No. 645,843. Patented Mar. 20, 1900.

J. S. WORTH.

FLANGING MACHINE.

(No Model.) (Application filed Oct. 23, 1897.)

7 Sheets—Sheet 1.

FIG. 1.

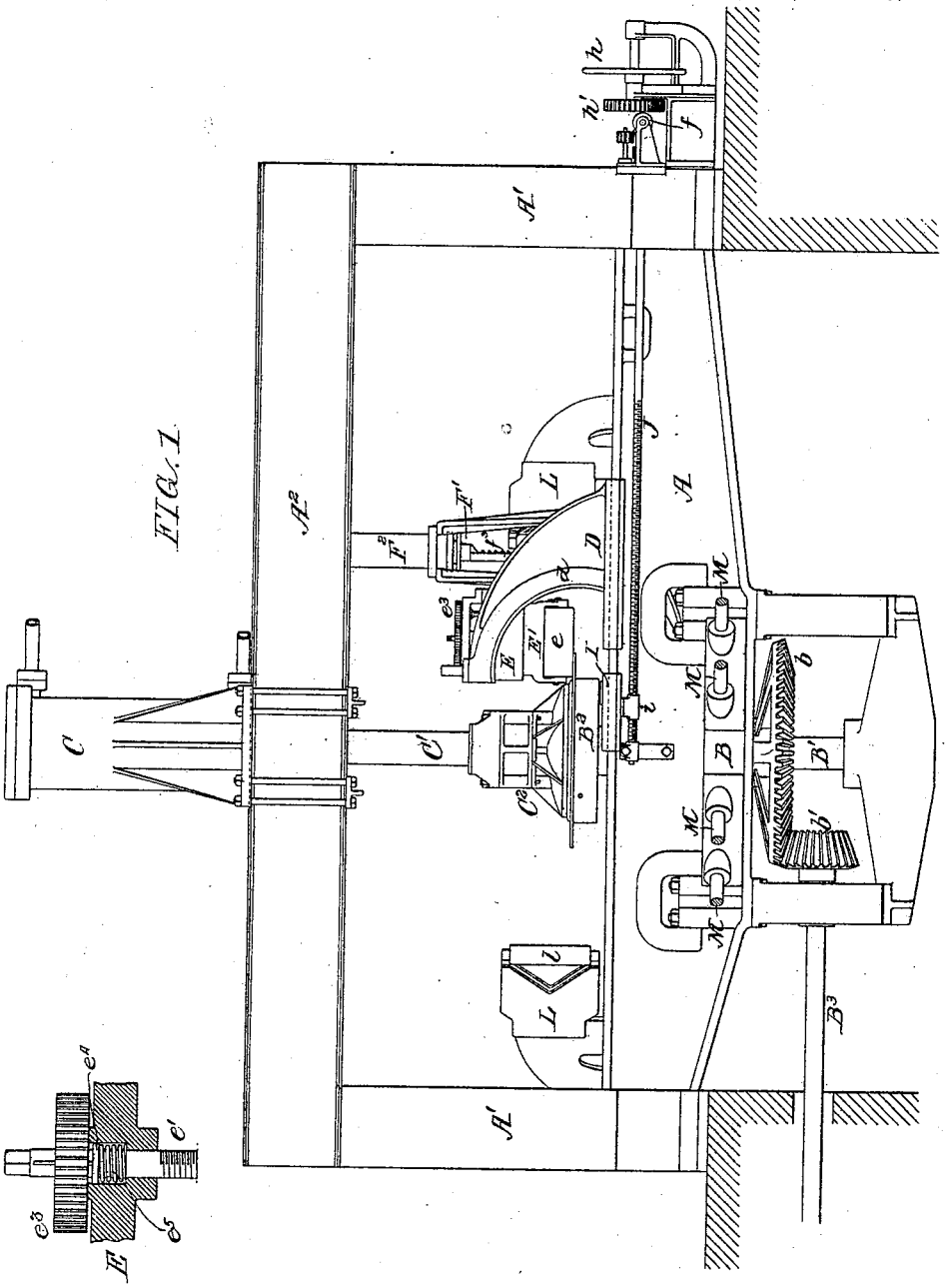

FIG. 1A.

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Will. A. Barr.

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(No Model.) 7 Sheets—Sheet 2.

