No. 819,194. PATENTED MAY 1, 1906.

C. WIGTEL.

HYDRAULIC PIPE RIVETING MACHINE.

APPLICATION FILED JAN. 17, 1901.

3 SHEETS—SHEET 1.

Fig. 2.

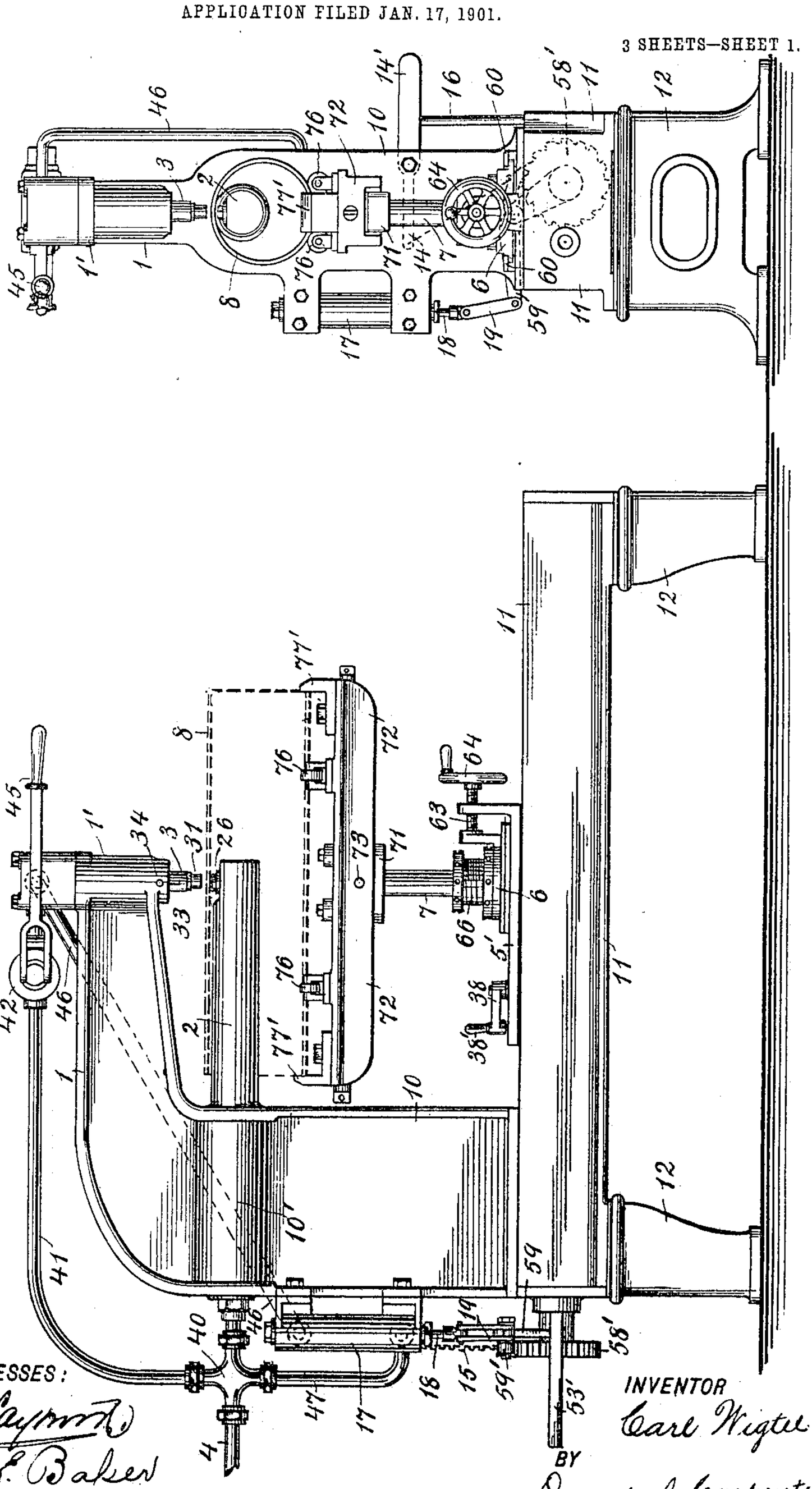

Fig. 1.

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3 SHEETS—SHEET 2.

Fig. 3.

