

No. 672,689.

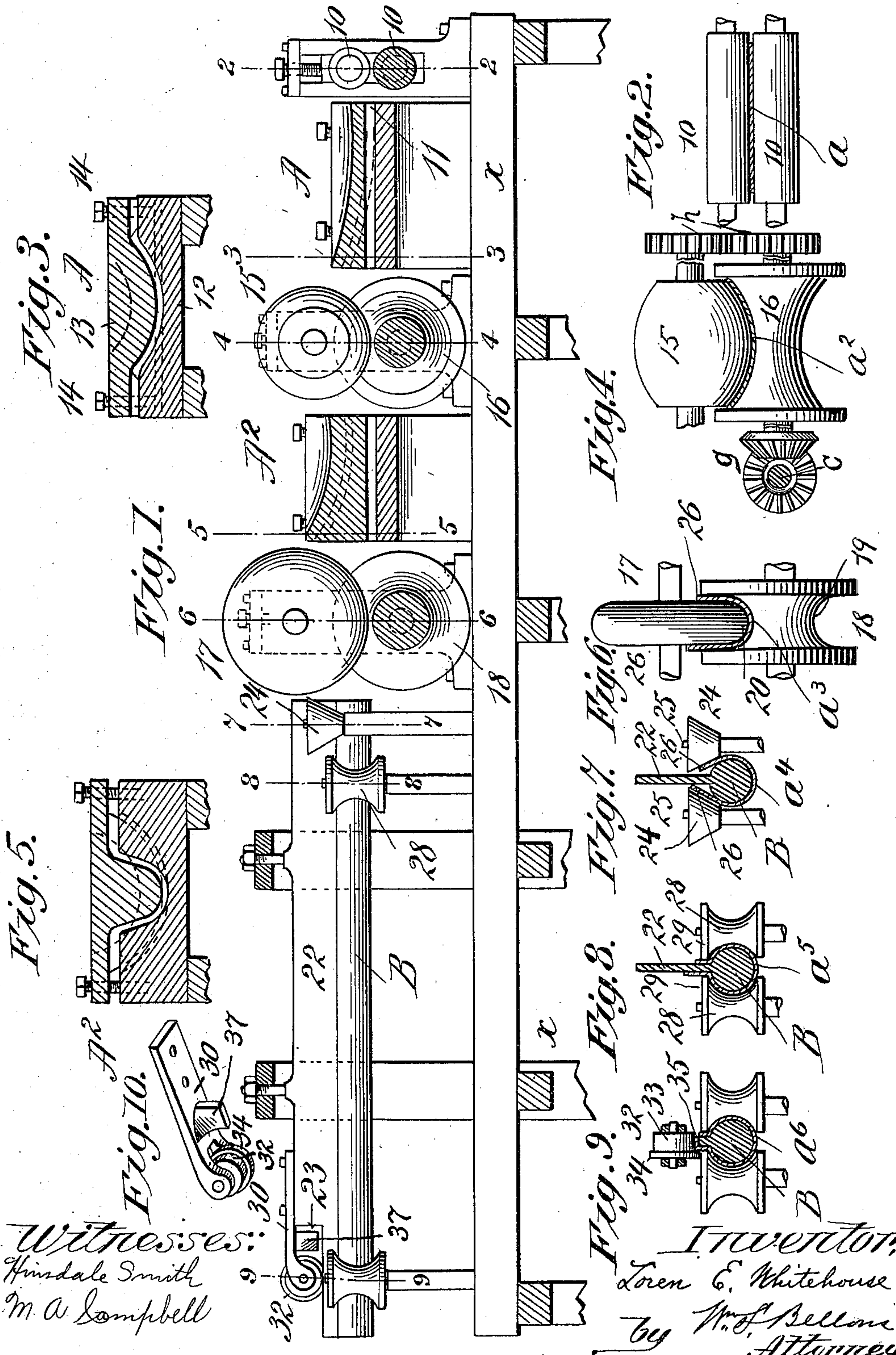
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L. E. WHITEHOUSE.

MACHINE FOR BENDING SHEET METAL STRIPS INTO TUBULAR FORM.

(Application filed Mar. 26, 1900.)

(No Model.)



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UNITED STATES PATENT OFFICE.

LOREN E. WHITEHOUSE, OF SPRINGFIELD, MASSACHUSETTS.

MACHINE FOR BENDING SHEET-METAL STRIPS INTO TUBULAR FORM.

SPECIFICATION forming part of Letters Patent No. 672,689, dated April 23, 1901.

Application filed March 26, 1900. Serial No. 10,126. (No model.)

