H. McCABE.

FLANGING MACHINE.

APPLICATION FILED FEB. 9, 1910.

1,006,861.

Patented Oct. 24, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

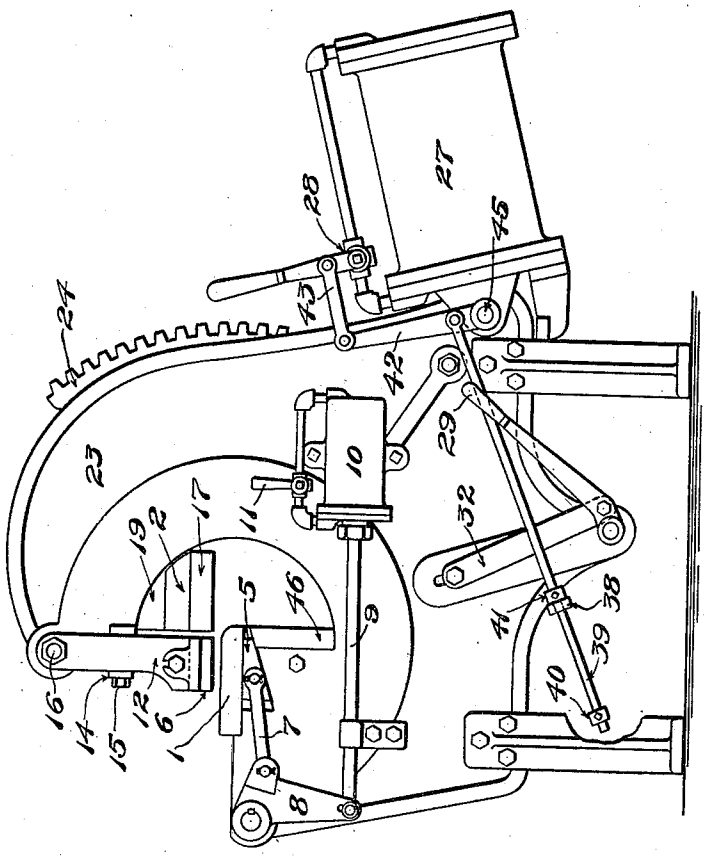
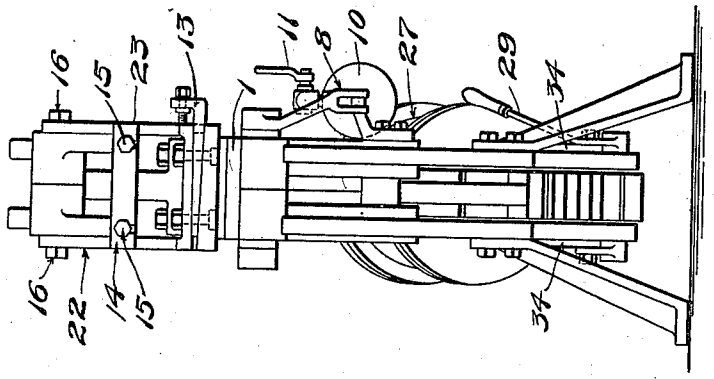


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 3.