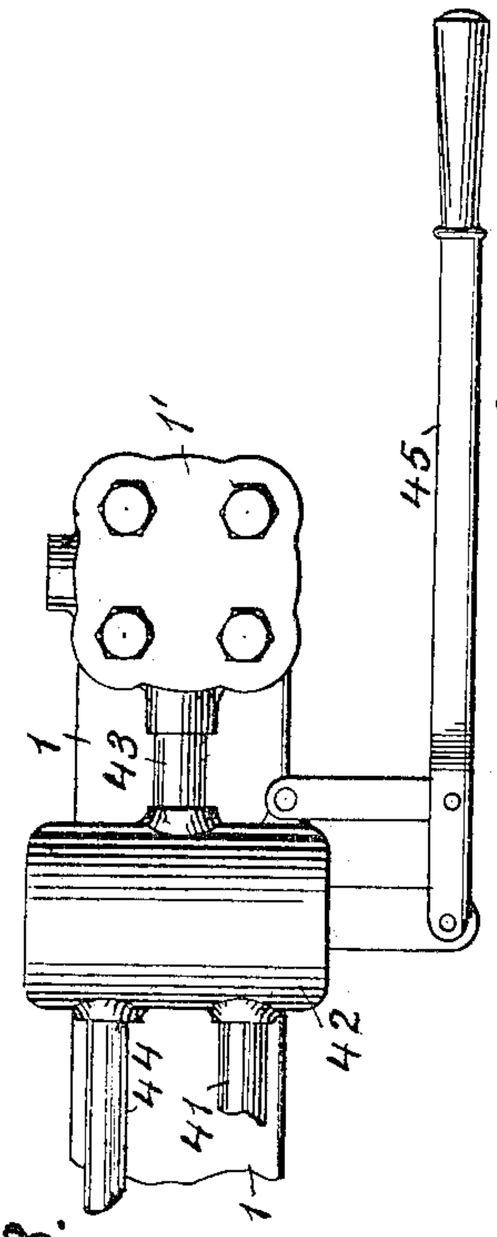


Fig. 6.

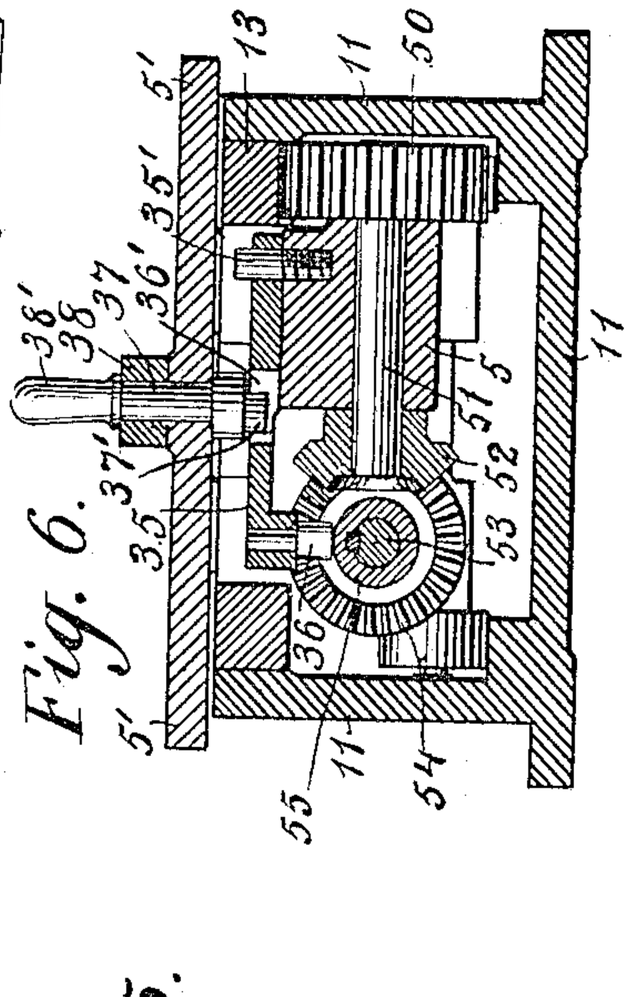


Fig. 5.

