

No. 819,193.

PATENTED MAY 1, 1906.

C. WIGTEL.  
HYDRAULIC PIPE RIVETING MACHINE.

APPLICATION FILED OCT. 5, 1900.

3 SHEETS—SHEET 1.

Fig. 1.

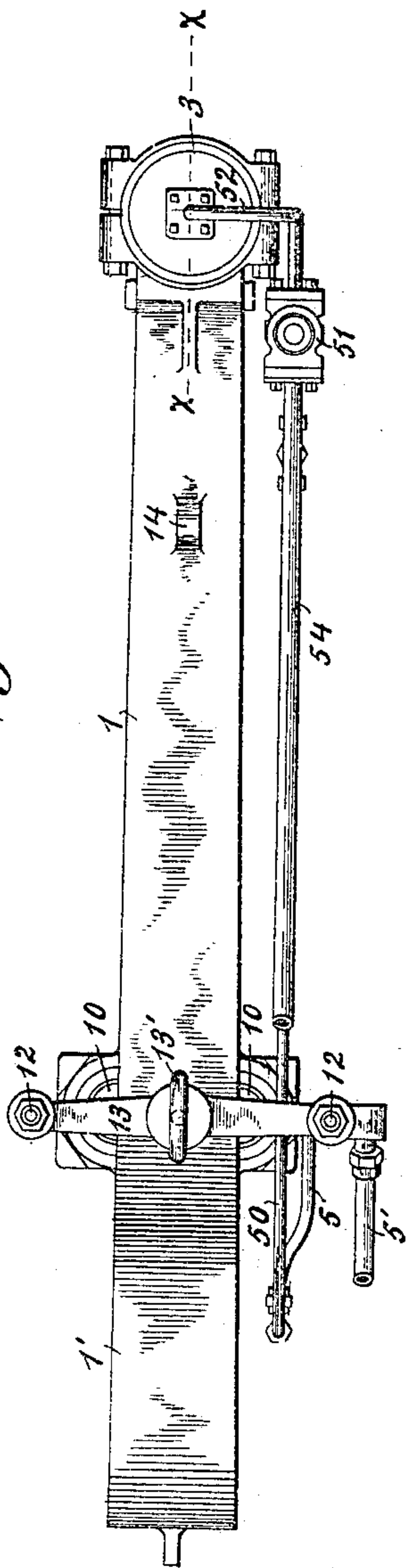


Fig. 2.

