

June 27, 1933.

G. F. HAUF

1,915,312

RING FORMING MACHINE

Filed Nov. 7, 1930

4 Sheets-Sheet 1

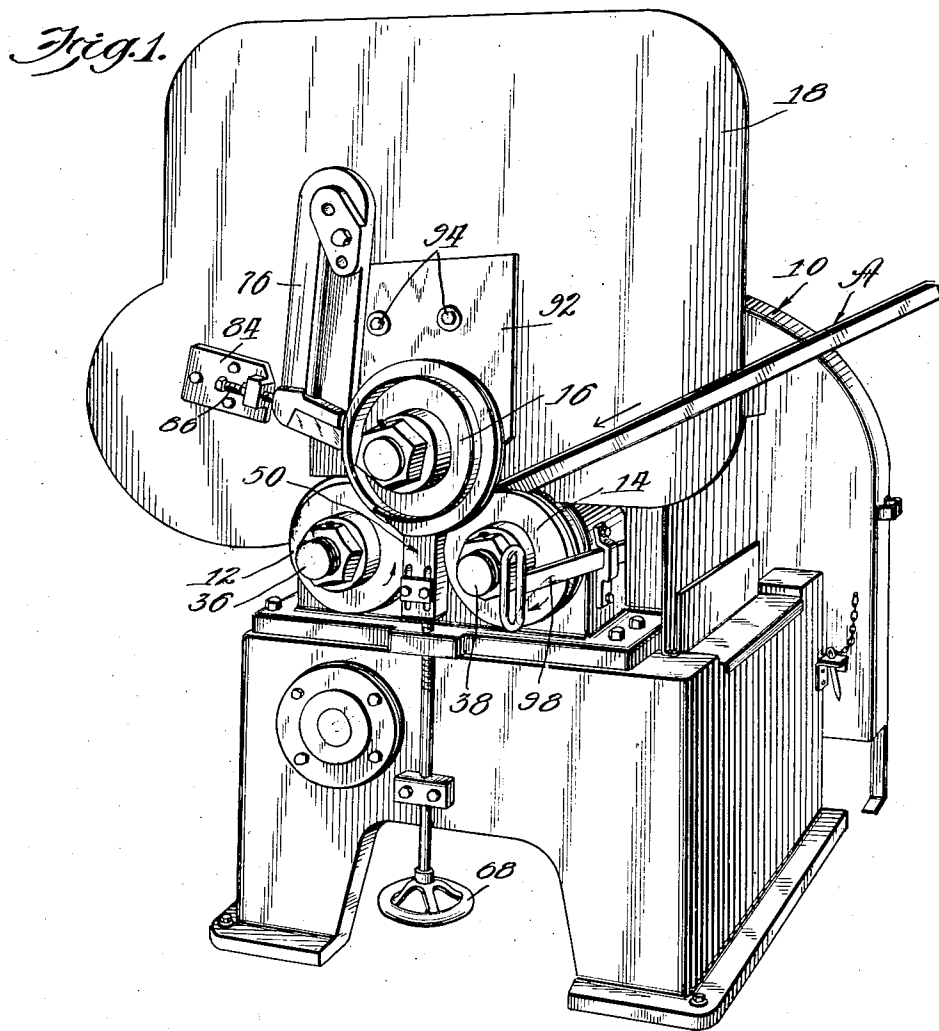
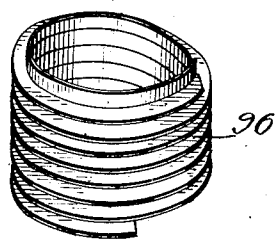
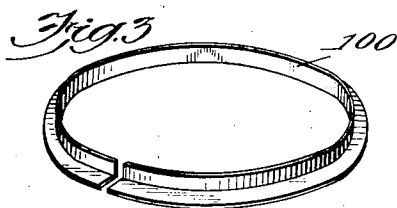


Fig. 2



Inventor:
George F. Hauf
By Williams, Bradbury
McCauley & Hinkle

Attys

June 27, 1933.