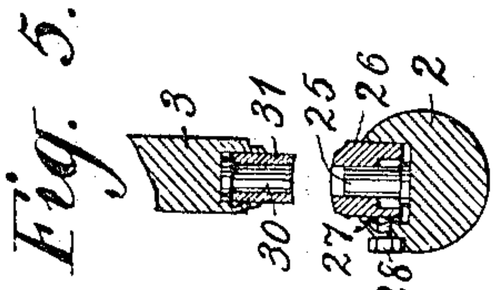
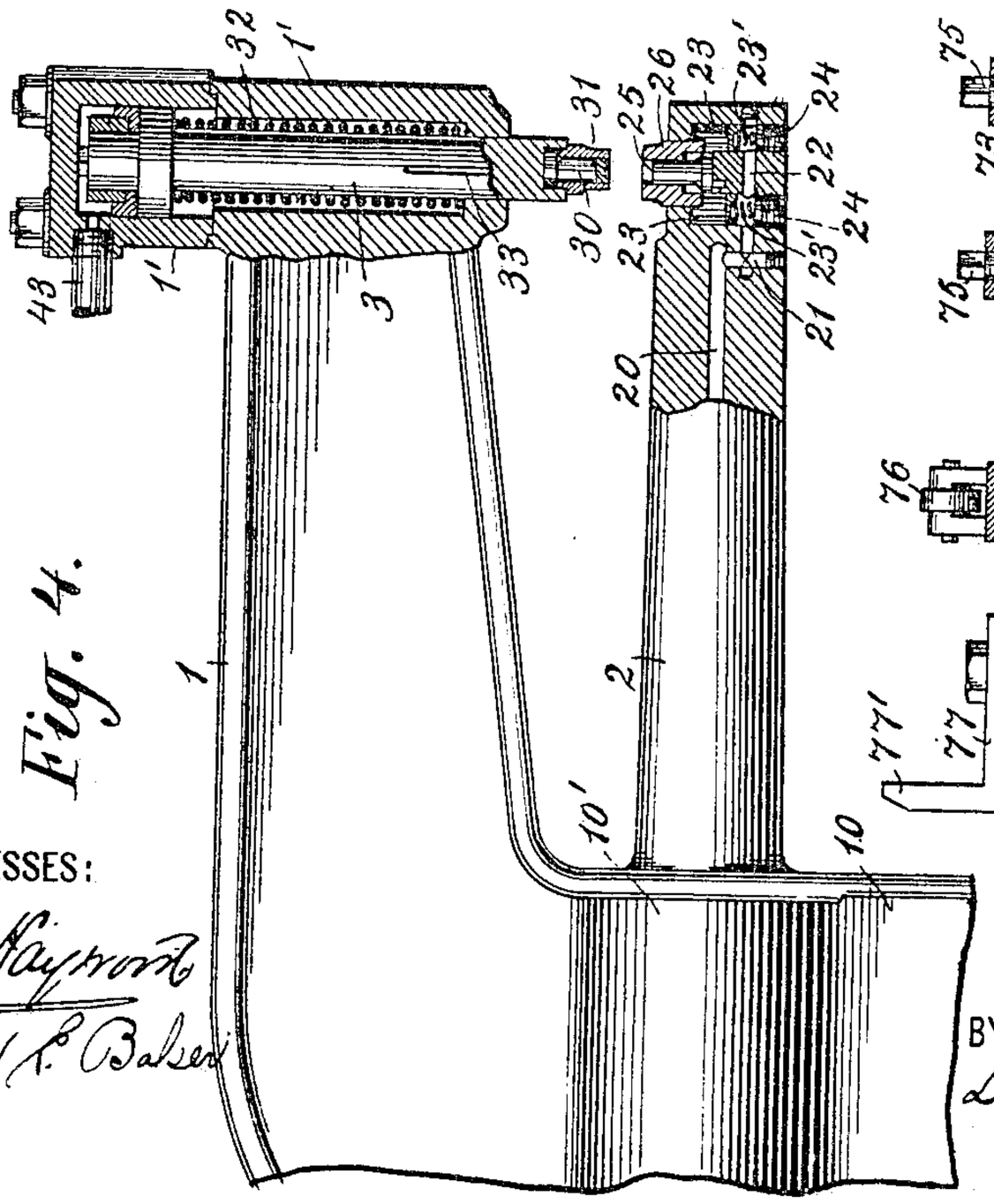
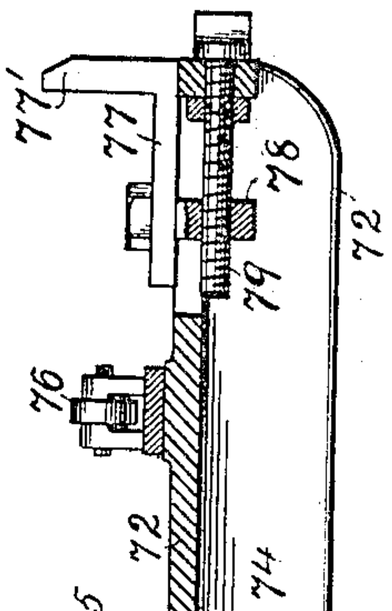


Fig. 4.





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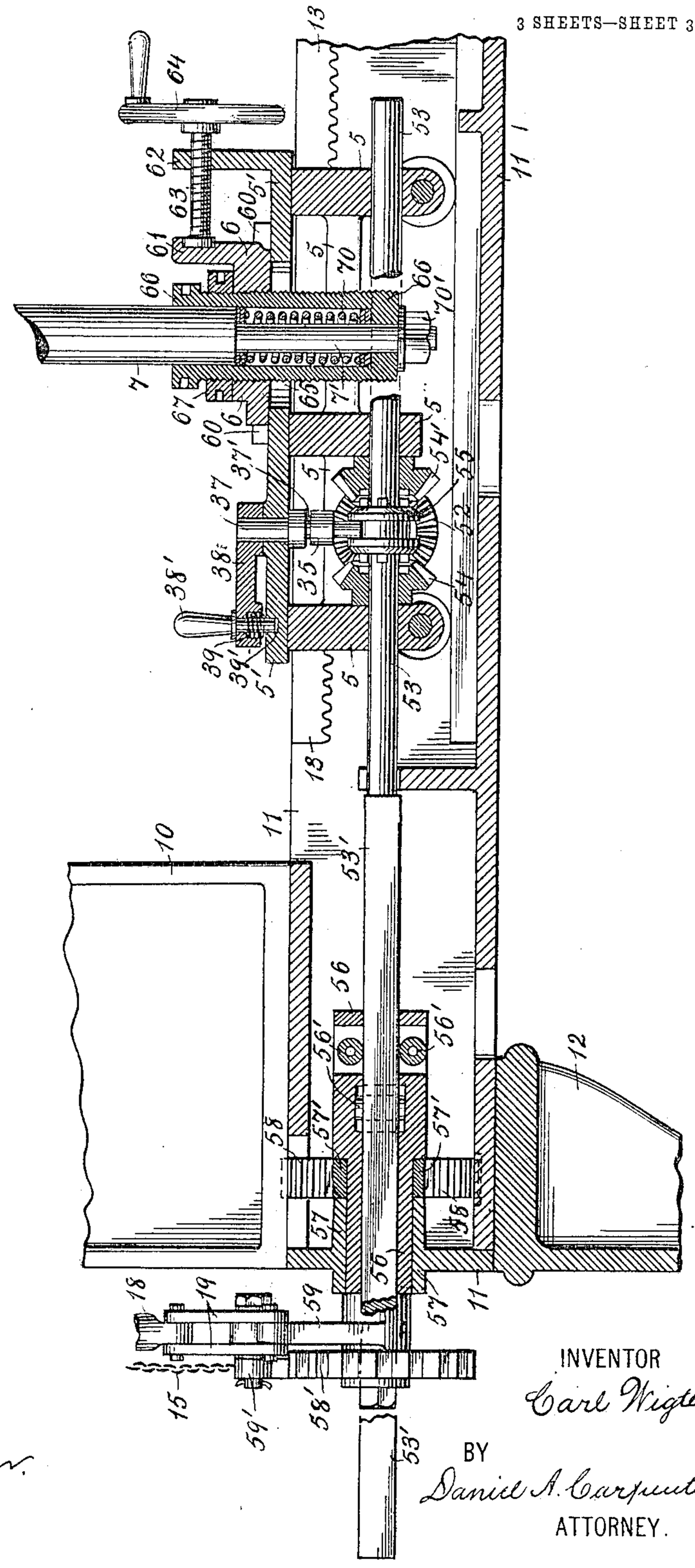
3 SHEETS—SHEET 3.

