(No Model.) 2 Sheets—Sheet 1.

R. H. TWEDDELL, W. BOYD, J. PLATT & J. FIELDING.

FLANGING MACHINE.

No. 307,357. Patented Oct. 28, 1884.

FIG. 1.

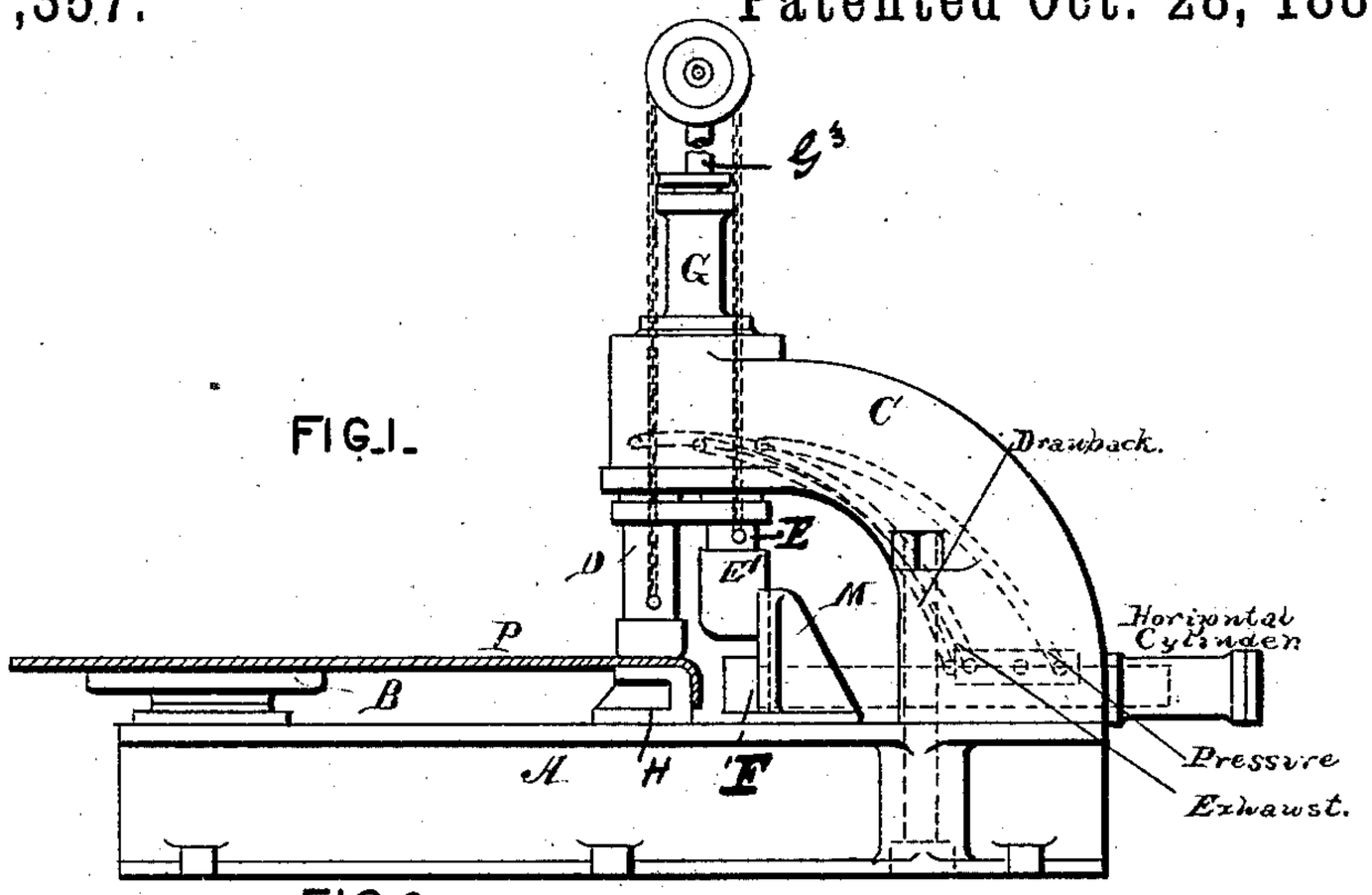


FIG. 2.

