(No Model.) 4 Sheets—Sheet 1.

P. B. ALEXANDER.

MACHINE FOR TURNING LOCK SEAMS ON SHEET METAL CONDUCTORS.

No. 594,222. Patented Nov. 23, 1897.

Fig. 1.

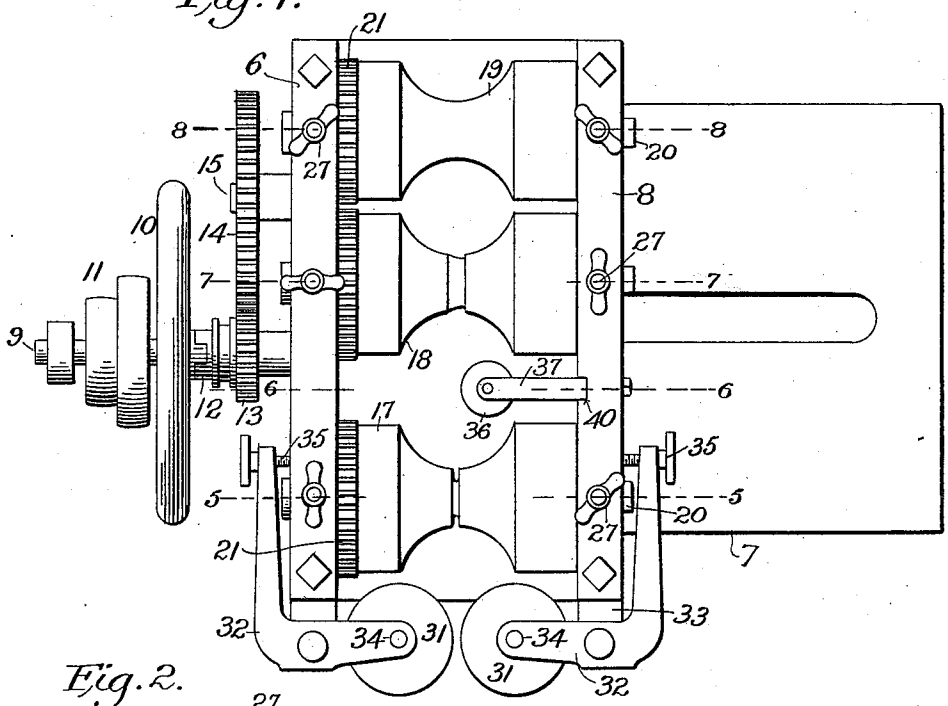
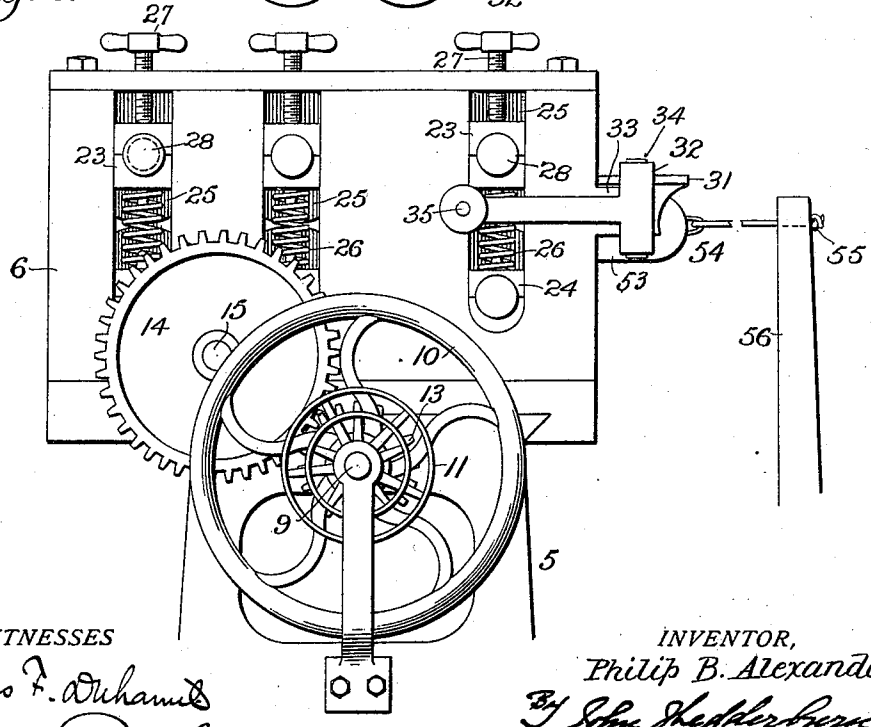


Fig. 2.



