March 18, 1930. T. A. M. PETERSEN 1,750,784

MACHINE FOR ROLLING BEADS IN STOVEPIPE CASINGS

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Fig. 1.

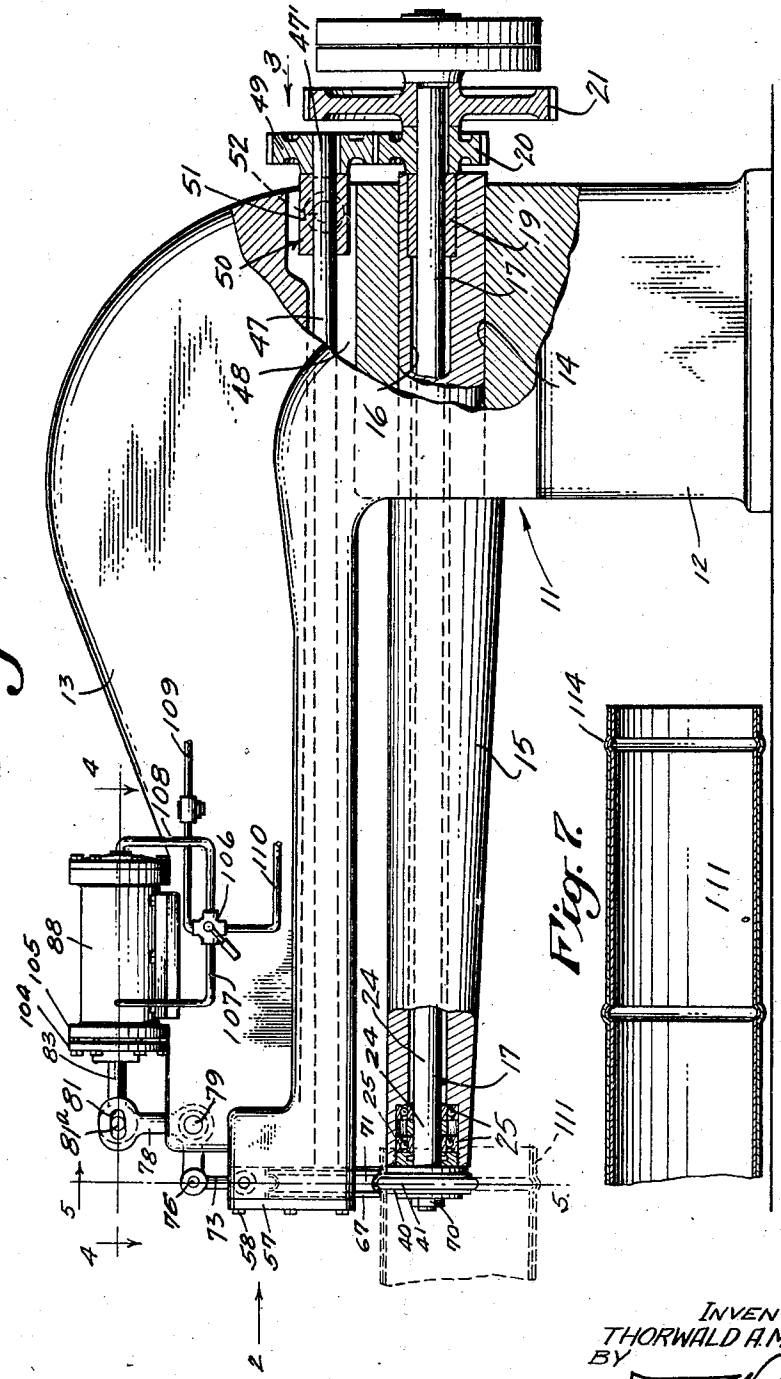


Fig. 2.

