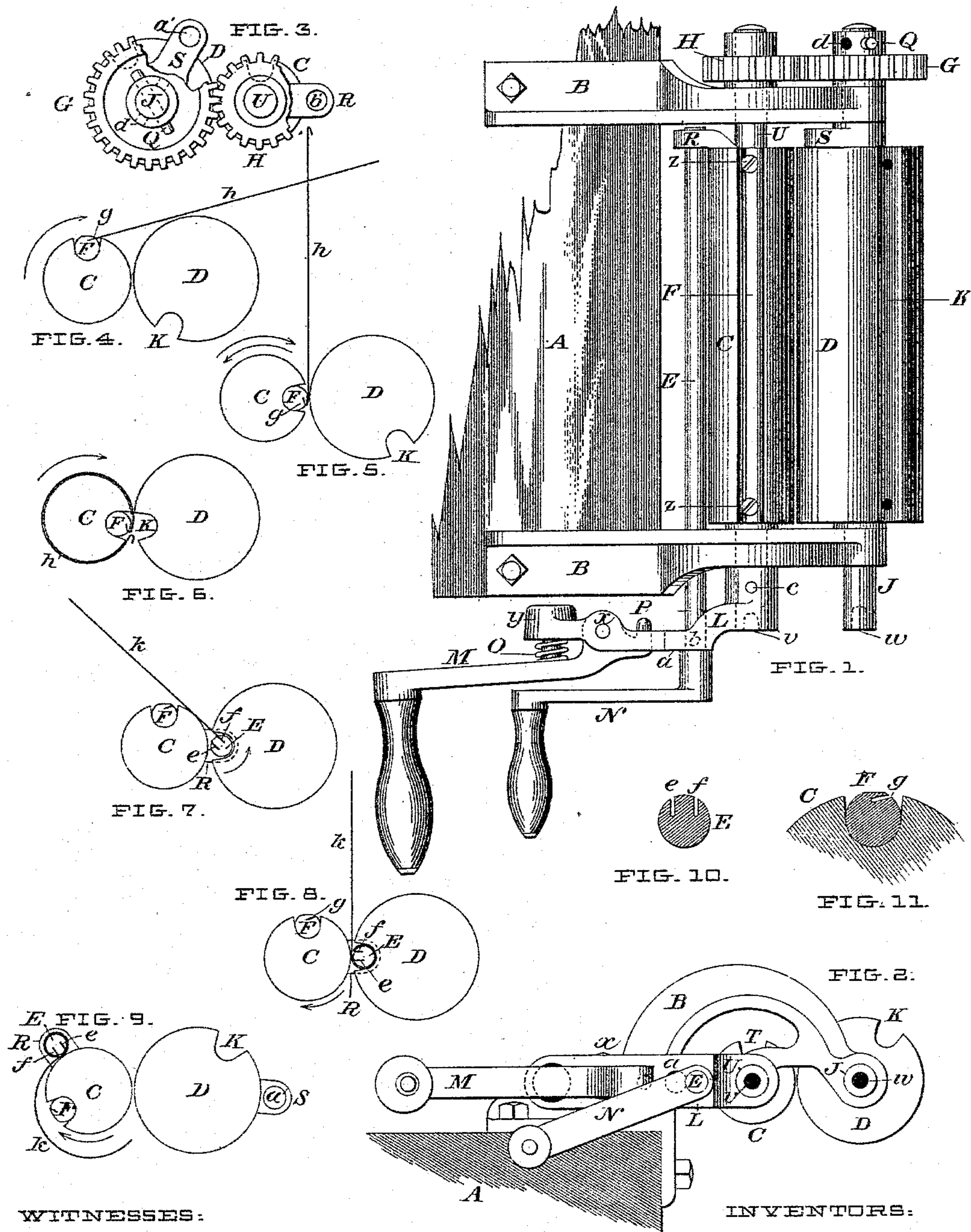


(No Model.)

E. G. WATROUS & H. A. RILEY.  
PIPE OR GUTTER FORMING MACHINE.

No. 494,936.

Patented Apr. 4, 1893.



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# UNITED STATES PATENT OFFICE.

EARL G. WATROUS AND HUGH A. RILEY, OF HOOSICK FALLS, NEW YORK.

## PIPE OR GUTTER FORMING MACHINE.

SPECIFICATION forming part of Letters Patent No. 494,936, dated April 4, 1893.

Application filed December 11, 1891. Serial No. 414,674. (No model.)

*To all whom it may concern:*

Be it known that we, EARL G. WATROUS and HUGH A. RILEY, of the village of Hoosick Falls, in the county of Rensselaer and State of New York, have invented certain new and useful Improvements in Pipe or Gutter Forming Machines; and we hereby declare that the following description, in connection with the accompanying drawings, constitutes a full, clear, and accurate specification thereof and of the best way of constructing and operating the same.

