(No Model.) 5 Sheets—Sheet 1.

J. CARROLL.

MACHINE FOR FLANGING SHEET METAL.

No. 519,527. Patented May 8, 1894.

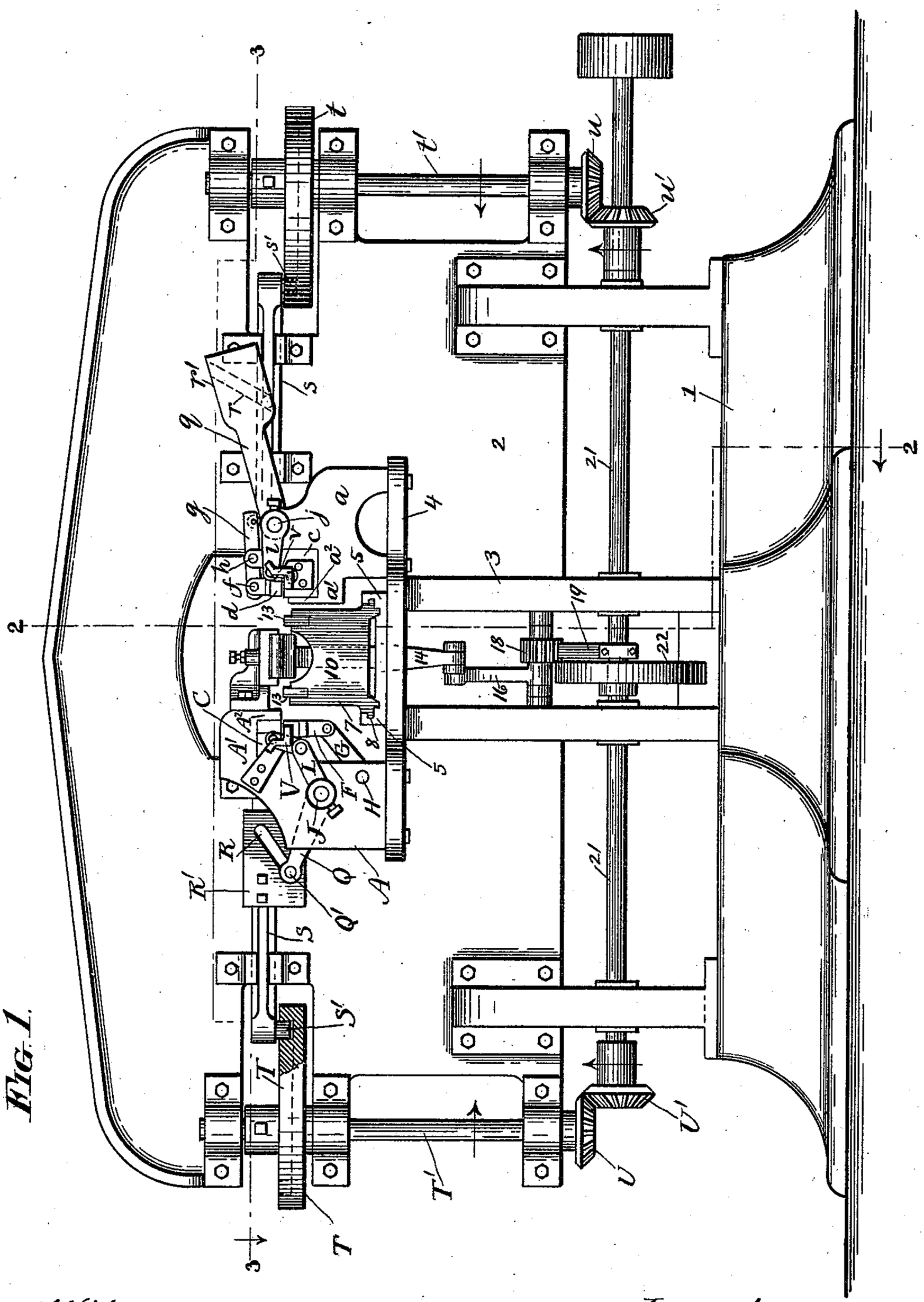


Fig. 1.