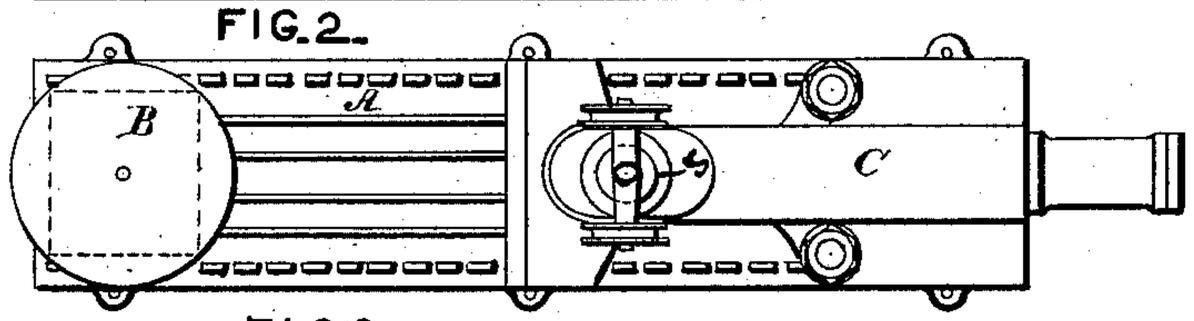


FIG. 3.

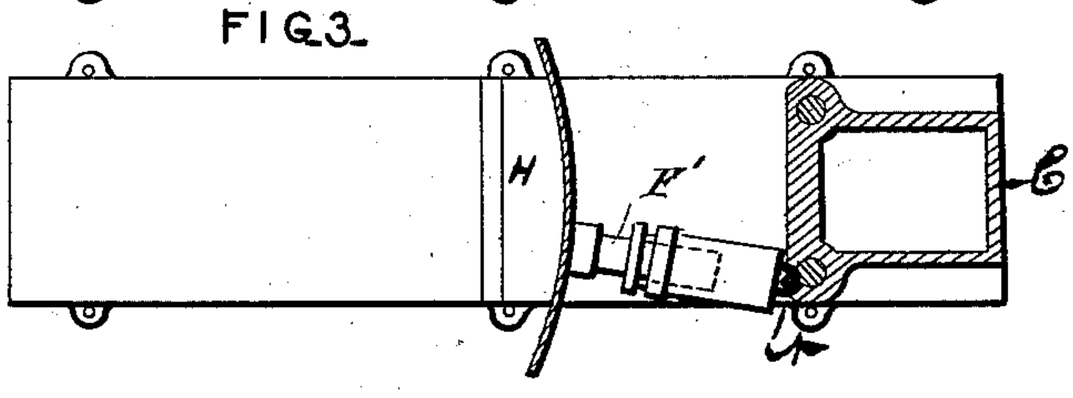
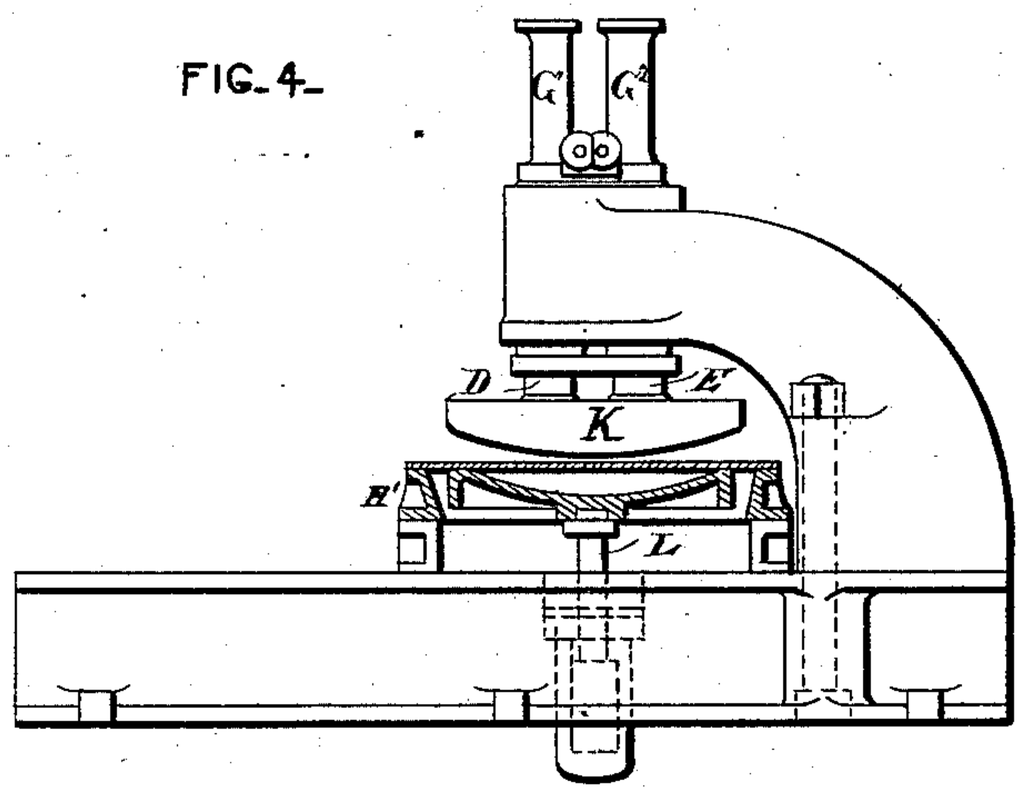