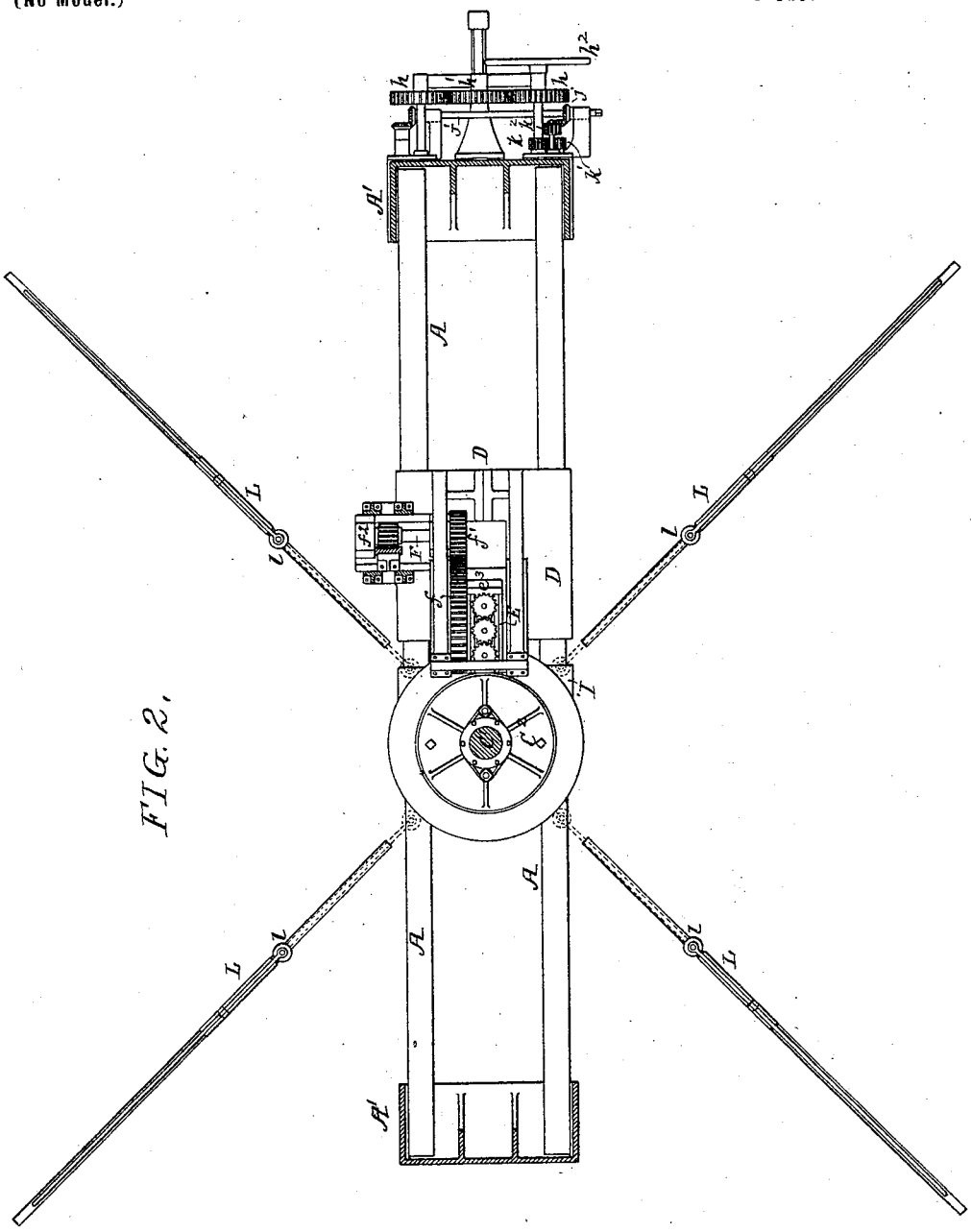

FIG. 2.

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(No Model.) 7 Sheets—Sheet 3.

