(No Model.) 5 Sheets—Sheet 1.

R. C. NUGENT & S. H. STUPAKOFF.

MACHINE FOR FLANGING AND NOZZLING METAL PLATES.

No. 422,615. Patented Mar. 4, 1890.

Fig. 4.

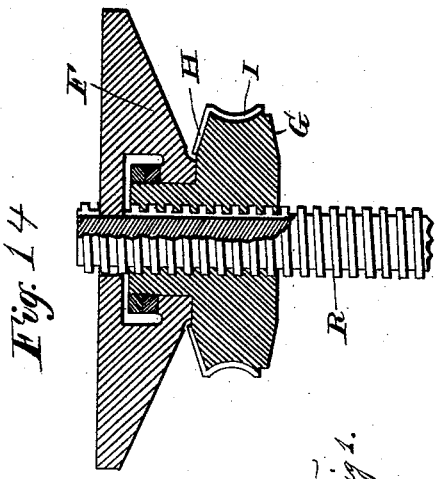

Fig. 1.

Witnesses:
R. F. Leathcart
Walter Reese

Inventors,
Richard C. Nugent
Simon H. Stupakoff
By Reese & Roney Attys

(No Model.)

5 Sheets—Sheet 2

R. C. NUGENT & S. H. STUPAKOFF.

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Fig. 1.

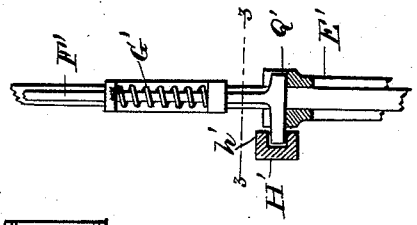
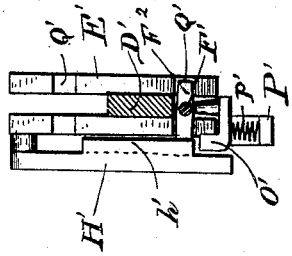


Fig. 2.

Fig. 1a.



Witnesses:
R. F. Leathcart
Wm. F. Reese

Inventors.
Richard C. Nugent
Simon H. Stupakoff
By Reese & Roney
Attys.

(No Model.)

5 Sheets—Sheet 3.

R. C. NUGENT & S. H. STUPAKOFF.

MACHINE FOR FLANGING AND NOZZLING METAL PLATES.

No. 422,615. Patented Mar. 4, 1890.

Fig 3.