WITNESSES

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(No Model.) 4 Sheets—Sheet 2.

P. B. ALEXANDER.

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Fig. 3.

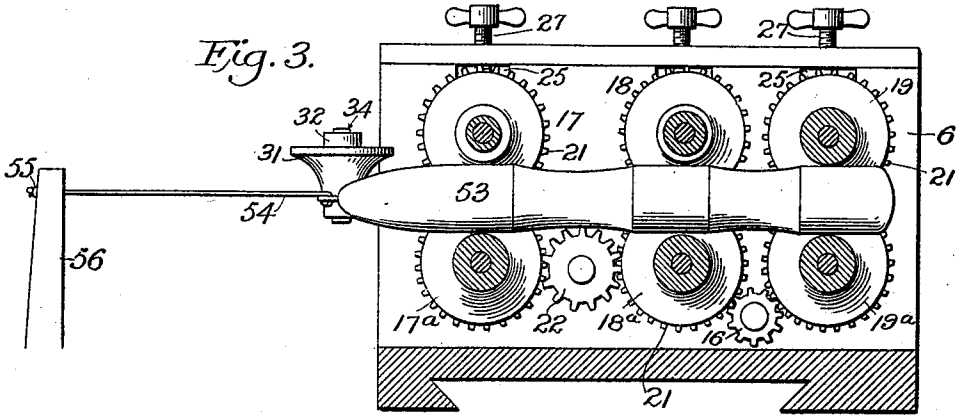


Fig. 4.

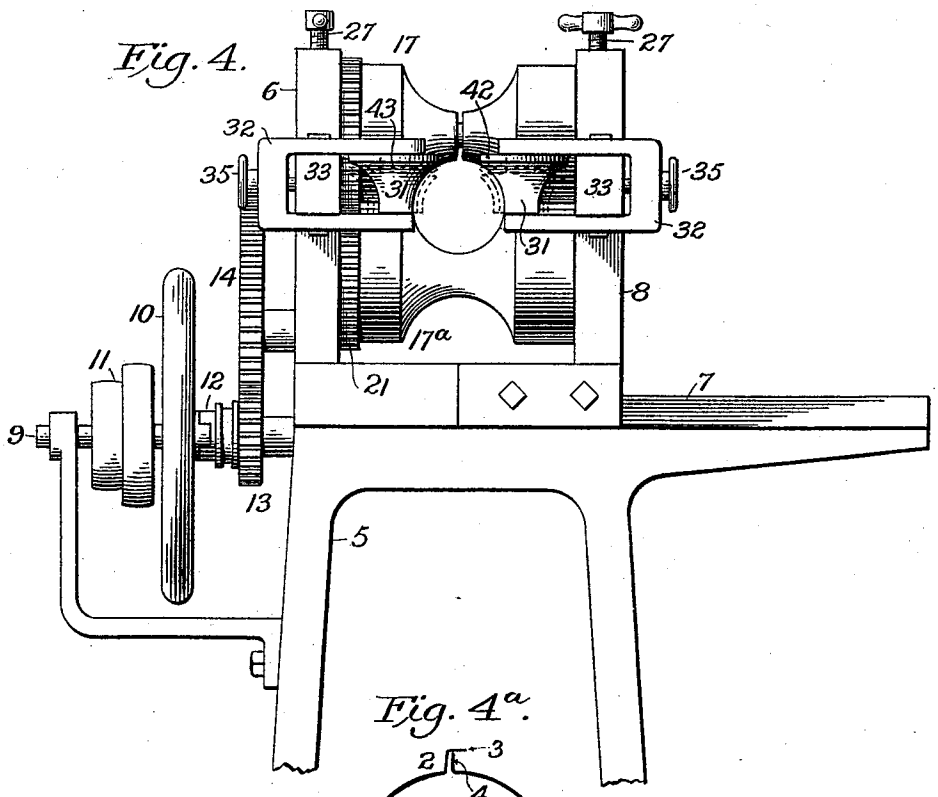
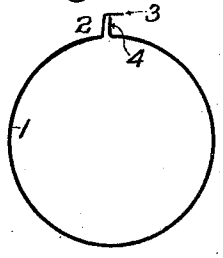


Fig. 4a.



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MACHINE FOR TURNING LOCK SEAMS ON SHEET METAL CONDUCTORS.

No. 594,222. Patented Nov. 23, 1897.

Fig. 5.