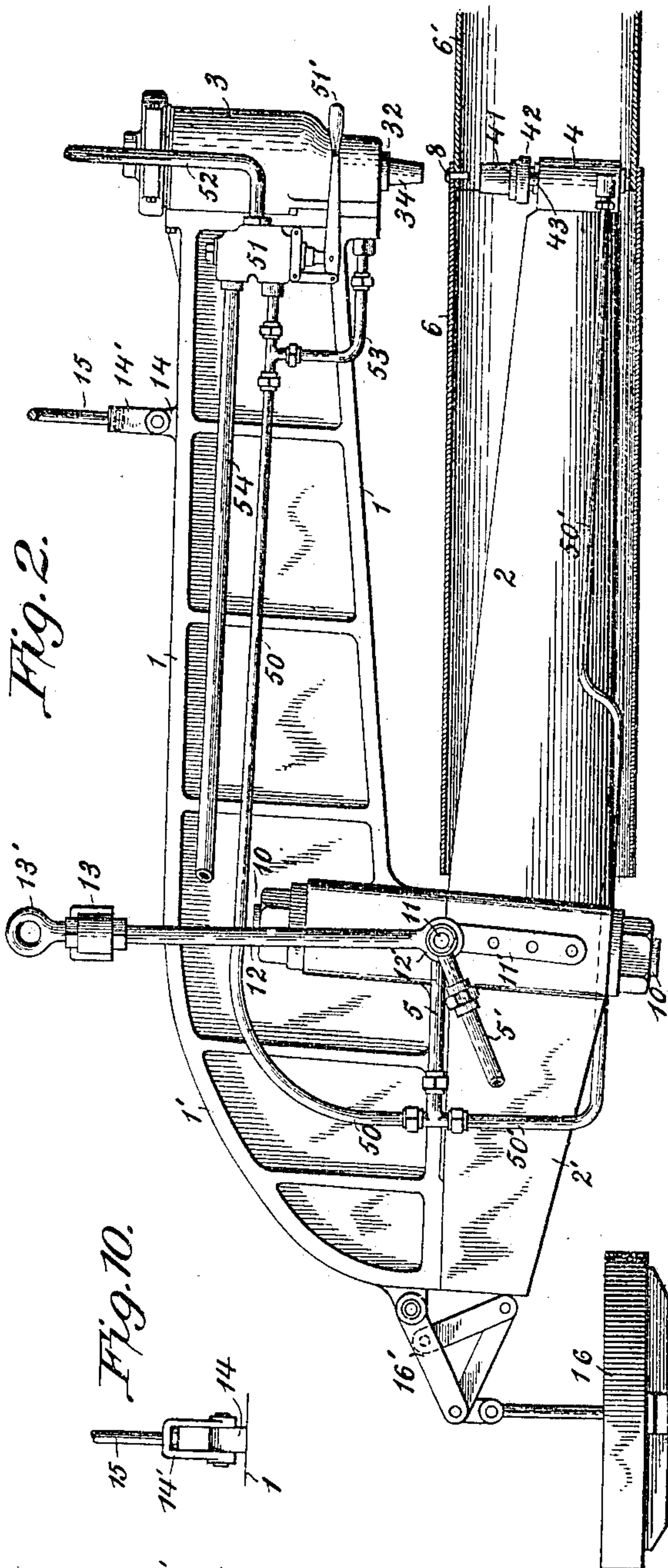


Fig. 10.

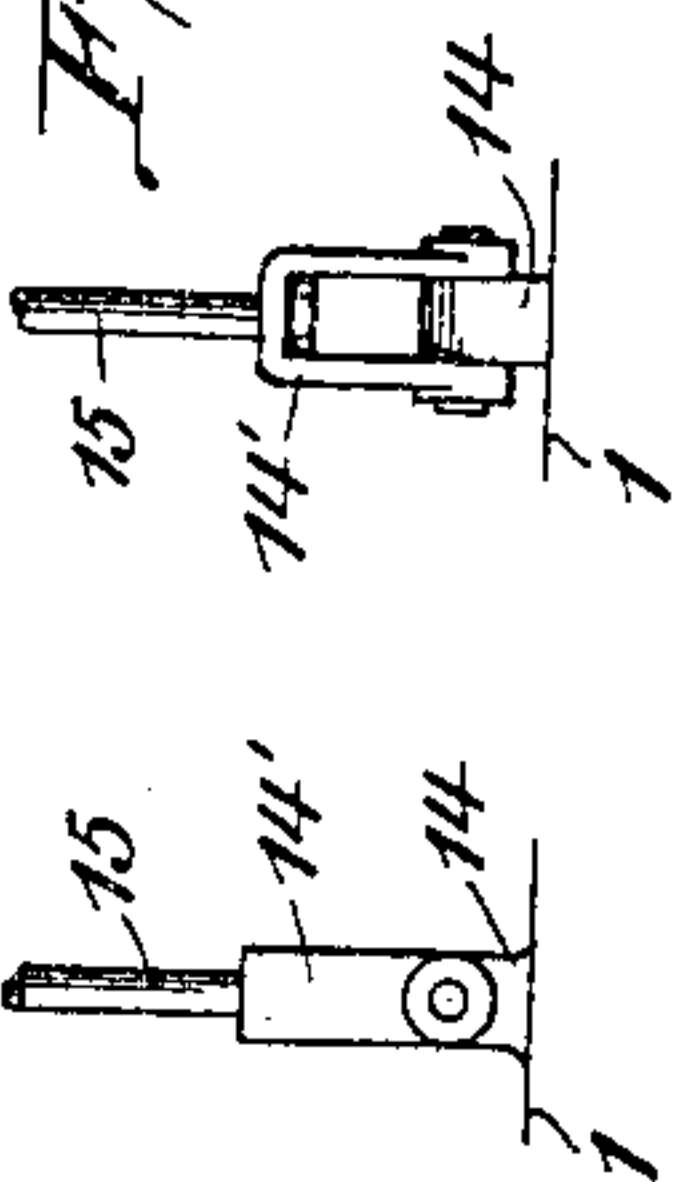
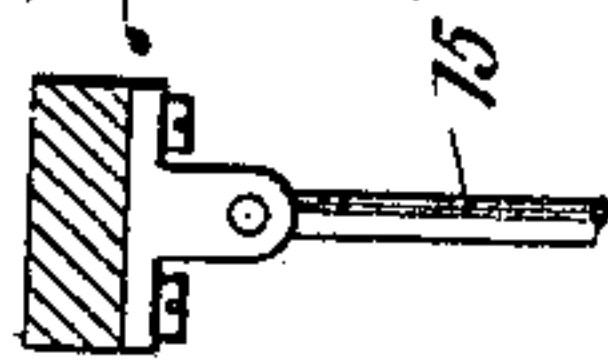


Fig. 9.