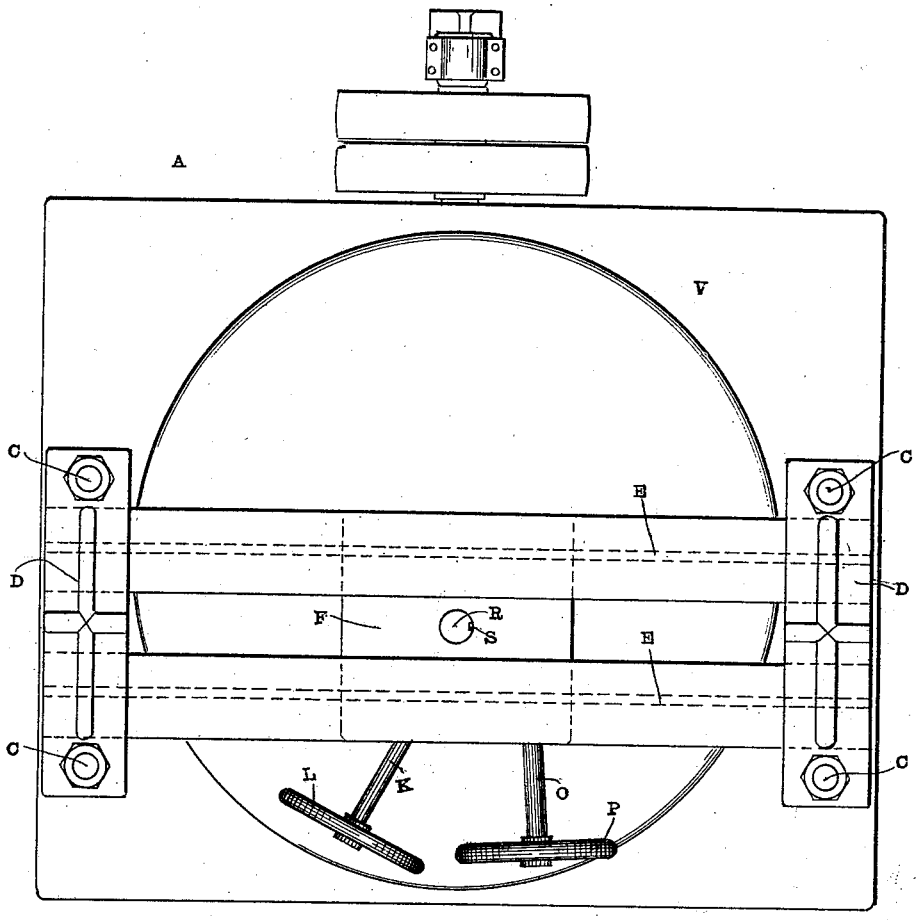


Fig. 6.

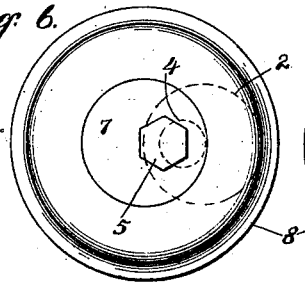


Fig. 7

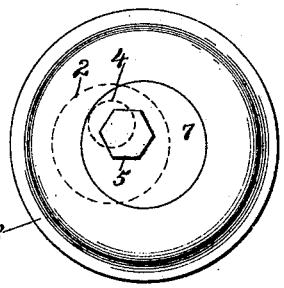
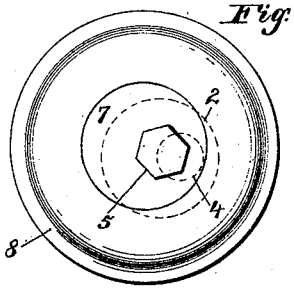


Fig. 8.



Witnesses:
R. F. Leathcart
Walter Rees

Inventors.
Richard C. Nugent
Simon H. Stupakoff
By Reuel & Ronay
Attys

(No Model.) 5 Sheets—Sheet 4.

R. C. NUGENT & S. H. STUPAKOFF.

MACHINE FOR FLANGING AND NOZZLING METAL PLATES.

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Fig 5.

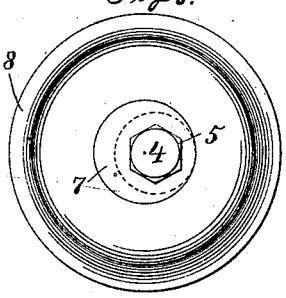


Fig 8½

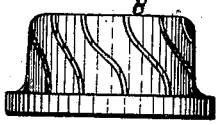


Fig 9.

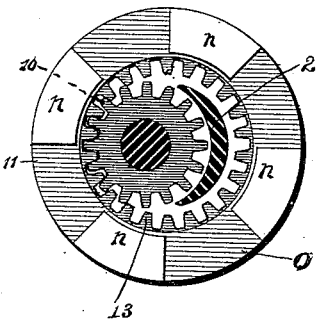


Fig 4

Fig 10.

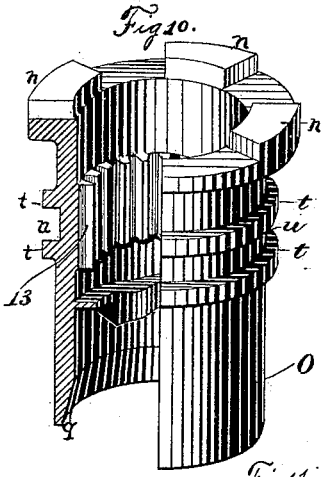
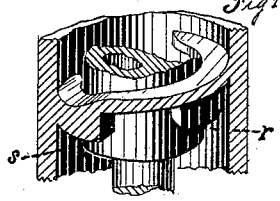


Fig 11.



Witnesses
R. F. Eathcart
Walter Reese

Inventors
Richard C. Nugent
Simon H. Stupakoff.
By
Reese & Rozey
Attys

(No Model.) 5 Sheets—Sheet 5.