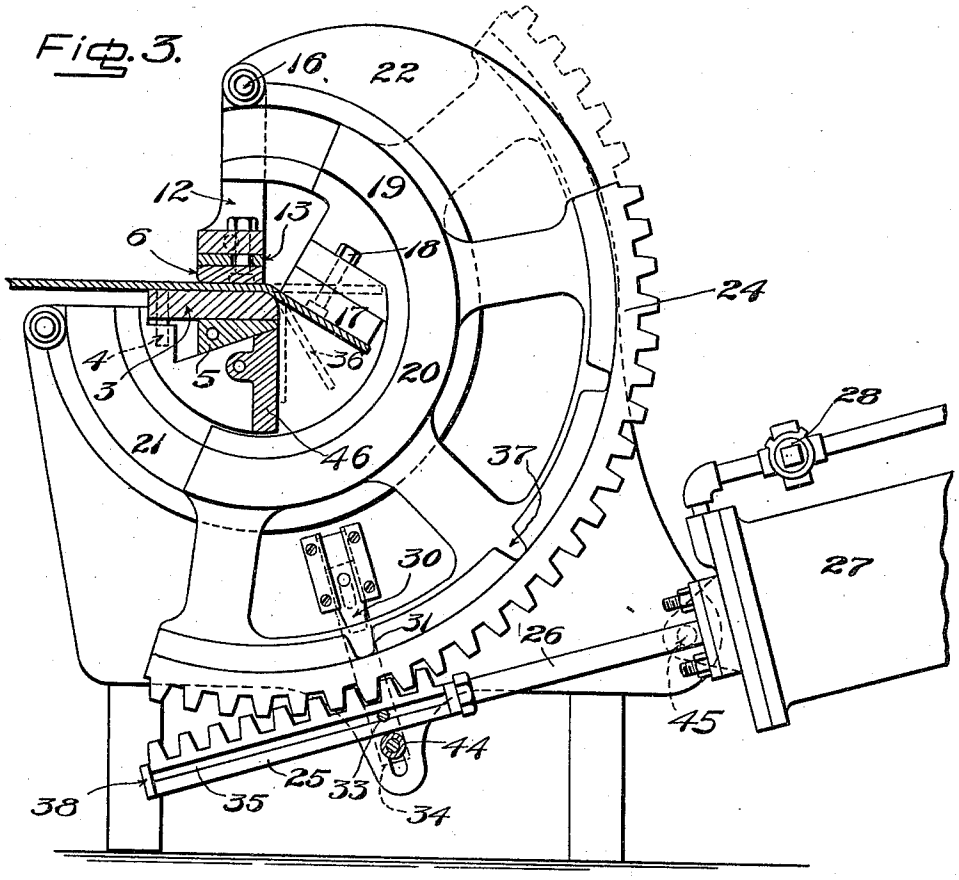
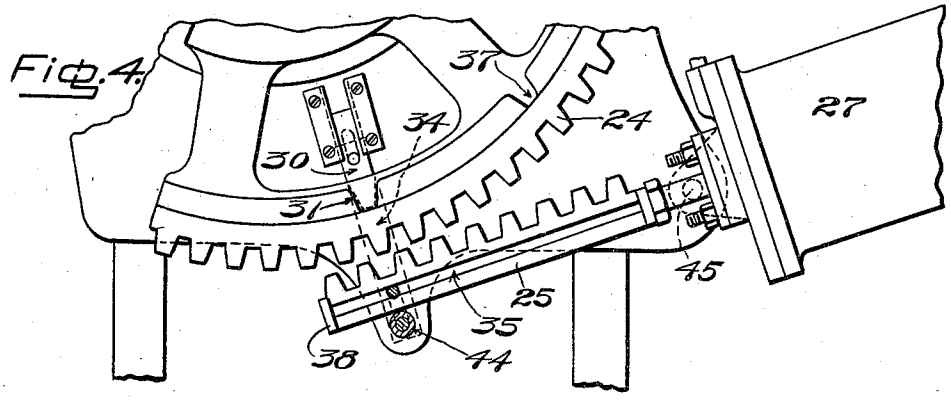


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

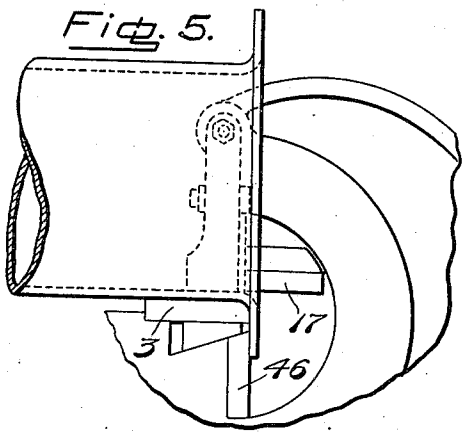


Fig. 6.