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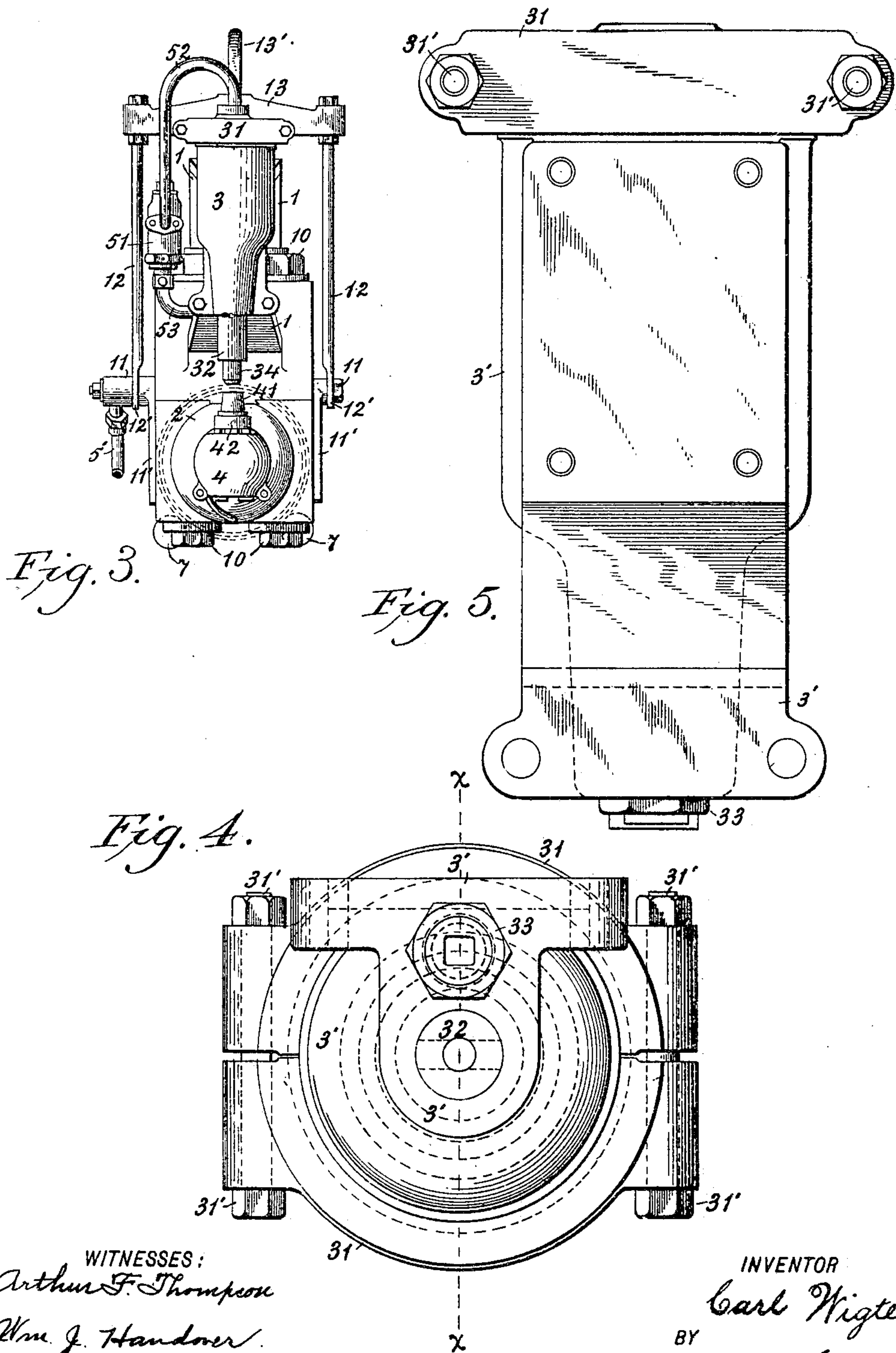
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