R. C. NUGENT & S. H. STUPAKOFF.

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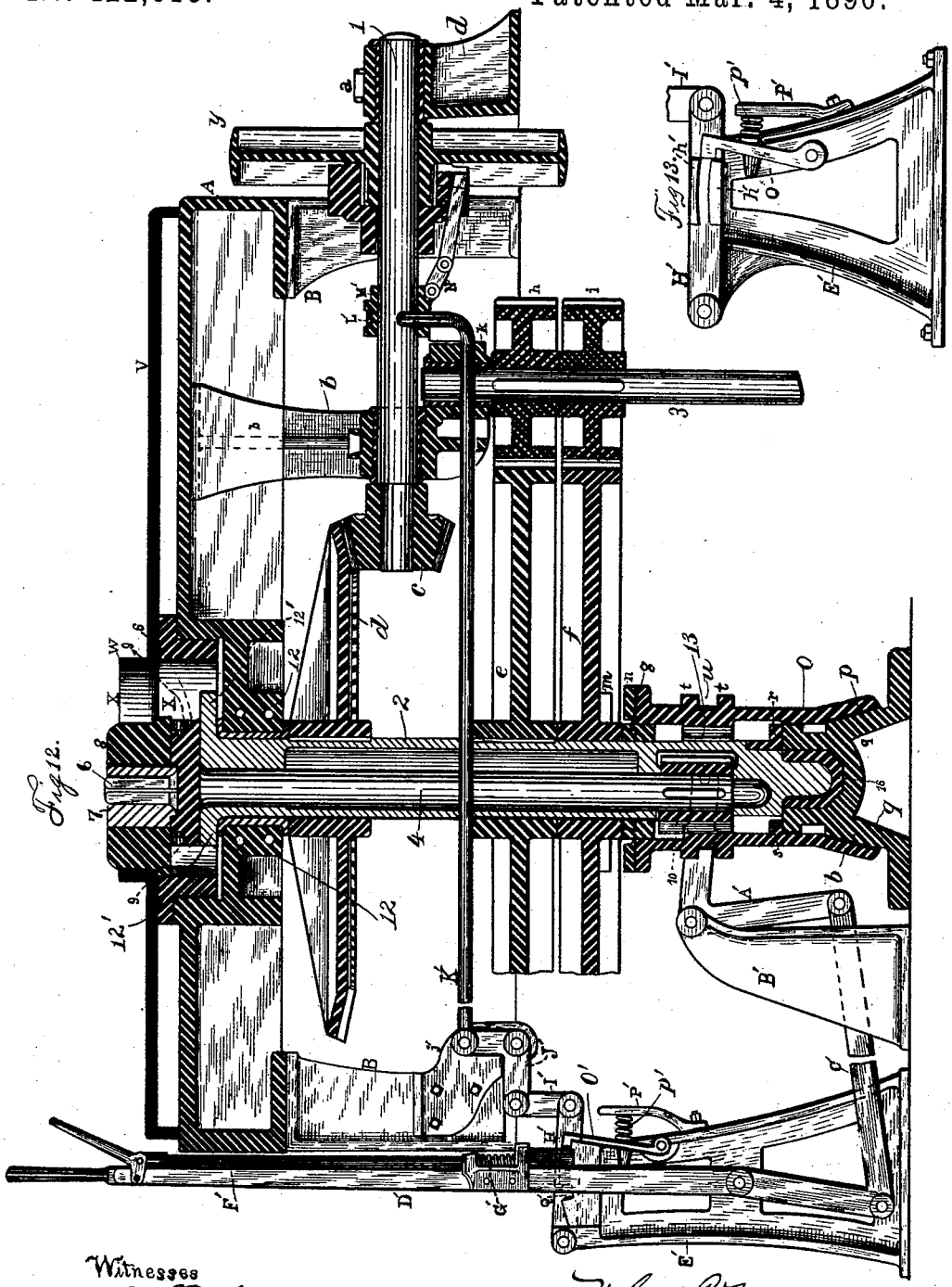

Fig 12.

Fig 13.

Witnesses
R. F. Cathcart
Walter Reese

Richard C. Nugent
Simon H. Stupakoff
By Reese & Roney
Attys

UNITED STATES PATENT OFFICE.

RICHARD C. NUGENT AND SIMON H. STUPAKOFF, OF PITTSBURG, PENNSYLVANIA.

MACHINE FOR FLANGING AND NOZZLING METAL PLATES.

SPECIFICATION forming part of Letters Patent No. 422,615, dated March 4, 1890.

Application filed August 24, 1888. Serial No. 283,690. (No model.)