Witnesses:
J. Halpenny
W. D. Cross

Inventor:
John Carroll
By his Attorneys
Bridley & Hopkins

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

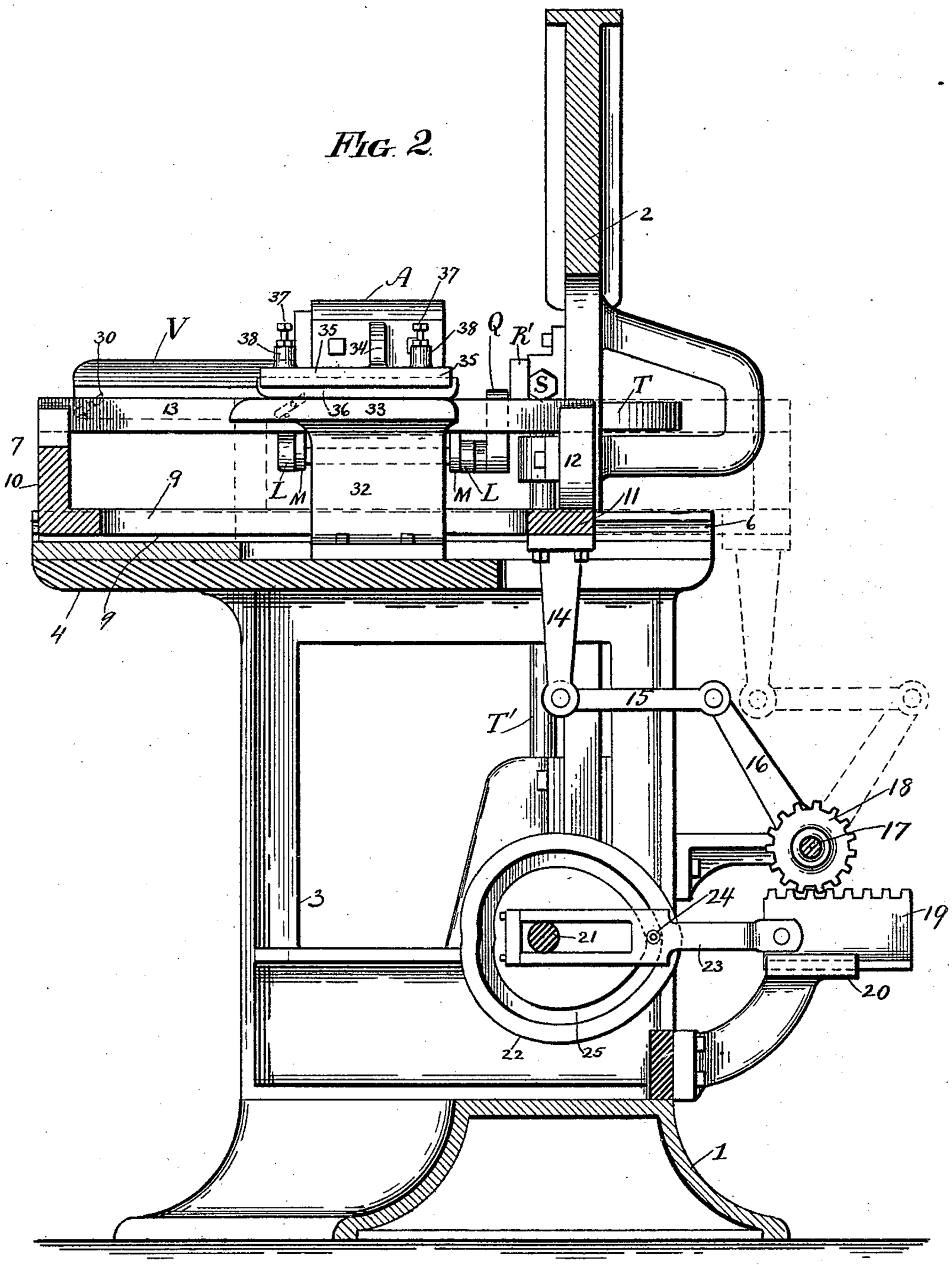
(No Model.) 5 Sheets—Sheet 2.

J. CARROLL.

MACHINE FOR FLANGING SHEET METAL.

No. 519,527. Patented May 8, 1894.

Fig. 2.



Witnesses:
J. Halpenny
W. D. Crow

Inventor:
John Carroll
By his attorneys
Gially & Hopkins

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

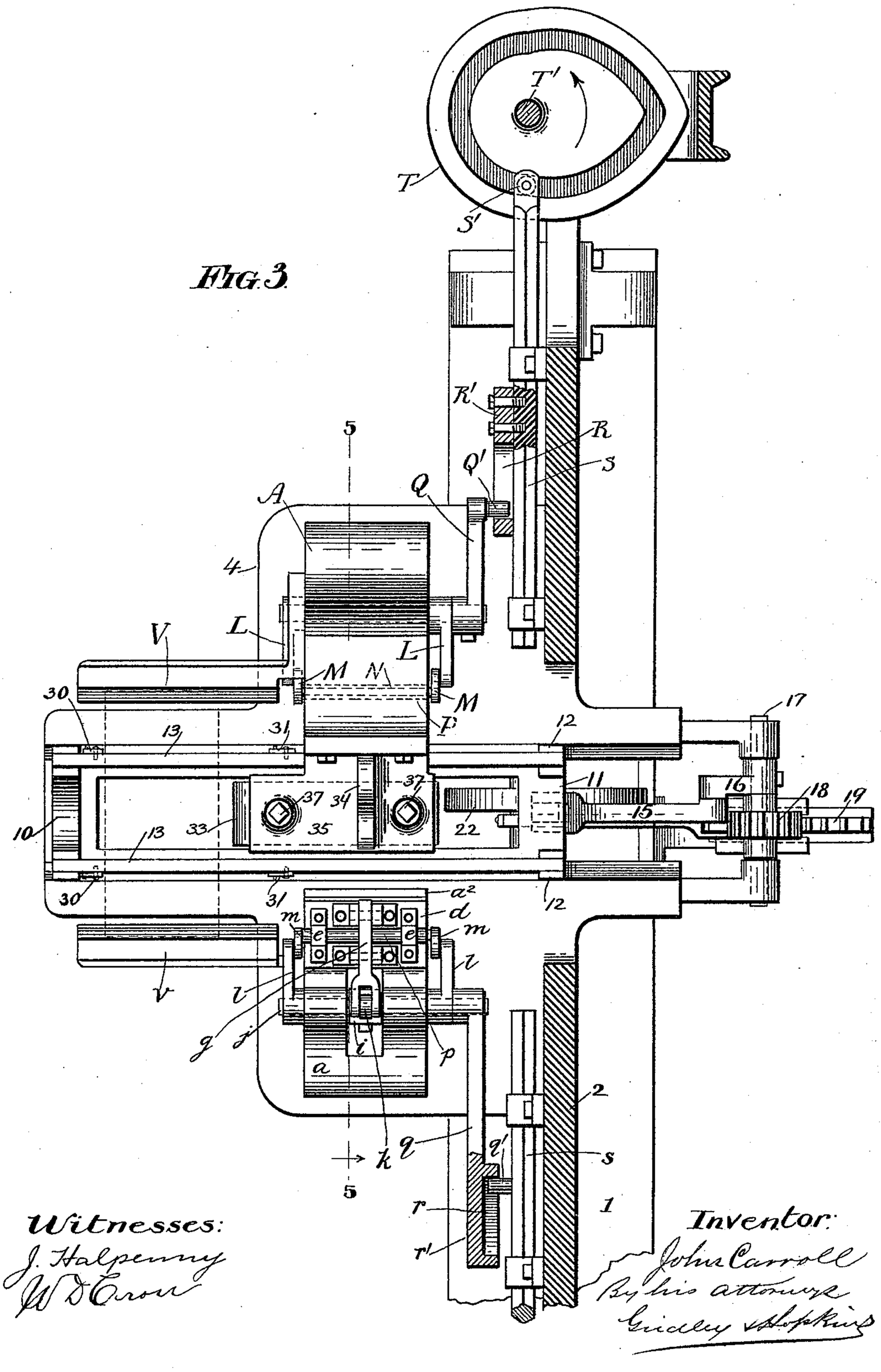
(No Model.) 5 Sheets—Sheet 3.