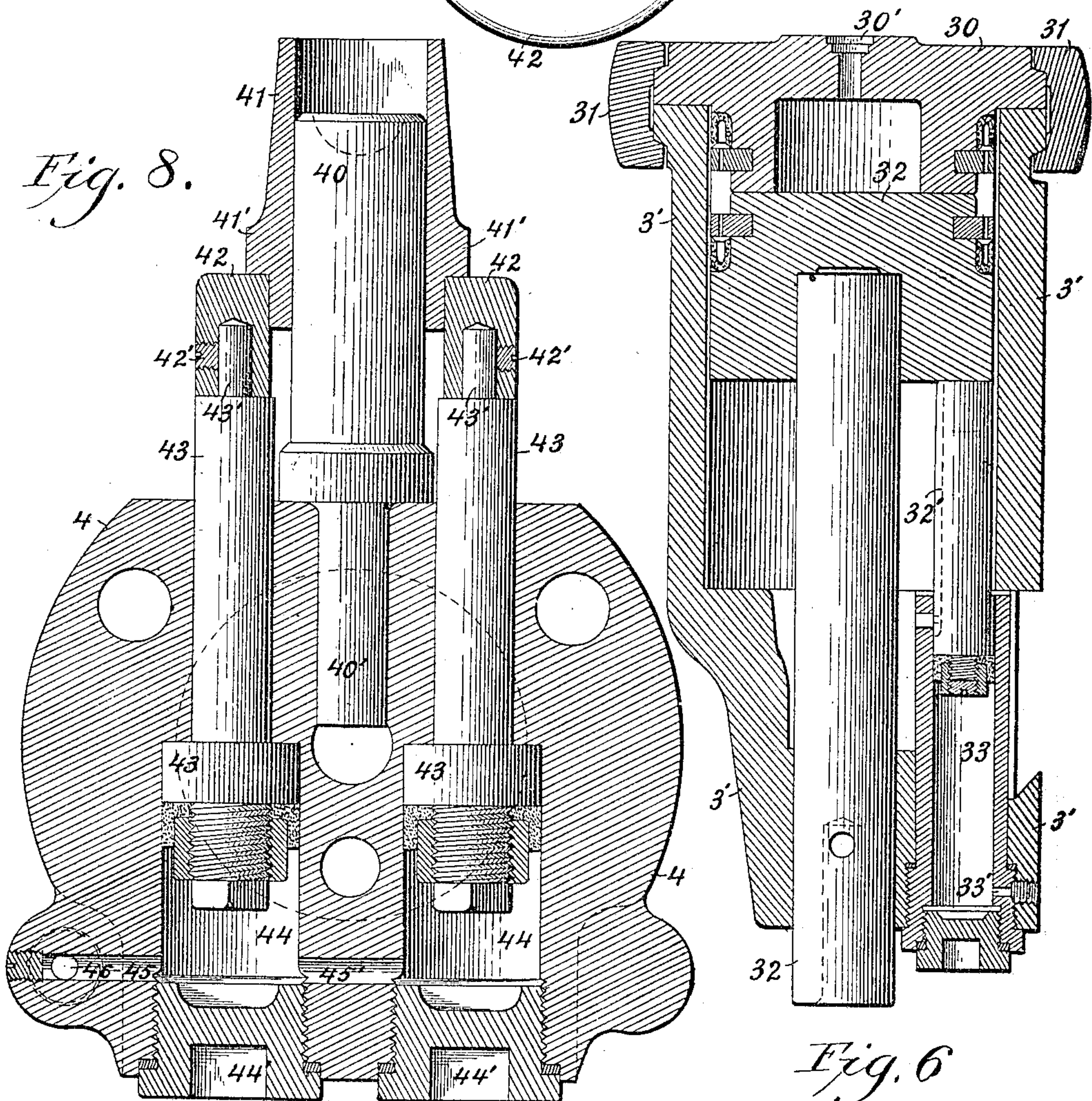
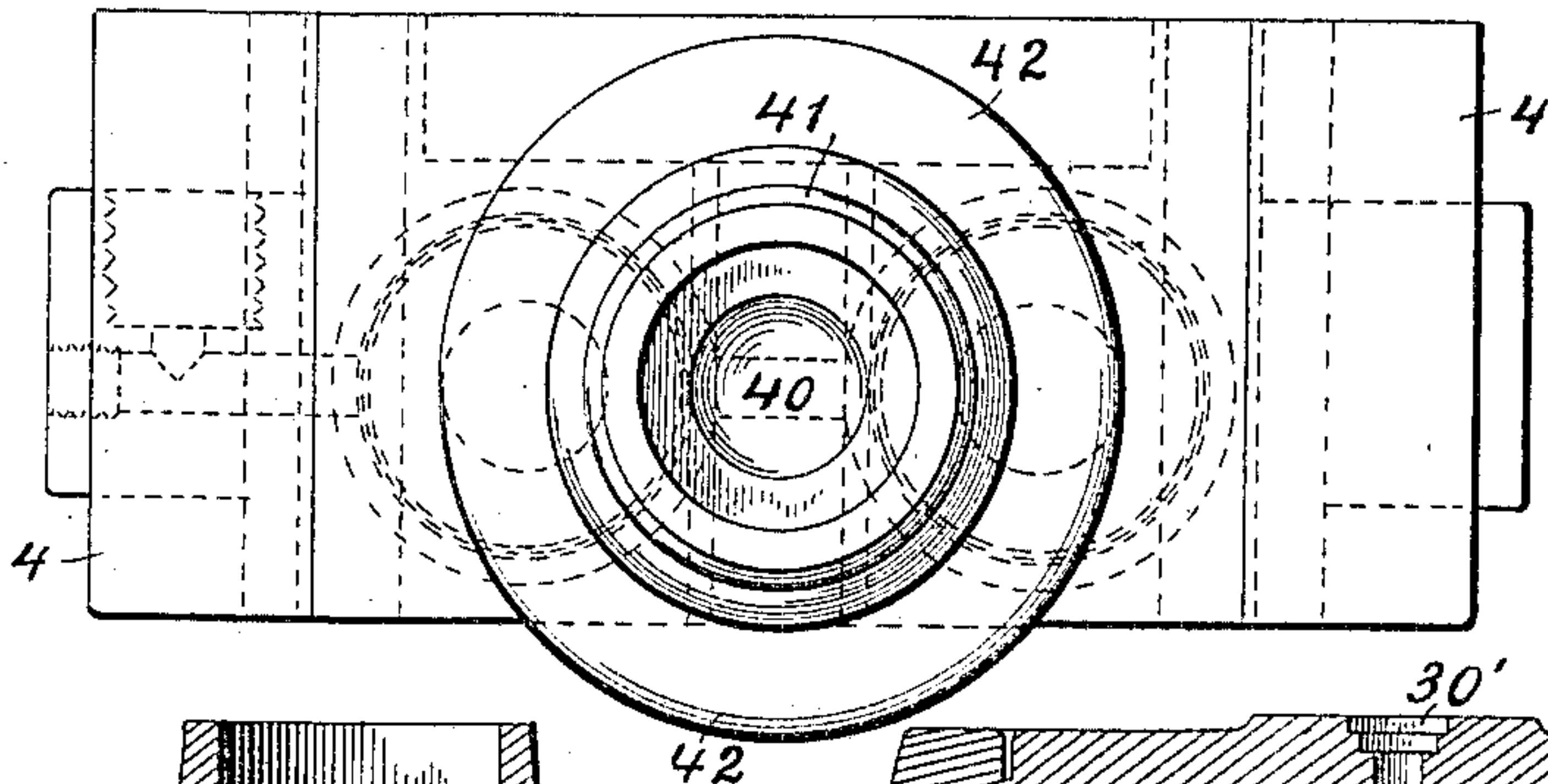
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3 SHEETS—SHEET 3.