To all whom it may concern:

Be it known that I, LOREN E. WHITEHOUSE, a citizen of the United States of America, and a resident of Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Machines for Bending Sheet-Metal Strips into Tubular Form, of which the following is a full, clear, and exact description.

In Letters Patent of the United States issued to Philip B. Alexander November 23, 1897, No. 594,222, is illustrated and described a machine for turning lock-seams on sheet-metal conductors or pipes.

The object of this invention is to produce a machine which is to be used in advance of the said Alexander machine and preferably in conjunction therewith.

The purpose of this improved machine is to form long parallel-edged strips or blanks of sheet metal into the shape which it is required that they shall have for introduction into the aforementioned machine to be in readiness to be thereby operated on to close and lock the longitudinal seam.

The invention consists in a succession of devices or mechanisms comprising feeding-rollers, upturning or concaving dies, further die-rollers for imparting a permanence or setting of the concaved or U-shaped metal, and a mandrel having combined therewith rollers of various shapes and dispositions in relation thereto, all substantially as hereinafter more fully described, and set forth in the claims.

Reference is to be had to the accompanying drawings, in which my present improved machine is illustrated.

Figure 1 is in part a side elevation and in part a sectional view substantially centrally and longitudinally. Fig. 2 is a cross-section taken on line 2 2, showing the initial pair of straight feed-rollers for the introduction to the working appliances of the flat strip of the sheet metal. Fig. 3 is a cross-sectional view on line 3 3, Fig. 1, the plane of section being through the fixed dies or former for imparting gradually to the flat strip a comparatively shallow concave form. Fig. 4 is a side elevation of the rollers next beyond the last-named former-dies, the journals of which are on line 4 4, Fig. 1. Fig. 5 is a cross-section of a fur-

ther set of formers or dies similar to Fig. 3, but for imparting a more decided U shape to the strip. Fig. 6 is a face view of the setting or die rollers following the last-described fixed dies. Fig. 7 is a vertical cross-sectional view of the mandrel next in order and of the frusto-conical rolls cooperating with the same, the place of section being indicated by 7 7, Fig. 1. Fig. 8 is a cross-sectional view of the mandrel and the peripherally-hollowed rolls, the location of the section and said rolls being indicated by line 8 8, Fig. 1. Fig. 9 is a cross-sectional view of the mandrel and a face view of three rolls cooperating therewith at the location indicated by the line 9 9, Fig. 1. Fig. 10 is a perspective view of a device hereinafter particularly referred to.

Similar characters of reference indicate corresponding parts in all of the views.

The right-hand end of the machine as represented in Fig. 1 is regarded as the rear end and the left-hand end as the forward end of the machine.

In Fig. 2, a represents by cross-section the flat condition of the strip when entered into the rear end of the machine; and in Fig. 9, a^6 represents the final condition or shape to which the strip is brought cross-sectionally, and a^2 , a^3 , a^4 , and a^5 show the intermediate conditions of the strip as successively imparted.

The strip is brought through the pair of straight feed-rolls 10 10, succeeding which is the former or fixed pair of dies, (indicated at A,) the adjacent faces of which have a contour merging from flat parallel surfaces at 11 to rather clearly-defined bowed or concave and convex surfaces, which at the rear end of these dies assume the form shown in Fig. 3. The lower die 12 is supported by the framing x of the machine, and the upper die 13 is sustained above and slightly separated from the die member 12 and has the adjusting-screws 14. Manifestly the strip in coming through these dies will have a cross-sectionally-bowed form, and the pair of rolls 15 16 next in advance are peripherally formed one with rounded or crowning surface and the other with a correspondingly hollowed or grooved surface, and their adjacent surfaces separated corresponding to the gage of the sheet metal being operated upon, and operate to set and re-

tain the stock in the curved shape to which it has thus far been produced, and to insure its introduction to and through the second pair of die members A^2 , which are constructed
 5 on the same idea for the performance of the further work as that embodied in the fixed die A ; but especially, as indicated in the cross-section, Fig. 5, the degree to which the upturning or rounding of the strip is carried by
 10 these rolls is much greater than that which it previously had. As a matter of fact, the strip has in emerging from the fixed dies A^2 a decided U form—that is, a form comprising half a tube or cylinder and with the marginal portions of the strip extended in parallelism, or substantially so.

Next following the fixed dies A^2 is the pair of rolls 17 18, the latter having a U-groove periphery, as indicated at 19, and the other
 20 having a thickness enough less than the width of the U-groove 19 to accommodate between its peripheral rounded edge 20 and flanks the U-shaped strip, which by these rolls is set and also fed forwardly to embrace the
 25 mandrel B, which is of circular form and provided with the upstanding midrib or feather 22, which extends from the rear end for its full width nearly, but not quite to its forward end, at which it is cut out or recessed,
 30 as seen at 23.