FIG. 4.



WITNESSES

Wm. T. Gill.

Geo. F. Downing.

INVENTOR

R. H. Tweddell

Wm. Boyd

J. Platt

and J. Fielding

By Peabody & Co.

ATTORNEY

(No Model.) 2 Sheets—Sheet 2.

R. H. TWEDDELL, W. BOYD, J. PLATT & J. FIELDING.

FLANGING MACHINE.

No. 307,357. Patented Oct. 28, 1884.

FIG. 5.

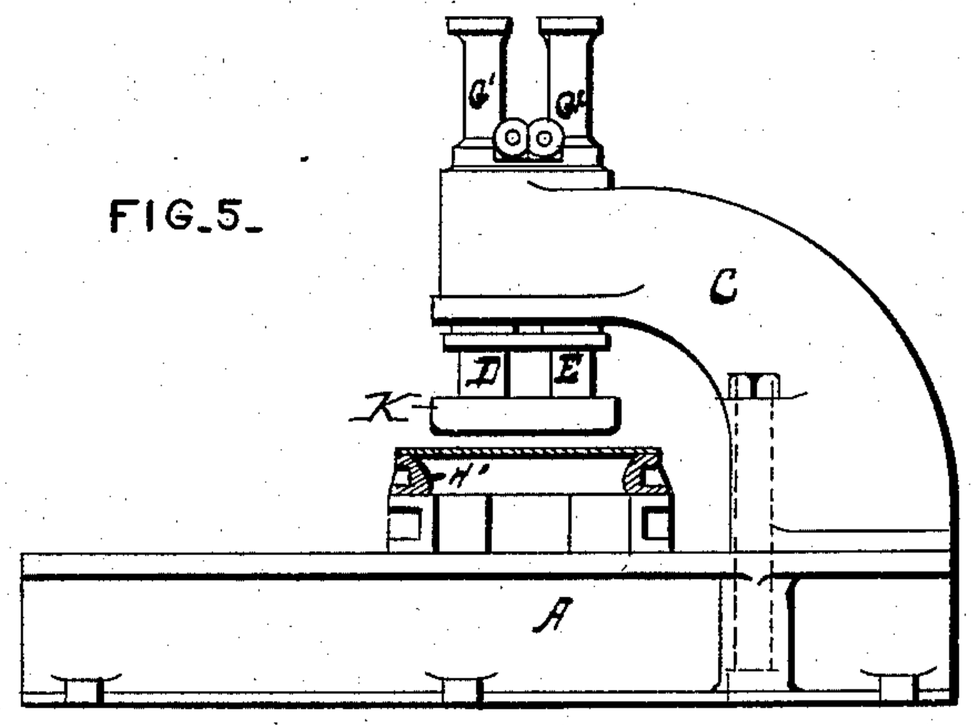


FIG. 6.