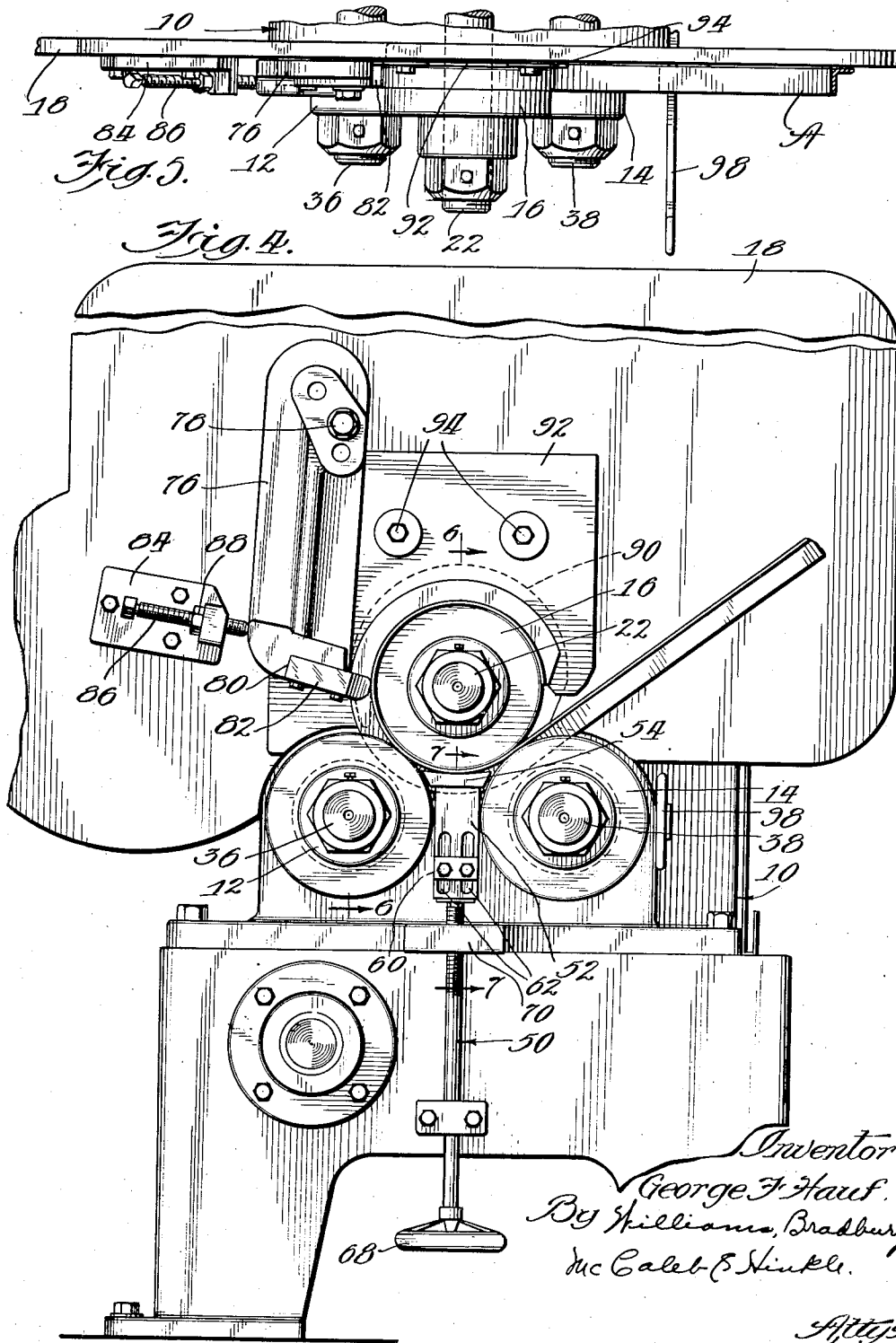
G. F. HAUF

1,915,312

RING FORMING MACHINE

Filed Nov. 7, 1930

4 Sheets-Sheet 2



Inventor.
George F. Hauf.
By Williams, Bradbury
McCauley & Hinkle.

Atty's.

June 27, 1933.