Fig. 7.



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HYDRAULIC PIPE-RIVETING MACHINE.

No. 819,194. Specification of Letters Patent. Patented May 1, 1906.

Application filed January 17, 1901. Serial No. 43,577.

To all whom it may concern:

Be it known that I, CARL WIGTEL, a citizen of the United States, and a resident of Brooklyn, in the county of Kings, in the city and State of New York, have invented a certain new and useful Improvement in Hydraulic Pipe-Riveting Machines, of which the following is a full, clear, and exact description, reference being made to the accompanying drawings, forming part of this specification.

This invention relates to improvements in the construction of hydraulic riveting-machines with which tubular skelps are riveted longitudinally to form sections of riveted pipe and which comprise a riveting-machine proper and supplemental work-carrying mechanism for supporting the skelps and facilitating their adjustment and feeding them forward and backward between the riveting-tools; and the object of the invention is to produce a machine to be used in making pipe-sections smaller in diameter than the smallest that are made with the particular machine shown in my application for a patent filed December 13, 1900, and bearing the serial number 39,668.

On the accompanying sheets of drawings, Figure 1 is a side elevation of a machine embodying the invention; Fig. 2, a front elevation thereof; Fig. 3, a plan of the head and a fragment adjacent to it; Fig. 4, a vertical and longitudinal section of the head, the front part of the anvil-stake, and the upper portion of the work-supporting apparatus; Fig. 5, a vertical and transverse section of the lower part of the ram and of the anvil-stake on the axes of the riveting-tools; Fig. 6, a cross-section of the base of the machine and of a part of the work-supporting and feeding apparatus, and Fig. 7 a longitudinal section of the base and a side view and longitudinal section of parts of the work supporting and feeding apparatus.

Similar reference-numerals designate like parts in different views.

Parts of other inventions, which are described and claimed in my aforesaid application and in another application filed by me October 5, 1900, and bearing the serial number 32,066, are embodied in this machine, and for that reason matter that otherwise might be claimed is not claimed in this application.

The machine illustrated is a four-ton riveter having a gap of sixteen inches, the stroke of the ram being an inch. It works under a pressure of fifteen hundred pounds per square inch and is used for riveting skelps of from four to eight inches in diameter with three-sixteenths cold rivets.

The main stake 1 of this machine is formed on a standard 10, and at the base of the stake and top of the standard is a socket 10′, in which is fixed the anvil-stake 2. The ram 3 is confined in and projects from the head 1′, whose lower part is formed on the main stake and whose upper part is bolted on the lower part, and in a recess in the face of the ram are fixed the riveting-tool 30 and a hollow post 31, through which the riveting-tool extends, as appears by Fig. 4. The riveting-tool contains at its lower end a cavity conforming to the heads of the rivets, and the faces of the tool and post are curved, as shown in Fig. 5, their curvature being that of the exterior surfaces of the tubular skelps which are to be riveted. A coil-spring 32 surrounds the ram and presses upward against the head of the ram. When the ram is in its highest position, it is sustained by this spring, and the spring also raises it to its highest position, when the fluid-pressure is withdrawn from it. The ram contains a groove 33, and in the head 1′ is a screw-pin 34, which extends into the groove 33, so that the ram is kept from turning, and the curved faces of the riveting-tool and post 31 are maintained in a proper relation to the curved surface of the work.

