILED MAY 4, 1912.

1,038,606. Patented Sept. 17, 1912.

4 SHEETS—SHEET 1.

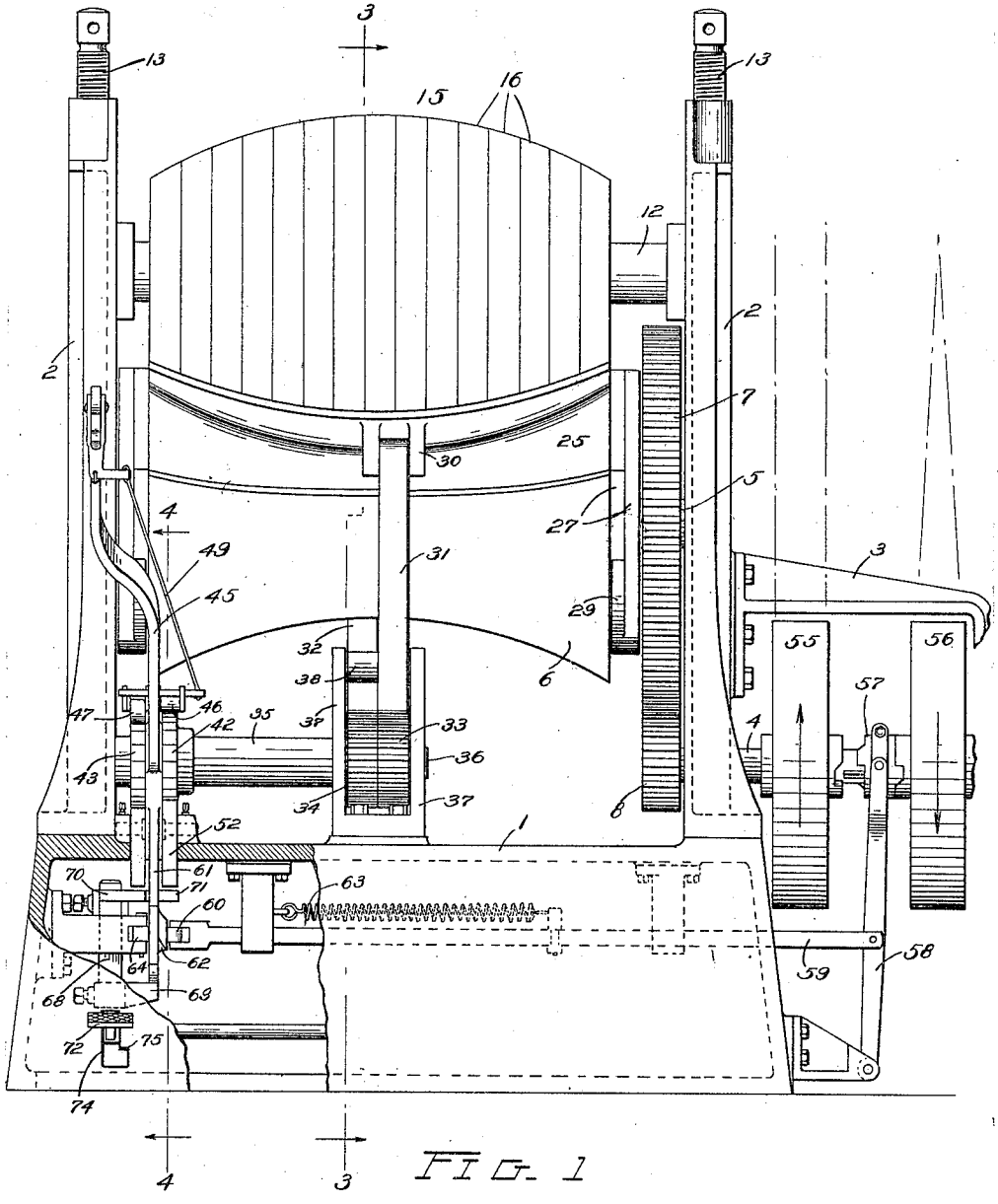


FIG. 1