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# UNITED STATES PATENT OFFICE.

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## HYDRAULIC PIPE-RIVETING MACHINE.

No. 819,193.

Specification of Letters Patent.

Patented May 1, 1906.

Application filed October 5, 1900. Serial No. 32,066.

*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 two or more sections of wrought iron or steel pipe are riveted together to produce a compound section of the required length; and the object of the invention is to provide for the construction of machines capable of properly riveting the primary sections together by upsetting the rivets on the inner surface of the pipe instead of on its exterior and of otherwise facilitating the performance of the work, as hereinafter explained.

On the accompanying sheets of drawings, Figure 1 is a side elevation of a machine embodying the invention; Fig. 2, a plan of the machine; Fig. 3, a front elevation thereof; Fig. 4, a plan of the head inverted; Fig. 5, a rear elevation of the head; Fig. 6, a vertical section of the head in the plane  $x x$ , Figs. 2 and 4; Fig. 7, a plan of the riveting-post and compressor and of the block on which they are mounted at the front end of the anvil-stake; Fig. 8, a sectional elevation of the compressor and block, showing the riveting-post and the compressor-pistons; and Figs. 9 and 10 are broken side and front views, respectively, of a stop.

Similar reference-numbers designate like parts in different views.

The drawings represent a machine built to rivet together six-foot sections of eighteen-inch pipe with three-quarters-inch rivets. The dimensions of the first three figures are one-sixteenth, those of the fourth, fifth, and sixth figures are one-quarter, and those of the seventh and eighth figures are one-half of the corresponding dimensions of the machine. The ram has a stroke of five and one-half inches and exerts a pressure of sixteen-hundred pounds per square inch. The machine is supported by trunnions in a horizontal or nearly horizontal position with respect

to its length and may be either suspended in a yoke, as shown, or mounted on a standard or truck.

The frame of the machine is composed of the main stake 1 and anvil-stake 2, provided with the extensions 1' and 2', respectively, and fastened together by the bolts 10. The head 3 is secured to the front end of the main stake, from which it is detachable. It is a hollow steel casting 3', covered by a cap 30, which contains a pipe-inlet 30', the cap being fastened on the casting 3' by the sectional ring 31, whose parts are clamped together by the bolts 31'. The head contains the ram 32 and the ram-lifting piston 32', whose cylinder 33 is provided with the pipe-inlet 33'. The riveting-tool 34 is affixed to the lower end of the ram by the stem of the tool driven into a hole in the ram.