J. CARROLL.

MACHINE FOR FLANGING SHEET METAL.

No. 519,527. Patented May 8, 1894.

FIG. 3.



Witnesses:
J. Halpenny
W. D. Crow

Inventor:
John Carroll
By his attorneys
Gridley & Hopkins

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 5 Sheets—Sheet 4.

J. CARROLL.

MACHINE FOR FLANGING SHEET METAL.

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FIG. 4

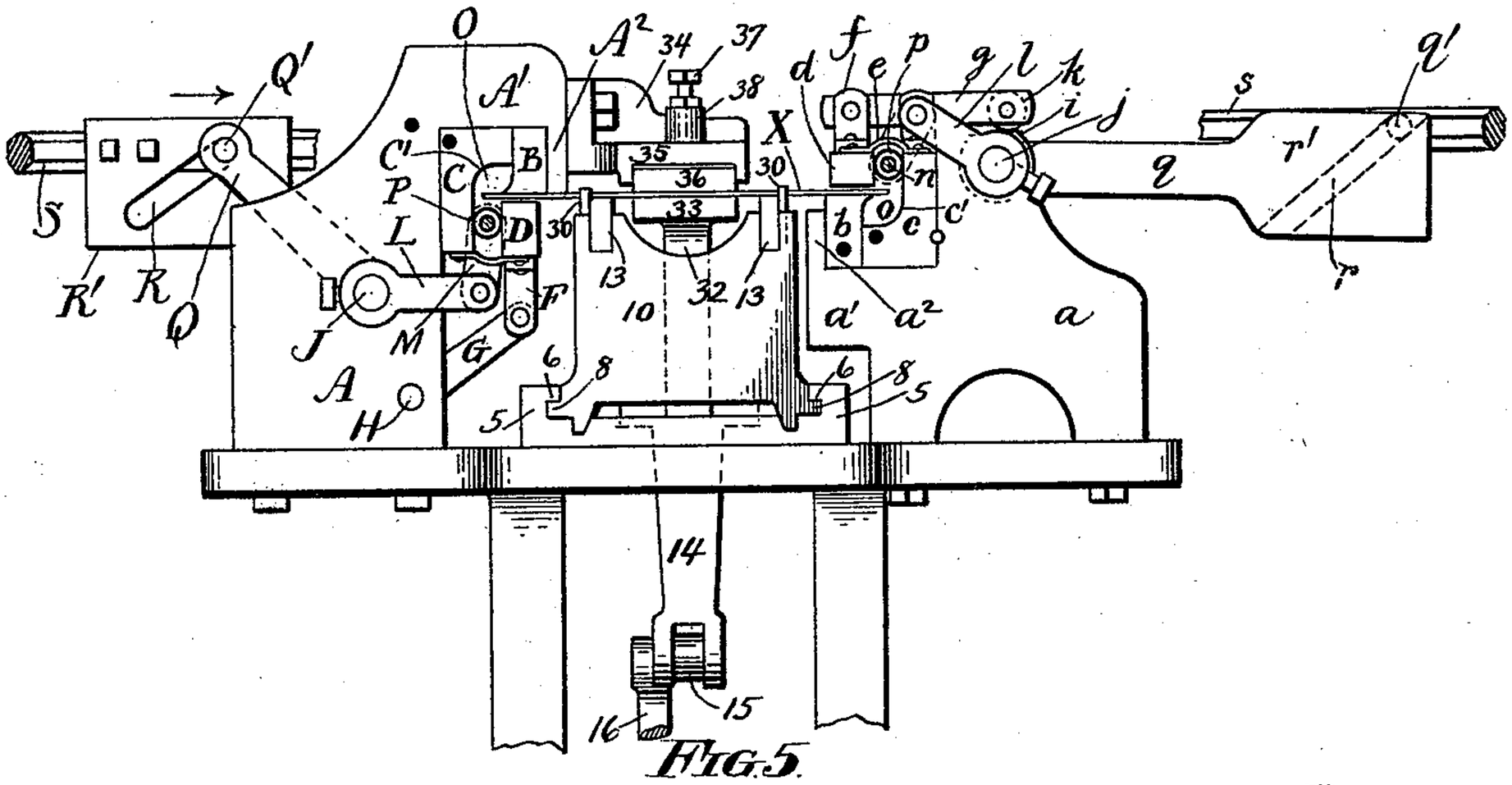
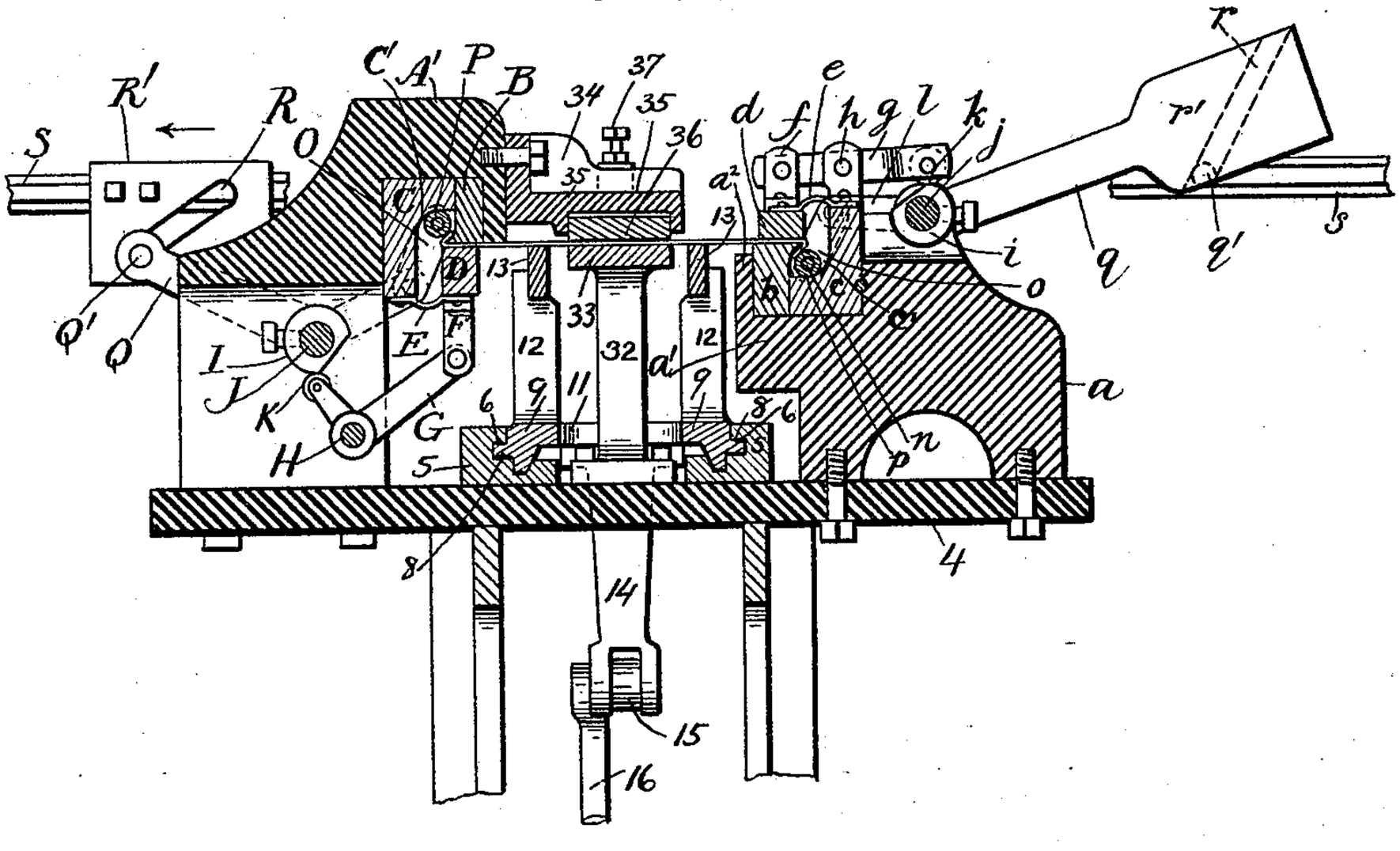