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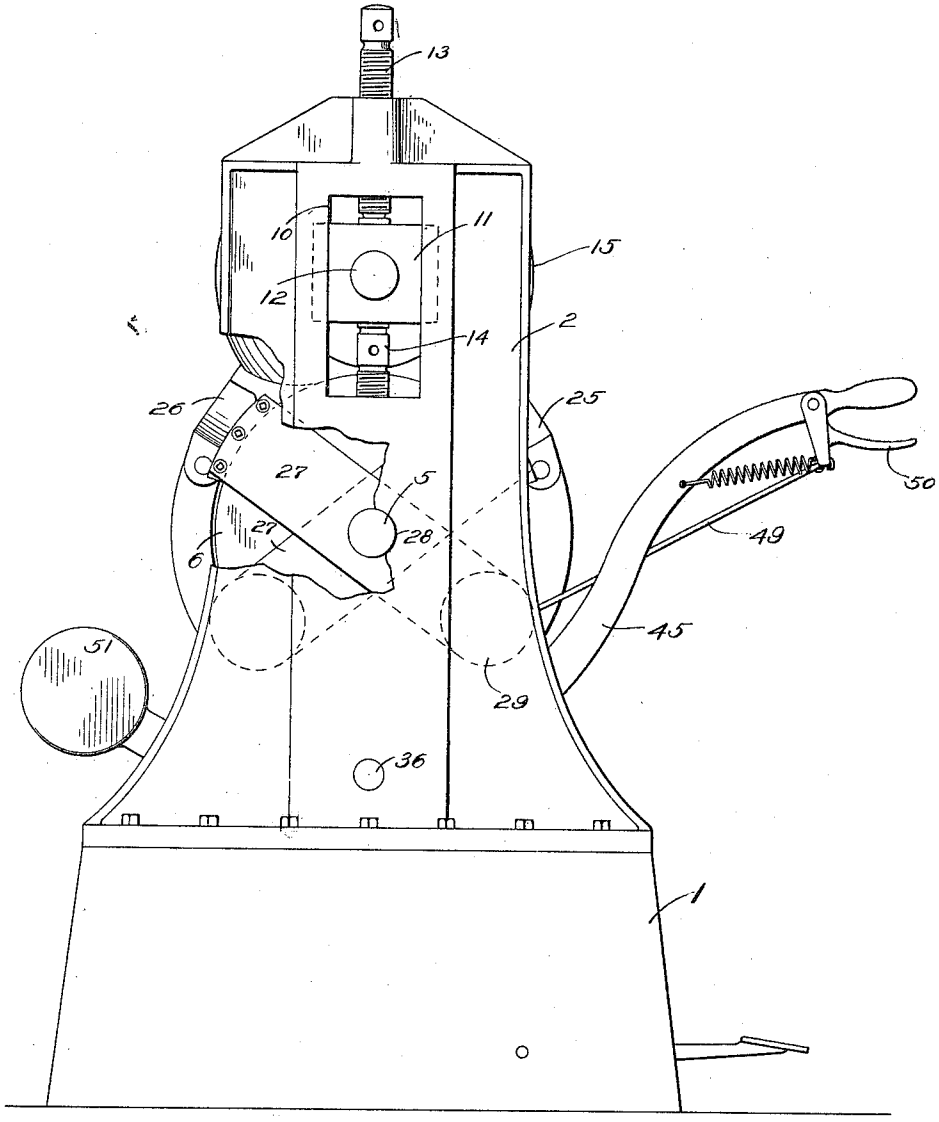


FIG. 2

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4 SHEETS—SHEET 3.