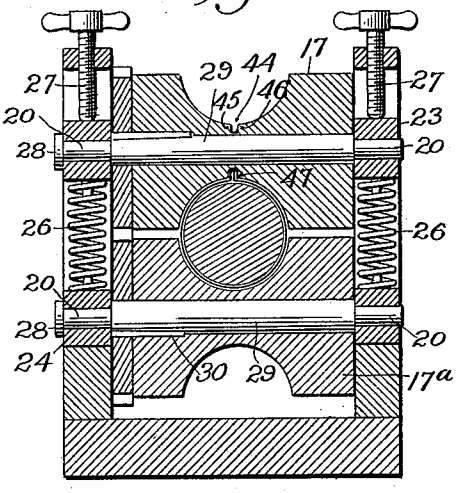


Fig. 6.

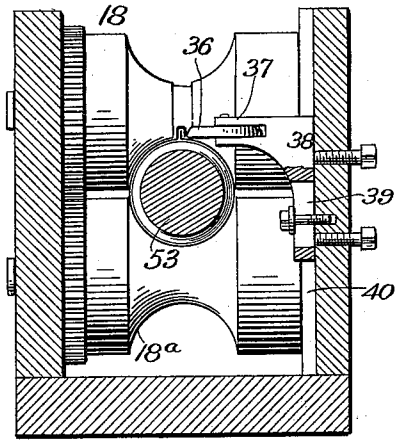


Fig. 7.

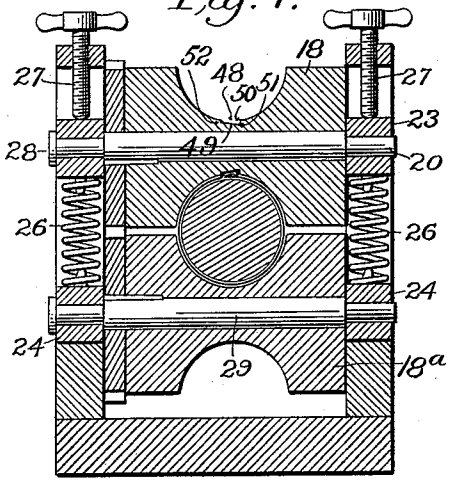


Fig. 8.

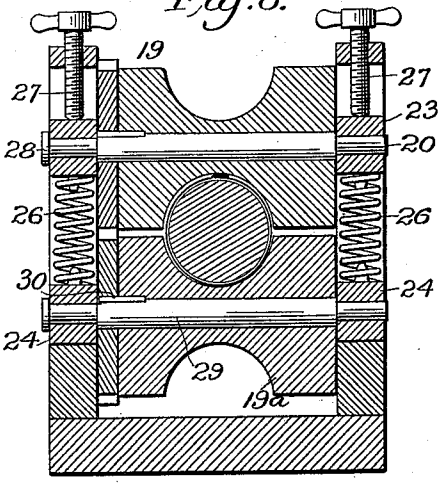
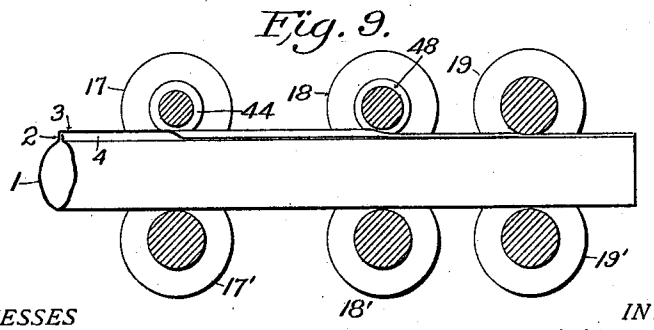


Fig. 9.



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MACHINE FOR TURNING LOCK SEAMS ON SHEET METAL CONDUCTORS.

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Fig. 10.

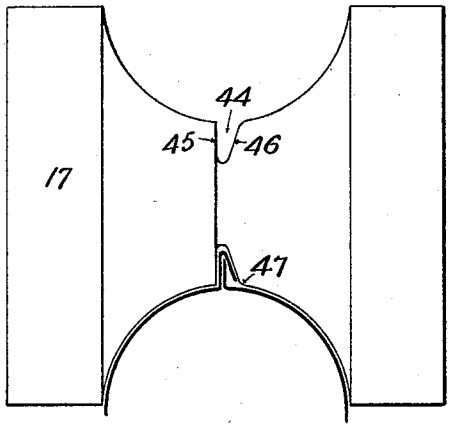


Fig. 11.