The block 4, on which are mounted the riveting-post and compressor, is a steel casting which fits on and against the front end of the anvil-stake 2 and is bolted to it. The riveting-post 40, at whose upper end is a heading-die formed in the post, rests on the block, its stem 40' being in a hole in the block. The compressor comprises, besides the block, the sleeve 41, the ring 42, and the piston and piston-rods 43. The pistons are contained in chambers 44, which extend into the block from the bottom and are closed by screw-plugs 44', and the piston-rods extend up through holes in the block to the ring 42, which rests on the piston-rods and is secured to them by pins 43', formed on the ends of the piston-rods, and by screws 42'. The sleeve 41 surrounds the upper part of the post 40 and fits in the ring 42, on which it is supported by the flange 41'. In the block are passages 45 and 45' and an inlet 46, which are drilled in the block and through which fluid is to be admitted to the chambers 44 to act on the pistons. The sleeve and ring 41 and 42 might be made in one piece, but are preferably separate pieces, since either can be replaced if it gets broken without replacing the other, and the sleeve can be removed from its support without the trouble of detaching the ring from the piston-rods.

The trunnions 11 are bolted to the frame by bolts passing through the oblong plates 11', formed on the trunnions. The yoke is



composed of the rods 12 and the cross-beam 13, the rods having eyes 12', which are the bearings of the trunnions, and on the cross-beam is an eye 13'.

5 One of the trunnions is hollow, and its interior communicates with an inch pipe 5, from which a half-inch branch 50 extends upward and forward along the stake 1, and a three-eighths inch branch 50' extends downward and forward along the stake 2, the latter being coupled to the block 4 by a gland through which it communicates with the inlet 46. The pipe 50 is connected by the valve-casing 51 with an inch pipe 52, which 15 communicates with the inlet 30' at the top of the head, and from the pipe 50 a three-eighths inch branch 53 extends to the inlet 33' at the bottom of the cylinder containing the ram-lifting piston. The pipe 54, coupled to the 20 valve-casing above the pipe 50, is the release-pipe, its diameter being an inch and a quarter. The valve-casing contains valves which are actuated by the handle 51' and by means of which either the passage from the pipe 50 to the pipe 52 is opened and the release-passage closed or the release-passage is opened and the other closed. The actuating fluid is forced into the hollow trunnion and thence into the pipes 50 and 50' through a pipe 5' 30 by pressure which may be generated by an accumulator or a pump or some other agency.

When the machine is to be operated, it is suspended by a chain or other holding device engaging the eye 13'. The support may be 35 stationary or it may be a truck movable in a direction parallel to the length of the machine. The weight of the machine is so distributed and supplemented, if necessary, by that of a weight or weights 16, suspended 40 from a bracket 16', attached to the back of the frame, that the machine is nearly but not quite balanced and that the front part tends to descend. On the top of the forward part of the main stake is a projection 14, to which 45 a link 14' is pivoted. A rod 15 extends through a hole in the top of the link and is provided with a head which prevents the link from being drawn off the rod. The link will slide up the rod until the projection 14 50 meets the head of the rod. This rod, which is attached at its upper end to a support, and the link 14' serve as a stop to maintain the forward parts of the machine in their proper positions during the interval between the 55 ending of each operation and the beginning of the next. They do this by preventing those parts from descending too far under the tendency of the machine to turn on its trunnions.

60 The fluid acts constantly on the ram-lifting piston and on the pistons in the block 4, and when it is not also acting on the top of the ram it sustains the weight of the ram and holds the sleeve 41 of the compressor at its 65 greatest elevation above the block, exerting

meanwhile on the pistons 43 enough force to counteract a moderately heavy pressure on the top of the sleeve.