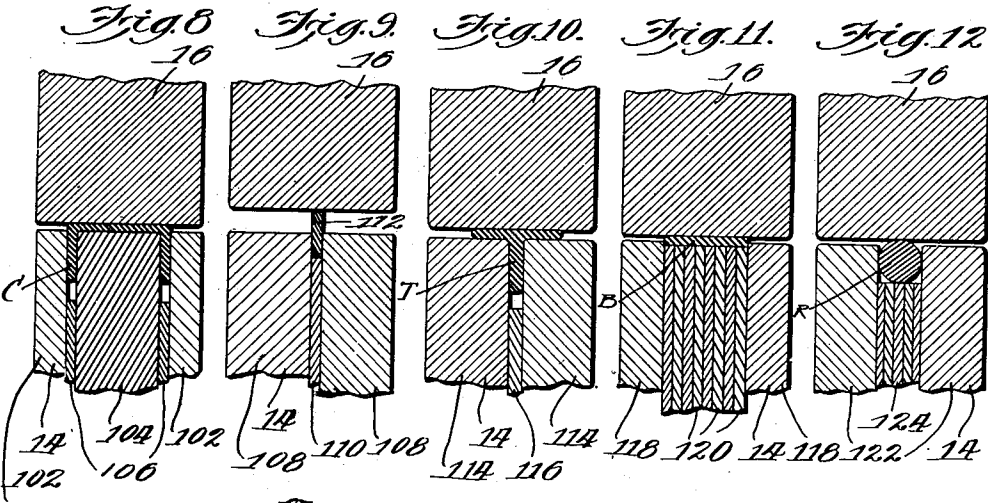
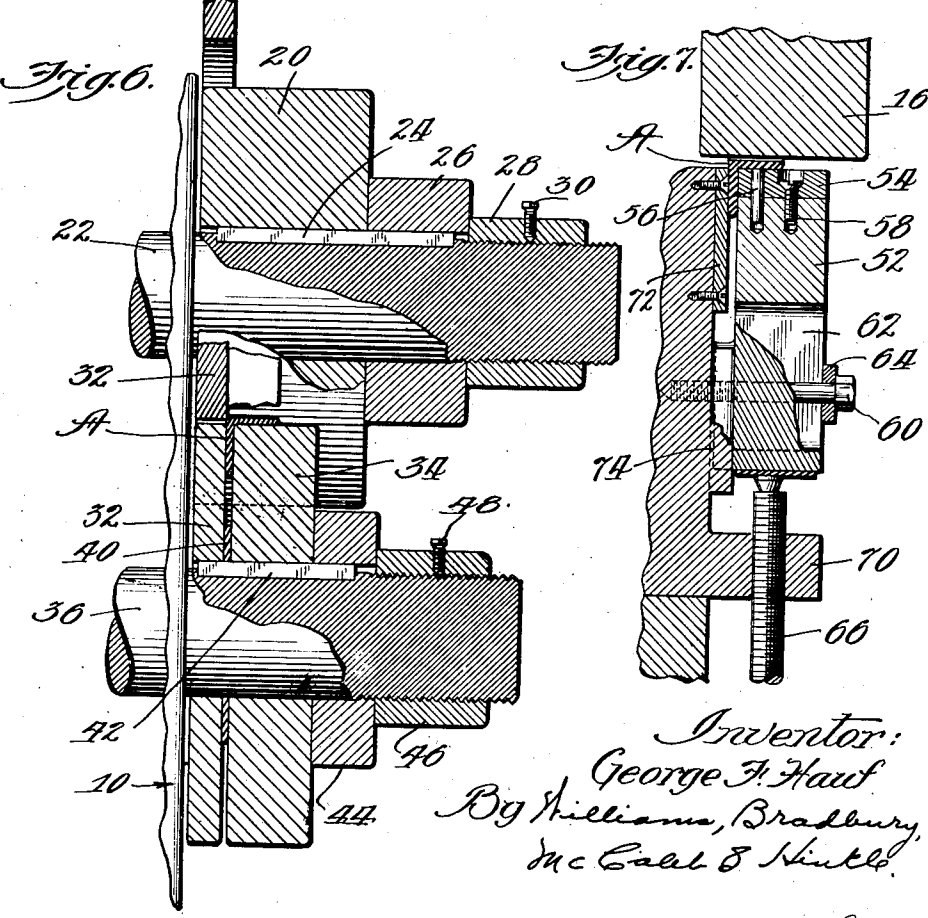
G. F. HAUF

1,915,312

RING FORMING MACHINE

Filed Nov. 7, 1930

4 Sheets-Sheet 3



Inventor:
George F. Hauf
By Williams, Bradbury,
McCull & Hinkle.