This invention is designed to facilitate the manufacture of pipes and gutters or eaves-trough from sheet metal by rolling and bending, and is fully elucidated in the drawings wherein

Figure 1 is a plan of our improved machine. Fig. 2 is a front elevation and Fig. 3 a rear end elevation of the same. Figs. 4, 5 and 6 are diagrams of the successive positions of the rolls as they appear in the process of turning the clinches and bending a piece of sheet metal for a section of conductor pipe. Figs. 7, 8 and 9 are similar diagrams showing positions of the rolls in the process of forming a section of ordinary gutter. Fig. 10 is a transverse section of the rod around which the gutter bead is turned. Fig. 11 is a transverse section through a part of one of the rolls and the bar used in connection therewith for bending the clinches for pipe seams.

The characteristic features of this invention lie in the combination of two or more rolls provided with longitudinal grooves and bars to be used in connection therewith which bars are also fitted with grooves for the reception of the edges of the sheet metal to be wrought, by the rotary manipulation of which the clinches of sheet metal pipe and the beads of gutters may be formed, and by the rotation of the rolls themselves the tubular part of the pipe or the semi-tubular or channel part of the gutter may similarly be formed. The rolls may be of the same or of different sizes but preferably they are made of different sizes and the bead and clinch forming rods and bars and the cranks for operating the rolls are made to fit either roll so that they are interchangeable, thus adapting the same pair of rolls to make two or more sizes of pipe and two or more sizes of gutter.

In the construction illustrated two rolls C and D of different diameters are shown mounted in bearings in the brackets B B which are attached to a suitable base A. Each is provided with a longitudinal groove T or K extending throughout its entire length and the shafts of the two are geared together by the gears H and G. The gears G and H may mesh directly with each other as shown, or they may be geared together by means of a train of two intermediates so as to preserve their proper relative motions, it not being an essential feature that gears G and H should intermesh. The gear G is held on its shaft by the pin Q which passes through the hub and shaft. The hub is bored with an extra hole *d* to facilitate change in the relative positions of the two rolls to each other in the conversion of the machine from a pipe former to a gutter former or vice versa. The rolls are revolved by means of a detachable crank L which is fitted to the journaled end of either of the two rolls as shown. To the crank L is pivoted the locking handle M at *x* which is fitted with the locking pin or projection P at its inner end and has its outer end normally thrown out by means of a spring O resting in the spring socket *y* of the outer end of the crank L. When the crank is attached to either roll and the crank is turned to its proper position this locking pin will strike one or the other of the pin sockets *v* or *w* as the case may be. The crank is perforated with two holes *a* and *b* and the rolls are also each provided with an arm bored at its extremity with a hole to correspond with the holes *a* and *b*. These arms are shown at R and S and when the crank is attached to one of the rolls it is adjusted so that one of the holes *a* or *b* shall be in axial coincidence with one or the other of the holes in the arms R or S. These holes constitute bearings for the reception of the gutter bead forming mandrel E which is shown in position in Fig. 1. This mandrel is fitted with a crank N by which it is turned. It is provided with one or more longitudinal grooves *e* and *f* Fig. 10, in which the edge of the sheet metal is inserted preparatory to the forming of a bead. Two are here provided so that the mandrel can be worked in opposite directions. The working position of the mandrel is determined by ad-



justing the gears G and H so that the axes of the mandrel bearing in one roll and the groove of the other roll shall coincide. That is to say the rolls should be turned until the hole 5 in arm R and the groove or mandrel seat K shall come opposite each other. When in this position gear G is pinned in its proper position and the crank is attached to the journal of roll C if it is desired to use that 10 roll in the formation of a gutter, but if the other roll is to be put in operation, then a similar adjustment is made with reference to roll D.

For making pipe the mandrel is dispensed 15 with and the clinch-bar F is employed. This is simply a straight bar fitted to the grooves K and T and adapted to be fastened therein by screws *z z*. It is fitted with the groove *g* Fig. 11 for the reception of the edge of the 20 metal and by changing it end for end the roll with which it is used may be worked in either direction. In use the opening of the groove *g* should be toward the opposite roll when the roll to which it is applied is turned 25 so as to bring the bar F to the upper side.

To adjust the machine for bending pipe the clinching bar F is secured in the groove of that roll about which it is desired to bend the plate. Then the gears are so adjusted that 30 when the blank is rolled up the groove of one roll will come around at the finish opposite the clinch bar of the other as in Fig. 6. The bead mandrel E is laid aside. To bend the blank the rolls are revolved to the position 35 [if the smaller roll is used as a former] shown in Fig. 4. Then one edge of the plate *h* is inserted in the clinch groove *g* of the clinch bar as shown. The roll C is next revolved in the direction of the arrow around into the position 40 seen in Fig. 5. This bends the clinch on one end of the plate; then the rolls are reversed and backed to the first position, the blank reversed, and its opposite end inserted in groove *g* and the rolls revolved as in the bending of the first 45 clinch. This brings the blank into the position and form seen in Fig. 5. Then by continuous rotation in the direction indicated by the arrow in Fig. 6 the blank is bent to the form shown, the plate being wrapped around 50 the roll, the first formed clinch falling into the groove in the opposite roll as shown at K Fig. 6. As the groove K passes the bar F the resilience of the metal causes the free end of the plate to spring out from the gap when, by 55 reversing the rolls sufficiently to carry the last formed clinch out of engagement between the rolls, the blank may be removed and the seam closed and finished in the usual way. This mode of adjustment and use ap- 60 plies to both rolls.