The relations to the machine of two sections 6 and 6' of pipe in which a rivet is about 70 to be upset are shown in Fig. 1. The section 6 surrounds the anvil-stake and is supported at one end by the stake and at the other by the section 6'. The section 6' is supported, as appears by Fig. 3, in which the sections are 75 indicated by dotted lines, by rollers 7 and other similar rollers mounted on standards, which for convenience may be fixed on a truck or trucks, and these rollers are so arranged that the contiguous ends of the sections 80 6 and 6' loosely surround the block 4 and the compressor, as shown by Fig. 1, the front parts of the machine being then in their lowest positions, where they are subject to the restraining action of the link 14' and the 85 rod 15. The rivets are inserted in the holes made for them in the sections of pipe from outside the pipe, the position of each rivet 8 in the sections before it is upset being that shown in Fig. 1. The fluid being allowed to 90 pass from the pipe 50 through the pipe 52 into the head by opening the valve between those pipes with a movement of the handle 51', which simultaneously closes the release-passage, the ram and riveting-tool 34 descend 95 under the action of the fluid on the ram, and since the ram presents a greater area to the action of the fluid than does the piston 32' that piston is forced downward by the ram. When the tool 34 is in contact with the head 100 of the rivet, the descent of the tool and ram is stopped by the resistance of the pipe containing the rivet. Then the reaction of the fluid against the top of the head 3 turns the rest of the machine on the trunnions, raising 105 the compressor and riveting-post within the pipe and bringing the sleeve 41 into contact with the pipe around the protruding stem of the rivet. As the force then acting to raise the front end of the anvil-stake is greater 110 than that acting upward on the pistons 43, since the interior area of the top of the head 3 is greater than the areas of the ends of those pistons the riveting-post continues to rise and the rivet is upset by it while the sections 115 of pipe are pressed firmly together by the joint action of the compressor and the tool 34, the fluid in the block being forced back by the pistons 43. When the fluid confined in the head above the ram is released by 120 opening the release-passage with a movement of the valve-handle 51', the other passage in the valve-casing being simultaneously closed, the ram is raised to its highest position in the head by the action of the piston 32', the machine turns on its trunnions 125 until the stakes are again in the positions in which they are shown in Fig. 1, and the compressor is restored to its greatest elevation with respect to the riveting-post 40 by the 130



action of the fluid on the pistons 43. During the action of the machine on the rivet or just as the riveting-tools are withdrawn from the rivet the next rivet is inserted in the pipe, and as soon afterward as the pipe can be moved it is turned on the rollers 7 and so adjusted that the latter rivet is properly held by it between the riveting-tools, ready to be upset by the next operation of the machine.

To the compound section of pipe composed of the primary sections 6 and 6', riveted together, other primary sections may be added in order, the compound section being supported by as many pairs of rollers 7 as may be required and the primary section by the anvil-stake and the contiguous end of the compound section until the section finally produced is as long as it is practicable to make it. Room for each additional primary section may be provided either by moving the machine backward when it is suspended from or mounted on a truck or by moving the compound section.

The construction of this machine being such that the rivets are upset by it inside the pipe, in consequence of which they are naturally inserted in the pipe from the outside, and it being feasible in the operation of the machine to put each rivet, except the first of each series, into its proper place in the pipe during or instantly after the action of the machine on the next preceding rivet, the machine may be kept in action constantly, or practically so, during the application of the whole of every series of rivets to the pipe.

This invention is apparently shown in Letters Patent of the United States No. 656,801, granted August 28, 1900, to John H. Batcher, the machine of this application being in nearly all respects the same as the machine described in that patent; but since certain parts of the machine are designated in the patent by other terms than are applied to such parts in the foregoing description and since it is desired to embody in this application exactly the claims of the patent, excepting only the fifth claim thereof, it is to be understood that in any of the following claims the terms "mandrel," "upper section," and "pressure-plungers" mean, respectively, "anvil-stake," "main stake," and "pistons" and that the term "rivet-head-forming tool" or "head-forming stem" or "head-former" means "riveting-post."

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 of: a frame comprising a rigidly-united main stake and anvil-stake mounted to turn on an axis, the main stake having on it a ram-cylinder containing a ram; a riveting-tool affixed to the ram and movable by it to the work on the exterior of a suitably-supported pipe; a riveting-post on

the anvil-stake to act on the work within the pipe; a sleeve surrounding and normally extending beyond the riveting-post; hydraulic apparatus on and within the anvil-stake to act on the sleeve; means to impose fluid-pressure on said hydraulic apparatus and on the ram; and means to render the force exerted by the ram great enough to overcome the resistance offered by the sleeve, the riveting-post acting on a rivet within the sleeve, and the inertia of the frame and mechanism mounted thereon, to the movement of the frame on its axis by said fluid-pressure to the proper extent to upset the rivet in the work clamped between the sleeve and head of the rivet; substantially as described.

2. In a hydraulic pipe-riveting machine mounted to turn on an axis, the part of the machine on one side of the axis overbalancing the part on the other side of the axis to render the machine movable by gravity to its normal position after a rivet has been set in the work, the combination of: a ram and riveting-tool on the main stake; a riveting-post and compressor on the anvil-stake; fluid-passages for conveying fluid to the ram and compressor; and a stop to limit the movement of the machine when it is restored by gravity to its normal position; substantially as described.

3. In a hydraulic pipe-riveting machine the combination of: a frame comprising a rigidly-united main stake and anvil-stake mounted to turn on an axis, the main stake having on it a ram-cylinder containing a ram; a riveting-tool affixed to the ram and movable by it to the work on the exterior of a suitably-supported pipe; a riveting-post on the anvil-stake to act on the work within the pipe; a sleeve surrounding and normally extending beyond the riveting-post; hydraulic apparatus on and within the anvil-stake to act on the sleeve, said apparatus including a piston or pistons smaller than the ram; and intercommunicating ducts wherein a continuous quantity of fluid acts on the ram and on said apparatus in opposite directions; substantially as described.