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MACHINE FOR ROLLING BEADS IN STOVEPIPE CASINGS

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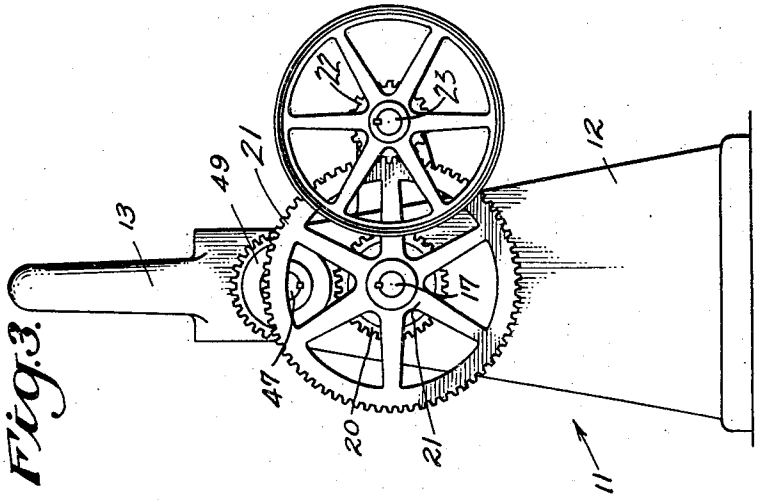


Fig. 3.

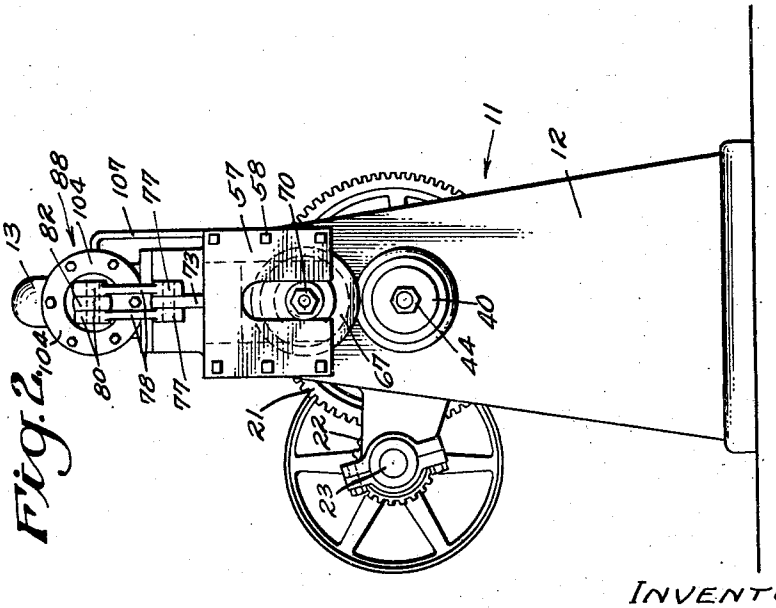


Fig. 2.

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MACHINE FOR ROLLING BEADS IN STOVEPIPE CASINGS

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Fig. 4.

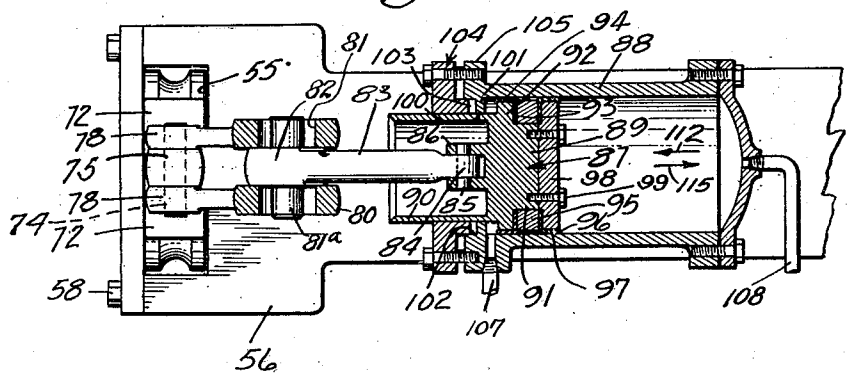


Fig. 5.

