2 Sheets—Sheet 1.

R. C. NUGENT.

Machine for Flanging Metal-Plates.

No. 214,181. Patented April 8, 1879.

Fig. 2

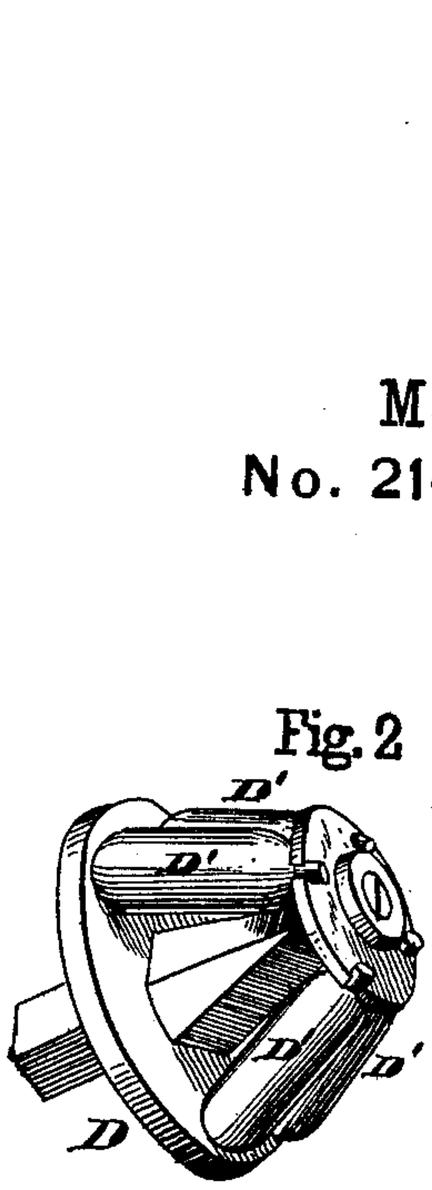
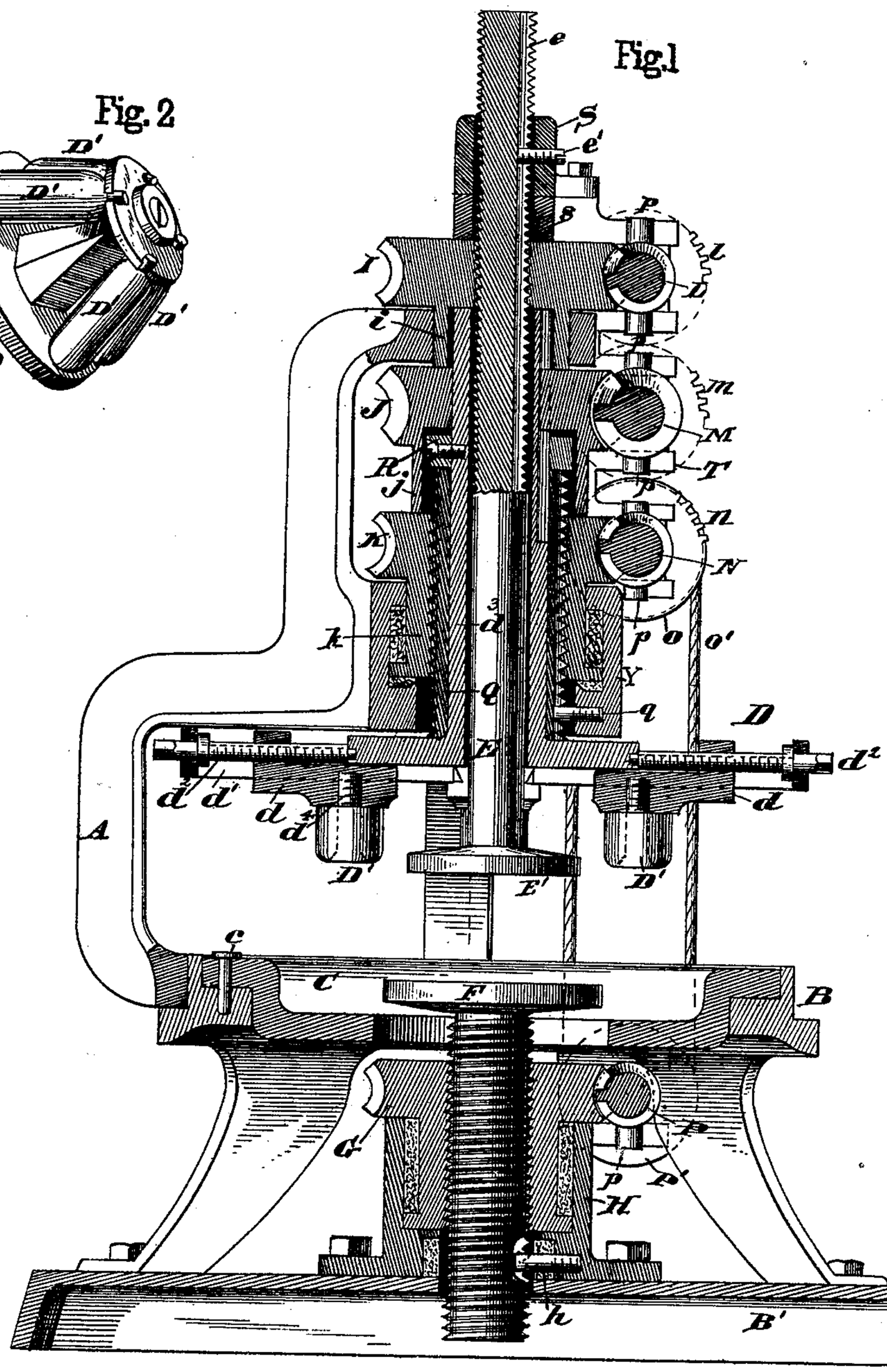