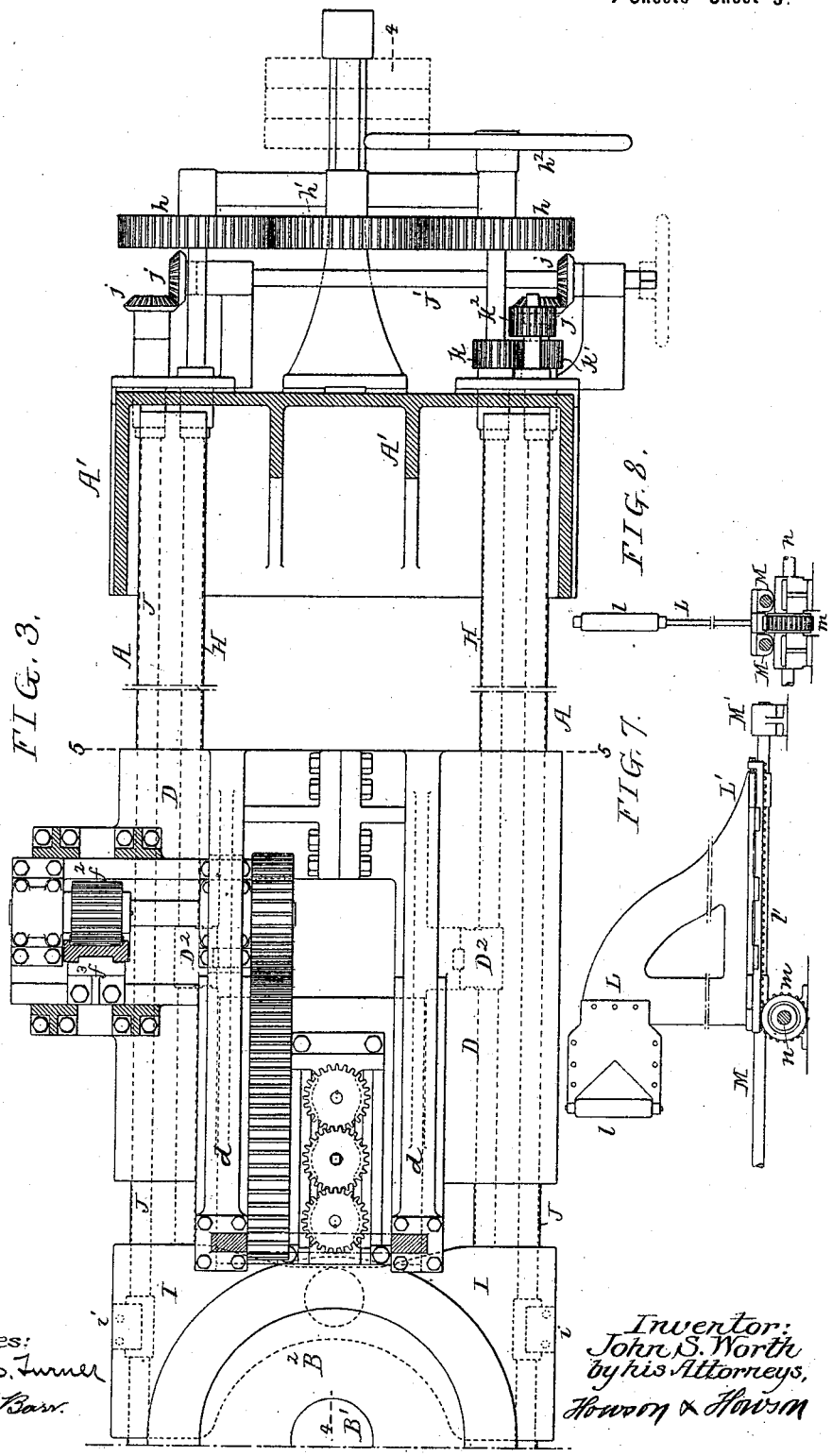

FIG. 3.

FIG. 8.

FIG. 7.

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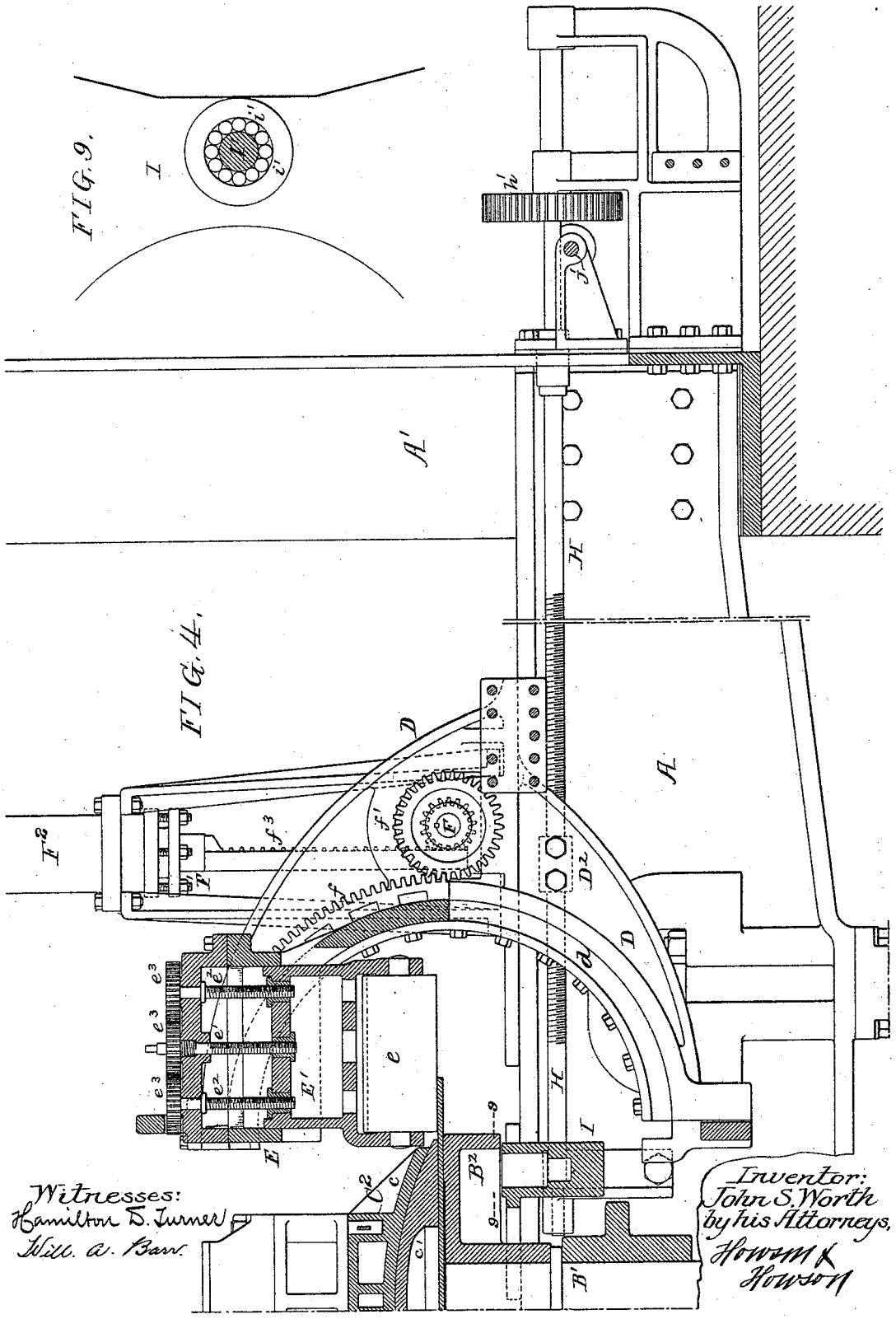
(No Model.) 7 Sheets—Sheet 4.

FIG. 9.

FIG. 4.