To all whom it may concern:

Be it known that we, RICHARD C. NUGENT and SIMON H. STUPAKOFF, citizens of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Machines for Flanging and Nozzling Metal Plates and Boiler-Heads; 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 pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification, in which—

Figure 1 is a side elevation, partly in section; Fig. 2, an end view; Fig. 3, a plan; Fig. 4, an enlarged vertical central section of the main and pressure shafts. Fig. 5 is a top plan of the flanging-roll, the eccentric crank-pin, and the eccentric sleeve inclosing the same. Figs. 6, 7, and 8 are top plan views of the main shaft, pressure-shaft, flanging-roll, and the eccentric crank-pin, and their relative positions at the beginning, in the middle of, and at the end of the flanging operation, respectively. Fig. 8½ is a side elevation of the flanging-roll, showing the series of spiral grooves upon its surface. Fig. 9 is a cross-section through the lower part of the main and pressure shafts, showing the pinion upon the pressure-shaft projecting through the orifice in the main shaft to enable the same to engage the inside gear of the shell which surrounds both shafts. Fig. 10 is a sectional perspective of the shell broken away to show the inside gear and the spirally-inclined projections upon the inside surface of the same. Fig. 11 indicates a sectional perspective of the shell and main shaft, the shell being broken away to show the spirally-inclined projection with its downwardly-extending lug upon the inside surface of said shell, and also the corresponding projection upon the outside surface of the main shaft. Fig. 12 indicates a side elevation on an enlarged scale, partly in section, of the flanging-machine below the plane of the table. Fig. 13 shows a reduced side elevation of the frame to which said levers are secured, also side view of a device upon said frame adapted to lock said levers when adjusted. Fig. 14 is a detail sectional view on an enlarged scale, showing the nut-housing. Fig. 15 is an enlarged view, in side elevation, of the means for locking the operating-lever D′; and Fig. 16 is a detail sectional view on the line 3 3 of Fig. 15.

In the drawings, A is an iron table supported on legs B B, and provided with columns C C, which are connected by the headpiece D and support the iron girders E E.

F is the housing of the nut G, said nut having a beveled gear-wheel H and worm-wheel I.

J is a smaller beveled gear-wheel secured to the horizontal shaft K, which is journaled in the bearing M. (Shown in the drawings as being part of nut-housing F.) The outer end of said shaft K is provided with the hand-wheel L.

N is a worm secured to the horizontal shaft O, or forming part thereof, which engages in the worm-wheel part of the nut G.

P is a hand-wheel fastened to the end of said shaft O, and Q a bearing of the same. (Shown in the drawings as being part of the nut-housing F, which, however, and also the bearing M heretofore referred to, may be formed of separate pieces suitably attached in their respective positions.) The front bearing of the shaft O is not shown in the drawings in order that a better view of the parts lying behind it may be had.

In Fig. 16 of the drawings we have illustrated a detail vertical sectional view through the rotary nut G, by an inspection of which it will be noticed that the nut is provided with a tubular extension or sleeve, which is suitably supported or journaled in the stationary housing in such a manner that the nut can be rotated on its axis when either shaft O or K is rotated, and the interior of this tubular extension or sleeve is provided with threads with which engage the vertically-movable feed-screw R, which carries the presser-foot.

R is screw provided with one or more longitudinal grooves for the reception of one or more splines or keys S, secured to the headpiece of the nut-housing to prevent the screw revolving around its axis.

T is the presser-foot of said screw, and U

is a removable ring fastened within the same by screws. (Not shown.)

V is a boiler-head, and W the upturned flange of the nozzle of the same.

X is a removable ring inserted into the central cavity of the table, suitably secured therein, and forming the head-piece thereof.

Y is a loose pulley on the horizontal driving-shaft 1, and Z a driving-pulley on the same.

a is a standard, on the top of which is the end bearing of said shaft.

b is a hanger secured to the table, provided with a second bearing for said shaft.

c is a small beveled gear-wheel fastened to said shaft, which engages the large beveled gear-wheel *d*, secured to the vertical main shaft 2.

e is a gear-wheel rigidly fastened to said vertical main shaft, and *f* is a second gear-wheel which fits loosely upon the same, so as to permit it to revolve independent of said shaft, and is supported by the ring or collar *g*. For convenience we have designated the gears just referred to as the "main" and "back" gear, respectively, and the gear-wheels *h* and *i*, which are secured to the intermediate shaft 3 and mesh with said main and back gear, as the "intermediate" gear.