Fig. 1



Attest.

W. S. Christopher

Wm. Hubbell Fisher

Inventor.

Richard C Nugent

2 Sheets—Sheet 2.

R. C. NUGENT.

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Fig.3

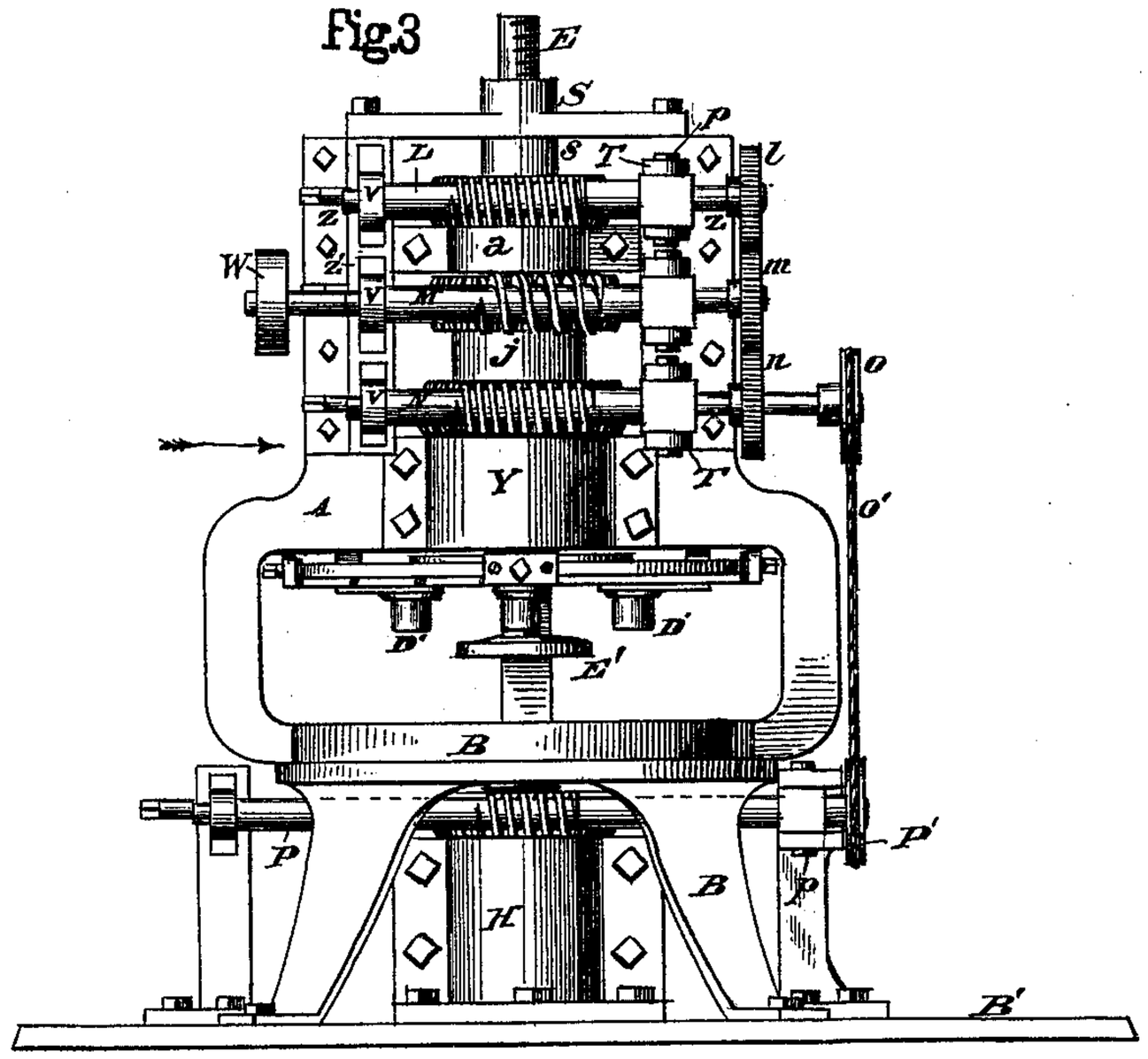


Fig.4

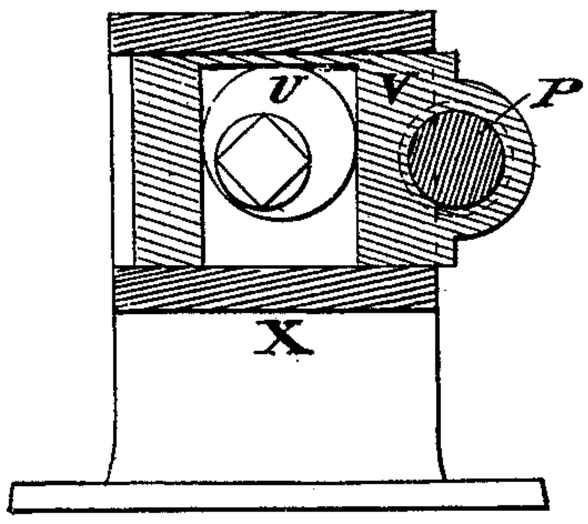
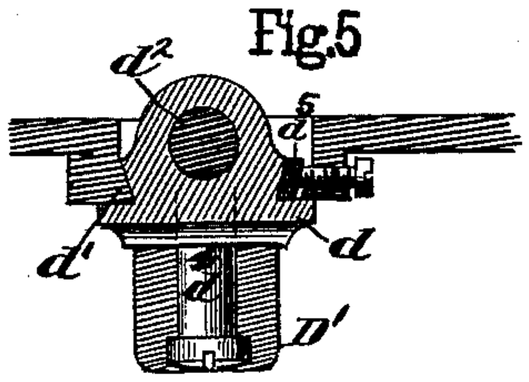


Fig.5



Inventor.

Richard C Nugent

Attest.

W. S. Christopher

Wm. Hubbell Fisher.

UNITED STATES PATENT OFFICE.

RICHARD C. NUGENT, OF CINCINNATI, OHIO, ASSIGNOR OF ONE-HALF HIS RIGHT TO McILVAIN & SPIEGEL, OF SAME PLACE.

IMPROVEMENT IN MACHINES FOR FLANGING METAL PLATES.