Attys

June 27, 1933.

G. F. HAUF

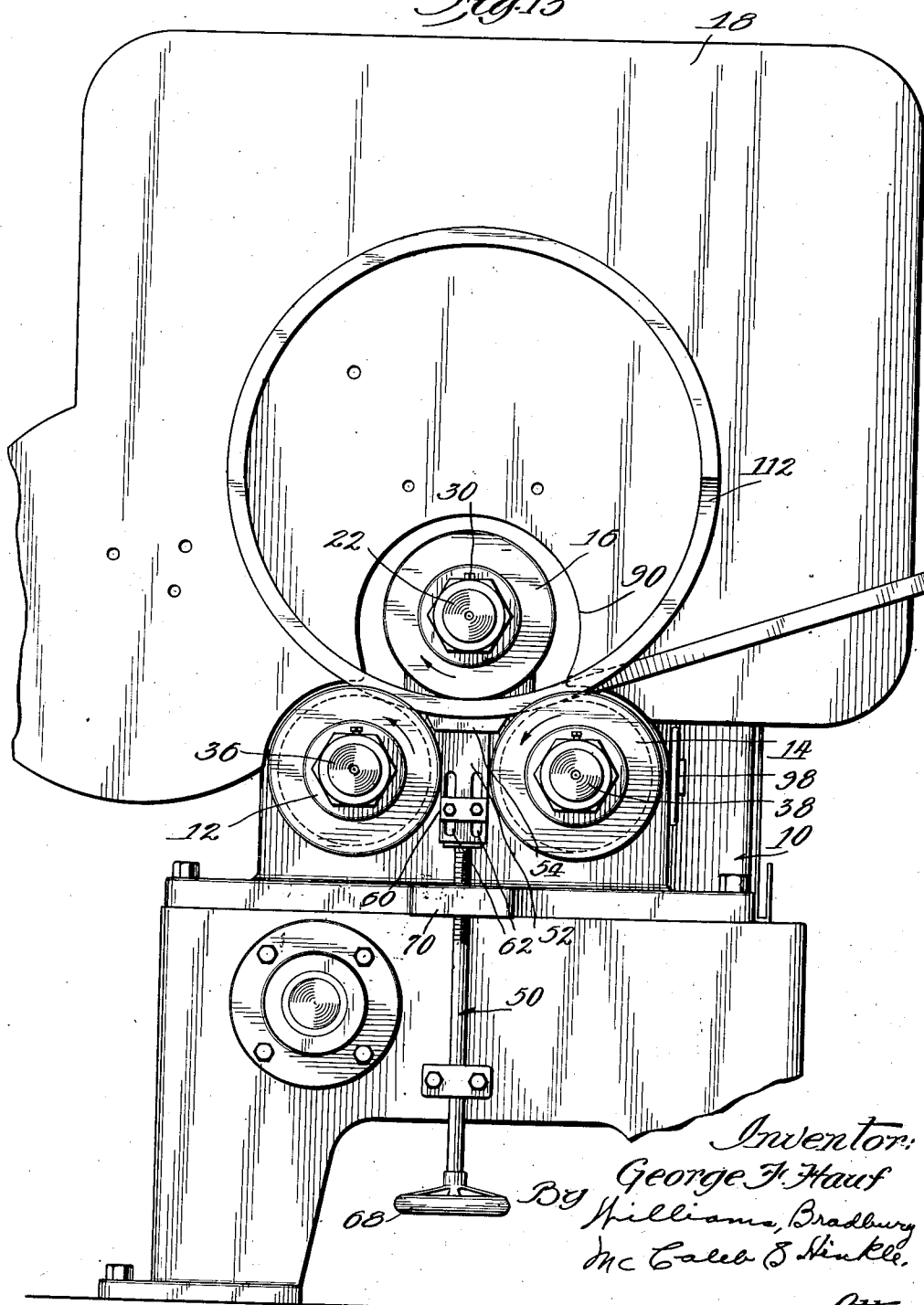
1,915,312

RING FORMING MACHINE

Filed Nov. 7, 1930

4 Sheets-Sheet 4

Fig. 13



Inventor:

George F. Hauf

*By Williams, Bradbury
Mc Ghee & Hinkle.*

Attys

UNITED STATES PATENT OFFICE

GEORGE F. HAUF, OF CHICAGO, ILLINOIS, ASSIGNOR TO CHICAGO METAL MFG. CO., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS

RING FORMING MACHINE

Application filed November 7, 1930. Serial No. 493,941.