FIG. 5.



Witnesses:
J. Halpenny
W D Orow

Inventor:
John Carroll
By his Attorneys
Bailey & Hopkins

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.) 5 Sheets—Sheet 5.

J. CARROLL.

MACHINE FOR FLANGING SHEET METAL.

No. 519,527. Patented May 8, 1894.

FIG. 6.

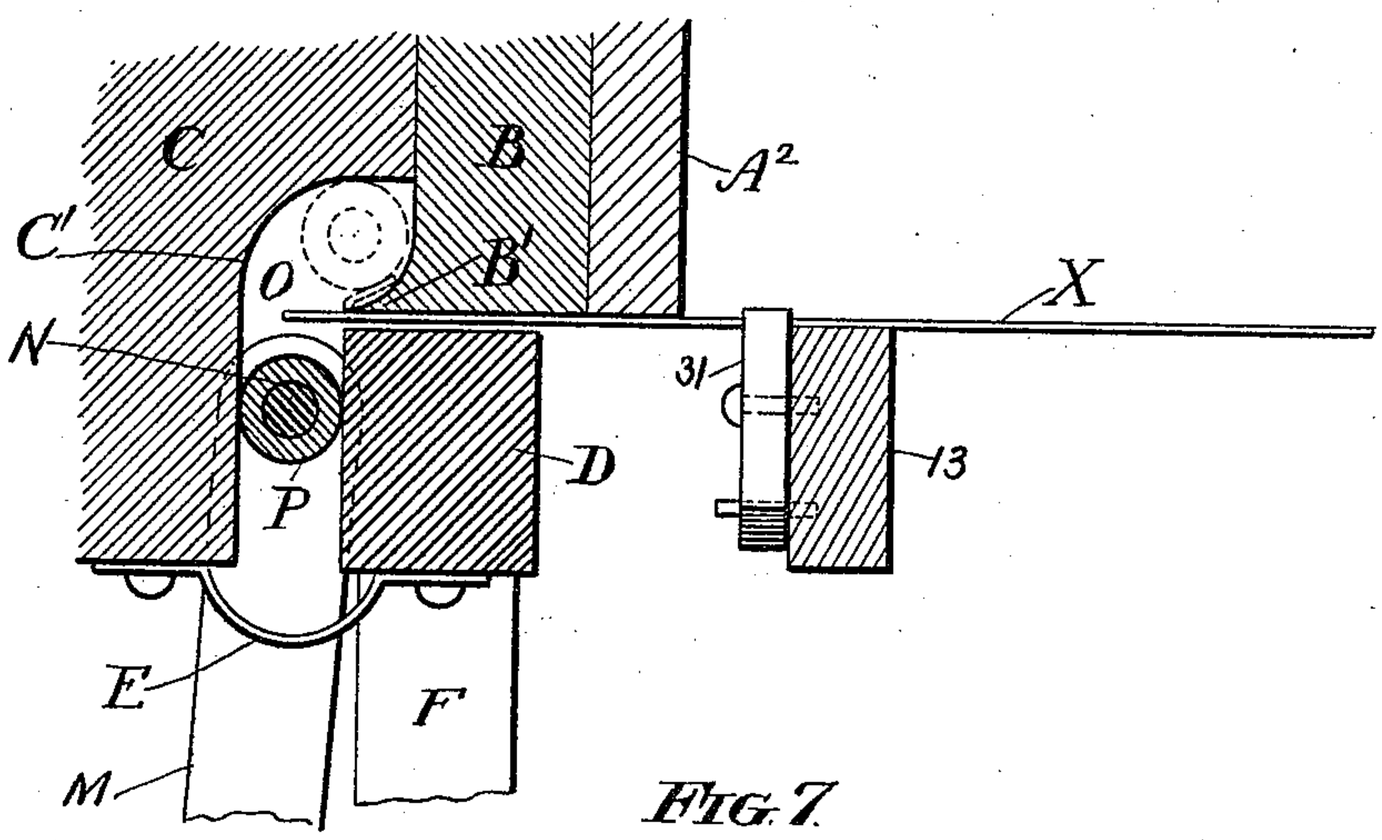


FIG. 7.