Specification forming part of Letters Patent No. **214,181**, dated April 8, 1879; application filed September 24, 1878.

To all whom it may concern:

Be it known that I, RICHARD C. NUGENT, of the city of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Machines for Forming Flanges on Metal Plates, of which the following is a specification.

The design of my invention is to provide a machine for turning the flanges on plates of metal, usually of iron, in a thorough, cheap, and expeditious manner.

My invention will first be described, and then pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a vertical axial section of a machine embodying my invention, the eye of the spectator looking at the right half-section in the direction indicated by the arrow of Fig. 3. Fig. 2 is a perspective view of the head for forming flanges to receive tubes or flues. Fig. 3 is a front elevation of the machine. Fig. 4 is a sectional elevation of devices for disengaging the screw-shaft; and Fig. 5 is a sectional view, showing the forming-roller and the preferable mode of connecting it to the disk or head.

B indicates the lower supporting portion of the frame of the machine, preferably circular in shape, and provided with legs, as shown, firmly secured to a base, B′. Each brace of the vertical portion A of the frame terminates at the bottom in a common semi-annular rim-connection piece, which encircles the rear side of annular portion of frame B, and is secured thereto by bolts. The vertical portions A are attached at top to a cross-piece, to which the collar-bearing *a* is secured. An annular box, H, is secured to the base B′ by bolts passing through flanges extending out horizontally at the base of the box. Within this box stands a horizontal worm-wheel, G, provided with a downwardly-extending neck encircling the screw-shaft of rest F, rotating within the box or cylinder H, upon the bottom of which it rests. This worm-wheel and neck are provided with a female screw engaging the screw-thread of the shaft of rest F.

A pin, *h*, fixed in the base H projects into a vertical slot in the periphery of said shaft, and prevents the shaft from turning, so that upon the rotation of the worm-wheel G the shaft and the rest F are vertically elevated or depressed.

The worm-wheel G is operated by a worm on shaft P, supported at either end by a journal-box upon standards, as shown, or other suitable supports. The worm is made to engage the wheel G, or disengage with same, by turning the eccentric U, journaled in standard X, and working in a recess in the box or slide V, receiving the journal of shaft P, and sliding back and forth in the standard X, according as the eccentric U, by means of a lever or hand-wheel attached to the end of the eccentric-shaft, is rotated to the right or left.

Attached to each of the right and left uprights of frame A is a projecting journal-bearing plate, Z, which support the worm-shafts L M N. The left-hand plate Z supports and receives between projections Z′ the journal-boxes V, worked by eccentrics U, as shown in Fig. 4, the projections Z′ being substituted for standard X.

The inner side of the right-hand plate is provided with projections T, between which are the journal-boxes having a stud or pin, *p*, projecting from the bottom and top thereof, these studs fitting into recesses in the inner side of the projections T, and preventing their journal-boxes from shifting to the right. The journals of the shafts L, M, and N being smaller than their shafts, the shoulders of the shafts rest against the ends of the journal-boxes, and prevent any longitudinal displacement of the shafts. A similar journal-box fitted into the right-hand standard supports the shaft P, and, by its studs, prevents the box V from shifting, the shaft being shouldered as is shaft L. These shafts L M N are, respectively, provided with gears *l m n*, which engage each other, so that when any one of the shafts is rotated by power—as, for example, shaft M by pulley-wheel W—all of the shafts will be rotated.

Shaft P is rotated preferably from shaft N by means of a pulley on each shaft connected by a belt, O′, the pulleys being of the same size, so that the shafts shall rotate at the same speed. The worm of shaft L meshes into and turns worm-wheel I, which has a central ori-

fice provided with a female screw engaging the screw on vertical shaft E, which terminates below in a foot vertically concentric with rest F. The shaft E is provided with a vertical slot, in which works a pin fixed in the collar of the cross-piece S, the latter bolted at either end to the vertical flanges Z.