My invention relates to ring-forming machinery and is more particularly concerned with the provision of improved machinery whereby a plurality of different kinds of metallic bars, rods or shapes may be formed into complete circles or ovals.

It is an object of my invention to provide an improved machine of this type which will roll many different shapes of metal into circles or ovals or portions of circles.

A further object of my invention is to provide an improved machine of the type described which is adjustable to form these different metal shapes into circles or ovals through a range of different sizes.

It is a further object of my invention to provide removable and adjustable parts for a machine of this type whereby the machine may readily be set up in a minimum of time to form shapes of different sizes.

It is a further object of my invention to provide an improved mechanism for rolling different shapes of metal into a spiral shape from which circular segments may be obtained.

It is a further object of my invention to provide an improved mechanism for rolling an angle strip of metal into a spiral shape from which circular segments may be obtained to form single flanges.

A further object of my invention is to provide a mechanism for rolling steel flanges into circular shapes which are within the customary limits ordinarily required of flanges for application to large piping.

A further object of my invention is to provide a mechanism capable of making flanges of this type which will be accurate in every dimension, uniform in curvature, free from distortion and provided with a perfectly smooth inner face.

The machine of my invention has been designed to manufacture many sizes and types of flanges, rings and arches heretofore considered extremely difficult or impossible. Some of the products required to be formed into oval or circular shapes are steel bars, rods, angles, channels, T-bars, U-bars and flat bars which are sometimes required to be bent the "hard way", that is, to form a flat

washer-shaped ring rather than a cylindrical ring. All of these types of steel shapes may readily be formed with the mechanism of my improved invention as will be readily apparent as the description progresses.

Other objects and advantages will be more easily understood from the following description reference being had to the accompanying drawings in which:

Figure 1 is a front perspective view of my improved forming machine with a strip of angle bar therein being formed into a spiral of a predetermined size;

Figure 2 is a perspective view of the spiral completely formed;

Figure 3 is a perspective view of a flange cut from the spiral shown in Fig. 2;

Figure 4 is a front elevational view of my improved ring forming machine;

Figure 5 is a plan view of the front portion thereof to which the invention more strictly applies;

Figure 6 is a vertical sectional view through the forming rolls taken generally on the line 6—6 of Fig. 4, looking in the direction of the arrows;

Figure 7 is a fragmentary vertical sectional view through a guide element used in my improved mechanism and is taken on the line 7—7 of Fig. 4, looking in the direction of the arrows;

Figure 8 is a fragmentary sectional view through the forming rolls showing a channel-shaped member being formed;

Figure 9 is a similar view showing the flat bar section being formed the "hard way";

Figure 10 is a similar view illustrating a T-bar being formed into a circular ring;

Figure 11 is a similar view illustrating a flat band being formed into a circular ring;

Figure 12 is a similar view illustrating a rod being formed into a circular ring; and

Figure 13 is a front elevational view of the machine illustrating a large cylindrical ring being formed upon the machine.

In the drawings I have designated the ring-forming machine generally by the numeral 10, in which suitable mechanism is provided for driving the ring-forming rolls 12, 14 and 16, rolls 12 and 14 in a counter-

clockwise direction and roll 16 in a clockwise direction. This mechanism is well known to those familiar with the art and will not be described with any more detail in this application. A suitable backing plate 18 is secured to the machine 10 directly behind the operating rolls 12, 14 and 16.

In the preferred embodiment of my invention, bending roll or drum 16 may comprise a cylindrical ring 20 mounted upon a shaft 22 which is driven from the operating mechanism of the machine. The cylindrical ring 20 is rigidly secured to the shaft 22 by means of a locking key 24. The ring 20 is further secured upon the shaft 22 by a spacer ring 26 and a lock-nut 28 which is screw-threadedly mounted upon the end of shaft 22 and locked in a desired position by the set-screw 30. Backing rolls 12 and 14, which may be identical, are adapted to be built up of a plurality of disc members and spacers to bend metal members of different sizes and configurations into circles or parts of circles. In the embodiment shown in Figs. 1 and 6, the disc-like members 32 and 34 are secured upon the shafts 36 and 38 which are driven in the direction previously mentioned by the suitable driving mechanism of the machine. To form a spiral as shown in Fig. 2 from a strip of angle iron, the discs 32 and 34 are separated upon the shafts 36 and 38 by a washer 40 which may be as thick as one leg of the angle A that is about to be bent. The discs are each suitably locked to the shafts 36 and 38 by a key member 42 and further secured against lateral movement upon the shafts by a suitable spacing washer 44 and the lock-nut 46 screw-threadedly mounted upon the end of shafts 36 and 38 and locked thereupon by the set-screws 48.