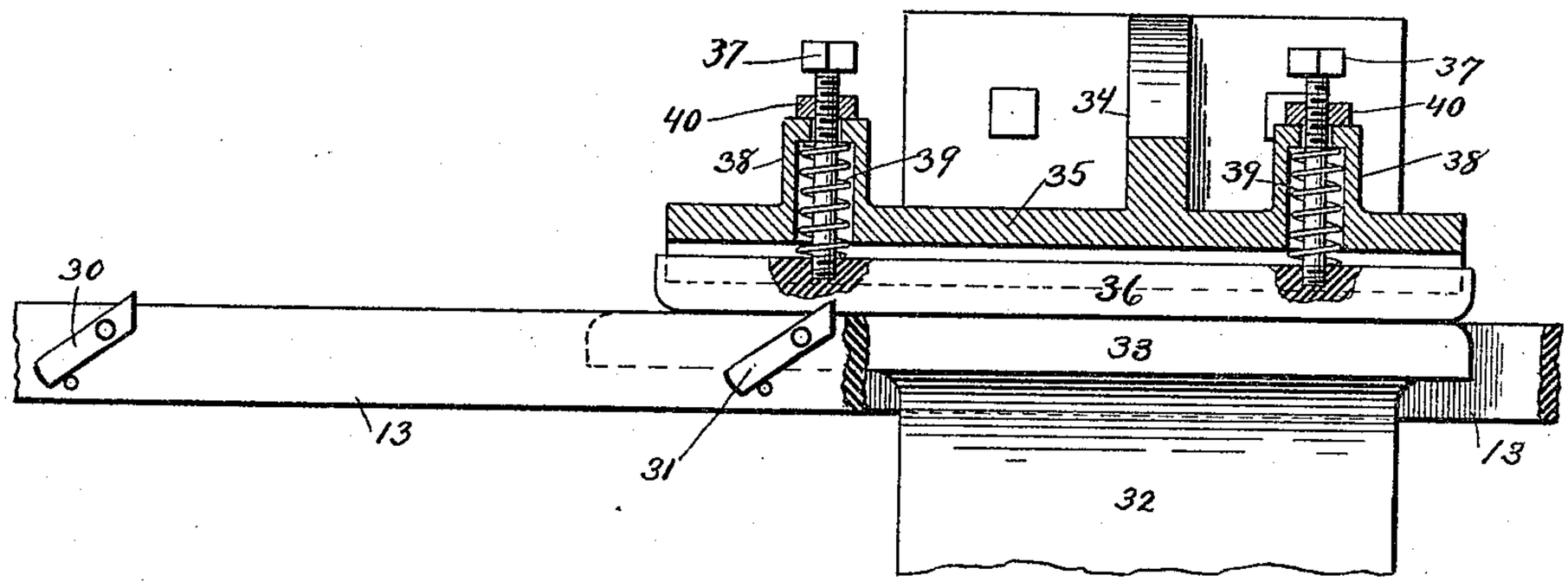
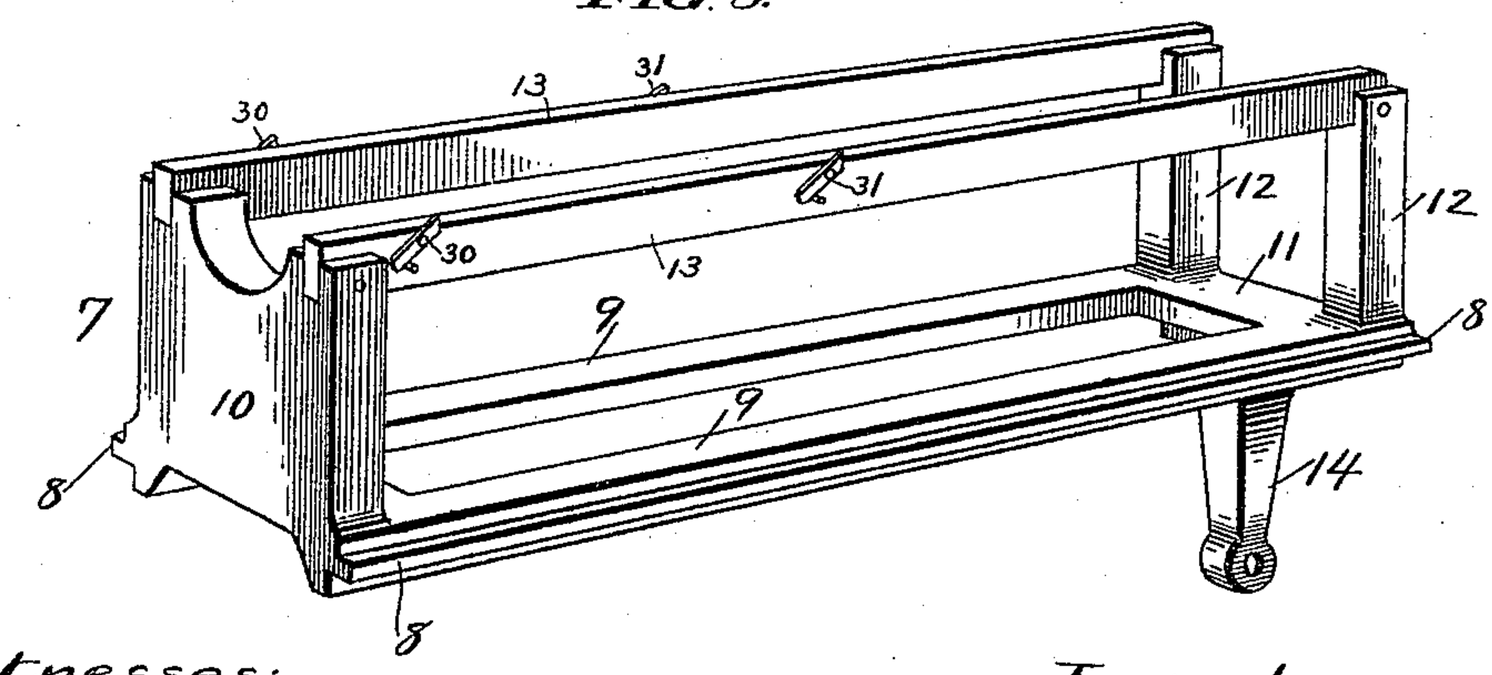


FIG. 8.