The rotation of worm-wheel I will thus elevate or depress the shaft E. A loose bearing-collar, *s*, around shaft E is interposed between the collar of S and the worm-wheel I. Worm-wheel I is provided with an annular flange, *i*, projecting vertically downward and turning within and between the cross-brace uniting the uprights of frame A and a half-collar or journal-box, *a*, secured to the cross-brace. The flange *i*, resting upon worm-wheel J, (which engages a worm on shaft M,) encircles the upper end of hollow shaft d^3, through which shaft E passes.

The wheel J is provided with an annular flange, *j*, resting upon worm-wheel K. Wheel J encircles the hollow shaft d^3, and a projection or key of the wheel fits into a vertical slot in this shaft, whereby the rotation of the wheel J causes the shaft to rotate, and at the same time permits it to slide up and down within the wheel J.

The means for rotating the shaft d^3 are as follows, viz: A hollow shaft, Q, whose periphery is provided outwardly with a screw-thread, encircles and rotates upon the shaft d^3, and abuts beneath against the shoulder formed by the horizontal extension of shaft d^3 into a disk or head, D, and is prevented from sliding upward by the collar R, secured to shaft d^3 by set-screws.

The worm-wheel K is provided with an annular flange projecting downward, and having at its lower end an outwardly-projecting flange, the latter working in an annular recess within and between the frame A and the shaft-collar Y, which secures the worm-wheel K to its place in the frame.

The wheel K turns within the frame and collar, and its vertical flange as well as its own central orifice is provided with a female screw which engages the screw on shaft Q. The shaft Q is operated by the worm-wheel K, turned by worm-shaft N, and, being prevented from rotating by the pin *q*, fixed in the bearing-collar Y, secured to the frame A, and projecting into and sliding in a vertical slot in this shaft, will move vertically as the wheel K is rotated, and carry with it in its vertical movement the shaft d^3 and head D.

In the head D, before referred to, are placed the forming-rollers, the means for rendering them adjustable being as follows: Slotted ways preferably converging toward the center of the head are formed therein, in which slide the holders *d*, provided with flanges which extend beneath the under surface of the head and secure the screw d^2 from being broken by upward pressure from the forming-rollers. On one (the left) side (see Fig. 5) the adjacent lower edge of each slotted way is wedge-shaped—*i. e.*, beveled outward and downward, fitting into a corresponding recess in the holder *d*. The other side of the holder has a correspondingly-shaped recess, in which lies a gib, d^5, which can be screwed up against the holder to take up the loose space formed by the wear of the holder against the head. A screw, d^2, engages a female screw in the holder, and at either end is firmly journaled in the head.

The flange-forming rollers D′ are journaled on a vertical axial pin, d^4, which is firmly screwed or fixed into the holder *d*. The pin is provided with a head countersunk into the end of the roller.

The plate or form C, for forming in conjunction with the rollers the flange, is preferably constructed as shown—viz., with a flange overlapping and fitting into a recess in the frame B, and with a central hole to allow the rest F to pass vertically through it. A pin, *c*, is passed through the plate into the frame B, to prevent the plate from rotating.

A device for flanging small holes, such as boiler-tubes, is shown by Fig. 2. It consists of a shaft and a disk thereon, the shaft being square where it projects behind beyond the disk, and where it projects on the other side of the disk of any desirable shape, but long enough to admit of rollers D′ to be journaled at one end in the disk near the edge of the latter, and at the other in a small disk screwed or otherwise affixed to the end of the said shaft, the whole forming a truncated cone or cage composed of long flange-forming rollers. These rollers have a great advantage over round or conical rollers, in that they form the flange more gradually, and hence are less liable to split it off in forming.

The mode in which my invention operates is as follows: A forming-plate, C, having a central recess between vertical flanges of a size proper to form the flanges on the plate of metal to be flanged, is placed upon and in frame B. The rollers are then adjusted by means of screws d^2 at the proper distance from the center of the head, so that when depressed they will act in conjunction with the forming-plate C to form the flange on the metal plate or sheet.