The anvil-stake, whose rear end protrudes from the socket 10′, contains a fluid-passage 20, that extends from the rear end of the stake to within a short distance of its front end. This passage is connected by passages 21 and 22 with chambers which contain pistons 23, under which are coil-springs 23′, the chambers being drilled in the stake and the lower ends of the holes being closed by screw-plugs and rings of packing 24. A riveting-post 25 is fixed in the stake between these chambers, and on the pistons 23 is a compressor-sleeve 26, which surrounds the riveting-post and extends above it when the pistons are in their highest positions, the sleeve and riveting-post both protruding from the stake through a hole that intersects the chambers of the pistons. The face of the sleeve is curved convexly, its curvature corresponding to that of the interior of the skelps. The sleeve contains a groove 27, and into

this groove extends a screw-pin 28, which is inserted in the anvil-stake and coacts with the groove in keeping the sleeve in a proper relation to the work by preventing the sleeve from turning.

A pipe 4, which is connected with an accumulator or other apparatus by which the actuating fluid is subjected to pressure, communicates through a four-way coupling 40 with the fluid-passage 20, and from this coupling a pipe 41 extends to the valve-casing 42 near and behind the head 1′. A pipe 43 connects the interior of the valve-casing with the chamber of the ram, and to the valve-casing is attached a release-pipe 44, as appears by Fig. 3. The valve-casing contains the valves by which the actuating fluid is admitted to the head 1′ from the pipe 41 and allowed to pass from the head into the release-pipe. They are actuated by the hand-lever 45. After the fluid is admitted to the pipe 4 it remains therein and in the fluid-passage 20 and the pipe 41 with the pressure upon it and acts upward constantly on the pistons 23 at the front end of the anvil-stake while the use of the machine continues.

The standard 10 is fixed on an oblong hollow base 11, which rests at its ends on supports 12. Within the base and close to its bottom is a track, on which is a work-supporting carriage, and at the top of one side of the base and on the inner face of the side is a rack-bar 13, which is fastened to the base. The carriage is composed of a frame 5, mounted on wheels, and of a plate 5′, fixed on the frame and projecting over the sides of the base, as appears by Figs. 6 and 7. On the carriage is a pinion 50, which engages with the rack-bar 13 and which is fast on a shaft 51, having a bearing in the frame 5, and a bevel-gear 52 is also fast on this shaft. Another shaft 53, whose axis intersects at right angles the prolonged axis of the shaft 51, has bearings in the frame 5, and on this shaft 53 are loosely mounted bevel-gears 54 and 54′ and a block 55, which is keyed to the shaft between the gears. These gears both engage with the bevel-gear 52 and may be alternately locked to the shaft 53 with the block 55, the shaft being movable lengthwise in its bearings, so as to allow the block to be engaged with either of the gears, or the block may be held disengaged from both gears. The rear part 53′ of the shaft 53 is square in cross-section and extends through a case 56, in which are vertical and horizontal rollers 56′, which are in contact with the faces of the shaft and which form roller-bearings in which the shaft is movable lengthwise with but little friction. The case 56 is mounted to turn in a bearing 57, formed on the back of the base 11, and on it is a pinion 57′. In another bearing formed on the back of the base 11 is a short shaft, on which is a gear 58, that engages with the pinion 57′, and on this shaft behind the base are a ratchet-wheel 58′ and a lever 59, on which is a pawl 59′, that engages with the ratchet, except when it is held out of engagement therewith. The pawl is connected with a bar 14 by a chain 15. This bar is loosely pivoted to the back of the standard 10, and its heavier arm 14′ is supported by a post 16 when the pawl engages with the ratchet-wheel. A cylinder 17 is attached to the standard 10, and in this cylinder is a piston whose piston-rod 18 is connected by a link 19 with the lever 59. Fluid-passages consisting of pipes 46 and 47 extend from the head 1′ above the ram and from the coupling 40 to the chamber of the cylinder above and below the piston, respectively.

Above the shaft 51 a bar 35 is pivoted on the frame of the carriage by a vertical pin 35′. This bar, which extends over the block 55, has on its under side a projection 36, that fits in the groove in the block, and in the bar is a slot 36′. A pin 37, to which is attached a pin 37′, that extends into the slot 36′, passes through the plate 5′ and is fixed in a crank-arm 38. The pin 37 is loose in the plate 5′, and the axis of the pin 37′ is farther from the pivot 35′ than is the prolonged axis of the pin 37. At the rear end of the crank-arm is a handle 38′, having a stem that passes through the crank-arm and has on it a coil-spring 39, that exerts pressure downward on the stem and keeps the stem in a hole 39′ in the plate 5′ or in either of two similar holes to which it may be turned on the axis of the pin 37 in opposite directions from the hole shown in Fig. 7.

If the block 55 is disengaged from both the gears 54 and 54′, as it is shown, then the carriage may be pushed along its track in either direction, the shaft 53 not being turned, but being moved lengthwise in the case 56. This shaft is rotated by the action on it of the piston in the cylinder 17 through the connecting mechanism, the motion being intermittent and in one direction only, and if the block 55 is engaged with one of the bevel-gears the shaft imparts an intermittent motion to the carriage, moving it toward the standard 10 if the block is engaged with the gear 54 and from the standard if the block is engaged with the gear 54′. The operator of the machine engages the block with or disengages it from either gear by raising the handle 38′ and turning the rear end of the crank-arm toward or from him, thereby turning the bar 35 on its pivot and moving the block 55 with the projection 36.