Witnesses:
J. Halpenny.
W. D. Crow

Inventor:
John Carroll
By his Attorneys
Bradley & Hopkins

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN CARROLL, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE CHICAGO STAMPING COMPANY, OF SAME PLACE.

MACHINE FOR FLANGING SHEET METAL.

SPECIFICATION forming part of Letters Patent No. 519,527, dated May 8, 1894.

Application filed November 13, 1893. Serial No. 490,779. (No model.)

To all whom it may concern:

Be it known that I, JOHN CARROLL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Machines for Flanging Sheet Metal, of which the following is a specification, reference being had to the accompanying drawings, which are made a part hereof, and in which—

Figure 1 is a front elevation of a machine embodying the invention. Fig. 2 is a vertical longitudinal section thereof on the line 2—2, Fig. 1. Fig. 3 is a horizontal section of a portion thereof on the line 3—3, Fig. 1. Fig. 4 is a front elevation of the principal working parts of the machine. Fig. 5 is a vertical transverse section thereof on the line 5—5, Fig. 3. Figs. 2 to 5 inclusive are drawn to a common scale, which is somewhat larger than the scale of Fig. 1. Figs. 6 and 7 are sections, on a still larger scale, of a portion of the bending mechanism and the friction clamp, respectively. Fig. 8 is a perspective view of the carriage.

The present invention consists in certain features of novelty that are particularly pointed out in the claims hereinafter, and the said features of novelty may be embodied in machines differing in construction from the one shown in the drawings. The one shown is designed particularly for flanging the margins of blanks used for forming the bodies of cans and similar sheet-metal vessels, and said machine is therefore provided with features that are necessary in order to give the blank those characteristics that must be present in blanks for this purpose. At a single operation the machine shown in the drawings flanges two opposite edges of the blank, turning the flanges toward opposite faces of the blank and bending them well back over the body of the blank, so that when the blank is bent into a cylinder the flanges will interlock with each other, in the manner required for forming a lock seam. I desire to have it understood, however, that this is merely illustrative, and that without departing from the spirit of my invention the features of the machine which determine the number and characteristics of the flanges may be changed. That is to say, the invention is not limited to a machine for forming any particular number of flanges on a blank, or to a machine for giving the flanges any particular direction, or shape, or angle with relation to the body of the blank.

The frame of the machine is of course constructed simply with a view to sustaining the various working parts, and the present invention is not concerned with the frame further than to require that it be sufficient for its purpose. As shown in the drawings, it comprises a heavy base 1, from which rises a heavy plate 2, occupying a vertical plane, and a hollow column or pedestal 3 surmounted by a table 4. To the top of the table are secured parallel tracks or guideways 5 having undercut grooves 6, and upon these tracks rests a reciprocable carriage 7 having tongues 8 that occupy said grooves and confine the carriage against lateral displacement, while permitting it to move freely endwise.

The carriage may be of any suitable construction, but that shown in the drawings is preferred because it is simple and gives satisfactory results. It consists of two base rails 9 united at their front ends by a plate 10 which rises above them, and at their rear ends by a cross bar 11, two posts 12 rising from the base rails near their rear ends, and two top rails 13 each of which is secured at its rear end to one of the posts, and at its front end to the plate 10. From the under side of the carriage a rigid arm 14 projects downward, and to the lower end of this arm is connected one end of a link 15, the other end of which is connected to the outer end of an arm 16 which is rigidly attached to a rock shaft 17 that is journaled in suitable bearings supported by the frame, or by arms projecting from it. To this shaft is secured a pinion 18 meshing with a rack 19, which is so mounted in a bearing 20 that it is confined against lateral movement while being permitted to move freely endwise. This rack derives its motion from the main shaft 21 through the medium of a cam 22 secured thereto and an arm 23 which is rigidly connected with the rack, and to which is journaled an anti-friction roller 24 fitting in the groove 25 of the cam. This cam is so shaped that at each complete revo-

lution it causes the rack to make a complete stroke in each direction, resulting in corresponding movements of the carriage. I desire to have it understood that the invention is not limited to this or any other particular means for operating the carriage.

Secured to the top of the table, at one side of the carriage, is a heavy block A, whose office is to support and afford bearings for the parts that clamp and bend one edge of the blank. It is provided with a horizontal portion A′ and a portion A^2 depending therefrom, resulting in a recess in which are placed and secured blocks B and C. The block B terminates at its lower edge a trifle above the horizontal plane of the top side of the carriage, so that a piece of sheet-metal, X, resting upon the carriage will pass beneath the block when the carriage is making its forward stroke. This block B constitutes both the fixed jaw of the clamp for holding the sheet while it is being bent, and the anvil or former over which the sheet is bent, and in order that it may perform this latter function it is provided on its inner and lower edge with a lip B′. The angle which the inner side of this block forms with its bottom side determines the angle which the flange forms with the main body portion of the blank, so that by varying the shape of this portion of the block (and by moving the bender in the proper direction, as hereinatter described) the character of the flange may be correspondingly varied.