k is the top bearing of said intermediate shaft, being a part of the hanger *b*, or it may be formed of a separate piece rigidly secured thereto or to the table, and *l* is the foot-bearing of the same. *m* is a series of spaced projections forming a clutch on the bottom of the back gear-wheel, and *n* is a clutch on the top of the shell *o*, corresponding with the same. The inside surface of said shell *o* is provided with teeth 13, which engage in teeth of a pinion on the pressure-shaft, as indicated in Figs. 1, 4, and 10.

p and *q* are respectively female and male parts of a friction-clutch.

r is a lug or extension on the main shaft, which, when in proper position, engages a corresponding lug *s* within the shell of the inside gear, which thereby forms a third clutch. According to their functions and for the purpose of conveniently designating them, we call these three clutches the "back-gear," the "stationary," and the "mainshaft" clutch, respectively.

t t are two annular rings, and *u* is an annular groove between them around the shell, which guides the rollers or their equivalent mechanism carried by the inner end of the bell-crank lever A′, which lever is pivoted to the upper end of the stationary frame or support B′. This bell-crank lever has its other free end connected to a link C′, which serves to connect said lever A′ to the vertical operating-lever D′, which is pivoted or fulcrumed near its lower end to a frame E′. This vertical hand-operating lever D′ carries a catch-rod F′, which is supported in suitable guides on the lever D′, so as to be free to move endwise vertically thereon, and this catch-rod is normally depressed by a coiled spring G′, which is fitted around the catch-rod near its lower extremity and between lugs or ears on a fixed plate carried by the lever D′, as shown in Figs. 12, 15, and 16. The lower extremity of the catch-rod is provided with a laterally-extending lug F^2, which fits and operates in a segmental guide *h′* on the inner side of a horizontal lever or link H′, this connection between said horizontal lever H′ and the catch-rod being such that the lateral lug F^2 of the catch-rod serves to elevate the inner end of the lever or link H′, when the catch-rod F′ is lifted vertically by operating its hand-piece at the upper extremity of the lever D′, the vertical play or movement of the catch-rod and horizontal lever or link H′ being effected without moving the hand-lever D′ on its pivot. The horizontal lever or link H′ is pivoted at its outer end to the upper outer end of the frame E′, and the segmental guide *h′* on said lever H′ is of less length and convexity than the arc of a circle described by the lug F^2 when the lever D′ is moved on its pivot or fulcrum, so that when the lever is thrown rearward, for a purpose hereinafter explained, the lug F^2 on the catch-rod will become disengaged from the segmental guide *h′* on the horizontal lever or link H′, this disengagement of the catch-rod and lever H′ being effected after the lever H′ has been operated to clutch the driving-pulley Y to the shaft 1.

The inner end of the horizontal lever or link H′ is attached to a vertical link I, which is pivoted to the horizontal arm of a bell-crank lever J′, the other arm of the lever J′ being connected to an endwise-movable shifting-rod K′, the free end of said shifting-rod being attached to a ring L′, which fits loosely around a sliding collar M′ fitted on the driving-shaft 1, so as to slide freely thereon a limited distance, this movement of the collar being controlled by the rod K′. The sliding collar carries a clutch rod or bar N′, which projects beyond the collar, and said bar or rod is adapted when the collar is forced forward by the rod to fit into a slot in the shaft and pulley Y, as shown in Fig. 12, in order to connect or secure said pulley rigidly upon said shaft.

When the lever or link H′ is elevated in the manner described and operated to clutch the driving-pulley to the shaft, said link or lever is held in its elevated position by means of a locking device or latch O′, which is thrown automatically beneath the lever or link when it is raised, whereby the lever D′ is free to move on its fulcrum, as the projection F^2 of the catch-rod is disengaged from the lever or link H′, and the latter is held in its stationary position in order to keep the pulley Y clutched to the shaft. This locking device consists of a vertical arm O′, which is pivoted at its lower end to standard or frame E′, and the upper end of the arm has a projection or hook which is adapted to take be-

neath the lever or link H′ when the latter is raised. The locking arm or latch is held in place by means of a coiled spring p', which presses against the pivoted locking-arm, and a fixed supporting-arm P on the stationary frame E′.

The top of the frame E′ is provided with a notch or notches Q′, into which the lower end of the catch-rod F′ is adapted to take or fit when said rod is depressed by its spring, in order to hold the vertical hand-operating-lever D′ in position and prevent the same from moving on its fulcrum.

4 is a vertical pressure-shaft journaled eccentrically in the vertical main shaft, the upper end of which above the flange or disk 6 terminates in an eccentric or crank pin 5, of polygonal cross-section.