A guide element 50 is provided between the operating rolls 12 and 14 and may comprise an adjustable supporting block 52 having a guide shoe 54 mounted on its upper side. The guide shoe 54 is suitably positioned upon the supporting block 52 by means of dowel pins 56 which engage complementary openings in the supporting block, and the shoe is rigidly secured in place upon the block by set-screws 58. As will be apparent in Fig. 4, guide shoe 54 is formed with an upper arcuately shaped face having its edges extending to a point near the circumferential edge of the backing rolls 12 and 14. The guide supporting block 52 is secured to the machine 10 by suitable screw members 60 which pass through elongated openings 62 in the supporting block and also through a bar 64 extending across the elongated openings. The supporting block 52 is provided with a tongue 74 which slides in a tongue and groove slot in the face of machine 10 so that the movement of the supporting block will be vertical. The support-

ing block 52 is adapted to be adjusted upwardly or downwardly by the rod 66 which is provided at its lower end with a hand-wheel 68 and adapted to be screw-threadedly mounted in a shoulder 70 on the frame of the machine 10. The upper end of the rod 66 bears against the lower end of the supporting block 52 and when the screw members 60 are loosened, the hand-wheel 68 may be revolved to move rod 66 upwardly or downwardly, thereby adjusting the supporting block 52.

As shown in the drawings, Fig. 7, the angle-iron A is adapted to be guided by the guide shoe 54, the face of the angle-iron riding upon the face of the guide shoe 54 and the leg of the angle extending downwardly along the side of the guide shoe. A wearing plate 72 is secured to the wall of the machine 10 adjacent the guide block 54.

A second guiding member 76 is arranged to be supported upon the back plate 18, being pivotally secured thereto upon the bolt 78 which passes through a suitable opening in the guide member and is screw-threadedly mounted in the back plate 18. The guide element 76 is formed with a socket 80 in its lower end in which a guide shoe 82 is adapted to be mounted. Means for supporting the guide element 76 in an operative position are also secured to the back plate 18 and may comprise a bracket 84 in which an adjusting screw 86 is screw-threadedly secured. The adjusting screw is adapted to bear against the outer edge of the guide member 76 in a desired position and may be locked in that position by the lock-nut 88. In making the spiral shown in Fig. 2, it is desirable to have the opening 90 in the back plate 18 closed, and this closure may be effected by the provision of an auxiliary plate 92 secured to the back plate 18 by the screw members 94.

The operation of the machine in forming the spiral 96 from the angle-iron A will now be described. A piece of angle-iron A of any desirable length is utilized and the end slightly curved with a hammer, and then the angle-iron is inserted from the right of the machine between the rolls 16 and 14 with a leg of the angle-iron in the space between the discs 32 and 34. The machine is now started through the medium of a clutch thrown into engagement by a clutch shifting lever 98 which extends to the front of the machine. As the rolls 16 and 14 turn in clockwise and counter-clockwise directions respectively, the angle-iron will be moved forward with its edge striking the face of guide shoe 54. Continued forward rotary movement of the rolls 14 and 16 will carry the angle-iron forward and the end will be engaged between the rolls 12 and 16, and due to the fact that roll 12 is operating in a counter-clockwise direction the end of the angle-iron will be pulled forward between the two rolls. An arc of sufficient