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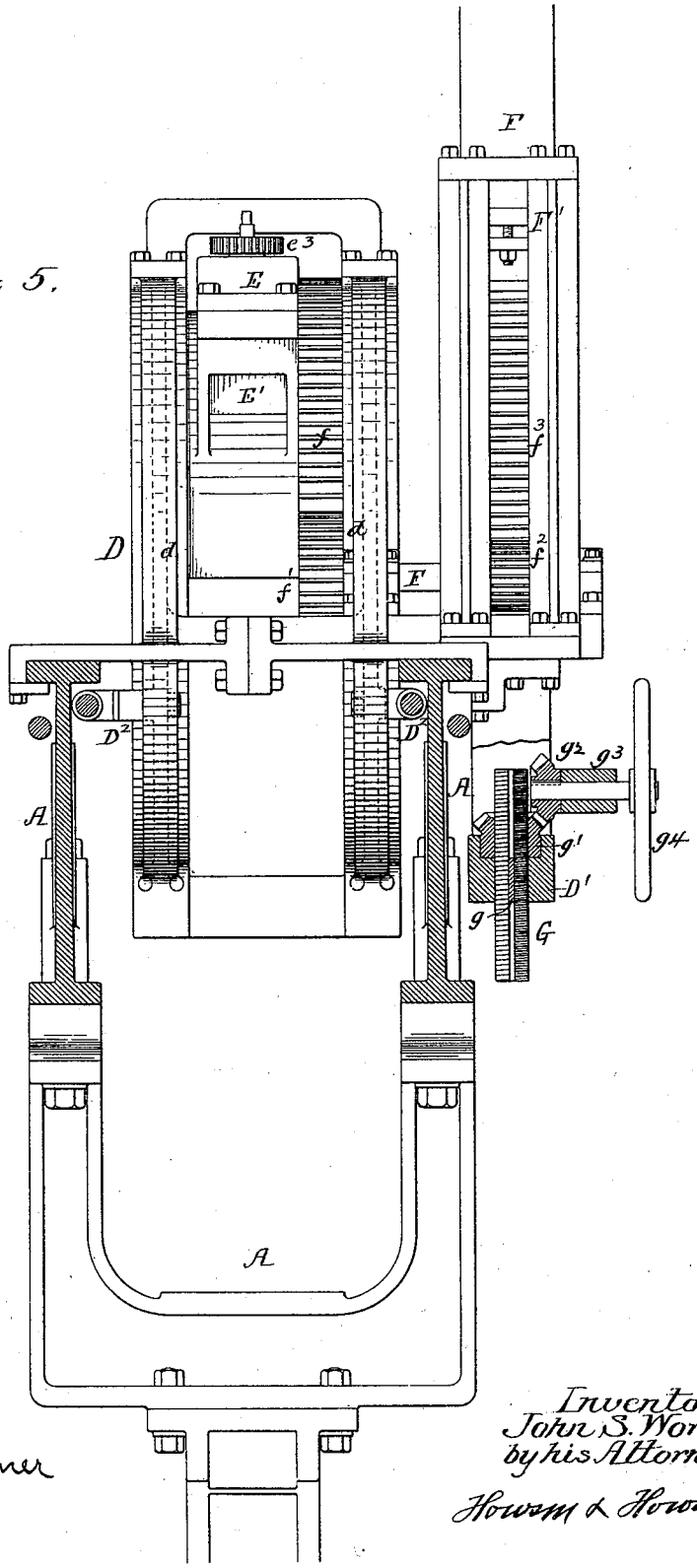
(No Model.) 7 Sheets—Sheet 5.

FIG. 5.



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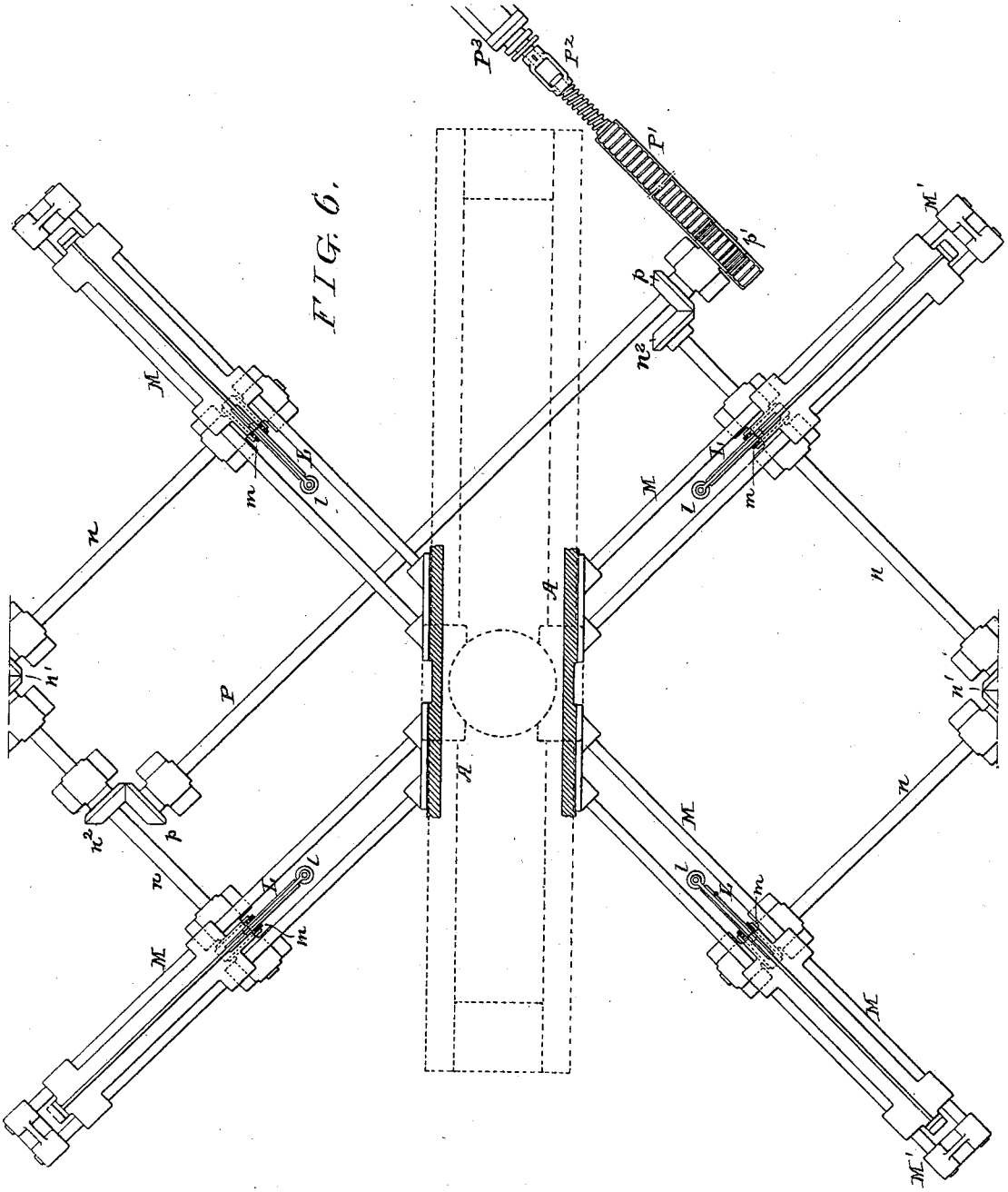
FLANGING MACHINE.