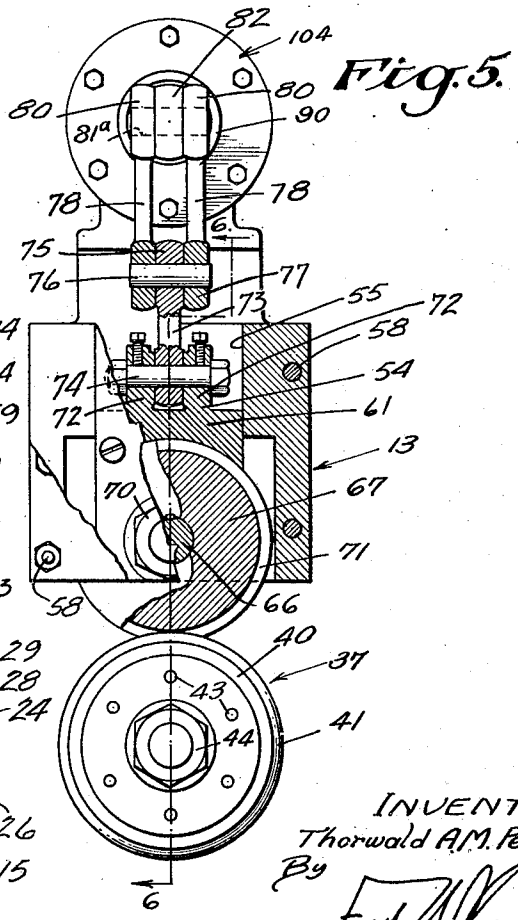
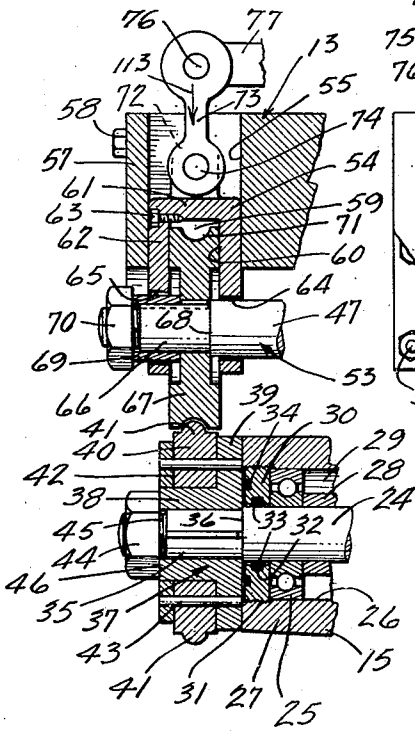


Fig. 6.



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Patented Mar. 18, 1930 1,750,784

UNITED STATES PATENT OFFICE

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MACHINE FOR ROLLING BEADS IN STOVEPIPE CASINGS

Application filed February 13, 1929. Serial No. 339,576.

This invention relates to apparatus for forming annular beads in stovepipe casing, such as used in an oil-well.

Stovepipe casing as manufactured at present comprises inner and outer layers of sheet metal which are rolled into cylindrical form and are secured axially together either by riveting or by forming inter-engaging corrugations in the inner and outer layers after they have been placed together.

The forming of corrugations in stovepipe casing has been found the most practical, for while riveting produces a casing that has ample compressive strength, the linear tensile strength of such riveted casing is inadequate to stand the strain of supporting five hundred to several thousand feet of casing, which is necessary in the installation of casing in a well.

Ordinarily, the annular corrugations or beads are formed in stovepipe casings by a hammer having a recess formed thereon, and a die having a bead formed thereon. These members constitute part of a hammering mechanism, the hammer of which is reciprocated while the stovepipe casing is rotated until an annular bead is completed.

The disadvantage of using hammering apparatus is that it takes too much time to form a corrugation and the corrugation is not as satisfactory as it might be.

It is an object of my invention to provide apparatus for rolling an annular bead in stovepipe casing.

It is a further object of my invention to provide an apparatus having rotating members provided with mating concave and convex surfaces for forming annular corrugations in well casing.

It is a still further object of my invention to provide apparatus of the character described in which pressure is transmitted to bead forming rollers during the rolling operation.

It is another object of my invention to provide means for increasing and decreasing the space between related rolling members.

It is a still further object of my invention to provide an apparatus of the character described, providing means for driving and means for synchronizing the bead forming rollers of the invention.

Other objects of my invention will be apparent from a perusal of the following specification, the accompanying drawings and the appended claims.

Referring to the drawings in which my invention is illustrated:

Fig. 1 is a side elevation of the apparatus embodying my invention.

Fig. 2 is an end elevation of the apparatus, taken as indicated by the arrow 2 of Fig. 1.

Fig. 3 is an elevation taken as indicated by the arrow 3 of Fig. 1.

Fig. 4 is a sectional view taken as indicated by the line 4—4 of Fig. 1.

Fig. 5 is a sectional view taken as indicated by the line 5—5 of Fig. 1.

Fig. 6 is a sectional view taken as indicated by the line 6—6 of Fig. 5.

Fig. 7 is a section of a stovepipe casing showing the utility of the invention.