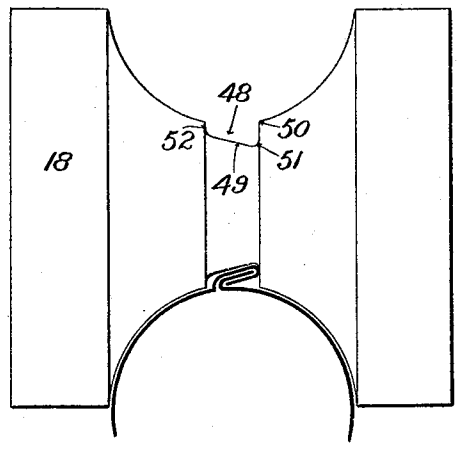


Fig. 12.

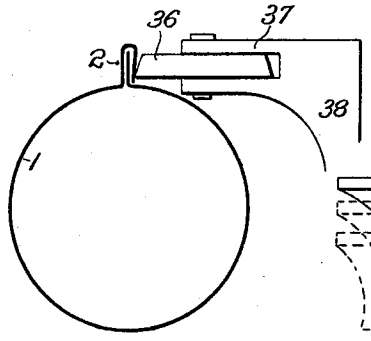
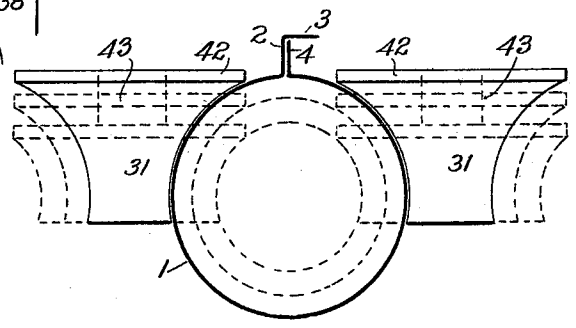


Fig. 13.



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UNITED STATES PATENT OFFICE.

PHILIP BROWNELL ALEXANDER, OF SPRINGFIELD, MASSACHUSETTS.

MACHINE FOR TURNING LOCK-SEAMS ON SHEET-METAL CONDUCTORS.

SPECIFICATION forming part of Letters Patent No. 594,222, dated November 23, 1897.

Application filed January 27, 1897. Serial No. 620,971. (No model.)

To all whom it may concern:

Be it known that I, PHILIP BROWNELL ALEXANDER, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Machines for Turning Lock-Seams on Sheet-Metal Conductors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention has reference to a novel construction in a machine for turning a lock-seam upon sheet-metal conductors or tubes, the object being to provide a machine of this character in connection with which conductors either circular or angular in cross-section can be formed of comparatively thick sheet metal with a lock-seam and in comparatively long sections in an expeditious and practical manner.

The invention consists in the features of construction hereinafter fully described and specifically claimed.

In the accompanying drawings, forming part of this specification, Figure 1 is a top plan of a machine constructed in accordance with this invention. Fig. 2 is a side elevation taken from the side whereat the operating-gear is situated. Fig. 3 is a central vertical longitudinal section of the upper portion of the machine. Fig. 4 is a front end elevation of the machine. Fig. 4ª is a cross-section in detail, showing the shape of the pipe as it is fed to the machine. Figs. 5, 6, 7, and 8 are vertical transverse sections illustrating the rolls for turning the lock-seam and showing the conductor and mandrel in place and taken, respectively, upon the lines 5 5, 6 6, 7 7, and 8 8 of Fig. 1. Fig. 9 is a vertical section showing the three sets of rollers and the conductor fastened between the same. Fig. 10 is a side elevation of the roller 17 and a portion of the conductor and taken on an enlarged scale. Fig. 11 is a similar view of the roller 18. Fig. 12 is a view showing the presser-roller and a portion of the conductor and taken on the same scale. Fig. 13 is an enlarged view demonstrating the feed-rollers and conductor as it passes between the same.

This machine is adapted to turn and fold the lock-seam, as before stated, upon sheet-metal conductors. The piece of sheet metal from which the conductor is made is suitably bent in any bending-machine of approved construction into the shape in cross-section as shown in Fig. 4ª, wherein the body portion 1 of the conductor is circular and is provided at its edges with an outer radial lip 2, having a tangentially-arranged flange 3. The other edge of the sheet-metal piece is provided with a radial inner lip 4. The bending-machine bends the piece of sheet metal practically to the shape shown in Fig. 4ª, although before it is placed in the machine the edges of this piece of sheet metal stand farther apart and are brought to the position shown in said figure by the guide-rollers between which the bent sheet metal first passes. This machine is intended to turn the lips 2 and 4 and the flange 3 into the position shown in Fig. 8—that is to say, it bends the flange 3 around the inner lip 4 and turns the lips and the flange flat upon the outer face of the conductor. This is accomplished by the sets of rolls and their adjuncts, hereinafter to be fully described.