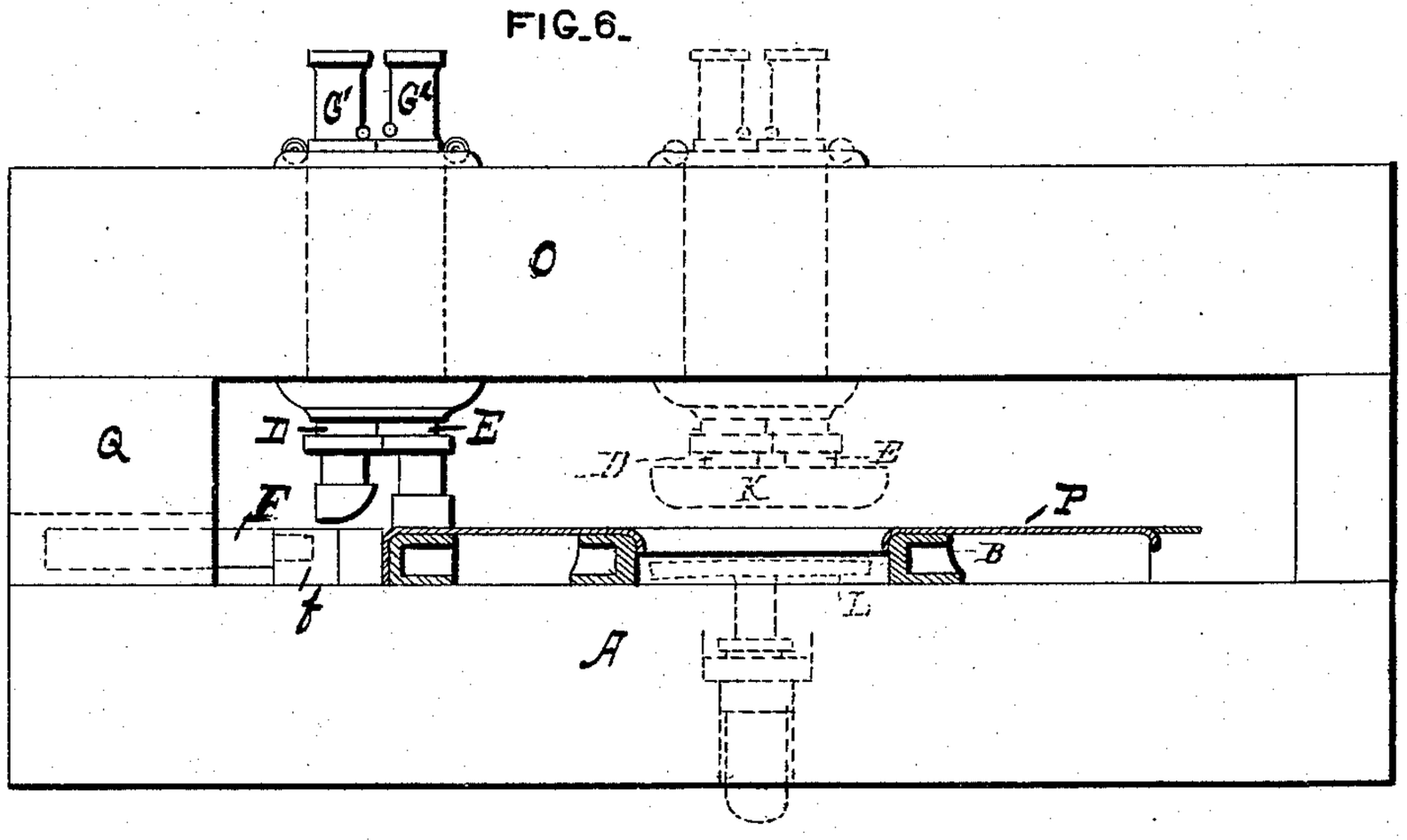
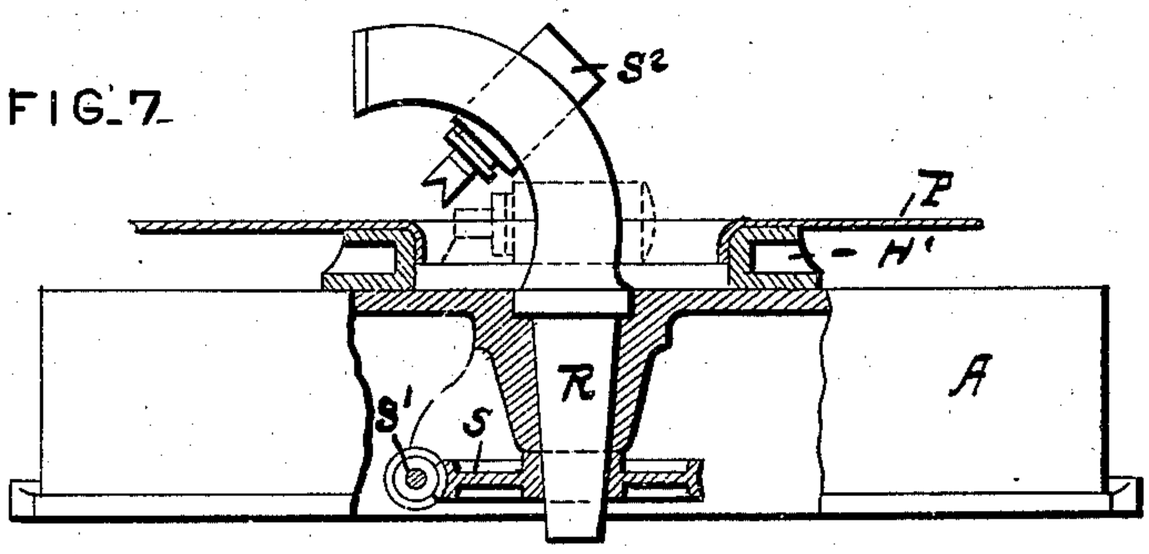