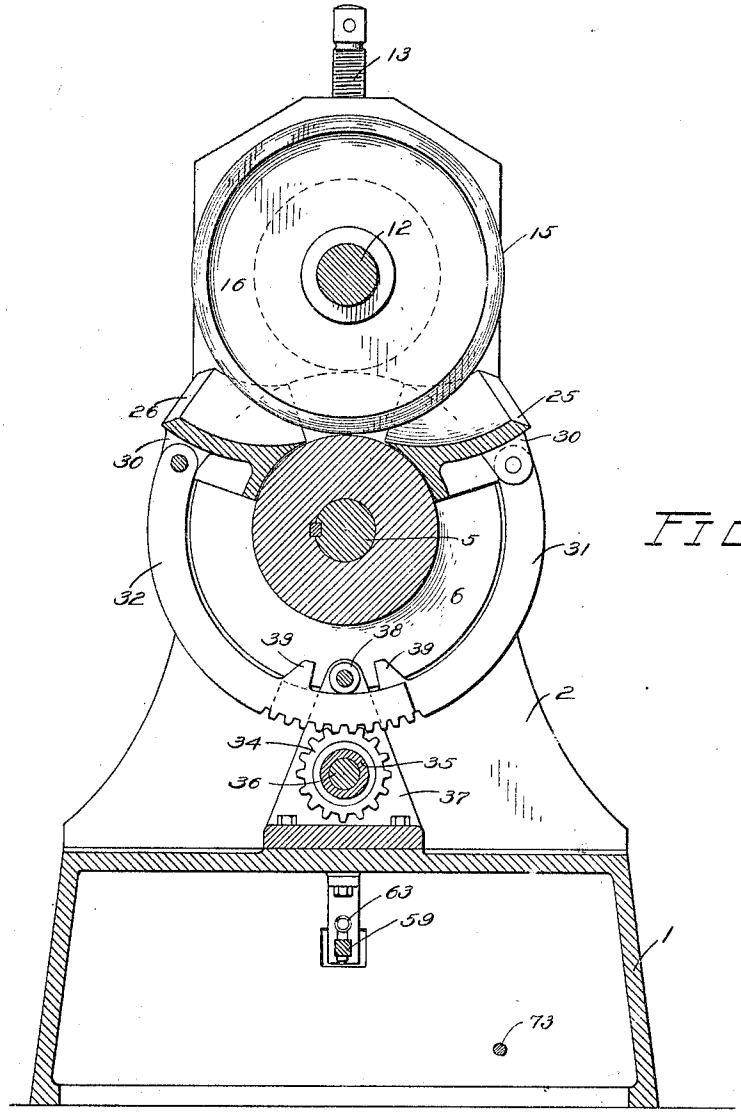


FIG. 3

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1,038,606.

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4 SHEETS—SHEET 4.