Referring now to said drawings, 5 indicates the frame of the machine, which is provided at one side with a stationary upright plate 6 and with an oppositely-extending bed 7, upon which is mounted a sliding plate 8, arranged to slide thereon and to be adjusted in different positions in relation to the stationary plate by any approved means, as is obvious. The turning-rolls are mounted in bearings upon these plates and are suitably rotated by convenient gearing, which in the instance illustrated consists of a power-shaft 9, mounted in bearings upon the side portion of the frame and provided with a balance-wheel 10, pulleys 11, and clutch 12. Rigidly mounted upon this shaft 9 is a gear-pinion 13, that intermeshes with the gear-wheel 14, mounted upon the stationary plate 6 of the machine and rigid with a shaft 15, fastened to said end plate 6, and provided with a gear-pinion 16, situated beyond the inner face of said stationary plate. The said gear-pinion 16 imparts the rotary movement to all the operative parts of the machine, as will be specifically pointed out hereinafter. In this way it is seen that the

power-shaft 9, controlled by the clutch 12, is the source of power for running the machine.

It is understood, of course, that a machine of this description is so constructed that the turning-rolls are interchangeable, whereby the locking-seam upon pipes varying in diameter can be turned. For this purpose the guide-rollers and turning-rolls are interchangeable, while the presser-roller is adjustable. The turning-rolls are arranged in three sets or pairs—namely, the upper rolls 17, 18, and 19 and the rolls 17^a, 18^a, and 19^a. These rolls are numbered in the order in which they receive the conductor upon which they operate, and the lower rolls of the three sets are the same in shape—that is to say, they have a circular concave face to receive the portion of the conductor opposite the seam thereof. The upper rolls 17, 18, and 19 vary in shape and will be specifically described hereinafter. All of these rolls are provided with trunnions 20, that turn in bearings upon the plates 6 and 8, while the left end of each roll is provided with a gear-wheel 21. The gear-wheels of the two rolls in each intermesh with each other, so that their adjacent faces move in the same direction to pass the conductor therethrough, while the gear-wheels of the lower rolls 18^a and 19^a intermesh with the gear-pinion 16, while an idler 22 is situated between the lower rolls 17^a and 18^a and intermesh with the gear-wheels thereof, so that by the intermediacy of the gear-pinion 16 and the gearing situated between the rolls the three sets of rolls are rotated at the same speed and in a direction to cause the conductor to pass between them. The trunnions of the said rolls are mounted in sliding bearings 23 and 24, that are situated within upright guides 25 in the plates 6 and 8. The spring 26 is situated between the bearings 23 and 24 in each of these upright guides 25 and serves to hold the bearings apart. The position of the bearings 23 and 24 of the upper rolls is controlled by means of set-screws 27 in the manner shown. It is understood, of course, that the manner in which these bearings for the rolls are arranged and constructed does not form a part of this invention and is a well-known construction. The trunnions 20 at the left end of the rolls are preferably provided with heads 28, while the trunnions at the opposite end are plain, as shown. These trunnions are made on the ends of the spindle 29, that is provided with a longitudinal guide 30, and the rolls are arranged to be slipped upon and over this spindle 29, as is obvious, so that when the rolls are to be changed it is only necessary to move the plate 8 toward the outer end of the bed to withdraw the trunnions from the bearings upon this movable plate, change the rolls, and then replace the trunnions within the bearings. By means of the set-screw 27 it is seen that the upper rolls can be adjusted, while it is obvious that the axis of the lower rolls is always at the same point.

The guide-rollers are indicated by 31 and have vertical axes, and are rotatably mounted at the ends of levers 32, that are pivoted upon projections 33 at the ends of the plates 6 and 8. The inner ends of these levers 32 are bifurcated and the rollers are held between the bifurcated ends by means of a removable pin 34, whereby the rolls are interchangeable. The outer ends of the levers 32, carrying these rollers, extend close to the outer face of the plates 6 and 8, and are provided with set-screws 35 for controlling the position of the guide-rollers with relation to each other and to the center of the rolls and the seam of the conductor.