(No Model.) (Application filed Oct. 23, 1897.)

7 Sheets—Sheet 6.

FIG. 6.



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(No Model.) (Application filed Oct. 23, 1897.)

7 Sheets—Sheet 7.

FIG. 10.

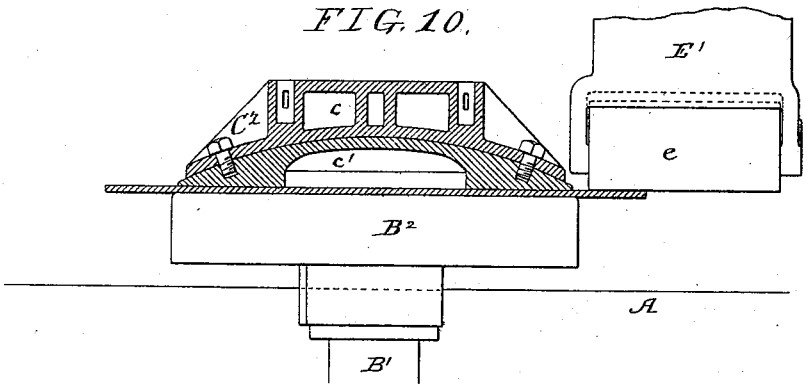


FIG. 11.

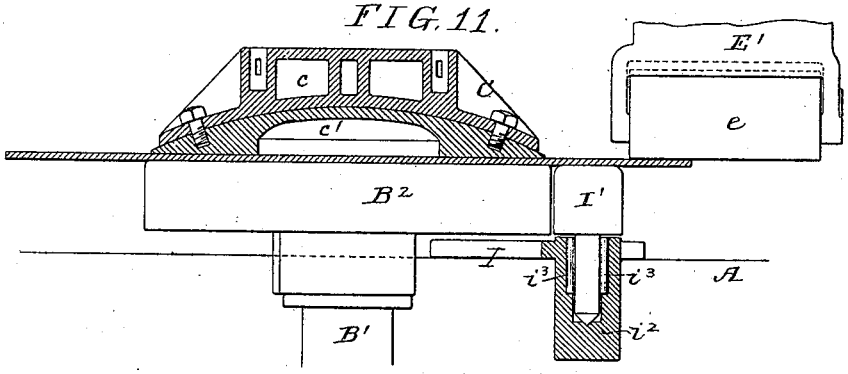


FIG. 12

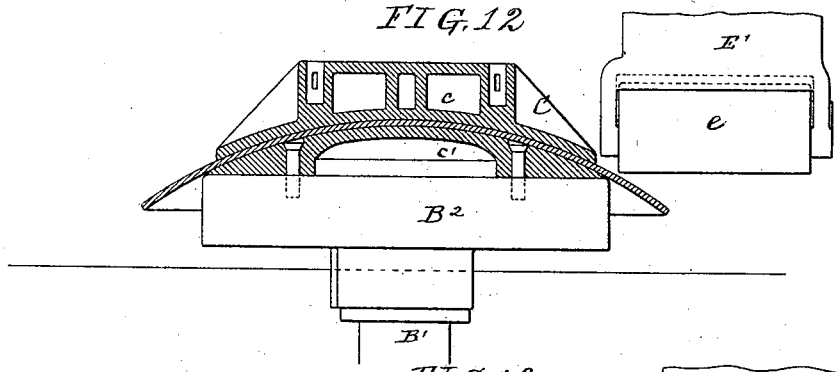
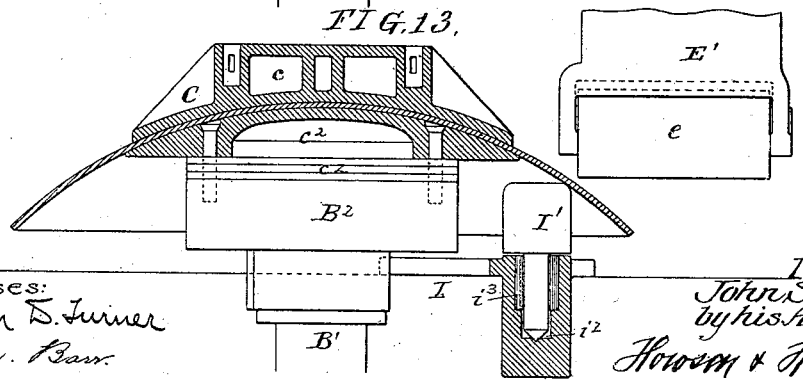


FIG. 13.