size has now been formed in the angle-iron to cause the end of the angle-iron to rest against the circumferential edge of roll 16, and as it continues upward around roll 16, guide shoe 82 will bear against the angle, pressing it against the roll 16. In this manner, guide means control the direction of movement of the angle for practically 180° of its travel around the roll 16, so that continued movement of the angle-iron through the rolls will cause the end to be moved around to approximately the position at which it was inserted into the machine. At this time the operation of the machine must be stopped momentarily and a crowbar or other tool employed to move the end of the angle-iron forward so that it will not move into the path of the balance of the angle-iron that is being driven through the rolls. It can thus be readily seen that a second coil will be formed in the angle-iron in the same manner that the first coil was formed, it being, however, unnecessary to stop the machine after the end has been moved from the path of the angle-iron as, after this is done, the coil will automatically be formed and be moving forward from the rolls so that the formed coil does not interfere with the balance of the angle-iron going through the rolls. Due to the plurality of guiding means the face portion of the angle-iron is formed into an accurate circle, and it has been found that the coils thus formed may be cut to provide the flanged rings 100, shown in Fig. 3, of an exact size so that they may be applied to piping without any truing-up or finish work.

The description thus far has been confined to the formation of circular rings from angle-iron. Many other shapes and forms of metal may be formed into accurate ring shapes in exactly the same manner. For example, in Fig. 8 a fragmentary sectional view is shown through roll 16 and roll 14 or 12. In this figure a channel-shaped member C is shown, being formed into a circle. The roll 14 in this instance is provided with the disc portions 102 and 104, separated by the washers 106. The roll thus formed provides a guiding element for the legs of the channel C and a disc portion 104 for cooperating with the roll 16 to form the channel C into a ring-like shape.

In the form shown in Fig. 9, the roll 14 has been formed from a pair of disc portions 108 separated by a suitable spacer washer 110 to provide a guide for the base of flat band 112 which is being rolled to form a washer-like disc.

In Fig. 10, the roll 14 has been formed with a pair of disc members 114 separated by a washer member 116 to form a roll suitable to engage a T-member. In Fig. 11, the roll 14 has been built up by the use of a pair of disc members 118 separated by a plurality of washers 120 to form a suitable work face on

the roll to engage a flat band B which is being rolled into a circular shape. Likewise in Fig. 12, the rolls 12 and 14 are provided with a pair of disc members 122 separated by suitable washers 124 to form a round rod R engaging surface.

It will thus be seen that by using different disc members or different spacings thereof in the building up of rolls 12 and 14, different engaging faces may be provided upon these rolls to suit any number of different shapes or sizes of material to be worked upon. The interchanging of these parts is very simple due to the fact that the locking nut 46 which secures them on shafts 36 and 38 may be easily removed and the discs interchanged.

In Fig. 13, I have illustrated the formation of a ring of a large diameter. As is well known in the art and as has been done in a plurality of machines of this type, to form rings of a larger diameter, the center roll 16 is moved upwardly so that a larger arc may be formed between the forming rolls 12, 14 and 16. Means for raising the upper roll 16 have not been shown in the drawings because it is not deemed necessary, due to the fact that many well-known machines are being built in this manner. However, it will be seen that by the use of the interchangeable discs I have provided, to build up the rolls 12 and 14, T-bars, channels, angles or rods of a large diameter may be formed into circles or circle segments. It will be noted from the drawings, Fig. 13, that in the formation of the larger size rings the guide element 76 and the backing plate 92 have been removed and the ring is supported against the back plate 18. It will also be noted that the guide shoe 54 remains between the rolls 12 and 14, being adjusted to the desired height for the size of the ring to be formed.

From the foregoing description it will be evident that by the simple substitution of different disc members and spacers in the rolls 12 and 14, most any conceivable form of metallic member may be formed into a circular ring or into a spiral such as the spiral 96. Hence, it will be seen that modifications and changes of structure may easily be made in the mechanism shown and described and I do not wish to limit myself to the specific structure shown. Rather, what I desire to protect and secure by Letters Patent of the United States is:

1. A bending machine comprising a bending roll, a pair of backing rolls parallel with said bending roll, a carriage supporting said rolls, a guide support positioned between said backing rolls, a removable guide shoe in said support, a guide element positioned above one of said backing rolls adjacent said bending roll, and said backing rolls built up to conform to the shape of the metal to be bent in said machine.

2. A ring-forming machine comprising a

cylindrical bending roll, a pair of backing rolls built up of discs and spacers laterally spaced on opposite sides of the axis of the roll, a carriage supporting said rolls, a movable guide shoe positioned between said backing rolls, and a guide shoe positioned adjacent said bending roll spaced away from said backing rolls.