4. A hydraulic pipe-riveting machine mounted to turn on an axis and comprising the combination of: a frame having an upper main stake and a lower anvil-stake extending in front of the axis; a head 3 on the main stake; a ram 32 in the head; a piston 32' active against the ram; a riveting-post on the anvil-stake; a compressor comprising a sleeve surrounding the riveting-post, and hydraulic mechanism for supporting and actuating the sleeve; and a system of intercommunicating pipes for conveying fluid to the ram and to the piston 32' and to the compressor; substantially as described.

5. A hydraulic pipe-riveting machine comprising the combination of: a frame mounted on trunnions one of which is hollow, and hav-



ing a main stake and an anvil-stake; a ram and riveting-tool on the main stake; a riveting-post and a hydraulic compressor on the anvil-stake; and a system of intercommuni-  
 5 cating pipes for conveying fluid to the ram and to the compressor, the system of pipes being attached to the frame and being in communication with the interior of the hollow trunnion; substantially as described.

10 6. In a hydraulic pipe-riveting machine the combination with a ram and riveting-tool of: an anvil-stake to act within the pipe; a riveting-post on this stake; and a compressor comprising a sleeve surrounding the riveting-  
 15 post, and pistons confined in intercommunicating chambers; substantially as described.

7. A hydraulic riveting and plate closing apparatus consisting of a ram and its cylinder with pipes by which fluid under pressure is  
 20 admitted thereto, a mandrel and a rivet-head-forming tool opposed to the ram, a sleeve loosely surrounding the rivet-heading tool, hydraulic pressure-plungers and a head transversely connecting the upper ends there-  
 25 of and supporting said sleeve and by which said sleeve is forced upwardly to form a support for the meeting pipe-sections whereby the pressure of the ram first closes the sec-  
 30 tions together, and afterward forces the support backwardly to allow the rivet to be headed.

8. A plate-closing and riveting device, consisting of a fluid-pressure cylinder, a ram movable therein and a riveting-plunger ac-  
 35 tuated by said ram, a mandrel over which the pipe-sections extend, a head fitted to the end of the mandrel and formed with a plurality of parallel vertically-disposed cylinders with plungers movable therein, a ring or head con-  
 40 necting the upper ends of the plungers transversely and a sleeve supported upon said ring or head, a head-forming stem intermediate of the cylinders and supported within said sleeve, means for applying hydraulic  
 45 pressure to the plungers whereby the sleeve is held in position to receive and resist the first pressure upon the pipe-sections whereby they are closed together, said sleeve afterward yielding to allow all parts to advance until

the inner end of the rivet contacts with and 50 is upset by the action of the head-former within the sleeve.

9. A hydraulic riveting apparatus consist-  
 ing of a suspended upper section and man-  
 55 drel, a cylinder and ram carried by the upper section, a head fitted to the end of the man-  
 drel and formed with a plurality of vertical parallel cylinders with plungers, a head or  
 60 ring transversely connecting the upper ends of the plungers and a sleeve actuated there-  
 by, a head-former intermediate of the cylin-  
 ders and over which the sleeve is slidable,  
 pipes by which fluid-pressure is transmitted  
 simultaneously from a common source to the  
 ram and to the sleeve-actuating plungers 65  
 whereby a yielding pressure of less force is op-  
 posed to that of the ram, and the plates or  
 pipe-sections are first closed together, and  
 the parts afterward moved by the superior  
 pressure of the ram until the end of the rivet 70  
 is headed by the head-former.

10. A plate-closing and riveting device in-  
 cluding an upper section and a mandrel  
 united at their inner ends, heads detachably  
 fitted to said section and mandrel and pro- 75  
 vided with riveting-tools, fluid-pressure de-  
 vices actuating said tools from a common  
 source, one of said heads formed with a plu-  
 rality of cylinders and connected plungers  
 movable therein, and plate-closing means ac- 80  
 tuated by the plungers.

11. A hydraulic plate-closing and rivet-  
 ing apparatus consisting of a mandrel and up-  
 per section united at one end and divergent  
 outwardly therefrom, a ram-cylinder fixed to 85  
 the end of the section and plate-closing pres-  
 sure-cylinders and plungers connected with  
 the mandrel, a swivel-jointed pipe through  
 which water from an accumulator or pressure  
 apparatus is brought to the riveter, branches 90  
 extending respectively along the upper sec-  
 tion and mandrel, one connecting with the  
 ram, and the other with the plate-closing  
 cylinders.

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In presence of—

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