FIG. 7.



WITNESSES

Wm. T. Gilles

Geo. F. Downing

INVENTOR

R. H. Tweddell.

Wm. Boyd.

J. Platt

& J. Fielding

By F. A. Seymour,

ATTORNEY

UNITED STATES PATENT OFFICE.

RALPH HART TWEDDELL, OF WESTMINSTER, COUNTY OF MIDDLESEX, WILLIAM BOYD, OF JESMOND ROAD, NEWCASTLE-ON-TYNE, AND JAMES PLATT AND JOHN FIELDING, OF GLOUCESTER, COUNTY OF GLOUCESTER, ENGLAND.

FLANGING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 307,357, dated October 28, 1884.

Application filed May 23, 1884. (No model.) Patented in England December 30, 1880, No. 5,493; in France July 2, 1881, No. 143,744, and in Belgium July 7, 1881, No. 55,105.

To all whom it may concern:

Be it known that we, RALPH HART TWEDDELL, of Westminster, in the county of Middlesex, and WILLIAM BOYD, of Jesmond Road, Newcastle-on-Tyne, and JAMES PLATT and JOHN FIELDING, of Gloucester, in the county of Gloucester, and country of England, have invented certain new and useful Improvements in Machines for Flanging Boiler and other Plates; and we 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.

Our invention relates to the flanging of plates in successive steps. The tools employed are simple and comparatively small in dimensions, and the hydraulic power, which has to perform only a fraction of the work at a time, is much less than when the whole work is done at once.

In order to illustrate the nature of our invention, we shall suppose that a large circular plate, such as would form the end of a boiler, has to be flanged all round its periphery. For this purpose we lay the plate horizontally on a suitable bed, in one part of which there is fixed a block or die, which is a small segment of what would be the complete circular die-block. Immediately over the anvil there is mounted a hydraulic cylinder, the ram of which being pressed down clamps the plate firmly on the anvil. Another hydraulic cylinder is mounted at the side of the former, and its ram terminates in a bending-tool so shaped that when it descends on the edge of the plate projecting beyond the die and clamping-ram it bends part of that edge down. A third hydraulic cylinder fixed horizontally has its ram provided with a finishing-head, so that when the plate has been bent down and the bending-ram has been withdrawn this finishing-head advances, and, pressing the bent-down part against the side of the die, flattens down such buckles as may have been formed in the bending, and finishes that portion of the flange. The rams being now withdrawn, the plate is turned partly round, so as to present the next portion of its circumference to be operated on in like manner, and thus step by step the whole circumference is flanged. It is of advantage to mount the plate on a turn-table worked by worm or other gearing, so that the plate can be readily moved by degrees round the axis of the turn-table. When the form of the plate is other than circular, it can be slid along the bed to the required position for flanging each portion of its periphery, and the tools may be altered to suit the different forms of these portions.