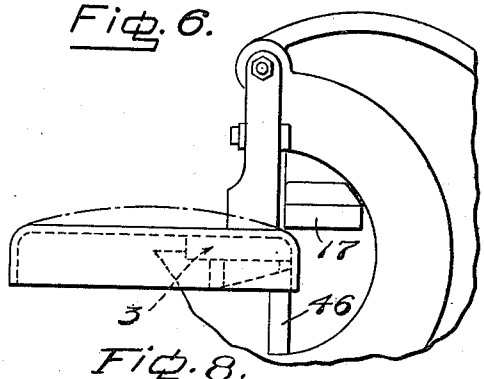


Fig. 7.

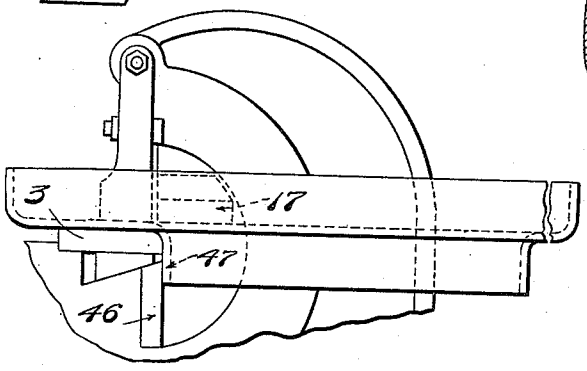


Fig. 8.

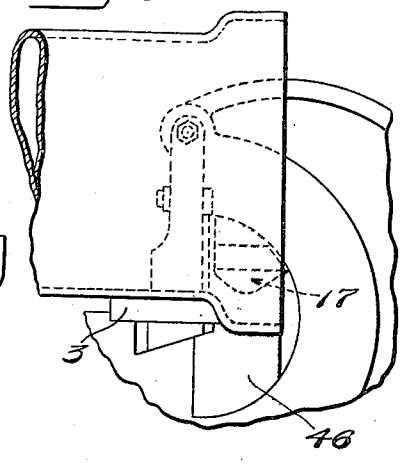


Fig. 9.

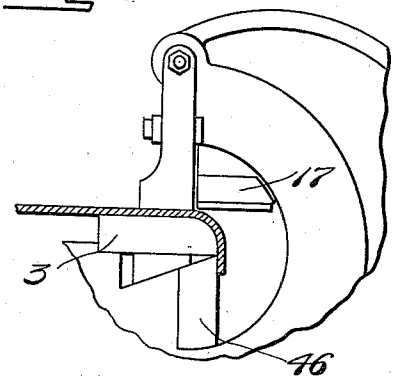
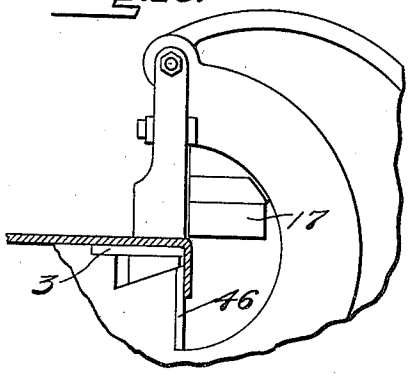


Fig. 10.



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UNITED STATES PATENT OFFICE.

HUGH McCABE, OF LAWRENCE, MASSACHUSETTS.

FLANGING-MACHINE.

1,006,861. Specification of Letters Patent. Patented Oct. 24, 1911.

Application filed February 9, 1910. Serial No. 542,821.

To all whom it may concern:

Be it known that I, HUGH McCABE, a citizen of the United States, residing at Lawrence, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Flanging-Machines; 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.

The present invention relates to an improvement in flanging machines.

Heretofore flanging machines have generally been constructed of such size as would take in the entire width of a sheet of metal upon which it was desired to form a flange. This has involved the construction of extremely large and heavy machines, not only because of the size necessary to take in the large sheet of metal, but also because of the strength required in order to bend the sheet across its whole width. It has also been proposed to form flanges on circular disks by the use of a flanging roller, which was carried around the disk and which was gradually turned so as to bend the flange farther and farther down until at last it occupied the desired position at right angles to the plate. This necessitated the use of a machine of sufficient size to take in the whole plate and complicated devices for actuating the flanging roller and for giving it successively greater inclinations as the flanging operation progressed.