FIG. 5

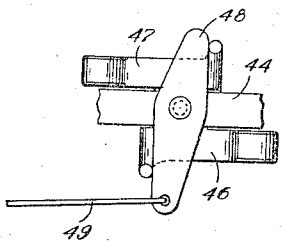


FIG. 6

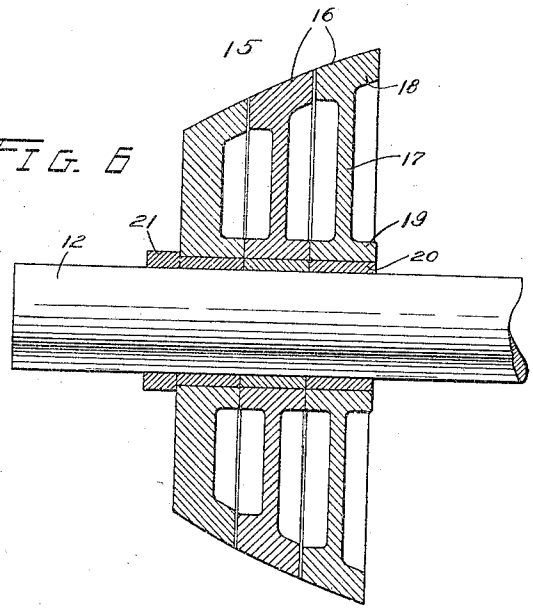
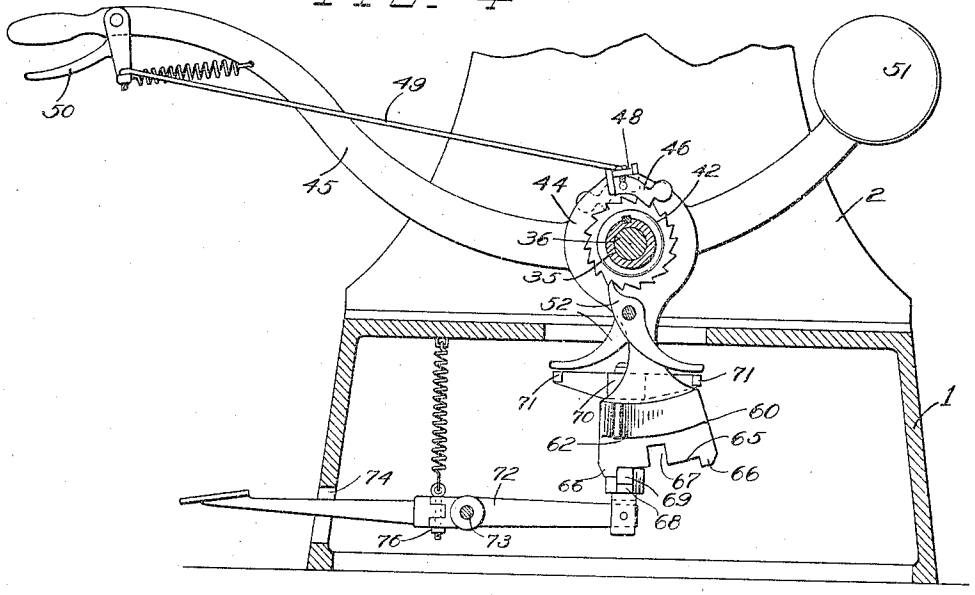


FIG. 4



Witnesses:

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Chas. A. Watt

George R. Lawrence Inventor

By Hull & Smith

Attys.

UNITED STATES PATENT OFFICE.

GEORGE R. LAWRENCE, OF CLEVELAND, OHIO, ASSIGNOR TO THE W. W. SLY MANUFACTURING COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

MACHINE FOR CIRCLING METAL BLANKS.

1,038,606. Specification of Letters Patent. Patented Sept. 17, 1912.

Application filed May 4, 1912. Serial No. 695,188.

To all whom it may concern:

Be it known that I, GEORGE R. LAWRENCE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Machines for Circling Metal Blanks, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to rolling machines whereby metal sheets or blanks may be bent to circular form and particularly to a machine which may be employed for the manufacture of bilge barrels.

The desirability of manufacturing barrels from sheet metal has long been apparent theoretically, but a commercially successful process of making such a barrel in the bilge or rotund form has not hitherto, to my knowledge, been produced. It was at one time proposed to make metal barrels of plain cylindrical shape, or of generally cylindrical shape, the sides being formed with varying numbers of projecting circular ribs, but it was soon discovered that such barrels were poorly received by the trade, partly on account of the conservatism of the workmen, and partly because of the greater ease of handling the older form of barrel.

The objects of the present invention are, therefore, the provision of a machine whereby blanks of sheet metal can be expeditiously circled or rolled into approximate barrel form; the provision of new and improved co-acting rollers whereby a bilge barrel can be rolled with a minimum of slipping of the rollers and consequent distortion of the blanks; the provision of new and improved mechanism for guiding the blank to its finished form; the provision of new and improved mechanism for governing the operation of the machine, while further objects and advantages of the invention will become apparent from the course of the following description and claims.

In the drawings accompanying and forming a part of this application, I have illustrated a barrel forming machine wherein my improvements are embodied, although it will be understood that the machine herein illustrated is but one of the many devices in which my improvements may be utilized.