In order to avoid the necessity for removing the plate for its successive heats, and to economize time and fuel, a furnace may be placed near the flanging-tools, so that there may be a portion of the edge of the plate being heated while the part previously heated is being flanged and when the plate is moved partly round the heated portion may in its turn be brought to the die to be operated on. The hydraulic cylinders may be fixed on framing projecting from the bed beyond the plate. We find it convenient, however, to provide a framing consisting of uprights far enough apart to admit between them the largest plate that is to be flanged and a girder supported by these uprights, and we fit the hydraulic cylinder to slide along this girder, so that it can be set in any required position on it relatively to the center of the turn-table, so as to suit plates of different diameters, the die below the plate being adjusted to a corresponding position. In this manner plates of other than circular form can be readily flanged, as described.

Instead of making the hydraulic cylinders and their die movable, the axis of the turn-table may be moved to suit different forms and sizes of plates, the cylinders and anvil being stationary.

It often happens that a plate has to be flanged internally around a hole to form the mouth of a flue or furnace or around several holes. In many cases these holes being of comparatively small dimensions are most conveniently flanged in the ordinary manner by the use of a single block and die, which form the flange at one effort. For this purpose the same hydraulic cylinder which for external flanging serves to clamp the plate on the anvil, or that which serves to bend down the edge of the plate, or both together, can be employed to work the

die. When, however, it is desired to form an internal flange round a hole in successive portions, the apparatus first described may be employed when the hole is sufficiently large to permit of the plate being passed over the hydraulic cylinders; or, when the hole is of smaller size, we arrange apparatus as follows: From a bed-plate on which is fixed a suitable segmental die a frame projects upward, this frame being sufficiently small to pass through the hole that is to be flanged, so that the plate when heated can be laid upon the bed-plate and die. The frame carries a hydraulic cylinder mounted on trunnions having their bearings fitted in slides, so that the cylinder can be turned to various inclinations and raised or lowered. The cylinder being raised above the plate and having its axis inclined at an angle of forty-five degrees, or thereabout, to the horizontal, its ram is caused to advance against the edge of the plate projecting over the die, and so to bend that edge downward, and the cylinder being thereafter lowered and turned to a horizontal attitude, its ram advancing against the bent-down portion of the plate, presses it against the side of the die, finishing the flanging of that portion. The plate being now turned partly round the axis of the hole, has another portion operated on in like manner. Instead of then turning the plate, the frame of the hydraulic cylinder and the anvil can be mounted on a vertical axis, so as to be turned to act on successive portions of the plate, which in that case remains at rest.

Although we have described the action of the bending and finishing hydraulic tools as if each made only one movement to effect its operation, it is to be understood that by alternately subjecting the rams to pressure and relieving them therefrom they can be made to perform their respective operations by a succession of movements as if they were slow-moving hammers, and in this manner the plate, after being flanged, can be flattened by the movements of the same tools.

Although in what has preceded we have referred to hydraulic pressure as the power employed, it is to be understood that other fluid pressure—such as that of steam or compressed air—might be employed in working apparatus such as we have described.

In the accompanying drawings, Figure 1 is a view in side elevation, and Fig. 2 is a plan, of apparatus constructed according to our invention; and Figs. 3, 4, 5, 6, and 7 show modified forms thereof.

A represents a bed on which is fixed, in any desired position, a turn-table, B, on which is laid the plate P to be flanged. On a frame, C, at the end of the bed are fixed three hydraulic cylinders, having plungers D, E, and F, on the ends of which are fixed suitable tools. The two plungers D and E, working vertically, may be drawn up by means of chains worked by the plunger of a single draw-back cylinder, G, fixed on the top of the frame; or separate cylinders may be employed for that purpose.

For flanging a circular plate, P, the turn-table B and a die, H, are fixed on the bed A and adjusted to the desired radius of the flange. The plungers D, E, and F being withdrawn, the plate, heated at the edge, is placed with its edge projecting beyond the die H. The plunger D is then lowered on the plate, so as to press it firmly on the die, and thereupon the plunger E, which moves in and is held against displacement by the bracket M, and which carries a tool, E′, suitably sloped on its face, descends, bending part of the edge of the plate P over the die H. The plunger E being now raised, the horizontal plunger F is advanced so as to press the bent-down part of the plate against the face of the die H. The plungers being again withdrawn, the plate P is turned partly round, so as to present a fresh portion of its edge, which is similarly operated on.