The present invention contemplates the production of a machine of comparatively small size which can be used for flanging metal sheets of any width or for flanging flat circular disks or cylindrical shells.

To this end the present invention consists in the flanging machine hereinafter described and particularly defined in the claims.

In the accompanying drawings illustrating the preferred form of the invention, Figure 1 is a side elevation; Fig. 2 is a front elevation; Fig. 3 is a sectional elevation; Fig. 4 is a detail; Figs. 5 to 10 inclusive are views of a portion of the machine illustrating different forms of work which the machine is adapted to accomplish.

The illustrated embodiment of the invention is described as follows:—

The machine comprises a plate clamp and a flange bender, and means for operating the parts. By reference to Fig. 3 it will be observed that the plate is thrust into the opening of the machine with its edge under the flange bender, that the plate clamp is closed upon the plate to hold it in position, and then the flange bender is operated to bend the edge of the plate to form the flange. The clamp is indicated in a general way by reference character 1, the bender by the reference character 2.

The clamp 1 consists of a plate 3 held from lateral movement by pins 4 which are supported in the frame of the machine. A wedge 5 under the plate 3 affords provision for lifting the plate 3 to press the plate against the top clamp plate 6. The wedge 5 is actuated by the link 7 by which it is connected to the bell crank lever 8, in turn connected by means of the rod 9 with a piston in the clamp operating cylinder 10. Compressed air supply is connected with the cylinder 10. A lever 11 affords a means for admitting the compressed air to either the one or the other side of the piston so as thereby to operate the wedge to lift the clamp plate 3 and hold the plate or to withdraw the wedge and loosen the clamp. The top clamp plate 6 is a face plate, secured by bolts to the top clamp carrier 12 and adjustably mounted thereon by means of the gib 13. This top clamp is therefore capable of adjustment to compensate the varying thicknesses of metal operated upon by the machine, and when adjusted to the proper position, it is secured in place by bolts. The bar 14 holds the top clamp in the position shown in Fig. 1. When the nuts 15 are loosened this bar 14 may be removed, the bar being provided with open-sided holes, and then the top clamp may be swung about the pivot 16 out of the way. This is all that is necessary under some circumstances,—for example, in flanging circular disks or cylinders. After the flange

is completed, the operator will leave the bender 2 in the lower position and loosen up the top clamp, swinging it back and thereby affording facility for taking the work out of the machine. In some work, as in forming a flange on one side of a sheet of metal, the removal of the top clamp is not necessary, as the plate may be removed laterally.