7 is an eccentric sleeve fitted to and slipped over the crank-pin, and 8 is an interchangeable flanging-roll provided with spiral grooves, as shown in Fig. 8½, said flanging-roll resting on the friction-rollers 9 9 of the crank-disk 6 and fitted upon the eccentric sleeve in such manner that it may freely revolve thereon.

10 is a pinion secured upon the pressure-shaft, the teeth of which project through an orifice in the main shaft and engage the corresponding teeth 13 of the inside gear of the shell, as indicated in Figs. 1, 4, and 10.

12 is the top bearing of the vertical main shaft, which is provided at the center of the table A and depressed below the plane of the top surface thereof, as shown in Fig. 12, the upper end of said hollow main shaft being provided with an annular flange 12′, that bears on the top of the upper bearing; and 16 is the foot-bearing of the said hollow main shaft.

In the practice of our invention the rotary motion of the inside or pressure shaft is somewhat more or less rapid than that of the main shaft inclosing it. The end is secured by providing the back gear-wheel on said main shaft with a greater or less number of teeth than the main gear-wheel upon the same shaft. We have secured very good results by increasing the speed of the pressure-shaft by constructing said back and main gears with one hundred and fourteen and one hundred and fifteen teeth, respectively, and the inside gear of the shell and the pinion upon the pressure-shaft with nineteen and fourteen, respectively.

Like letters indicate like parts wherever they occur.

The operation of the apparatus is as follows: The metal plates, having been provided with one or more circular apertures and heated in a furnace to the necessary degree of heat, are placed upon the table of the machine, so that the flanging-roll, standing in its normal position concentric to the axis of the main shaft and to the pressure-foot of the overhead clamping device, will protrude through one of said apertures in the plate, thereby centering the same upon the table, the pressure-foot of the overhead piece or clamping device being quickly lowered by turning the hand-wheel L, attached to the shaft K, which operates the beveled gear J, which forms part of the pressure-nut. Immediately the pressure-foot of the clamping device impinges upon the surface of the plate an additional and powerful pressure may be applied by throwing the worm N into gear with the worm-wheel I of the nut and turning the hand-wheel P, attached to the end of the shaft O, which operates said worm. The operator in charge now operates the vertically-movable catch-rod F′ to clutch the driving-pulley Y to the shaft 1, which is accomplished by lifting the catch-rod vertically, so that its lateral stud F^2 raises the inner end of the horizontal lever or link H′, thus turning the bell-crank lever J′ to force the shifting-rod K′ forward, whereby the sliding collar M′ is moved to force the clutch bar or rod N′ into the slot on the shaft and driving-pulley, thus rigidly connecting said parts, the lever or link H′ being held in its elevated position by the spring-pressed locking-arm O, which takes beneath the lever or link as soon as it is elevated. The hand-lever D′ can now be moved backward to operate the link C and bell-crank lever A′ in order to lift the vertically-movable shell, and as the lever is turned on its fulcrum the pin or lug F^2 on the catch-rod is disengaged from the segmental guide h' on the horizontal lever or link H′ by reason of said segmental guide being curved eccentric and of less length than the arc of a circle described by the lug F^2 when the lever D′ is moved on its fulcrum, as before explained.

The lever H′ is locked by the locking-arm to hold the driving-pulley clutched to the shaft 1, and, the lever D′ being free from the lever H′, it can be moved on its pivot, as explained, to lift the shell sufficient to enable the clutch on the top thereof to engage the corresponding clutch on the main gear-wheel, after which said lever D′ is locked in position by the lateral projection F^2 on the catch-rod F′, fitting in one of the notches Q′ on the top of the frame E′. The two operating-levers H′ D′ being thus locked in position, and the shell having converted the loose pulley into a driving-pulley, power is applied to impart rotary motion to the main shaft 2 from the horizontal driving-shaft 1 by means of the beveled gear-wheel on said shaft and beveled gear-wheel on the main shaft, and the motion is transmitted from the main shaft through the main gear-wheel to the intermediate gear-wheel, to the intermediate shaft and through the same to the back gear-wheel on the main shaft. By means of the clutch on the bottom of the back gear-wheel, which engages a corresponding clutch on the top of the shell, rotary motion is transmitted to said shell, and said motion is considerably accelerated and trans-