On opposite sides of the mandrel and suitably adjacent to the junction of the feather thereof with a top cylindrical portion are the frusto-conical rolls 24 24, arranged with their
 35 tapers downward, and these being mounted to roll on suitable journals 25 exert a crowding action to inwardly turn the extremities or marginal portion 26 of the strip toward the feather, as shown in Fig. 7.

Next beyond the pair of rolls 24 is a pair 28
 40 28, having nearly semicircular grooves to almost entirely embrace and conform to the round portion of the mandrel, with cylindrical or plinth-formed rims 29, especially at their
 45 upper ends, to quite sharply inturn and shoulder the material or strip, whereby it conforms quite closely both to the cylindrical portion of the mandrel and to the upstanding feather, so that the edge portions of the strip assume
 50 the form of longitudinal upstanding or radial lips.

It will be here remarked that the strip in being fed through the dies A and A^2 is passed through them with its longitudinal median
 55 line a little offset from the corresponding line of the said dies, so that there is at one side of the U-shaped strip an unbent portion which is a little wider than the unbent portion at the other side, and so, as seen in Fig. 8, the
 60 lip at the left side stands higher than the one at the right-hand side.

The mandrel supports by the midrib or feather the journal-bracket 30 for the roller 32, having the step-shaped periphery, as
 65 shown in Fig. 9, and which roller overlies as

to its portion 33 of the smallest diameter that portion of the midrib or feather which is recessed, and therefore of lessened height, as indicated at 23, while the flange 34 is a little off
 70 side of and in a plane parallel with the one side face of the midrib, and so when the strip having the cross-sectional shape shown at a^5 is brought to the forward end of the mandrel the wider upstanding edge 35 in coming under the roller 32 is broken down or angularly
 75 turned by that roller, as shown in Fig. 9. To insure deflecting the edge 35, the deflector 37, having an inclined face, Fig. 10, is provided, the same being advantageously supported on the wheel holder or bracket 30.

The rollers 10 10, 15 16, and 17 18 are all driven for a forward feeding motion of the stock in any suitable manner, it being of course understood that there was not intended to be any drawing action on the material, but a uniform feeding motion, and that the rollers 15 16 and 17 18, in addition to being setting or die rollers, are also of value as feed-rolls.

As a means for the propulsion of the rolls, the machine along one side has the horizontal
 90 driving-shaft C in common to and passing the ends of the journals of the rolls 18 16, the lower rolls 10 having, as indicated in Fig. 4 at g , a bevel-gear connection with the journals of the respective rolls. The journals of
 95 the paired rolls at their opposite ends are, as indicated in Fig. 4 at h , connected by spur-gearing.

The strips to be operated upon may advantageously be about two-thirds or three-quarters
 100 of the length of the machine, so that the feed-rolls will be operative before the rear end of the strip has passed through them to carry the forward end of the strip well in advance of the forward end of the mandrel.

By having the Alexander machine suitably close ahead of my machine, which may be regarded as a feeder thereto, said patented machine also serves to assist in the final feeding
 110 out of the stock from my machine.

I may for purposes of certainty of operation interpose guides which are stationary and suitably arranged between the successively-operating parts or appliances in the machine, so that the stock may not sag or become deflected out of its proper longitudinal
 115 course; but as the provision of the guides will be suggested by their positive necessity and as the provision thereof would be nothing of invention, but would be common expedients, I have not deemed it necessary to illustrate them or further refer to them, and where my machine is constructed with reference to the capabilities for adjustment whereby it is conformable to stock of different gages
 120 I claim nothing in these features.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a machine of the character described 130

the combination with the mandrel having the longitudinal midrib 22 constructed at its end portion with the recess 23, of the wheel or roll 32 overlying the said recessed portion of the mandrel for the purpose set forth.

2. In a machine of the character described the combination with the mandrel having the rib 22 constructed at its end portion with the recess 23 of the roller 32 supported in said recess in a plane coincident with said rib, and having at its one side the flange 34.

3. The combination with the rib-provided mandrel having at its end portion the recess 23 of the deflector 37 above said recess 23,

and therebeyond the roller 32 substantially as described.

4. In combination, the mandrel B having rib 22 constructed with the recess 23, an oppositely-arranged pair or pairs of the grooved rolls, 28, 28, the holder 30 provided with the deflector 37 and having the wheel 32 provided with flange 34, journaled therewithin, substantially as described.

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