The bender 2 has a face plate 17 which is adapted to engage the metal to be flanged, being secured on the bender 2 by the bolts 18. The bender is formed upon a segmental bender carrier 19 which is provided with laterally projecting circular flanges 20 which engage corresponding recesses 21 in the two portions 22 and 23 of the frame of the machine. This bender segment 19 is provided on its outer periphery with a segmental gear 24. A piston actuated rack 25 is provided which engages the segmental gear 24. The rack 25 is secured to the end of the piston rod 26, which is attached to a piston in the bender operating cylinder 27 by which it is actuated. The cylinder 27 is supplied with compressed air and the regulating valve 28 affords provision for admitting air to the one or the other side of the piston. With the bender in the position illustrated in Fig. 1, and a sheet of metal held in position by the clamp, the operator admits air to the right hand end of the bender cylinder 27, thereby causing the rack 25 to be forced outwardly—to the left, as viewed in Fig. 3—moving the bender from the position illustrated in Fig. 1 to the position illustrated in Fig. 3, thereby causing the first bend to be given to the plate. In flanging straight plates, two or more men should be employed, one to operate the valves 11 and 28, and the other or others to handle the plate. Starting with one edge of the plate under the bender, the machine operator moves the valve 11, thereby closing the clamp, and then moves the other valve 28 to admit air to the right hand end of the bender cylinder, thereby moving the bender from the position illustrated in Fig. 1 and to the position illustrated in Fig. 3. Then he returns the bender to its original position by operating the valve 28 to cause the cylinder to pull back the bender to its original position. He then loosens the clamp, and the man, or men, move the plate at right angles to the machine, so as to bring the next succeeding portion of the edge of the plate which is to form the flange under the bender plate 17. The clamp is again closed, the bender again actuated to bend that portion of the plate down to the position indicated in Fig. 3, and so on across the entire edge of the plate. Then the machine operator takes hold of the handle of the lever 29 and moves it to the position indicated in Fig. 1, thereby bringing the dog 30, mounted on the frame member 22, down into engagement with the recess 31 of the bender, thereby holding it in the position illustrated in Fig. 3. At the same time the dog 30 is forced into engagement with the recess 31 by means of the lever 29 and the link 32 extending from the lever 29 to the dog 30, a pin 33 mounted in the side of the slide bar 34 and secured to the dog 30, by its engagement with the groove 35 in the side of the rack 25, depresses the rack and withdraws its teeth from engagement with the teeth of the segment 24. When thus withdrawn into the position illustrated in Fig. 4, the operator moves the valve 28 and thereby brings the rack 25 back to the position indicated in Fig. 4, whereupon a reverse movement of the lever 29 reëngages the rack 25 with the segment 24 and disengages the dog 30 from the recess 31 and thereupon the machine is ready for bending the edge of the plate from the position indicated in full lines in Fig. 3 to the position indicated at 36, the former oeprations being repeated throughout the width of the plate, when it is again necessary to disengage the rack 25 from the segment gear 24 and to engage the recess 37 with the dog 30, while the rack is drawn back in position for reengagement with the segment gear at a new place. Thus by a series of successive bending operations performed along the edge to be flanged, the edge of the sheet is bent from its original position, and by a plurality of such series of operations the edge of the plate is bent into position at right angles thereto, or into a position at any lesser angle, as may be desired.

In order to prevent driving the piston rod 26 too far toward the left, and thereby causing the piston to strike the end of the cylinder, the rack is provided at its end with a collar 38 which embraces a rod 39, but moves freely thereon. The collars 40 and 41 are secured on said bar 39 at appropriate places. The bar 39 is connected to a lever 42, and by means of a link 43 with the valve 28. The above-described arrangement is such that upon the rack's completion of its outward movement the collar 38 strikes the collar 40 and pulls upon the rod 39 thereby shutting off the admission of air to the right hand end of the cylinder 27. Movement in the opposite direction is correspondingly arrested when the collar 38 strikes the collar 41 and moves the bar 39 to the right, thereby operating the air valve 28 and shutting off the admission of air to the left hand end of the cylinder 27.

Two bars 34 are employed, one upon one side and the other upon the other side of the machine and an anti-friction roll 44 is mounted upon the pin which connects the two bars 34 and occupies a position which enables it to support the pressure exerted by

the rack 25. The cylinder 27 is pivoted at 45 to the frame of the machine. This is necessary because the rack 25 is supported rigidly on the piston rod and with the described movements of the rack for engagement with and disengagement from the segment gear 24, the cylinder 27 is required to participate in such movements. Two sides of the frame 22 and 23 are practically symmetrical and afford adequate support for the segment gear 24.

In the case of bending outwardly extending flanges on cylinders, the clamp plates 3 and 6 should be given proper shapes, to correspond to the cylinder introduced into the machine, to be flanged. Where the flanging of circular disks is to be done, the bender face plate 17 and the coöperating face of the plate 46 should be formed to correspond to the curvature which it is desired to give to the flange. Of course, the edges of the clamp plate 3 and wedge 5 should also be properly curved.