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UNITED STATES PATENT OFFICE.

JOHN S. WORTH, OF COATESVILLE, PENNSYLVANIA.

FLANGING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 645,843, dated March 20, 1900.

Application filed October 23, 1897. Serial No. 656,200. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. WORTH, a citizen of the United States, and a resident of Coatesville, Pennsylvania, have invented certain Improvements in Flanging-Machines, of which the following is a specification.

My invention relates to certain improvements in machines for flanging metal plates; and the object of my invention is to so construct the machine that the operating parts can be adjusted so as to accommodate plates of different diameters and thicknesses and to regulate the bend of the flange as well as to center the plates on the machine, as fully described hereinafter, reference being had to the accompanying drawings, in which—

Figure 1 is a side view of my improved flanging-machine. Fig. 2 is a plan view, partly in section. Fig. 3 is a plan view, partly in section, of a portion of the machine drawn to an enlarged scale. Fig. 4 is a section on the line 4 4, Fig. 3. Fig. 5 is a transverse section on the line 5 5, Fig. 3. Fig. 6 is a sectional plan view directly below the floor-level, illustrating the means for centering a plate on the machine. Fig. 7 is a side view of one of the centering-arms shown in Fig. 6. Fig. 8 is an end view of Fig. 7. Fig. 9 is a plan view on the line 9 9, Fig. 3, drawn to an enlarged scale and showing the roller-bearings for the anvil-roller. Figs. 10, 11, 12, and 13 are diagram views showing different methods of making the flange, and Fig. 14 is an enlarged view of a detail shown in Fig. 4.

A is the base of a flanging-machine, made in the present instance of two I-beams supported on suitable foundations.

B is the center bearing, in which is mounted a vertical shaft B′, carrying the head B^2, upon which the plate to be flanged is placed.

A′ are uprights supporting the overhead framework A^2, which carries the cylinder C, having the piston-rod C′, to which is attached the clamp C^2 for clamping the plate onto the head B^2.

The shaft B′ is driven in the present instance by means of a bevel-gear and pinion $b\,b'$ from a driving-shaft B^3; but it will be understood that any form of driving mechanism may be used without departing from the main features of the invention.

Adapted to slide upon the frame A is a carriage D, having two segmental guides *d*, forming quadrants, in which is guided the carrier E for the bending-roller *e*. Adapted to this carrier E is a sliding head E′, having journal-bearings for the bending-roller *e*, Fig. 4. This head E′ is adjusted in the present instance by means of three set-screws $e'\,e^2\,e^2$, and these screws are geared together by wheels e^3. The center screw *e′* has a thread cut in a direction opposite to the threads on the two side screws e^2, so that on turning the central shaft *e′* in one direction by means of a hand-wheel, as shown by dotted lines in Fig. 4, the head will be moved away from the work, but by reversing the motion it will be moved toward the work. By this means the roller can be regulated to accommodate different thicknesses of metal and to flange the head over formers or rollers of different radii, so that the radius of curvature of the bend of the flange can be varied to any desired amount.

As shown in Figs. 4 and 14, the shaft *e′* has a collar e^4, between which and the carrier E is a spring e^5, which tends to draw the head E′ into the carrier and to bind against the side screws e^2, preventing chattering due to lost motion. The screws $e'\,e^2$ are adapted to headed nuts in the head E′, as shown.

The carrier has a segmental rack *f*, which meshes with a pinion *f″* on a transverse shaft F. This shaft has a pinion f^2, which meshes with a vertically-arranged rack f^3, attached to the piston-rod F′ of the cylinder F^2, mounted upon the carriage D. On operating the valves to allow for the flow of fluid into the cylinder the rack can be moved up or down, and consequently this motion will be imparted to the carrier through the pinions and its segmental rack, so that it will turn in the segment of a circle, and the roller *e*, carried thereby, will form a flange of the proper radii on the plate inserted between the head B^2 and the clamp.

In order to limit the downward movement of the carrier, I provide an adjustable stop G, Fig. 5, against which strikes the end of the rack f^3. This stop is in the form of a screw splined throughout its entire length and held from turning by means of a key *g*, resting in this spline and secured to the bracket D′, depending from the carriage D. Adapted to the threads of the screw is a nut *g′*, having

bevel-teeth which mesh with the bevel-pinion g^2 on the hand-shaft g^3, provided with a hand-wheel g^4, so that on turning this hand-wheel the stop G can be raised or lowered to limit the movement of the rack f^3, and consequently the movement of the carrier E, in its segmental guides.

In order to move the carriage toward and from the work, I provide two screw-shafts H H, which pass through screw-threaded lugs D^2 on the carriage. These screw-shafts H have gear-teeth h at their extreme ends, which mesh with the intermediate wheel h', and one of the shafts H has a hand-wheel h^2, by which it is turned, so that both shafts turn in unison, being geared together by the intermediate wheel h'. On turning the hand-wheel in one direction the carriage is moved toward the work, and on reversing the movement it is withdrawn from the work. The shaft on which the wheel h' is mounted may be provided with belt-pulleys, as shown by dotted lines in Fig. 3, for driving the screw-shafts H by power.