The worms on shafts L, M, and N being disengaged from their respective worm-wheels, power is applied, and the rest F elevated above the level of the forming-plate C. The plate to be flanged is then placed upon the rest F, and the worm of shaft P disengaged from worm-wheel G, and the rest F caused to remain stationary, while the worm of shaft L is made to engage wheel I and depress the shaft E and its foot until the latter rests upon the plate, and the plate is firmly clamped between the foot and the rest. I then disengage the worm of shaft L from wheel I, and, making the connection between the worm on shaft N and wheel K, I depress the rollers D′ until they touch the upper side of the plate to be flanged. I now engage all the worms with

their respective wheels. The plate to be flanged will be steadily depressed between the foot E′ and the rest F, and be carried down, so that its edges will rest upon the top of the forming-plate C. At the same time the rollers will be as rapidly depressed, and will be slowly rotated.

As the plate to be flanged reaches the forming-plate the action of the forming-rollers upon the plate, the supplementary assistance of the central firm downward pressure of the foot E′, and the annular resistance of the edge of forming-plate C combine to form the desired flange upon the plate. As the rollers and foot are depressed, the plate is depressed, and its edges bent up against the interior sides of forming-plate C, and the flanging is completed.

The rest, the foot, and the rollers are now elevated, the elevation of rest F being stopped after it has raised the plate above the level of forming-plate C, the foot and rollers being elevated somewhat higher and the plate removed, so that another plate may be introduced and be flanged by a like operation.

To flange a plate by operating the forming-rollers upon the outside of the flange, the forming-plate is removed, and the same one, or one having a more suitable diameter of base, is selected, and then introduced, upside down, beneath the forming-rollers. The rest F is run down out of the way. The plate to be flanged is now placed on the forming-plate, and the foot is now depressed upon the plate till it holds the latter firmly to and concentric with the forming-plate, and is then disengaged from its actuating-worm. The rollers are now adjusted by means of the screw d^2, so that when they are depressed they shall press upon that portion of the metal of the plate to be flanged which is outside of the edge of the present top of the forming-plate C. The head D is now rotated and depressed, the rollers flanging the plate. Frequently this process of outside rolling down of the flange is preferable to the process of inside rolling, heretofore described, as it is less liable to crack or injure the metal. In cases where the material to be operated upon is brittle or friable, the process of outside rolling will be employed.

In putting the flanges upon small holes for flues or tubes, I employ the cage or nozzler shown in Fig. 2, preferably as follows: A square hole is made in the center of the bottom of shaft or foot E′. The cage D is then affixed thereto by inserting the upper end of the shaft of the cage in this square recess in the foot E′. A feather is now placed against shaft E, so as to lock worm-wheel I thereto, and pin e' is removed. Rest F is run down out of the way, and forming-plate C is placed bottom up, as when outside flanging is to be performed. The boiler-plate whose tube-holes have been punched is laid upon the plate C, with the hole to be flanged directly beneath the cage. The forming-rollers D′ are then depressed until they reach and press the plate whose tube-holes are to be flanged firmly against the plate B, thus clamping it in position. The cage D is then depressed, and rotated by causing wheel I to rotate. Entering the tube-hole, the cage steadily and effectively puts a flange thereon. This device will be found a very expeditious mode of flanging those holes in a boiler head which are intended to receive tubes or flues.

Of course, many portions of the above machine may be changed or modified without altering the essential features of my invention.

I do not limit myself to this arrangement of the mechanism for operating the rollers, or foot, or rest, but expect to employ and expect that there will be employed with the other and more important features of my invention various arrangements of mechanism to operate these principal features different from those shown and described herein.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination of the roller or rollers D′, plate C, and foot E′, substantially as and for the purposes specified.

2. The combination of the roller or rollers D′, plate C, and foot E′, and rest F, substantially as and for the purposes set forth.

3. The combination of the plate C, rollers D′, and foot E′, and rest F, shafts E, d^3, Q, worm-wheels I J K, worm-shafts L M N, and gear l m n, substantially as and for the purposes specified.

4. The combination, with the foot and rest, and the rollers, adapted to longitudinal movement, as described, and the forming-plate, of the shafts E, d^3, and Q, and operating mechanism, substantially as and for the purpose described.

RICHARD C. NUGENT.

Attest:

E. GILLIGAN,

W. S. CHRISTOPHER.