A block 6 is secured on the plate 5′ between fixed guides 60, in which it is movable lengthwise of the carriage. It has an upright extension 61, to which is attached a screw that passes through and engages with an upright extension 62 of the plate 5′, the screw 63 having on it a hand-wheel 64. In the plate 5′ under the block 6 is an oblong

hole 65 and through the block 6 and this hole passes a socket 66, which is screwed in the block and on which is a lock-nut 67. A post 7 fits in this socket, in which it is supported by a coil-spring 70, a rod or extension 7′ passing through the spring and the bottom of the socket and having a nut 70′ upon it. The post 7 has a block 71 affixed to its upper end. To this block a platform or frame 72 is pivoted by a pin 73, and springs 74 held in holes in the block press upward against screws 75, inserted in the platform. On the top of the platform are rollers 76, and at its ends are slides 77, having upright extensions or jaws 77′. Lugs 78 are attached to the bottoms of the slides, and screws 79 extend through the ends of the platform and engage with these lugs.

Each skelp is commonly riveted with two rows of rivets. It is first fed inward over the anvil-stake until half or about half of the rivets of one row are fixed in it. The skelp 8 rests on the rollers 76, clamped between the jaws 77′, pressing against its ends, the socket 66 being so adjusted that the skelp clears the compressor-sleeve, except when it is held in contact therewith by the riveting-tool and post 30 and 31. As the ram descends the riveting-tool and post meet the head of the rivet and top of the skelp, and since the spring 70 and the pin 73 and springs 74 allow the platform to be depressed and tilted the skelp is forced downward on the compressor-sleeve, and its parts are pressed tightly together between the sleeve and the riveting-tool and post 30 and 31, the stem of the rivet extending into the sleeve. The pressure of the skelp on the compressor-sleeve depresses the sleeve, the force acting upward on the pistons 23 being less than that acting downward on the ram, for the areas of the lower ends of the pistons are less than the area of the top of the ram, and the rivet is driven against the post 25 and upset thereon against the inner surface of the skelp.

When the actuating fluid is admitted to the head 1′, it depresses not only the ram, but also the piston in the cylinder 17, on which it acts through the pipe 46 and on which it exerts a greater force than that by which the piston is sustained, because the area of the top of the piston is greater than that of the annular surface on which the fluid acts upward under the piston. The pawl 59′ is thereupon drawn backward until it engages with the next tooth of the ratchet-wheel 58′. As the pressure is withdrawn from the ram after the rivet has been upset it is also withdrawn from the top of the piston in the cylinder 17. The ram is retracted by the spring 32, and the platform 72 is raised by the spring 70, so that the skelp again clears the compressor-sleeve, while the sleeve is restored to its highest position by the action of the springs 23′ and the fluid on the pistons 23, the springs first raising the pistons far enough to allow the fluid to get under them. The piston in the cylinder 17 is raised after it is released from the pressure above it by the fluid which constantly acts upon it through the pipe 47, and the ratchet-wheel 58′ is accordingly turned by the pawl, whereupon the case 56 and the shaft 53 are rotated and motion is imparted to the carriage through the action of the pinion 50 on the rack-bar 13. As the carriage moves the shaft 53 is pushed or drawn lengthwise in the case 56, as well as turned with the case. The distance traveled by the carriage each time the ratchet-wheel is turned is equal or approximately equal to that from the axis of a rivet-hole to the axis of the next rivet-hole, the ratchet-wheel and the gearing connecting it with the case 56 and that connecting the shaft 53 with the rack-bar 13 being such as are required to properly regulate the movements of the carriage. If a rivet should not be brought by the carriage exactly into alinement with the riveting-tools, the work is moved forward or backward by turning the screw 63 with the hand-wheel 64, and thereby moving the block 6 in the guides 60. Should it be desirable to render the ratchet-wheel temporarily inoperative, the bar 14 is pushed off the post 16, whereupon the heavier part 14′ of the bar descends and the pawl is drawn and held by the chain 15 out of engagement with the ratchet-wheel. Hence another movement will not be imparted to the carriage after the operation on the next rivet, or until the pawl is reengaged with the ratchet-wheel. The bar may be pushed off the post during the last inward movement which the carriage can make without forcing the platform against the standard 10 by a device attached to the platform or carriage and arranged to meet the bar when the carriage makes that movement.

When the carriage has traveled inward to the position in which it is shown in Fig. 1, and half of the rivets of one row have been set, the skelp is turned and adjusted on the rollers 76 and then fed forward and riveted with half of the second row of rivets. After that the platform is turned through half a revolution, the post 7 turning in the socket 66, and the skelp is again fed first inward and then outward and riveted as before from the end to the middle and from the middle to the end.

The hollow post 31 and the compressor-sleeve 26 are interchangeable respectively with other similar posts and sleeves which fit skelps of different diameters, and when skelps larger or smaller than that shown are riveted then a post 31 and a compressor-sleeve which fit the outer and inner surfaces of the larger and smaller skelps are used.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a hydraulic pipe-riveting machine

the combination with a ram and riveting-tool of: an anvil-stake that extends into the skelps and that has within it a fluid-passage extending from the base to the outer part of the stake; a riveting-post at the outer end of this stake; and a compressor comprising a sleeve surrounding the riveting-post, and hydraulic apparatus to which fluid is conducted through said fluid-passage; substantially as described.