It will be understood that the conductor in passing through the machine is so situated that the flange when turned upon the inner lip is on the side adjacent to the movable plate 8, and between the first and second set of rolls there is a presser-roller that is adapted to hold the lips and flange in the position in which they are turned by the first roller while the second roller is turning these parts toward the outer face of the conductor. This presser-roller 36 is carried by a bracket 37, having an upright slide 38, provided with an upright slot 39. This upright slide 38 is situated within an upright guide-groove 40 in the inner face of the movable plate 8, and is held in position by means of a set-screw 41, passing through the slot 39 and fastened to the plate 8, and to adjusting-screws passing through from the outside of plate 8 at the inner edge of the upright slide 38. In this way it will be seen that the slide carrying the presser-roller 36 can be moved vertically, while by means of the set-screw and adjacent screws its relation to the turning-grooves of the rolls 17 and 18 is regulated.

The above description relates to the construction and organization of the parts for operating the machine, and I will now proceed to describe the construction of the rolls and rollers by means of which the seam is turned.

As before stated, the piece of sheet metal upon which the lock-seam is to be made is first bent into the shape shown in Fig. 4^a, with the outer radial lip 2, the tangential flange 3, and the inner radial lip 4. In this position it is fed to the guide-rollers 31. These guide-rollers are concaved, as shown, and conform to the curvature of the conductor to be made. The upper end of these guide-rollers is provided with an overhanging flange 42, while the lower end of the roller 31 extends below the axial center of the pipe, whereby the conductor is held between these rollers. The overhanging upper flanges 42 serve to press the inner and outer lips together, as shown in said Fig. 4, in which position the conductor is fed to the first set of rolls 17 and 17^a. The guide-rollers 31, as before stated, are interchangeable to conform to the diameter of the conductor to be acted upon. In view of the fact that the axial center of the conductor in passing between the turning-rolls is always the same it is obvious that the guide-rollers

must be so arranged that their lower ends always extend below the axis of the conductor. For this purpose, as shown in dotted lines in said Figs. 4 and 13, when the conductor to be treated is of less diameter the guide-rollers are provided with upwardly-extending bosses 43, whereby they fit between the bifurcated ends of the lever 32. It is understood, of course, that the shapes of the rolls and the guide-rollers herein shown are only such that are used in connection with circular conductors, it being obvious that in a square, hexagonal, or any other form the contour of these rolls must conform therewith.

The upper or face rolls 17, 18, and 19 for turning the lock-seam will now be described. These rolls are shown with a circular groove to conform to the circular conductor; but it is to be understood that while they are to conform to the shape of the conductor, yet they can be used further without coming in contact with as much surface of the conductor as herein shown—that is to say, instead of coming in contact with practically the upper half of the conductor these face-rolls can be either short or just long enough to contain the seam-turning grooves now to be described. Therefore, except in the claims for the specific construction, it is understood that I do not limit this invention to these and other details of construction referred to.

It is seen upon reference to the drawings that the conductor is fed to the first set of rolls with the lips and flange in the position therein shown, while this face-roll 17 bends the parts to the position shown in Fig. 5—that is to say, the lips 2 and 4 are brought close together and the flange 3 is turned down and pressed close against the outer face of the inner lip 4. The roller for accomplishing this operation is shown in said Figs. 5 and 10 and is provided at a point in alinement radially with the conductor with a groove 44. The depth of this groove is approximately the width of the lock-seam, and it is provided with a straight wall 45, situated on the side from which the seam is to be turned and an inclined wall 46, situated on the side toward which the seam is turned. These walls are joined by a slight curve, while the juncture between the inclined wall and the outer face of the roller is curved in the manner shown. As will be seen in reference to Fig. 5, this groove turns the flange downwardly upon the inner lip 4, while the outer lip 2 comes in contact with the straight wall 45 of the groove and the curved portion 47 between the inclined wall 46 and the outer face of the roll bends the flange downwardly. In this position the conductor passes to the second set of rolls 18 and 18ª. The face-roll 18 bends the three superposed portions of the stock—namely, the lips and the flange—to the position shown in Figs. 7 and 11, and it is obvious that in bending the parts in this manner there is a tendency to twist the conductor. This is obviated by means of the presser-roller 36. This presser-roller 36, as described, is fastened to the movable plate 8 of the machine or upon the side of the conductor toward which the seam is turned. The presser-roller 36 is a small steel wheel having a slanting edge and which is adjusted by means of the device referred to, so that this edge runs along in contact with the side of the portions of the stock forming in the seam and is situated as close as practical to the roll 17, so that any tendency on the part of this roller to twist the pipe owing to the torsional strain in turning down the stock is carried by this presser-roller. It is seen, of course, that this roller can be adjusted vertically or laterally by means of the devices referred to to bring its edge in the desired position. This is shown in Fig. 6, and in Figs. 7 and 11 is illustrated the shape of the second face-roll 18. This roll is provided with a groove 48, having an inclined rear wall 49, which extends on both sides of the center of the conductor, while the distance between the center of the conductor and the wall toward which the seam is turned is practically the width of the finished seam, as illustrated in Fig. 11, wherein it is seen that there is a little space between the short side of the groove and the adjacent edge of the seam, while the opposite edge of the seam is against the opposite or deep wall. The deep wall 50 joins the inclined wall 49 by curved portion 51, while the other end of the inclined wall meets the outer face of the roll by a slightly-curved portion 52. The deep wall 50 of this groove 48 meets the outer wall of the roll practically at right angles and forms a sharp corner. The edge of this sharp or abrupt corner and the deep wall of the groove serve as a guide for the conductor, for while the seam is being turned over by this roll the outer edge thereof bears against this deep wall at its juncture with the wall 49, so that this contact further prevents the pipe from twisting, as is its tendency. The seam is then in the position shown in Figs. 7 and 11. Then passing to the third face-roll 19 it is turned down flat, as shown in Fig. 8. This third roll 19 is provided with a plain face, or, as shown in the drawings, is practically semicircular, it being noted, of course, that in a hexagonal or square conductor the face of this roll would be straight.