In these drawings, Figure 1 represents a front elevation of the complete machine, a portion of the base being broken away so as to disclose the governing means; Fig. 2 is a right hand end elevation of the machine, a portion of the adjacent upright being broken away to disclose the manner of supporting the forming shoes; Fig. 3 is a vertical, transverse, cross-sectional view taken substantially on the broken line 3—3 of Fig. 1 and looking in the direction of the arrows; Fig. 4 is a detail cross-sectional view taken on the line 4—4 of Fig. 1 and looking in the direction of the arrows; Fig. 5 is a detail view of the mechanism for operating the lever pawls; and Fig. 6 is a longitudinal cross-sectional view of a portion of the idle or driven roll.

Describing the parts by reference characters, 1 indicates the base of the machine, 2—2 a pair of upright standards carried thereby, 3 a bracket carried by one of those standards and 4 a drive shaft journaled in the bracket and adjacent standard.

Journaled in the standards 2—2 upon a substantially horizontal axis is a shaft 5 to which is rigidly attached a roll 6 here shown as of generally concave shape for the formation of the barrel exterior, said shaft having a gear wheel 7 meshing with a pinion 8 secured to the drive shaft 4. Adjustably mounted in elongated guideways 10 formed in the uprights 2—2 above the shaft 5 are journal boxes 11, in which is mounted a second horizontal shaft 12, suitable set screws 13—13, 14—14 being provided for the vertical adjustment of these boxes. The shaft 12 carries the complementary roll, this roll being in the present instance of convex or bilge form so as to coöperate with the roll 6 in the formation of a bilge barrel. This roll is indicated generally by the reference character 15, but instead of being made of a single metal member, as has heretofore been the case, it is made of a plurality of separately revoluble, flat, metallic disks 16, independently sleeved upon the shaft 12. The preferred construction of these disks is illustrated in Fig. 6, wherein it is seen that each of the same comprises a flat, annular web 17, having at its outer edge a laterally-projecting rim 18 and at its center a cylindrical hub 19, the width whereof is slightly greater than the width of the rim, so as to engage

the ends of the adjacent hubs in advance of engagement of the sides of the rims. The hubs 19 are preferably provided with bushings 20 of anti-friction metal, while the disks are held in fixed relation adjacent to each other by suitable means such as collars 21 secured to the shaft 12. The importance of this construction arises from the fact that, owing to the varying diameters of the two rolls, the smallest part of the driven roll 15 tends to rotate more rapidly than the larger part thereof. When this roll is made in one piece, as heretofore has been done, its rotation is accompanied by a constant slipping of some portion of its surface over the surface of the adjacent roll or over the surface of the sheet of metal which is passing therebetween. The position and direction of this slipping will depend upon the relative curvature of the two rolls, since if the driving roll be formed with slightly less longitudinal curvature than the driven roll, the driving will be from the center thereof, thus causing the driven roll to rotate at its slowest speed. The result is that the end portions of the driven roll will advance less rapidly than the metal blank and will pull backwardly upon the marginal edges of that blank so as to set up strains in the metal which will cause the blank to assume a warped position and render its finishing a difficult matter. Likewise, if the driving roll be more rounding than the driven roll, the latter will tend to rotate at its highest speed, and the slippage will occur at the center of the sheet in a forward direction, but with the same result. As a matter of fact, in actual practice it is found that the point of driving falls somewhere between these limits, with the effect that the central portion of the sheet is crowded forward and the marginal portions are retarded, the result of the operation being the very noticeable distortion of the sheets and the rapid wearing of the rolls. When a sectional roll is employed it will be found that this distortion and wearing are almost entirely overcome, the different sections of the driven roll advancing at rates corresponding inversely to their diameters, so that the metal can be rolled much more exactly to shape than has hitherto been possible because of the absence of any distortion or unequal stretching of the metal which would cause the finished product to assume unexpected shapes.