2. A hydraulic pipe-riveting machine comprising the combination of: a riveting-machine proper having an upper main stake and a lower anvil-stake; a vertically-movable work-support under the anvil-stake; and a spring acting upward on the work-support; substantially as described.

3. A hydraulic pipe-riveting machine comprising the combination of: a riveting-machine proper; and a work-support comprising vertically-yielding work-holding apparatus mounted to turn on a vertical axis; substantially as described.

4. A hydraulic pipe-riveting machine comprising the combination of: a riveting-machine proper; a work-support that is movable horizontally and that comprises vertically-yielding work-holding apparatus; and feeding mechanism to actuate said work-support; substantially as described.

5. A hydraulic pipe-riveting machine comprising the combination of: a riveting-machine proper; and a work-support comprising a platform or frame mounted to rock on a horizontal axis; substantially as described.

6. A hydraulic pipe-riveting machine comprising the combination of: a riveting-machine proper; and a work-support comprising a platform or frame mounted to rock on a horizontal axis and to turn on a vertical axis; substantially as described.

7. A hydraulic pipe-riveting machine comprising the combination of: a riveting-machine proper; and a work-support comprising a vertically-yielding platform or frame mounted to rock on a horizontal axis and to turn on a vertical axis; substantially as described.

8. A hydraulic pipe-riveting machine comprising the combination of: a riveting-machine proper; vertically-yielding work-holding apparatus; a carriage on which said apparatus is mounted; and mechanism to actuate the carriage; substantially as described.

9. A hydraulic pipe-riveting machine comprising the combination of: a riveting-machine proper; vertically-yielding work-holding apparatus; a carriage on which said apparatus is mounted; means to adjust said apparatus horizontally; and mechanism to actuate the carriage; substantially as described.

10. A hydraulic pipe-riveting machine comprising the combination of: a riveting-machine proper; vertically-yielding work-holding apparatus mounted to turn on a vertical axis; a carriage on which said apparatus is secured; and mechanism to actuate the carriage; substantially as described.

11. A hydraulic pipe-riveting machine comprising the combination of: a riveting-machine proper; a platform or frame having work-holding devices thereon; a vertical post on which the platform or frame is mounted; a socket in which the post is secured; a spring within the socket, supporting the post; and a carriage to which the socket is attached; substantially as described.

12. A hydraulic pipe-riveting machine comprising the combination of: a riveting-machine proper; a platform or frame having work-holding devices thereon; a vertical post on which the platform or frame is mounted; a socket in which the post is secured; a spring within the socket, supporting the post; a carriage; and a slide supporting the socket on the carriage; substantially as described.

13. In a hydraulic pipe-riveting machine the combination with the riveting-tools and hydraulic apparatus for actuating them of: a carriage with work-holding apparatus secured thereon; a pinion and gear fast on a common shaft mounted on the carriage; a fixed rack-bar with which the pinion engages; and mechanism connected with said hydraulic apparatus and said gear and operative to actuate said gear.

14. A hydraulic pipe-riveting machine comprising the combination of: a riveting-machine proper; a carriage with work-holding apparatus secured thereon; and carriage-driving mechanism comprising a shaft and a case through which the shaft extends, the case being mounted to turn in a fixed bearing, and the shaft having bearings on the carriage and being movable on its axis with the case and movable lengthwise in the case; substantially as described.

15. A hydraulic pipe-riveting machine comprising the combination of: a riveting-machine proper; a carriage with work-holding apparatus secured thereon; and carriage-driving mechanism comprising a shaft 53 and a case 56, the case being mounted in a fixed bearing 57, and the shaft having bearings on the frame of the carriage, and the part 53′ of the shaft extending through the case between the rollers 56′; substantially as described.

16. A hydraulic pipe-riveting machine comprising the combination of: a riveting-machine proper; a carriage with work-holding apparatus secured thereon; carriage-driving mechanism operative to actuate the carriage in the intervals between the operations of the riveting-tools on the rivets, said mechanism comprising a shaft having bearings on the carriage and movable lengthwise with the carriage; and means to reverse the motion of the carriage; substantially as described.

17. A hydraulic pipe-riveting machine

comprising the combination of: a riveting-machine proper; a carriage with work-holding apparatus secured thereon; a fixed rack-bar; a pinion mounted on the carriage and engaging with the rack-bar; a shaft having bearings on the frame of the carriage and movable lengthwise with the carriage; gearing between the pinion and said shaft; and shaft-driving mechanism to rotate said shaft; substantially as described.

18. A hydraulic riveting-machine consisting of a stationary frame having an arm or support and a mandrel, said arm or support and mandrel united at the rear and separated at the front, a fluid-pressure ram upon the arm or support, and a heading-tool carried thereby, a yielding plate-closing device and an internal heading-tool carried by the mandrel, said tools operating at right angles to the arm or support and mandrel, connections with a source of pressure-supply whereby the upper heading-tool is depressed, and connections located within the mandrel by which pressure is supplied simultaneously to act upon the plate-closer whereby the plates are clamped between it and the upper heading-tool, said plate-closer being moved by superior pressure from above to allow the rivet to contact with the inner head-forming tool.