It is understood, of course, that in turning down the lock-seam of this kind a mandrel 53 is employed, as shown in Figs. 2, 3, 4, 5, 6, 7, and 8, said mandrel being omitted from the other figures for convenience of illustration. This mandrel 53 is held in position by a cable 54, having a cross-head 55, that is hooked in the slotted upper end of the post 56 in the usual manner.

The advantages of a machine of this description are of course apparent to a person skilled in the art to which it appertains, and among the marked advantages can be mentioned the fact that it practically and accu-

rately turns a lock-seam of the kind shown upon comparatively long sections of conductors of comparatively heavy sheet metal, and, furthermore, it will effectually complete this operation with galvanized iron. As far as I am informed this machine is capable of turning the lock-seam of sheet-metal conductors of greater lengths and of heavier metal than can now be accomplished.

It is understood, of course, that as far as the structure of the frame and other parts of the machine, except the face-rollers, is concerned other structures can be designed that will accomplish the ends attained by this machine, and therefore, except in the claims for this construction, I do not wish the invention to be limited to the structural features referred to.

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

1. In a machine of the kind specified, a plurality of sets of rolls for forming and turning a lock-seam, the first of said sets of rolls being adapted to receive a conductor having a circular body portion with one edge provided with an inner radial lip and the other edge provided with an outer radial lip and a tangential flange and consisting of a supporting-roll and a face-roll provided with a groove, the depth of said groove being equal to the width of the seam to be turned, and the said groove being provided with straight and inclined walls.

2. In a machine of the kind specified, a plurality of sets of rolls for forming and turning a lock-seam, the first of said sets of rolls being adapted to receive a conductor having a circular body portion with one edge provided with an inner radial lip and the other edge provided with an outer radial lip and a tangential flange and consisting of a supporting-roll and a face-roll provided with a groove, having a straight wall situated upon the side thereof from which the seam is to be turned and an inclined wall situated upon the side toward which the seam is turned.

3. In a machine of the kind specified, a plurality of sets of rolls for forming and turning a lock-seam, the first of said sets of rolls being adapted to receive a conductor having a circular body portion with one edge provided with an inner radial lip and the other edge provided with an outer radial lip and a tangential flange and consisting of a supporting-roll and a face-roll provided with a groove having a straight wall situated upon the side thereof from which the seam is to be turned and an inclined wall situated upon the side toward which the seam is turned, said inclined wall meeting the outer face of the roll by a curved portion.

4. In a machine of the kind specified, a plurality of sets of rolls for forming and turning a lock-seam, the second of said sets of rolls consisting of a supporting-roll and a face-roll having a groove provided with a straight inclined rear wall and a deep wall on the side thereof toward which the seam is turned, said inclined rear and deep walls being connected by a curved portion.

5. In a machine of the kind specified, a plurality of sets of rolls for forming and turning a lock-seam, the second of said sets of rolls consisting of a supporting-roll and a face-roll having a groove, said groove being wider than the seam to be turned and having a straight inclined rear wall and a deep wall upon the side thereof toward which the seam is to be turned, said deep wall connecting with the rear wall by a curved portion and with the outer face of the roll by a sharp corner.