Instead of arranging the plunger F in line with the plungers D and E, as shown in Figs. 1 and 2, it may be arranged to work obliquely at the side, as shown at F′ in the plan, Fig, 3. In this case it is not necessary to withdraw either of the plungers E or F in order to permit the advance of the other. When a straight-edged plate has to be flanged, there may be fixed on the bed A a slide (not shown) having a lateral traverse instead of the turn-plate B, or when the edge of the plate has a curvature other than circular the plate may, by the combined movements of the turn-table and the lateral slide, be caused to traverse in the desired direction, and in case of variation of curvature the die H may be provided with removable facings, which may be changed from time to time.

In Figs. 4 and 5 we have shown a machine adapted particularly for internal flanging. In these machines the solid die shown in Fig. 1 is removed and the hollow or open dies H′ employed in their stead, and the two plungers D and E, instead of being provided with independent tools, are connected to the block or head K. The plate to be flanged may, if required, be held up by a plunger, L, (shown in Fig. 4,) exerting less pressure than the two combined plungers D and E. These plungers D and E, together with the block or head K, connected thereto, can be drawn up by two cylinders, G′ and G², instead of one cylinder, as previously described. When the arrangement of the plunger F′ and its cylinder is as shown in Fig. 3, this cylinder may be turned aside, working on the bolt N as a center, in which case it is necessary to remove only the die H and guide M.

Fig. 6 shows a modified arrangement of the machine, the hydraulic cylinders being in this case fixed on a carriage which can be moved along a strong girder, O, connected to the bed A by uprights Q Q.

The turn-table B of Fig. 6 may be made hollow, so that it can be used to receive the die

for an inwardly-flanged plate, the flanging block K being worked by the two plungers D and E combined, as indicated by the dotted lines, a holding-up plunger, L, being employed, if required.

To suit various diameters of externally-flanged plates, the cylinders of D and E are moved along the girder O, and the plunger F is fitted with suitable lengthening-pieces, as *f*.

Fig. 7 is a side view of apparatus according to our invention for internal flanging round a hole in a plate. In this case on a bed, A, is fixed a circular die, H′, of the size required. In the center is mounted a vertical axis, R, which can be turned round by worm-gearing or other suitable gearing, S S′. The upper part of this axis is curved to a circular arc, forming a guide, on which the hydraulic cylinder S^2 can slide. The plate P being fixed on the die with the edge of its hole projecting inwardly, the cylinder S^2 is set at the higher part of the arc, and its plunger then being advanced against the edge of the plate bends it downward. The axis R being turned, the plunger of cylinder S^2 makes a series of strokes, so as to bend the edge of the plate all round. The cylinder S^2 is then lowered a little, and its plunger makes another series of strokes while the axis R is turned, and thus the edge of the plate is gradually bent downward until, when cylinder S^2 arrives at its lowest position, the flange is finished.

Having fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination of a die, a plunger for holding the plate on the die, a plunger for bending the edge of the metal, and a third plunger for forcing the bent edge over against the die, substantially as set forth.

2. The combination of a die, a plunger for holding the plate on the die, a plunger for bending or turning the edge of the plate, and a separate and independent plunger arranged at right angles to the other two plungers for forcing the bent edge of the plate against the die, substantially as set forth.

3. The combination of a die, a hydraulic plunger for holding the plate on the die, a hydraulic plunger for turning the edge of the metal plate, and a plunger or plungers for lifting both plungers, substantially as set forth.

4. The combination of a die, a hydraulic plunger for holding the metal plate on the die, a hydraulic plunger for bending the edge of the plate, a plunger or piston for elevating the holding and bending plungers, and a horizontal plunger for forcing the bent edge of the metal plate against the anvil, substantially as set forth.

5. The combination of a stationary die, a vertically-movable plunger for holding the plate on the die, a vertically-movable bending plunger provided with a beveled edge, and the bracket M, for guiding the bending plunger and for holding it against lateral displacement, substantially as set forth.

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

RALPH HART TWEDDELL.

Witnesses:
H. G. SCOTT,
WM. BAILEY.

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

WILLIAM BOYD.

Witnesses:
ROBERT G. IRVING,
JOHN P. BLENKINSOP.

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

JAMES PLATT.
JOHN FIELDING.

Witnesses:
JOHN A. POPE,
H. CADENNE.