In the drawings I show a main supporting frame 11, comprising a base 12 and an upper supporting arm 13. The base 12 provides a bore 14 retaining one end of a mandrel 15, the other end of which protrudes from the base 12 at right angles thereto, directly below and parallel with the arm 13. The mandrel 15 is provided with a longitudinal bore 16 through which a shaft 17 extends. The shaft 17 is supported at its inner end by a bushing 19 pressed into the bore 16. The shaft 17 extends through the bushing a sufficient distance to accommodate a gear 20 and one of a pair of reduction gears 21, both of which are keyed to the shaft 17. The gear 21 meshes with a pinion 22, which is keyed to a stub shaft 23. The shaft 23 is supported by the frame 11 as shown in Figs. 2 and 3. Mounted on the end of the stub shaft 23 is a tight and loose pulley arrangement driven from a source of power, not shown.

I will now refer to the more pertinent details of my invention.

The outer end 24 of the shaft 17 is supported by a pair of ball bearings 25, which are pressed within a recess 26 in the outer end 27 of the mandrel 15. The bearings 25 are spaced apart by a spacing sleeve 28 to pro-

vide an oil chamber 29. The bearings 25 and an oil chamber 29. The bearings 25 and the sleeve 28 are retained within the recess 26 by a nut 30, threadedly engaging interior threads 31 in the outer end 27 of the mandrel 15. The nut 30 is provided with an annular groove 32 to retain a packing 33 and is also provided with wrench engaging notches 34 in the outer face thereof.

Extending outward from the end 27 of the mandrel is a reduced portion 35 of the shaft 17, the reduced portion providing a shoulder 36. Keyed to the reduced portion 35 of the shaft 17 and bearing against the shoulder 36 is a thimble 37, comprising a cylindrical body portion 38 and a flange 39.

Adapted to be carried on the body portion 38 of the thimble 37 is a primary rolling member 40 of the invention, having an annular bead 41 on the periphery thereof. A retaining plate 42 is placed against the rolling member 40, and the plate 42, the rolling member 40, and the flanges 39 of the thimble 37 are held together by pins 43. The thimble 37, the rolling member 40, and the retaining disk 42 constitute a roller assembly that is readily detachable from the shaft 17 by the removal of a locking nut 44 which engages a threaded portion 45 on the outer end of the shaft 17 and bears against the outer end 46 of the thimble 37.

Directly above, and in parallel relation with the shaft 17, is a shaft 47, extending through an enlarged bore 48 in the upper portion of the base 12. On the inner end 47′ of the shaft 47 is keyed a gear 49 which meshes loosely with the gear 20. The inner end 47′ of the shaft is supported by a pivot bearing 50, comprising a bearing portion 51 and pins 52 which are suspended in the bore 48. The pivot bearing 50 and the loose fit between the gears 20 and 49 allow limited vertical movement of the shaft 47.

The outer end 53 of the shaft 47 carries a head 54, slidably retained in a U-shaped recess 55 formed in the outer end 56 of the supporting member 13. The open side of the U-shaped recess 55 is closed by a plate 57 held by cap-screws 58.

The head 54 is provided with a notch 59 defined by a rear wall 60, a top wall 61, the outer open face of the notch 59 being closed by a cover 62 retained by cap-screws 63. The shaft 53 extends through an opening 64 in the rear wall 60 of the head 54 and an opening 65 in the cover plate 62.

Keyed on a reduced portion 66 of the shaft 47 and rotatable within the notch 59 is a secondary rolling member 67, which is pressed against a shoulder 68 formed by the reduced portion 66 of the shaft 47, by a retaining sleeve 69 and a nut 70, the nut 70 being threaded on the end of the shaft 47.

The secondary rolling member is provided with an annular groove 71 in the periphery thereof, the annular groove 71 being vertically alined with the annular bead 41 of the primary rolling member 40.

On the upper portion of the head 54 is a pair of lugs 72 between which one end of a link 73 is pivoted by a bolt 74.

Pivotally connected with the upper end 75 of the link 73 by a pin 76 are the lower free ends 77 of a pair of bell-cranks 78. The bell-cranks are pivotally supported in the supporting arm 13 at 79, and the upper free ends 80 thereof are provided with slots 81 adapted to retain a pin 81^a in a pin and slot connection.

Intermediate the ends 80 of the bell-cranks 78 and also pivotally retained by the pin 81^a is an outer end 82 of a piston rod 83. The piston rod 83 is pivotally connected at its inner end 84 by a pin 85 to a pair of lugs 86, integral with a piston 87.