mitted through the inside gear of said shell and the pinion upon the pressure-shaft to the pressure-shaft. The pressure-shaft terminates in an eccentric-crank pin, from which the flanging-roll, which projects through and revolves in the aperture in the boiler-head on plate, directly and immediately receives rotary motion. In the beginning of the flanging operation the axis of the flanging-roll, eccentric-crank pin, and main shaft practically coincide. During the progress of the operation, however, the eccentric-crank pin gradually but continually shifts its axis with reference to that of the main shaft, producing similar changes in the axis of the flanging-roll with reference to that of the main shaft, and thus, while traveling a constantly-increasing circle or orbit around the axis of the main shaft, it is impelling or forcing the flanging-roll against the metal to be flanged. When the flanging operation has been completed, as above described, the operator disengages the clutch on the shell from the corresponding one on the back gear-wheel, and its own weight, or, if necessary, that of the counter-weight attached to the clutch-lever, forces the female part of the friction-clutch formed by the conically-shaped extremity of said shell upon the male part of said friction-clutch formed by the conically-shaped part of the bearing of the main shaft, thereby arresting the rotary motion of the shell and pressure-shaft and enabling the main shaft, which is meanwhile revolving, to make about one-half of a revolution requisite to bring the main shaft, pressure-shaft, and flanging-roll into the positions relatively occupied by each at the beginning of the flanging operation. Before the projections upon the shell and main shaft respectively come in contact the spirally-inclined upper surface of the main shaft projection, moving along the corresponding lower surface of the shell projection, gradually elevates said shell sufficiently to release it from the friction-clutch. When the projections upon the shell and main shaft engage, the shell is carried (in case the machine is permitted to run) along with the main shaft without changing the relative positions of the main shaft, pressure-shaft, and flanging-roll until the shell is again elevated and clutched by the main gear-wheel.

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

1. In a metal flanging and nozzling machine, the combination of a hollow vertical main shaft, a pressure-shaft eccentrically journaled therein, a flanging-roll mounted on the pressure-shaft, and means for rotating the main and pressure shafts at different velocities, substantially as and for the purpose herein described.

2. In a metal flanging and nozzling machine, the combination of a hollow vertical main shaft, a pressure-shaft eccentrically journaled therein, a flanging-roll mounted on the pressure-shaft, and means to rotate the main and pressure shafts at different velocities, and a means to firmly secure the boiler-head upon the table, substantially as and for the purpose herein set forth.

3. In a metal flanging and nozzling machine, the combination of a hollow main shaft provided with an orifice or opening, a pressure-shaft eccentrically journaled therein, provided with a pinion projecting in the orifice in the main shaft, a flanging-roll mounted on said pressure-shaft, a shell with inside gear, and means for rotating the main shaft and shell at different rates of speed, substantially as and for the purpose herein set forth.

4. In a metal flanging and nozzling machine, the combination of a hollow vertical main shaft provided with an orifice or opening, a pressure-shaft eccentrically journaled therein, provided with a pinion projecting in the orifice in the main shaft, a flanging-roll mounted on said pressure-shaft, a shell with inside gear, and means to rotate the shell and main shaft at different rates of speed, and means to firmly secure the boiler-head upon the table, substantially as and for the purpose herein set forth.

5. In a metal flanging and nozzling machine, the combination of a hollow vertical main shaft provided with an orifice and upon its outside surface with a projection, a pressure-shaft eccentrically journaled in said main shaft, carrying a flanging-roll, and provided with a pinion projecting in the orifice in the main shaft, a vertically-movable shell having a projection on the inside, and internal gear meshing with the pinion on the pressure-shaft, and means for rotating the shell and main shaft at different rates of speed, substantially as and for the purpose herein set forth.

6. In a metal flanging and nozzling machine, the combination of a hollow vertical main shaft, provided with an orifice upon its outside surface, with a projection, and provided with a bearing, the conical part of which forms the male part of a friction-clutch, a pressure-shaft eccentrically journaled in said main shaft, carrying a flanging-roll, and provided with a pinion projecting in the orifice in the main shaft, a vertically-movable shell, the lower end of which is adapted to fit upon the conical bearing of the main shaft and form a friction-clutch, and provided with internal gear and upon its inside surface with a lug, and means for rotating the shell and main shaft at different velocities, substantially as and for the purpose herein set forth.