To convert the machine to a gutter former the bar F is fixed in the groove of that roll upon or about which it is proposed to bend the plate to form the gutter. This is for the 65 purpose of filling the groove so as to present a fair cylindrical surface. Then the gears are adjusted so as to bring the mandrel bear-

ings of the roll upon which the plate is to be bent, into apposition with the groove of the roll when they are turned to the position 70 seen in Fig. 8. The crank is then attached to the intended forming roll so that one of the holes *a* or *b*, will coincide with the mandrel bearing at the opposite end of the roll. The crank is then turned until the two rolls are 75 brought into such position that the mandrel bearings of one roll stand opposite the ends of the mandrel seat or groove of the other roll. When so adjusted it will be found that the locking pin P will coincide with the socket in 80 the end of the other roll than the one to which the crank is attached. By depressing handle M the pin P can be sprung or snapped into position in the end of the journal and thus holds the rolls secure from disarrange- 85 ment. The mandrel E is next inserted through the hole in the crank and shoved into its position in the groove in the roll. The parts are then in the position seen in Fig. 7. To form the gutter a sheet *k* is inserted as 90 shown in groove *f* Fig. 7 and the mandrel crank N turned in the direction of the arrow until the parts assume the position shown in Fig. 8. This motion forms the bead. Then the crank L is unlocked by depressing the 95 handle M and the roll C turned in the direction of the arrow as in Fig. 9 until the plate has passed out from between the rolls, when the mandrel E is withdrawn and the completed gutter section released. By a simple 100 transposition of parts the other roll may be used in the same way as the former.

In bending pipe the clinch bar F is used to fill the groove of the forming roll so as to make its surface practically continuous. 105

We therefore claim as our invention—

1. A roll provided with a bearing at each end for the reception of a rotary bead forming mandrel, provided with a groove for the reception of one edge of a sheet metal blank, 110 and a crank or equivalent means for its rotation in its bearings, in combination with another parallel roll having a longitudinal surface groove in which said mandrel meshes in the act of rotation of said rolls, the same being 115 connected by gears whereby the rotation of one propels the other, and provisions substantially as shown connected with one of said rolls for revolving the same substantially in the manner described and for the purposes set 120 forth.

2. The combination of a roll provided in its peripheral surface with a longitudinal clinching groove for the reception of the edge of a sheet metal blank, arranged at an acute angle 125 with such periphery, with another roll provided with a longitudinal groove in its surface, the two rolls being geared together so that in revolution the two grooves shall come in apposition at the finish of their work, and 130 provisions substantially as shown, for rotating said rolls in the manner described and for the purposes set forth.

3. Two parallel rolls of different diameters



geared together, each of which is provided at one end with a mandrel bearing, and a beading mandrel seat in its surface, with a removable rotatable grooved beading mandrel and a crank fitted for attachment to either roll and carrying two mandrel bearings coinciding respectively with the mandrel bearings of the opposite ends of the two rolls combined and arranged to operate substantially in the manner described and for the purposes set forth.

4. The described rolls for forming beaded gutter, geared together, one of which carries a grooved rotary beading mandrel mounted in bearings connected with said roll, and the other a longitudinal groove in its surface with which said mandrel co-operates, and means connected with one of said rolls for revolving the same substantially as and for the purposes set forth.

5. The combination of two parallel rolls for forming sheet metal pipe, one of which has a longitudinal slit in its surface inclined at an acute angle with the periphery of the roll for receiving the edge of the plate which is to be folded, and the other roll has a longitudinal groove or gap in its surface for the reception of the free folded end of the blank incidental

to the wrapping of the plate around the forming roll or cylinder, said rolls being geared together by any appropriate means and provided with appliances adapted to drive one of them, substantially as specified.

6. An interconvertible pipe and gutter former consisting of two rolls each grooved as shown, geared together and provided with crank or analogous means for rotating them and bearings, one of which may be in said crank, for carrying a rotary beading mandrel, an interchangeable rotary beading mandrel adapted for rotation simultaneously in the bearings of one and of the groove of the other roll an interchangeable grooved clinching bar adapted to be seated and held in the groove of either roll, constructed and arranged to operate substantially in the manner described and for the purposes set forth.

In testimony whereof we have hereto subscribed our names this 8th day of December, A. D. 1891.

EARL G. WATROUS.  
HUGH A. RILEY.

In presence of—

DENNIS A. HEALY,  
FRANK MCEVOY.