The movable jaw of the clamp is shown at D, and consists simply of a block of metal which is sustained in its proper position by means of a plate spring E which is secured at its respective ends to the blocks C and D. From the under side of the jaw D projects a rigid arm F to which is jointed one end of a bell-crank lever G which is fulcrumed upon a shaft H supported by the block A. The block A is recessed for the accommodation of this lever, and for the accommodation of a cam I, which is fixed to a rock-shaft J and engages an anti-friction roller K carried by the lever. The cam and other parts are so constructed and arranged with relation to each other that the jaw D is moved either toward or from the jaw B, accordingly as the shaft J is turned in one direction or the other. To the portions of the shaft J that project beyond the ends of the block A are attached a pair of arms L, to the outer ends of which are loosely jointed a pair of links M, and the free ends of said links are connected by a rod N that extends through a space O left between the block C and the blocks B and D. Upon the rod is a loose sleeve P, which is of such diameter that it extends nearly from side to side of the space O. The initial positions of the parts last described are shown in Figs. 4 and 6, and when the shaft J is rocked or partially rotated, either by the mechanism hereinafter described or by any other suitable mechanism that may be substituted therefor, the operations of said parts are as follows: The cam I, operating upon the anti-friction roller K of the bell-crank lever G, moves said lever upon its fulcrum, and thereby moves the jaw D toward jaw B far enough to firmly clamp the sheet between them. During this movement the bender (which is shown in the drawings as consisting of rod N and sleeve P, but which may be of other suitable construction) is of course moving, but the movable jaw of the clamp completes its movement before the bender comes into contact with the sheet which is projecting into and partly across the space O. An instant after the sheet has been clamped the bender comes into contact with the aforesaid projecting portion of the sheet, and the continued movement of the rock-shaft carries the bender into the position shown by full lines in Fig. 5, and indicated by dotted lines in Fig. 6, bending the edge of the sheet over the lip or former B′. In order to compel the bender to move in the direction in which it must move in so bending the sheet, I provide the block C with an appropriately curved surface C′ which constitutes, in effect, a track or race which engages the bender and directs its movement. As soon as the parts have arrived at positions shown in Fig. 5 the movement of the rock-shaft is reversed, and the parts are moved in an order the reverse of that just described back to their initial positions.

I desire to have it understood that the present invention in its broadest aspect is not limited to any particular construction of the mechanism for imparting movement to the rock-shaft. The mechanism shown in the drawings is simple and has been found effective. It consists of a lever Q fixedly attached to the projecting end of the rock-shaft and carrying at its outer end a stud or pin Q′ occupying a diagonal slot R formed in a plate R′ that is carried by a rod S which is attached to the frame of the machine in such manner that it is capable of endwise reciprocation. The rod is provided with an anti-friction roller S′ that occupies the groove of a cam T which is secured to a vertical shaft T′ carrying at its lower end a beveled gear wheel U that meshes with a corresponding wheel U′ carried by the main shaft 21 of the machine. It will be understood that the metal forming the opposite margins of the slot R constitutes, in effect, cams one or the other of which engages the stud Q′ and moves it from the position shown in Fig. 4 to the position shown in Fig. 5, or vice versa, according to the direction of the movement of the rod S.

Thus far I have described mechanism for flanging only one edge of the sheet. Where both edges are to be flanged simultaneously, suitable mechanism must be located upon both sides of the carriage. Where the flanges are both to be presented toward the same side of the sheet, it is simply necessary to duplicate, in every particular, the parts above de-

scribed and lettered A to U′, inclusive, locating one set of parts upon each side of the carriage. Where the flanges are to be presented toward opposite surfaces of the sheet, as shown in Fig. 5, a slight modification in the construction of some of the parts is necessary in order that the benders may move in opposite directions during the operation of bending. The parts *a*, *a′*, *a²*, *b*, *c*, *c′*, *d*, *e*, *f*, *g*, *h*, *i*, *j*, *k*, *l*, *m*, *n*, *o*, *p* and *q* are similar in construction and operation to the parts above described bearing similar capital letters, the only differences between the two sets of mechanism being such differences in location and shape of the parts as are necessary in order to cause the benders to move in opposite directions. The lever *q* derives its movement from a rod *s* through the medium of a slot *r* and pin *q′*, but in this instance the pin is carried by the rod, and the slot is formed in a plate *r′* carried by the lever. The rod *s* derives its motion from the main shaft 21 through the medium of beveled gear wheels *u*, *u′*, shaft *t′*, cam *t*, and anti-friction roller *s′*. It will be understood of course that the cams T and *t* are so located with relation to each other that they move the rods S and *s* simultaneously, but in opposite directions, and they are so constructed that during the period of one-half of each revolution of the main shaft they permit the rods (and, of course, the parts that derive their movement from said rods) to remain at rest. This period of rest corresponds in point of time with the period during which the cam 22, and intervening mechanism, is causing the carriage to move forward, or from the position shown by full lines in Fig. 2 to the position indicated by dotted lines. As soon as the carriage reaches this dotted position the cams T, *t* begin their operation of moving the parts from the positions shown in Figs. 4 and 6 to the positions shown in Figs. 1, 3, and 5, and back again from this latter to the former position, the entire work of said cams T and *t* being completed during the time that the carriage is being moved from the position indicated by dotted lines to the position shown by full lines in Fig. 2.

V and *v* are arms bolted to the blocks A and *a*, respectively, so as to project parallel with the top rails 13 of the carriage. These arms are of L-shape in cross-section, and are so located that their horizontal flanges occupy the same plane as does the top side of the carriage, and their vertical flanges are of sufficient distance apart to form guides for the edges of the sheet to be bent.

In operation the sheet is placed between the vertical flanges of these arms and rests upon their horizontal flanges and upon the top side of the carriage, as indicated more clearly in Fig. 3. The carriage is provided with dogs 30 pivoted to the top rails 13, and so located that they project a short distance above said rails and engage the rear edges of the sheet so as to compel it to advance, with the carriage, to the proper position to be acted upon by the bending mechanism. The carriage is also provided with dogs 31, pivoted to the top rails 13, and so located that when the carriage is in its retracted position, as shown in Fig. 3, they will be in position to engage the rear edges of the sheet which was advanced by the previous forward movement of the carriage, and which has in the meantime been flanged, so that when the carriage is again advanced from the position shown by full lines in Figs. 2 and 3 to the position indicated by dotted lines in Fig. 2, the dogs 31 will engage the flanged sheet and move it from its position between the clamping jaws B—D, *b*—*d*, ejecting it at the rear end of the machine. Thus, it will be seen, at each forward movement of the carriage the flanged sheet is ejected and a new sheet is placed in position to be flanged. The dogs 31 are so pivoted that during the backward movement of the carriage their top sides are engaged by the sheet that is in position to be flanged, and are by such engagement depressed in order that they may pass the sheet without hinderance.