7. In a metal flanging and nozzling machine, the combination of a table with a central cavity, a means to secure and center the boiler-head thereon, a hollow vertical main shaft having an orifice or opening and upon its outside surface a lug, and provided with a bearing, the conical part of which forms the male part of a friction-clutch, a pressure-shaft eccentrically journaled in said main shaft,

terminating in an eccentric crank-pin on which is mounted a removable collar, a flanging-roll mounted thereon, a vertically-movable shell with inside gear, having upon its inside surface a lug, one extremity of said shell being adapted to fit upon the corresponding part of the bearing of the main shaft, and means to rotate the main shaft and shell at different velocities, substantially as and for the purpose herein set forth.

8. In a metal flanging and nozzling machine, the combination of a table having a central cavity provided with a removable pressure-ring, a clamping device to secure and center the boiler-head upon said table, a hollow vertical main shaft provided with an orifice and upon its outside surface with a spirally-inclined projection, and provided with a bearing, the conical part of which forms the male part of a friction-clutch, a beveled and an ordinary gear-wheel securely attached thereon, and an ordinary gear-wheel loosely fitting thereon, provided with a coupling-clutch, a pressure-shaft eccentrically journaled in said main shaft and terminating in an eccentric crank-pin, and provided with a pinion journaled in the orifice in said main shaft, a removable sleeve, a flanging-roll mounted thereon, a vertically-movable shell with inside gear and provided at one of its extremities with a coupling-clutch, its other end being conically shaped and adapted to fit upon the corresponding part of the bearing of the main shaft, said shell having upon its inside surface a spirally-inclined projection, and adapted to be elevated and lowered upon said main shaft by means of a lever or levers, an intermediate vertical shaft provided with gear-wheels, and a horizontal driving-shaft provided with beveled gear-wheels and pulleys, substantially as and for the purpose herein set forth.

9. In a metal flanging and nozzling machine, the combination of a rotary hollow shaft, a pressure-shaft arranged eccentrically within said hollow shaft, and carrying a flanging-roll at its upper extremity, mechanism for driving said main and pressure shafts at different rates of speed, and a clutch controlled by a lever for throwing the hollow main shaft into and out of gear at will, substantially as described.

10. In a metal flanging and nozzling machine, the combination, with a driving-shaft having a loose pulley, a vertical main shaft, a pressure-shaft arranged eccentrically within said main shaft and adapted to be rotated at different speed, and a flanging-roll carried by said pressure-shaft, of a vertically-movable clutch adapted to engage with the main shaft, a sliding clutch fitted on the driving-shaft to engage the driving-pulley, a single operating-lever connected to the vertically-movable clutch, a horizontal lever connected to the sliding clutch, and a vertically-movable catch-rod adapted to engage the horizontal lever to operate the latter and the sliding clutch, substantially as described, for the purpose set forth.

11. In a metal flanging and nozzling machine, the combination, with a driving-shaft having a loose pulley, a hollow main shaft, and a pressure-shaft eccentrically arranged with relation to said main shaft and carrying a flanging-roll, of a sliding clutch fitted on the driving-shaft and arranged to engage the loose pulley, a shifting-rod connected to said sliding clutch, a horizontal lever or link H′, to which the rod is connected, and having a segmental guide, a vertical operating-lever connected by intermediate devices to a vertically-movable clutch arranged to engage the vertical main shaft, and a catch-rod carried by the vertical operating-lever and having a lateral projection adapted to fit in the segmental guide on the lever H′ to lift the latter vertically, substantially as described.

12. In a metal flanging and nozzling machine, the combination of a vertical hollow main shaft, a pressure-shaft eccentrically arranged therein, mechanism for driving said main and pressure shafts at different rates of speed, a table, a vertically-movable feed-screw carrying a presser-foot, a rotary nut for feeding said screw, and mechanism whereby different degrees of pressure may be exerted by the presser-foot on the work, substantially as described, for the purpose set forth.

13. In a metal flanging and nozzling machine, the combination of a vertical hollow main shaft, a pressure-shaft eccentrically mounted therein and carrying a flanging-roll arranged to operate laterally against the work, as described, mechanism for driving said main and pressure shafts at different rates of speed, and a vertically-movable presser-foot carried by a vertical feed-screw and adapted to exert pressure in a vertical direction on the work, substantially as described, for the purpose set forth.

In testimony that we claim the foregoing we hereunto affix our signatures this 21st day of August, A. D. 1888.

RICHARD C. NUGENT. [L. S.]
SIMON H. STUPAKOFF. [L. S.]

In presence of—
EDWARD T. EVANS,
JNO. H. RONEY.