3. A bending machine comprising a bending roll, a pair of backing rolls parallel with said bending roll, a frame supporting said rolls, a back plate vertically positioned at the rear face of all of said rolls, a guide member positioned between said backing rolls, a second guide member pivotally mounted on said back plate arranged to guide the work around said bending roll, and said backing rolls being built up of discs and spacers to conform to the shape of the work going through the machine.

4. A bending machine comprising a forming roll, a pair of built-up backing rolls positioned parallel with said forming roll, a framework supporting said rolls, a vertically adjustable guide support positioned between said backing rolls, a removable guide plate upon said support, a guide element support pivotally suspended above one of said backing rolls adjacent said forming roll, a locking means associated with said guide element for locking said element in an operative position, and a back plate vertically positioned at the rear of said rolls for supporting said guide element and its locking device.

5. A ring forming machine comprising a bending roll, a pair of driven shafts laterally spaced on opposite sides of the axis of the roll, built-up backing rolls to form a backing for a desired metallic shape mounted upon said shafts, means for locking said backing rolls for rotary movement to said shafts, a removable lock-nut upon said shafts locking said rolls against lateral movement, a vertically movable guide support positioned between said backing rolls, a removable guide shoe in said support, and a movable guide shoe positioned adjacent said bending roll above one of said backing rolls.

6. Means for forming an angle-iron into a spiral shape, comprising a cylindrical bending roll, a pair of backing rolls mounted parallel with said bending roll, guide slots in said backing rolls for the extended leg of said angle-iron, and a guide shoe positioned between said backing rolls for forcing said angle-iron around said bending roll, said angle-iron adapted to be drawn around said bending roll guided by said backing rolls to form a spiral.

7. Means for forming a bar shape into a spiral, comprising a bending roll, a pair of backing rolls mounted parallel with said bending roll, said backing rolls having guide slots therein to conform to the bar shape to

be bent, a guide shoe positioned between said backing rolls, and said bar shape arranged to be guided by the slots in said backing rolls as it is drawn around said bending roll to form a spiral.

8. In a bending machine a pair of spaced parallel backing rolls, each composed of discs and spacers, a forming roll positioned parallel to and intermediate the backing rolls, the axes of the backing rolls and the forming roll being at the apices of a triangle, said spacers serving to support the material and serving to separate the discs to accommodate the material being formed.

9. In a bending machine, a forming roll, backing rolls mounted in cooperative relationship with said forming roll and cooperating therewith to bend a strip of metal passed therebetween, said backing rolls each composed of discs and spacers, said spacers serving to support the material being formed and to space said discs to accommodate the material, and means for restraining the material against the forming roll as it is fed into the machine.

10. In a bending machine, a forming roll, backing rolls mounted in cooperative relationship with said forming roll and cooperating therewith to bend a strip of metal passing therebetween, said backing rolls each composed of discs and spacers, said spacers serving to support the material being formed and serving to space said discs to accommodate the material, means for restraining the material against the forming roll, and means for restraining the material in the direction of the bending roll and causing it to form a circle of substantially the size of the bending roll.

11. A machine for arcuately forming metal strips, comprising a driven roll about which the arcuate strip is formed, and tangentially to which the strip is fed, a pair of backing rollers on the opposite side of the strip, the axes of the three rolls being in triangular relation, a radially adjustable backing guide between the backing rolls, whereby as the strip is fed to the driven roll, it passes first between a backing roll and the driven roll, then between the guide and the driven roll and then between the other backing roll and the driven roll.

12. A machine for forming a ring from a strip of metal stock comprising a bending roll tangentially to which the strip is fed, a backing roll for the strip at the point of tangency, a second backing roll beyond (as regards the travel of the strip) the first backing roll, the axes of the three rolls forming a triangle and the angle of the triangle at the apex at the axis of the bending roll being an acute angle measured in the direction of the travel of the strip, a first guide shoe between the backing rolls and within said angle and a second guide shoe restraining the strip inwardly against

the bending roll and positioned adjacent the second backing roll but beyond said angle, the contacts of the two backing rollers and the two shoes with the work occurring on one
5 side of a diameter of the bending roll.

In witness whereof, I hereunto subscribe my name this 7th day of October, 1930.

GEORGE F. HAUF.

10

15

20

25

30

35

40

45

50

55

60

65