The blanks from which the barrels are made are preferably rolled to a concave or trough-shape form before being delivered to this machine, their curvature being substantially the same as that of the bilge of the barrel which is to be made therefrom. The purpose of the present machine is merely to circle these plates and bring their ends adjacent to each other preparatory to riveting or welding. This circling is effected by interposing in the path of the plate as it passes between the roll a guide block or shoe which shall deflect the same in the direction in which the curvature is desired. The general idea of circling a metal blank in this manner is old, but in the drawings accompanying this application I have illustrated certain novel expedients for facilitating and expediting the operation of these guide blocks or shoes, and for governing the operation of the rolls, the construction and operation of which will now be described.

The guide shoes in question are illustrated at 25 and 26, respectively, the face of each of said shoes having a longitudinal curvature conforming substantially to that of the driven roll 15 and also having a lateral curvature corresponding substantially to the varying circumferential curvature of the same roll. Each of these shoes has at each end an arm 27 apertured at 28 for the passage of the shaft 5 and formed at the end opposite to the shoe with a counterweight 29. The edge of the shoe adjacent to the roll 6 is preferably shaped to conform substantially to the surface of such roll, as shown in Fig. 3, and remains always at a fixed distance from said roll from the fact of its being pivoted about the same axis.

Secured to each of the shoes 25, 26, as by being pivoted in ears 30—30 formed thereon, is a curved rack 31, 32, the ends of which lie close beside each other, as shown in Fig. 1, and mesh with pinions 33 and 34 respectively. The pinion 34 is secured to the end of a hollow sleeve 35 and the pinion 33 to the end of a shaft 36 projecting through said sleeve. The inner ends of the sleeve and shaft are journaled in the upright sides 37—37 of a U-shaped bracket, between the upper ends of which are pivoted the rollers 38 whereby the racks are maintained in engagement with their respective pinions. The racks may also be formed with abutments 39—39 adapted to engage either the rollers 28 or the sides of the bracket so as to limit the downward movement of the shoes 25 and 26. The other end of the shaft 36 may be journaled in the upright standard 2, as illustrated in Fig. 2.

Secured to the outer end of the sleeve 35 is a ratchet wheel 42, and secured to the shaft 36 at a point spaced from this ratchet wheel is a second ratchet wheel 43, said ratchet wheels having their teeth facing in opposite directions. Journaled upon the shaft 36 between these ratchet wheels is the hub 44 of a lever 45, and to the opposite sides of this hub are pivoted weighted pawls 46 and 47 coöperating with the ratchet wheels 42 and 43, respectively. A button 48 pivoted to the hub 44 engages suitable projections carired by these pawls so that when it is rocked by means of the link 49 and grip

50 the pawls will be disengaged from their ratchets. The end of the lever opposite to the handle is preferably provided with a counter weight 51, and weighted stop pawls 52—52 are provided for holding the ratchet wheels 42 and 43 against backward movement.

Loosely sleeved upon the drive shaft 4 are oppositely rotating pulleys 55 and 56, the adjacent faces of whose hubs are formed with clutch teeth. Non-rotatably splined upon the shaft between these pulleys is a slidable clutch spool 57 having clutch teeth at its ends adapted to engage said first clutch teeth and having swiveled to its exterior the lever 58. Articulated to this lever is a reciprocable bar 59 which passes through the base of the machine and is provided at its end with a roller 60. The hub 44 of the lever 45 is provided with a depending extension 61, the side whereof is formed with a cam surface 62 adapted to engage the roller 60 and reciprocate the bar so as to shift the clutch. The return movement of this bar may be effected by means of a spring 63. In this embodiment I have also illustrated a roller 64 carried by a fixed bracket opposite to the end of the bar 59 so as to sustain the side thrust on the lever. The lower end of the extension 61 terminates in a segmental portion 65 having at its ends the ears 66—66 and at its center the notch 67. Slidably mounted in a vertical position adjacent to this extension is a bar 68 having a laterally-projecting finder 69, extending between the ears 66 and having a bracket 70 formed with branches 71—71 extending adjacent to the ends of the pawls 52—52. The lower end of the bar 68 is articulated to a treadle 72 pivoted about a horizontal axis at 73 and projecting through a slot 74 in the machine base, the lower end of said slot being preferably formed with an off-set portion 75 to permit the treadle to be held in depressed position, the forward arm of the treadle being formed in two parts hinged upon a vertical axis at 76 for this purpose.