32 is a standard rising from the table 4, and surmounted by a flat table or plate 33, the top side of which is flush with the top side of the carriage. 34 is an arm bolted to and projecting from the block A and provided with a plate 35 recessed in its under side for the reception of a plate 36, into which are tapped screws 37 which pass loosely through hollow bosses 38 formed upon the top side of the plate 35. 39 are coiled springs located within the bosses and bearing upward against them and downward against the plate 36, and 40 are nuts turned onto the bolts 37 and engaging the upper ends of the bosses for limiting the movement of the plate 36 toward the plate 33. These parts form a friction clamp whose jaws 33 and 36 are held closed by a yielding force, and whose office is to prevent the sheet from being carried back by the return movement of the carriage. They also serve as means for supporting the central portion of the plate and preventing it from bending or buckling while it is being acted upon by the flanging mechanism.

I have shown my invention embodied in a machine which simply flanges the sheet, but I desire to have it understood that it may be associated with mechanism for carrying out other steps in the manufacture of the article. For example, in machines for manufacturing tin cans and similar articles it is a common expedient to embody in one machine mechanism for flanging the edges of the blank, other mechanism for bending the blank into a cylinder and at the same time interlocking its flanges, and still other mechanism for "bumping" it, or, in other words, mashing down the flanges to form the seam.

My present invention is confined wholly to the flanging mechanism, and therefore I have not shown any mechanism for carrying out

later steps in the process, but as above intimated, it may be associated in one machine with other mechanism for carrying out other steps in the manufacture of the article.

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

1. In a machine for flanging sheet-metal, the combination of means for holding the sheet, a former, a fixed race located opposite the working face of the former so as to leave between them a space into which the sheet to be bent projects, a laterally movable bender located in said space and filling it save for a sufficient space to accommodate the sheet to be bent, and means for producing a continuous movement of the bender which completes the bending operation, the race having a working face which follows a course that first crosses the plane of the sheet and then proceeds around the former and toward the sheet, the working face of the race and the bender having direct contact with each other whereby the movement of the bender is directed, substantially as set forth.

2. In a machine for flanging sheet-metal, the combination of means for holding the sheet, a former, a fixed race located opposite the working face of the former so as to leave between them a space into which the sheet to be bent projects, a laterally movable bender located in said space and filling it save for a sufficient space to accommodate the sheet to be bent, said bender being round in cross section and capable of revolving, and means for producing a continuous movement of the bender which completes the bending operation, the race having a working face which follows a course which first crosses the plane of the sheet and then proceeds around the former and toward the sheet, the working faces of the race and bender being in direct contact with each other whereby the movement of the bender is directed, substantially as set forth.

3. In a machine for flanging sheet-metal, the combination with means for holding the sheet, of a laterally movable bender, a pair of links by which said bender is carried, a pair of arms to which said links are loosely jointed, a rock-shaft to which said arms are attached, means for moving said rock-shaft, and a fixed race with which the bender has direct contact and by which its movement is directed substantially as set forth.

4. In a machine for flanging sheet-metal, the combination with a bender, of the clamping jaws B and D, the spring E engaging the jaw D, whereby it is supported, guided and held normally out of contact with the jaw B, and means for moving the jaw D toward and from the jaw B, substantially as set forth.

5. In a machine for flanging sheet-metal, the combination with the block A, the fixed clamping jaw B and the race C′, of the movable clamping jaw D, means for operating said jaw, the rock-shaft J journaled in the block A, the arms L carried by said rock-shaft, the links M carried by the arms, and a bender carried by the links and adapted to work in the space between the clamping jaws and the race, substantially as set forth.

6. In a machine for flanging sheet-metal, the combination with the block A, the fixed clamping jaw B and the race C′, of the movable clamping jaw D, a lever connected to said movable jaw, the rock-shaft J journaled in the block, the cam I fixed to the rock-shaft and engaging the lever, the arms L attached to the rock-shaft, the links M carried by the arms, and a bender carried by the links and occupying the space between the clamping jaws and the race, substantially as set forth.

7. In a machine for flanging sheet-metal, the combination of two sets of clamping jaws, each set being adapted to clamp the sheet near one of its edges, means for operating said jaws, and flanging mechanism adapted to operate upon the edges of the sheet, of a third set of clamping jaws located between the two sets aforesaid and adapted to hold the central portion of the sheet against bending, and means for operating the third set of clamping jaws independently of the others, substantially as set forth.

8. In a machine for working sheet-metal, the combination with mechanism for simultaneously operating upon opposite edges of the sheet, of the plates 33 and 36 adapted to engage the intermediate portion of the sheet and prevent its bending, and springs holding said plates normally in contact with each other substantially as set forth.

9. In a machine for working sheet-metal, the combination with mechanism for operating upon the sheet and a reciprocable carriage adapted to carry the sheet into position to be operated upon, of a pair of clamping jaws for engaging the intermediate portion of the sheet, and means for holding said jaws normally in contact with each other with a yielding pressure, substantially as set forth.

10. In a machine for working sheet-metal, the combination with a reciprocable carriage, of the plate 33, the plate 35, the plate 36 interposed between plates 33 and 35, springs interposed between the plates 35 and 36, and means for preventing the displacement of the plate 36, substantially as set forth.

11. In a machine for working sheet-metal, the combination with the reciprocable carriage, of the plate 33, the plate 35 having hollow bosses 38, the plate 36 interposed between the plates 33 and 35, springs 39 located within said bosses and engaging the plate 36, and the bolts 37 passing through said bosses and engaging the plate 36, substantially as set forth.

12. In a machine for working sheet-metal, the combination with a reciprocable carriage of the plate 33, the plate 35, the plate 36 interposed between the plates 33 and 35, springs engaging the plate 36 and forcing it toward

the plate 33, and means for limiting the approach of said plates, substantially as set forth.

13. In a machine for working sheet-metal, the combination with the mechanism for operating upon the sheets, of two sets of clamping jaws B—D, *b*—*d*, a reciprocable carriage located between the two pairs of jaws and having the bars 13, and a friction clamp located between the bars 13, and adapted to engage and hold the sheet while being operated upon substantially as set forth.

14. In a machine for working sheet-metal, the combination with a reciprocable carriage, of a rock-shaft 17, connections between said shaft and the carriage, a pinion secured to said shaft, a rack engaging said pinion, and means for imparting reciprocating movement to said rack, substantially as set forth.

JOHN CARROLL.

Witnesses:
N. C. GRIDLEY,
L. M. HOPKINS.