6. In a machine of the kind specified, a plurality of sets of rolls for forming and turning a lock-seam, the first of said sets of rolls being adapted to receive a conductor having a circular body portion with one edge provided with an inner radial lip and the other edge provided with an outer radial lip and a tangential flange and consisting of a supporting-roll and a face-roll having a deep and narrow groove, the second of said sets of rolls consisting of a supporting-roll and a face-roll having a shallow and wide groove, and the third set of said rolls consisting of a supporting-roll and a plain face-roll.

7. In a machine of the kind specified, a plurality of sets of rolls for bending or turning down the stock forming the seam, and a single presser-roller situated between the first and second sets of rolls and adapted to come in contact with the overlapping flange on one side of the partially-bent lock-seam, and against the side toward which the seam is turned.

8. In a machine of the kind specified, a plurality of sets of rolls, each of said sets of rolls consisting of a supporting-roll and a face-roll mounted in sliding bearings, springs for lifting said bearings, and set-screws for moving said bearings in an opposite direction.

9. In a machine of the kind specified, a plurality of sets of rolls, each of said sets of rolls consisting of a supporting-roll, and an adjustable face-roll, and a presser-roller adjustably secured to the frame of the machine and situated between the first and second sets of rolls and adapted to come in contact with the overlapping flange on one side of the partially-bent lock-seam, and against the side toward which the seam is turned.

10. In a machine of the kind specified, a stationary plate, a movable plate, and a plurality of sets of rolls carried by rotatable spindles mounted in bearings upon said plates, said spindles being provided at one end with headed trunnions that are mounted in the bearings of the stationary plate, with straight trunnions mounted in the bearings of the movable plate, and with a longitudinal key to enter a groove upon the roller.

11. In a machine of the kind specified, a plu-

rality of sets of supporting and face rolls, and a vertically and laterally adjustable presser-roller mounted upon the frame of said machine and situated between the first and second sets of said rolls.

12. In a machine of the kind specified, a plurality of sets of supporting and face rolls, and a presser-roller mounted at the upper end portion of the upright slide that is situated within an upright guide in the frame of the machine and between the first and second sets of said rolls and provided with an adjusting and set screw.

13. In a machine of the kind specified, a plurality of sets of supporting and face rolls, and a presser-roller mounted at the upper end portion of the upright slide that is situated within an upright guide in the frame of the machine and between the first and second sets of said rolls, a slot in said upright guide, and a headed set-screw extending through said slot and fastened to said frame and adjusting-screws upon said frame engaging said slide.

14. In a machine of the kind specified, the combination with the supporting and face rolls, of a pair of conical guide-rollers situated in front of the same, each of said guide-rollers consisting of a rotatable roller having a wide overhanging upper end portion, and a narrow inwardly-extending lower end portion adapted to embrace the conductor passing therethrough at and below its center.

15. In a machine of the kind specified, the combination with the supporting and face rolls, of a pair of guide-rollers situated in front of the same, said guide-rollers being mounted upon pivoted levers, and set-screws for adjusting said pivoted levers.

16. In a machine of the kind specified, the combination with the supporting and face rolls, of a pair of guide-rollers mounted upon the inner ends, of levers pivoted to the frame of the machine, the outer end portions of said levers being situated close to the outside of said frame and being provided with set-screws engaging the same.

17. In a machine of the kind specified, a frame provided with a stationary side plate, a movable side plate, devices for moving said side plate, a plurality of supporting and face rolls mounted between said side plates, the rolls of each set being provided with intermeshing gearing, a gear-pinion intermeshing with the lower rolls of two of said sets and with a source of power, and an idler intermeshing with the lower roll of the third set and one of said first-mentioned sets.

18. In a machine of the kind specified, a pair of guide-rollers supported upon upright axes, a plurality of sets of rolls having horizontal axes and adapted to form and turn a lock-seam, the first of said sets of rolls, consisting of a supporting-roll and a face-roll provided with a deep and narrow groove having straight and inclined side walls, the depth of said groove being equal to the width of the seam to be turned, the second of said sets of rolls consisting of a supporting-roll and a face-roll having a shallow and wide groove provided with an inclined rear wall, a deep wall on the side thereof toward which the seam is turned, said inclined rear and deep walls being connected by a curved portion, the third set of said rolls consisting of a supporting-roll and a plain face-roll, and a pressure-roller situated between the first and second sets of rolls and on the side thereof toward which the seam is turned, said pressure-roller being adapted to come in contact with the side of the partially-turned lock-seam.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

PHILIP BROWNELL ALEXANDER.

Witnesses:

RALPH W. ELLIS,

CARRIE E. BACON.