The operation of the machine is as follows: The shoes 25 and 26 are initially depressed to a point such that a horizontal line through the space between the rolls will just pass above their edges, and a blank, preferably initially curved to conform substantially to the longitudinal curvature of the rolls is introduced therebetween. Supposing this blank to be inserted over the shoe 25, the lever handle 45 will next be raised so as to advance the ratchet wheel 42 one tooth, thus raising the shoe 26 so as to bring the same into the path of movement of the blank, and simultaneously shifting the clutch spool 57 toward the right so as to cause it to engage the pulley 56 and effect the rotation of the rolls in a direction to draw the plate therethrough. When this plate has nearly passed through the rolls, the lever 45 will be depressed so as simultaneously to advance the ratchet wheel 43, thus raising the shoe 25, and to shift the clutch spool 57 into engagement with the pulley 55, thus reversing the movement of the blank. When the blank has nearly left the rolls in the opposite direction, the attendant again raises the lever 45 so as to elevate the shoe 26 another step and reverse the direction of movement of the blank, this operation being repeated as many times as may be necessary to circle the blank by the required amount. When this point has been reached the lever 45 is brought to mid position, thus shifting the clutch spool to its neutral point, and the grip 50 is operated to disengage the pawls 46 and 47. The treadle 72 is then depressed into the notch 75 so as to introduce the finger 69 into the notch 57 so as to lock the clutch, and simultaneously to raise the pawls 52 so as to free the ratchet wheels 42 and 43 and permit the shoes 25 and 26 to fall to their original positon. The extent to which the circling operation is carried will ordinarily be limited only by the necessity for leaving sufficient room between the ends of the blank to permit the withdrawal of the same from the roll 15. Inasmuch as the diameter of this roll will ordinarily be considerably less than that of the completed barrel, and as the metal blank will possess a certain amount of elasticity, the ends of the same can be brought reasonably close together without rendering unduly difficult the removal of the same from the machine. The adjacent ends of the blank can then be trimmed to the required shape and brought together in a suitable press so as to permit riveting or welding, the barrel heads being afterward applied in any convenient manner. Several other expedients have been suggested for removing the blank from the rolling machine, any of which expedients can be employed without departure from my present invention. It is also possible to roll the blanks only into semi-circular form, afterward securing two such blanks together to form a completed barrel. The angular movement of the lever 45 will be limited by the engagement of the projections 66 with the finger 69, this movement being sufficient to cause the shoes to progress alternately past each other.

It will be understood that while I have described my improvement in connection with a barrel-forming machine it will be possible to employ the same in the manufacture of other devices than barrels without departing from the scope of my invention. It will also be understood that while I have necessarily described by invention in detail, I do not propose to be limited to such details, except as the same may be positively

included in the claims hereto annexed or may be rendered necessary by the prior state of the art.

Having thus described my invention, what I claim is:

1. In a device of the character described, the combination, with a driving roll having portions of different diameters, of a driven roll having portions of diameter complementary to the corresponding portions of said first roll, said driven roll being formed as a plurality of separately revoluble disks.

2. In a device of the character described, the combination with a driving roll, different portions of which are of different diameter, of a shaft substantially parallel with the axis of said driving roll, means for adjusting said shaft toward and from the same, a plurality of separately revoluble disks independently sleeved on said shaft, the diameter of said disks being complementary to the diameter of the portions of said driving roll opposite which they lie, said disks forming together a driven roll, and means for rotating said first roll.