Referring to Figs. 5 to 10 inclusive, all of which are self explanatory, Fig. 5 illustrates the use of the machine in forming an outwardly extending flange on a cylinder; Fig. 6 illustrates a method of use of the machine in forming a flange on a circular disk; Fig. 7 shows the machine in use in forming an inside flange, being the flange marked 47; Fig. 8 illustrates the formation of a bell mouth or ogee on a cylinder; Fig. 9 illustrates the formation of a flange of easy bend; while Fig. 10 illustrates the formation of a sharp-bend flange. It will be understood that for these various forms of work, the surfaces of the various parts are required to be adapted more or less closely to the shapes desired to be produced.

It is to be understood that the present invention, viewed in its broader aspects, is not limited to a power operated machine, as it contemplates as well a hand machine for use in bending material up to $\frac{3}{16}$ or $\frac{1}{4}$ inch in thickness.

The invention is not limited to the details of construction, as it may be embodied in various forms within the scope of the following claims:—

1. A flanging machine, having, in combination, a plate clamp, a bender, means for actuating the bender comprising a part carried by the bender, and a power-operated part adapted to be operatively engaged with successive sequential portions of the part carried by the bender, whereby the bender is given its complete throw in a plurality of steps.

2. A flanging machine, having, in combination, a plate clamp, a bender, actuating means for the bender, means for operating said bender actuating means a constant amount of less extent than that sufficient to move the bender through its complete movement, and means whereby the actuating means may thereafter be disengaged therefrom and reëngaged to move the bender through successive sequential portions of its complete movement.

3. A flanging machine, having, in combination, a plate clamp, a bender, bender actuating means, comprising a segment gear and rack, and means for disengaging and engaging the rack and gear, said rack having an amplitude of reciprocation of less extent than that sufficient to move the bender through its complete movement.

4. A flanging machine, having, in combination, a plate clamp, a bender, bender actuating means comprising a segment gear having teeth extending over the surface of the gear a distance sufficient to move the bender through a distance corresponding to the maximum possible movement of the bender, a rack having fewer teeth than the segment, and means for engaging and disengaging the rack and gear so as to move the gear through portions of its bending movement successively.

5. A flanging machine, having, in combination, a plate clamp, a bender, a segment gear carrying the bender, a rack for actuating the segment gear having less number of teeth than the segment gear, said rack and gear having provision for engagement of the rack with different portions of the segment gear.

6. A flanging machine, having, in combination, a plate clamp, a bender, a bender carrying segment gear, a rack of less length than the gear, a cylinder, a piston rigidly connected with the rack, said cylinder being pivotally supported so as to permit the engagement and disengagement of the rack and segment gear, substantially as described.

7. A flanging machine, having, in combination, a combined clamp plate and former block, a bender, and bender actuating means comprising a segment gear and rack having means for disengaging the rack from the gear adapted to be operated after the bender has been operated to bend a flange on the plate through a part of the angle through which it is desired to bend the flange, and to reëngage the rack with the gear to bend the flange through a further portion of the angle desired, substantially as described.

8. A flanging machine, having, in combination, a normally stationary narrow plate clamp member, a narrow combined clamp and former block movable toward and from the stationary plate clamp member to engage and hold the work, means for moving the combined clamp and former block toward and from the work clamp a distance less than the width of the flange to be bent and bending means coöperating therewith.

9. A flanging machine for bending wide circular flanges, a normally stationary clamp

member, means to permit the same to be removed from operative position for removing the work, a movable combined clamp and former block, and means for moving it toward and from the stationary plate clamp member a distance less than the width of the flange to be formed, a bender, and means for actuating it substantially as described.

10. A flanging machine, having, in combination, a plate clamp, clamp actuating means, a bender, a pneumatic cylinder, piston and connections for actuating the bender, and means for preventing overthrow of the piston, substantially as described.

11. A flanging machine, having, in combination, a combined clamp and former block, actuating means adapted to move the combined clamp and former block, a bender, means to cause the clamp to engage different thicknesses of work, a removable face plate for the clamp, a removable face plate for the bender, and means for actuating the bender.

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