I is a saddle mounted on the lower frame A of the machine, and this saddle carries the roller-anvil I', Fig. 11, which is used when the plate to be flanged is of a greater diameter than the head B^2. This saddle can be moved toward and from the center of the machine by means of two screw-shafts J J, adapted to screw-threaded lugs $i\ i$ on the saddle I, and these shafts extend to one end of the machine and are geared together through the medium of bevel-wheels $j\ j$ and a cross-shaft J'. The end of this cross-shaft is squared, so as to receive a hand-wheel, as shown by dotted lines in Fig. 3, so that the screw-shafts can be turned in unison to move the saddle.

In order to operate the carriage D and the saddle I in unison, I mount on one of the shafts H a gear-wheel k and on one of the shafts J a gear-wheel k', and I gear these two wheels together by a sliding intermediate wheel k^2, so that when it is wished to operate the carriage D and the saddle I in unison the intermediate pinion is thrown into gear with the two gear-wheels $k\ k'$, and by turning the hand-wheel h^2 all the screw-shafts will be operated and the carriage and saddle will be moved together; but by sliding the wheel k^2 out of engagement with the wheels $k\ k'$ the two sets of shafts can be moved independently.

In order that the roller-anvil I' shall work freely in its bearing in the saddle I, I form the spindle i', which extends down into the saddle and rests upon the stop i^2, and it is supported at the sides by rollers i^3, arranged between the bearing and the stem, as shown in Fig. 9, thus considerably reducing the friction and allowing it to freely revolve as the plate is rotated.

In order to center the plate in the machine, I provide three or more arms—four in the present instance, as shown in Figs. 2 and 6. The arms L extend up above the surface of the head B^2 and are preferably provided with vertically-arranged rollers l at their extreme ends and are mounted upon carriages L', adapted to slide upon guideways M, which radiate from the center of the machine and are secured to the base-frame A of the machine at their inner ends and to stands M' at their outer ends.

On the under side of the carriages L' are racks l', which mesh with pinions m on shafts m. These shafts are geared in pairs by bevel-wheels n', so that they will turn in unison, and each pair is geared to a driving-shaft P by bevel-wheels n^2 and p.

The driving-shaft P has a pinion p', which meshes with a rack P', attached to the piston P^2 of a cylinder P^3, so that when fluid under pressure is allowed to flow into one or the other end of the cylinder the rack will be moved in one direction or the other and will consequently turn the series of shafts and move the carriages and their arms toward or from the center of the flanging-machine.

To center a plate on the head B^2 of the machine, all that is necessary is to operate the valves so that the arms will travel in unison toward the center of the machine, and they will thus center the plate, so that it can be properly flanged, after which the plate is held firmly onto the head B^2 by the clamp C^2.

Fig. 10 illustrates a plan of flanging a plate where the flange is turned down directly onto the edges of the head B^2 by the roller e.

Fig. 11 shows the method of turning down a flange of a plate of larger diameter by using the saddle I and its roller-anvil I', which is adjusted so as to be beyond the head B^2. The carriage in this instance is moved backward, so that the roller e will turn down the flange over the roller-anvil.

It will be noticed in Figs. 10 and 11 that the clamp C^2 is made in two parts $c\ c'$. These parts are secured together in any suitable manner, preferably by bolts. They form then simply a flat clamp for a flat plate; but by detaching the two and securing the part c' to the head B^2, as shown in Fig. 12, a previously-dished plate can be clamped between the two parts, or the plate may be dished by the clamping operation. The edges of the plate can be then flanged by the roller e, as in Fig. 12, so as to produce a dished flanged head.

When the dished plate is much larger than the part c', as shown in Fig. 13, I may elevate the lower part c' by inserting washers or plates c^2 between the part c' and the head B^2, so as to adjust the plate in respect to the anvil-roller I', which is moved out to flange the plate at the proper point. It will be readily seen that I can by this method reduce the cost of special clamps or heads for this type of flanging-machine and can adjust the parts very quickly to flange different-sized plates. The roller-anvil I' can pass under the edge of the former c' when necessary, so that the full effect of the clamp is obtained and at the same time utilizing the anvil-roller. In some

cases this convex plate may form part of the head B^2; but I prefer to make it detachable, so that I can use the same head for flanging either flat or dished plates.

I claim as my invention—

1. The combination in a flanging-machine, of means for clamping the plate to be flanged, a carriage having segmental guideways, a carrier adapted to the guideways, a head on the carrier, a flanging-roller carried by the head, with means for so adjusting the head and its roller that the radius of curvature of the bend of the flange can be varied on the carrier, substantially as and for the purpose described.

2. The combination in a flanging-machine, of means for clamping the plate to be flanged, a carriage having segmental guideways, a carrier adapted to the segmental guideways, a flanging-roller carried by the carrier, a segmental rack on the carrier, a cylinder having a piston, a rack attached to the said piston, a shaft having pinions, one engaging with the piston-rack and the other with the carrier-rack, and an adjustable stop to limit the movement of the piston-rack, substantially as described.

3. The combination in a flanging-machine, of a clamp for the plate to be flanged, a carriage, means for moving the carriage toward and from the clamp, said carriage having a segmental guideway, a roller, a carrier therefor adapted to the guideway, a fluid-pressure cylinder mounted on the carriage, a piston therein, gearing connecting the piston to the carrier so that when fluid under pressure is admitted to the cylinder the carrier will be traversed in its guideway, substantially as described.

4. The combination in a flanging-machine, of a head, a clamp, said head being undercut, an anvil-roller adapted to the undercut portion of the head and means for turning down a flange of a plate over the anvil, substantially as described.