3. In a device of the character described, the combination with a driving roll having a longitudinally curved outer surface, of a driven roll rotatable about an axis parallel to said first roll and having its outer surface curved longitudinally complementarily to said first roll, said driven roll being formed of a plurality of separately revoluble circular sections.

4. In a device of the character described, the combination, with a driving roll having a longitudinally curved outer surface, of a shaft supported in a position substantially parallel to said driving roll, a plurality of separately revoluble disks independently sleeved on said shaft and having their collective outer surface curved longitudinally complementarily to said first roll, said disks being formed with interiorly located spacing means whereby their peripheries are maintained out of engagement with each other.

5. In a barrel-forming machine, the combination of a pair of parallel rolls having their outer surfaces complementarily curved in a longitudinal direction, means for driving one of said rolls so as to draw a metal plate therebetween, and a forming member adapted to engage said plate as it passes between said rolls and deflect the same circularly in the direction of said driven roll, said driven roll being formed of a plurality of independently rotatable, circular sections sleeved on a common shaft.

6. In a device of the character described, the combination with a pair of parallel rolls and a deflecting member at each side of said rolls, of means for alternately advancing said deflecting members in a step-by-step manner so as to bring the same more completely to obstructing position, and means governed by said advancing means for rotating said rolls in the direction of the deflecting member last advanced.

7. In a device of the character described, the combination with a pair of parallel rolls and a deflecting shoe at each side of said rolls, of a single oscillable member, means for limiting the oscillation of said member, connections between said member and each of said shoes whereby, upon the movement of said member from one limit to the other, one of said shoes will be advanced more completely into obstructing position than the other shoe, and means operated by the movement of said member from one limit to the other for reversing the direction of rotation of said rolls so as to cause the advance of a blank toward the shoe last advanced.

8. In a device of the character described, the combination with a pair of parallel rolls and a deflecting shoe at each side of said rolls, of a single oscillable member, means for limiting the oscillation of said member, connections between said member and each of said shoes whereby, upon the movement of said member from one limit to the other, one of said shoes will be advanced more completely into obstructing position than the other shoe, means coöperating with said member for causing the rotation of said rolls in opposite directions when said member is in opposite extreme positions, and means for preventing the rotation of said rolls when said member is in mid-position.

9. In a device of the character described, the combination, with a pair of parallel rolls and a deflecting shoe at each side of said rolls, both of said shoes being movable about an axis coincident with the axis of one of said rolls, of a pair of oppositely rotating members, means for alternately advancing said shoes in a step-by-step manner in the direction of the roll other than the one about which they are pivoted so as to bring the same more completely into obstructing position, and means operated by said advancing means for connecting one of said rolls successively with one of said rotating members whereby said rolls are rotated in the direction of the shoe last advanced.

10. In a device of the character described, the combination, with a pair of parallel rolls and a deflecting shoe at each side of said rolls, both of said shoes being movable about the axis coincident with the axis of one of said rolls, of a rack connected to each of said shoes, a pinion meshing with each of said racks, a ratchet wheel connected to each of said pinions, a pawl for each of said ratchet wheels, and means for advancing said pawls alternately to advance said shoes alternately into obstructing position.

11. In a device of the character described,

the combination, with a pair of parallel rolls and a deflecting shoe at each side of said rolls, both of said shoes being movable about an axis coincident with the axis of one of said rolls, of a rack connected to each of said shoes, a pinion meshing with each of said racks, a ratchet wheel connected to each of said pinions, a single oscillable member symmetrically placed as regards said ratchet wheels, a pair of pawls carried by said member, one of said pawls engaging each of said ratchet wheels and adapted to advance the same in a direction to advance the corresponding shoe when said member is moved from one direction to the other, and means coöperating with said member for causing the rotation of said rolls in opposite directions when said member is in opposite extreme positions and for preventing the rotation of said rolls when said member is in mid-position.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

GEORGE R. LAWRENCE.

Witnesses:
HAROLD E. SMITH,
BRENNAN B. WEST.