The piston 87 is adapted to reciprocate within a cylinder 88 and comprises a body portion 89 and a cylindrical skirt 90. The body portion 89 of the piston 87 has a reduced portion 91 and a shoulder 92. Placed over the reduced portion 91 against the shoulder 92 is a flexible cup washer 93 having a peripheral flange 94, said flange extending between the periphery of the shoulder 92 and the inner wall of the cylinder 88. Placed outwardly of the cup washer 93 is a spacing member 95. Placed outwardly of the spacing member 95 is a cup washer 96 having a peripheral flange 97 extending in the opposite direction from the flange 94 of the cup washer 93. The cup washer 93, the spacing member 95, and the cup washer 96 are retained on the reduced portion 91, and pressed against the shoulder 92 of the piston 87 by a retaining plate 98 secured to the body portion by cap screws 99.

The skirt 90 projects through a cylindrical bore 100 in the "rod end" wall 101 of the cylinder 88. The wall 101 is provided with an annular recess 102 in which packing 103 is compressed by a gland member 104. The gland member 104 is retained relative to the cylinder 88 by cap-screws threaded into a flange 105 provided on the cylinder.

Connecting the cylinder at either side of the piston 87 with two sides of a four-way valve 106 are air lines 107 and 108. Connecting with the other two sides of the four-way valve 106 are an air supply line 109 and an exhaust line 110.

In the operation of my invention, a tubular member with inner and outer layers of sheet metal of the type previously described is placed over the mandrel 15, the wall of the tubular member being disposed between the primary rolling member 40 and the secondary rolling member 67, as shown at 111 in Fig. 1.

The valve 106 is then operated to cause air pressure from the supply line 109 to flow into the cylinder 88 at the right side of the piston 87 through the line 108, and to exhaust the air contained in the cylinder 88 at the left of the piston 87 through the line 107 and the exhaust line 110.

As the piston 87 moves in the direction of the arrow 112, Fig. 4, motion is imparted through the piston rod 83 and the bell cranks 78, causing the link 73 to force the head 54 downward. The downward movement of the head 54 causes the secondary rolling member 67 carried thereby to exert considerable pressure on the outer surface of the tubular member 111, in the direction of the arrow 113 of Fig. 6.

The downward movement of the head 54 in the recess 59 of the supporting arm 13 causes a pivotal movement of the shaft 47, pivoting in the bearing 52.

This slight pivotal movement of the shaft 47 and the secondary rolling member 67 within the recess 59 is provided for by the loose fit between the shaft 47 and the openings 64 and 65. The rolling member 67 is also loosely housed within the recess 59 of the head 54 to provide for the slight relative movement occurring between the head 54 and rolling member 67.

Rotary motion is then imparted to the primary and secondary rolling members 40 and 67 through their respective shafts 17 and 47, gears 20 and 49, the gears 21 and 22, and the tight and loose pulley.

Frictional contact between the primary and secondary rollers 40 and 67 and the tubular member 111, causes the tubular member to rotate. Sufficient pressure is applied to the secondary rolling member 67, to cause the walls of the tubular member 111 to be pressed into conformation with the bead 41 and the groove 71 of the primary and secondary rolling members 40 and 67 to produce an annular bead in the wall of the tubular member 111, as shown at 114 in Fig. 7.

After the annular bead 114 is formed in the tubular member 111, the valve 106 is again operated to raise the secondary rolling member 67 by causing the line 108 to exhaust through the line 110 and the line 107 to be connected to the air supply line 109 to return the piston 87 in the direction of the arrow 115, Fig. 4.

From the foregoing description, it will be seen that my invention will expeditiously roll beads in a tubular member, the actual process being about four times faster than the hammering method referred to previously.

Although I have herein disclosed only one complete embodiment of my invention, it should be understood that various features might be changed and numerous embodiments thereof might be devised by those skilled in the art, without departing from the spirit and scope of my invention.

I claim as my invention:

1. In a device for rolling corrugations in a tubular member, the combination of a primary forming element; a secondary forming element; means for synchronously operating said elements; a supporting body; walls forming a recess in said body; a plate covering said recess and secured to said body; a head operating in said recess; walls forming a notch in said head; a cover closing one side of said notch and secured to said head, said operating means extending through openings in said head and said cover, said secondary forming element secured to said operating means and operable therewith within said notch; retaining members securing said element to said operating means; a pivot bearing, said operating means supported in said pivot bearing; a gear train, said gear train synchronously operating said primary and secondary forming elements; and mechanism for moving said head and moving said element associated therewith toward or away from the other of said elements.