5. The combination in a flanging-machine, of a clamp for the plate, a carriage having segmental guideways, a carrier adapted to the guideways and a flanging-roller carried by the carrier, a cylinder, piston therein and rod, a rack connected to the rod and meshing with a pinion, a shaft carrying said pinion, said shaft being geared to the carrier so that on moving the piston and its rack the carrier will be moved in the segment of a circle, a screw-threaded stop situated under the rack so as to limit its movement, a nut adapted to the screw, said screw being free to be raised and lowered by the nut, with means for turning the nut so as to raise or lower the screw-stop, substantially as described.

6. The combination in a flanging-machine, of the base-frame, clamps for holding the plate to be flanged, a carriage carrying the flanging-roller, means for moving the roller to flange the plate, a saddle, a roller-anvil carried by the saddle and over which the flange is formed, with two screw-shafts extending one on each side of the base-frame and screw-threaded lugs on the saddle through which they pass, and means for turning these screw-shafts in unison, substantially as described.

7. The combination in a flanging-machine, of the base-frame, clamps for holding the plate to be flanged, a carriage carrying the flanging-roller, means for moving the roller to flange the plate, a saddle, a roller-anvil carried by the saddle and over which the flange is formed, two screw-shafts extending along the frame of the machine and engaging with the saddle, means for turning these screw-shafts in unison, screw-shafts engaging with the carriage and gearing whereby the several screw-shafts are geared together so that they will turn in unison, substantially as described.

8. The combination in a flanging-machine, of a clamp for the plate, a flanging-roller, a saddle having a step-bearing, an anvil-roller over which the plate is flanged, the spindle of said roller extending into the saddle and resting upon the step-bearing, with a series of vertically-arranged rollers mounted between the spindle and the wall of the cavity in the saddle so that the roller will turn freely under side pressure, substantially as set forth.

9. The combination in a flanging-machine, of a head for supporting the plate, a clamp for clamping the plate to the head, flanging mechanism and three or more guides radiating from the center of the machine, carriages on each guide, arms extending from the carriages above the upper surface of the head so as to engage the plate, a rack on each carriage, a series of geared shafting and pinions meshing with the several racks, with a driving-shaft so that a uniform motion is imparted to the carriages whereby a plate placed on the head will be centered, substantially as described.

10. The combination in a flanging-machine, of a head for supporting the plate, a clamp for clamping the plate to the head, flanging mechanism and three or more guides radiating from the center of the machine, carriages on each guide, arms extending from the carriages above the upper surface of the head so as to engage the plate, a rack on each carriage, a series of geared shafting and pinions meshing with the several racks, a driving-shaft for imparting motion to the series of shafts, a rack, a pinion on the driving-shaft engaging with the rack, a fluid-pressure cylinder, a piston and piston-rod, said rod being connected to the rack, substantially as described.

11. The combination in a flanging-machine, of a head having a flat upper surface, a clamp having a concaved under surface, a central section adapted to be attached either to the head or the clamp and having a flat under surface and a convexed upper surface of substantially the same radius as the concaved surface of the clamp, substantially as described.

12. The combination in a flanging-machine, of the convexed head and a concaved clamp

and a roller-anvil, with means for adjusting the head in respect to the anvil, and means for turning down the flange of a plate over the anvil, substantially as described.

13. The combination in a flanging-machine, of means for holding the plate to be flanged, a carriage adapted to be moved toward and from the clamping means, a carrier adapted to the segmental guideways in the carriage, a head adapted to the carrier, a flanging-roller carried by said head, two or more screws for adjusting the head in the carrier, a spring acting upon one of said screws so as to hold the head between two of the screws to prevent lost motion, substantially as described.

14. The combination in a flanging-machine, of a clamp for the plate, a flanging-roll, a head carrying said roll and a carrier adapted to travel in the arc of a circle, three screws for adjusting the head in the carrier, one screw having a thread in one direction and the other two screws having threads in the opposite direction, a spring on the first-mentioned screw tending to draw the head against the threads of the other screws, substantially as and for the purpose set forth.

15. The combination in a flanging-machine, of a head having thereon a convex section extending from the edge of the head, a concaved clamp adapted to clamp the sheet on the concaved section, a roller-anvil arranged on one side of the head and adapted to pass under the edge of the section thereon, with means for turning down the flange of the plate over the anvil, substantially as described.

16. The combination in a flanging-machine, of a frame, a carriage thereon, two screws engaging with the carriage, means for holding said screws against longitudinal movement, gear-wheels on the screws, and a driven shaft having a gear-wheel meshing with the gear-wheels on the screw-shafts and a hand-wheel on one of said screw-shafts, substantially as described.

17. The combination in a flanging-machine, of a frame, a saddle, a roller-anvil carried thereby, two screw-shafts adapted to the saddle, a cross-shaft, bevel-gears connecting the cross-shaft with the screw-shafts, a driven shaft geared to one of said screw-shafts, the cross-shaft having a head to which a crank-handle can be applied, substantially as described.

18. The combination in a flanging-machine, of a centering device having travelers, vertical rollers thereon, racks on the travelers, gear-wheels meshing with the racks, shafts on which the gear-wheels are mounted, bevel-gears gearing the several shafts together, a driving-shaft, a pinion thereon, and a rack meshing with the gear-wheel, substantially as described.

19. The combination in a flanging-machine, of a head, a clamp, an intervening section having one surface flat and the other surface convexed, the head and clamp conforming to the shape of the intervening section, substantially as described.

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

JOHN S. WORTH.

Witnesses:
HENRY HOWSON,
JOS. H. KLEIN.