19. In hydraulic riveting apparatus, a fixed mandrel and arm or support, a yielding plate-closer and heading-tool carried by the mandrel, a fluid-pressure-actuated ram and a heading-tool carried thereby in opposition to the plate-closer and tool carried by the mandrel, a carriage and mechanism by which it is advanced after the setting of each rivet to bring the next rivet-hole in line, and a tilting carrier or frame mounted upon the carriage and forming a pipe-support whereby the pipe is allowed to automatically adjust itself to the positions of the riveting-tool.

20. In a hydraulic riveting apparatus, a mandrel and arm or support, an internal yielding plate-closer and riveting-tool concentric therewith, an exterior fluid-pressure ram and heading-tool carried thereby, a carriage and mechanism by which it is advanced a distance equal to that between the rivet-holes after the setting of each rivet, a tilting-carrier supported thereon, supports fixed in pairs upon said carrier upon which the pipe rests and upon which it is turnable to bring either series of rivet-holes into the line of the riveting-tools, and an end clamping mechanism by which the pipe-section is held in position after adjustment.

21. A hydraulic riveting-machine, exterior and interior heading-tools, a fluid-pressure ram and yielding plate-closer, a tilting carrier and clamps by which the pipe is secured thereto, a carriage upon which the carrier is supported, mechanism by which the carriage is advanced a distance equal to that between the rivet-holes after the setting of each rivet, and a supplemental slide movable upon the carriage whereby the carrier and pipe may be exactly adjusted to the riveting-tools.

22. In a hydraulic riveting-machine, the exterior and interior rivet-heading tools, a fluid-pressure ram and yielding plate-closing device, a carrier and means for supporting and securing the pipe thereon, a carriage movable to bring the rivet-holes successively in line with the riveting-tools, a standard supporting the carrier from the carriage, and a guide or socket within which it is vertically slidable, and a yielding support to said standard whereby the pipe is raised from the mandrel after a rivet is set, and is allowed to be depressed with relation thereto while the riveting is being effected.

23. In a hydraulic riveting apparatus, a fixed hollow mandrel and a standard or support from which it is supported, a fluid-pressure ram carried by the standard and a riveting-tool actuated thereby, a second riveting-tool supported upon the end of the mandrel and an annular plate-closing socket-piece movable with relation to said interior tool, plungers movable in cylinders and acting to press the plate-closer upwardly, pipe connections with the source of pressure-supply extending through the hollow mandrel and connecting with the cylinders.

24. In a hydraulic riveting-machine, a fixed mandrel and a standard from which it projects and is supported, a fluid-pressure ram mounted upon the standard and a riveting-tool carried thereby, a second riveting heading-tool mounted upon the end of the mandrel in opposition to that carried by the ram a sleeve or socket concentric and movable with relation to the interior tool, vertically-moving plungers fitting in cylinders upon each side of the heading-tool having their upper ends adapted to support opposite sides of the socket-piece or sleeve, a pipe or passage opening into the cylinders and connecting with a source of fluid-pressure supply whereby the plungers are simultaneously raised and the sleeve forced above the level of the riveting-tool so that plates to be riveted are first compressed together between the exterior riveting-head and the interior yielding sleeve and the latter is afterward forced down by superior pressure of the ram to allow the rivet to be headed between the two tools.

25. In a hydraulic riveting-machine, a fixed mandrel, a standard to which it is connected, a fluid-pressure ram, a riveting-tool carried by the ram, an interior riveting-tool arranged in opposition to the tool carried by the ram and supported upon the outer end of the mandrel, a yielding socket-piece or sleeve vertically movable with relation to the riveting-tool of the mandrel having a convex surface coincident with the curvature of

the pipe and a corresponding socket-piece through which the riveting-tool of the ram passes, said socket-piece having a concaved lower face coincident with the exterior curvature of the pipe whereby the latter is first compressed between said socket-piece before the riveting-tools have acted to head the rivet.

26. In a hydraulic riveting-machine, a fixed mandrel and supporting-standard having an arm or support, a fluid-pressure ram mounted upon the arm or support, the riveting-tool carried thereby, an internal riveting-tool supported upon the outer end of the mandrel, said tools operating substantially at right angles to the projection of the arm or support and mandrel, socket-pieces or sleeves through which the riveting-tools pass, the interior socket-piece being yieldingly supported and slidable with relation to the tool which it incloses having a convex surface corresponding with the curature of the pipe and the concavity of the exterior socket-piece, and a guide whereby it is maintained in position and prevented from turning during its reciprocations.

27. In a hydraulic riveting-machine, a fixed mandrel with riveting-tool and yielding plate-closer arranged substantially at right angles thereto, an exterior fluid-pressure ram and a riveting-tool carried thereby, socket-pieces through which the exterior and interior riveting-tools pass, said socket-pieces having their faces respectively made concave and convex to fit the shape of the pipe and guides by which they are prevented from turning.

28. In a hydraulic riveting apparatus, a fixed mandrel a riveting-tool carried thereby and surrounding yielding socket-piece, a fluid-pressure ram and exterior riveting-tool carried thereby with corresponding socket-piece through which it passes, said tools operating substantially at right angles to the mandrel and said socket-pieces having the angles cut away to allow them to extend between the adjacent lines of rivets without contact therewith.

CARL WIGTEL.

In presence of—
DAVID P. DONOVAN,
ANDREW P. HACHTMANN.