2. In a device for rolling corrugations in a tubular member, the combination of a primary forming element; a secondary forming element; means for synchronously operating said elements; a mandrel; walls forming a bore in said mandrel; operating means extending through said bore; journaling members within said bore supporting said operating means; a thimble and a retaining disk fastened to said primary forming element, said primary forming element secured to said operating means and operable therewith; locking means for retaining said primary forming element and parts associated therewith to said operating means; a head for supporting said secondary forming element; and mechanism for moving said head and moving said element associated therewith toward or away from the other of said elements, said mechanism including a cylinder, a piston operable in said cylinder, means for admitting compressed fluid into either end of said cylinder for moving said piston, and parts connecting said head and said piston.

3. In a device for rolling corrugations in a tubular member, the combination of a primary forming element; a secondary forming element; a mandrel; walls forming a bore in said mandrel; operating means extending through said bore; journaling members within said bore supporting said operating means; a thimble and a retaining disk fastened to said primary forming element, said primary forming element secured to said operating means and operable therewith; locking means for retaining said primary forming element and parts associated therewith to said operating means; a supporting body; walls forming a recess in said body; a plate

covering said recess and secured to said body; a head operating in said recess; walls forming a notch in said head; a cover closing one side of said notch and secured to said head, said operating means extending through openings in said head and said cover, said secondary forming element secured to said operating means and operable therewith within said notch; retaining members securing said element to said operating means; a pivot bearing, said operating means supported in said pivot bearing; a gear train, said gear train synchronously operating said primary and secondary forming elements; and mechanism for moving said head and moving said element associated therewith toward or away from the other of said elements.

4. In a device for rolling corrugations in a tubular member, the combination of a primary forming element; a secondary forming element; a mandrel; walls forming a bore in said mandrel; operating means extending through said bore; journaling members within said bore supporting said operating means; a thimble and a retaining disk fastened to said primary forming element, said primary forming element secured to said operating means and operable therewith; locking means for retaining said primary forming element and parts associated therewith to said operating means; a supporting body; walls forming a recess in said body; a plate covering said recess and secured to said body; a head operating in said recess; walls forming a notch in said head; a cover closing one side of said notch and secured to said head, said operating means extending through openings in said head and said cover, said secondary forming element secured to said operating means and operable therewith within said notch; retaining members securing said element to said operating means; a pivot bearing, said operating means supported in said pivot bearing; a gear train, said gear train synchronously operating said primary and secondary forming elements, said secondary forming element having an annular groove in the periphery thereof and said primary forming element having an annular bead on the periphery thereof, said annular groove mating with said annular bead for forming a corrugation in a tubular member; and mechanism for moving said head and moving said element associated therewith toward or away from the other of said elements.

5. In a device for rolling corrugations in a tubular member, the combination of a primary forming element; a secondary forming element; a mandrel; walls forming a bore in said mandrel; operating means extending through said bore; journaling members within said bore supporting said operating means; a thimble and a retaining disk fastened to said primary forming element, said primary forming element secured to said operating means and operable therewith; locking means for retaining said primary forming element and parts associated therewith to said operating means; a supporting body; walls forming a recess in said body; a plate covering said recess and secured to said body; a head operating in said recess; walls forming a notch in said head; a cover closing one side of said notch and secured to said head, said operating means extending through openings in said head and said cover, said secondary forming element secured to said operating means and operable therewith within said notch; retaining members securing said element to said operating means; a pivot bearing, said operating means supported in said pivot bearing; a gear train, said gear train synchronously operating said primary and secondary forming elements, said secondary forming element having an annular groove in the periphery thereof and said primary forming element having an annular bead on the pehiphery thereof, said annular groove mating with said annular bead for forming a corrugation in a tubular member; and mechanism for moving said head and moving said element associated therewith toward or away from the other of said elements, said mechanism including a cylinder, a piston operable in said cylinder, means for admitting compressed fluid into either end of said cylinder for moving said piston, a piston rod, said piston rod connecting with said piston, a bell-crank, said rod connecting with said crank, a link, said link connecting said bell-crank with said head, said piston comprising a body, cup washers, a retaining washer, said washer securing said cup washers to said body, a cylindrical skirt, walls forming a bore in said cylinder, said skirt extending through said bore, and a packing member, said skirt extending through said packing member.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 8th day of February, 1929.

THORVALD A. M. PETERSEN.