(No Model.) 4 Sheets—Sheet 1.

H. V. LOSS.

HYDRAULIC RIVETING MACHINE.

No. 496,059. Patented Apr. 25, 1893.

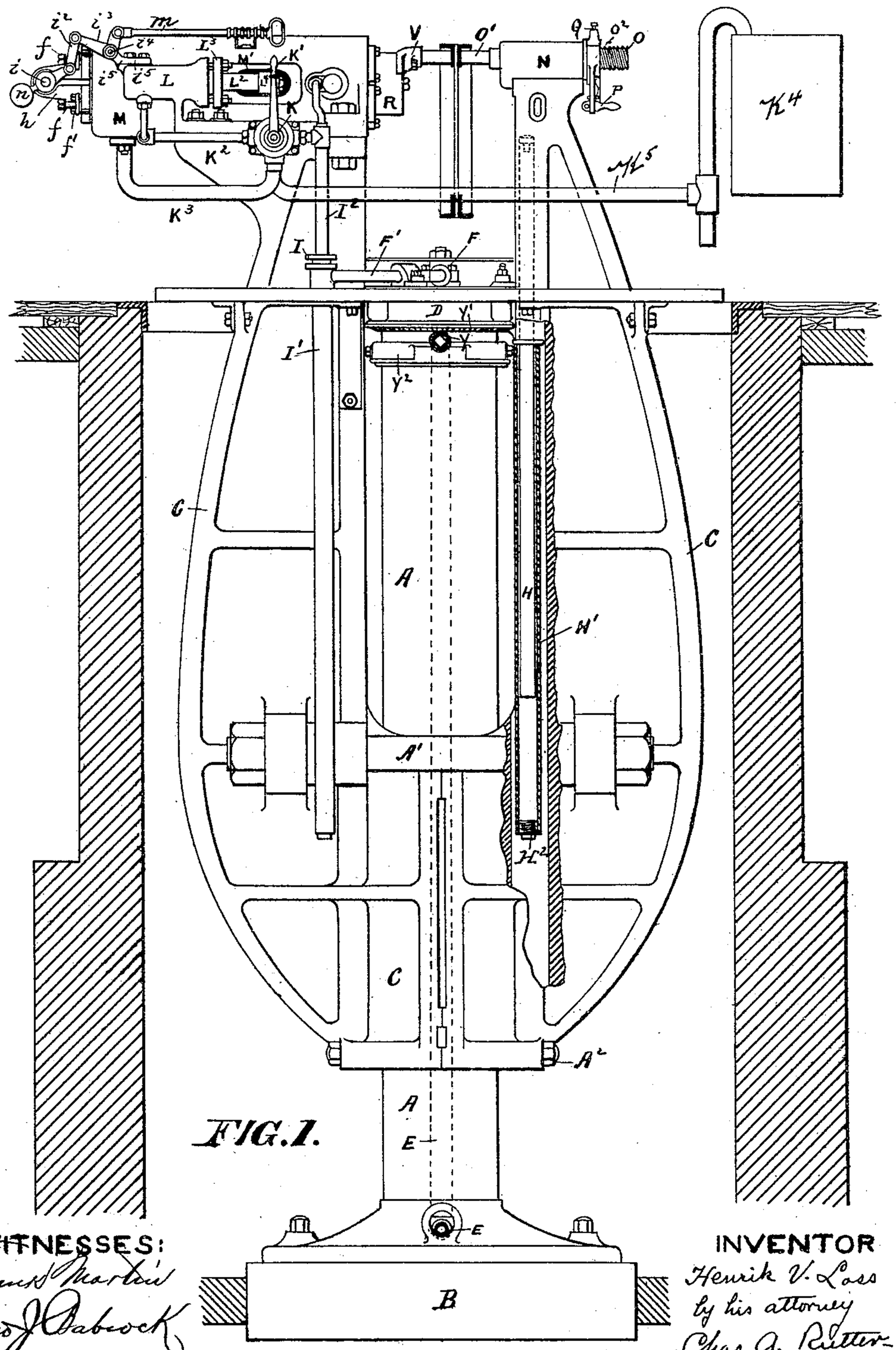

FIG. 1.

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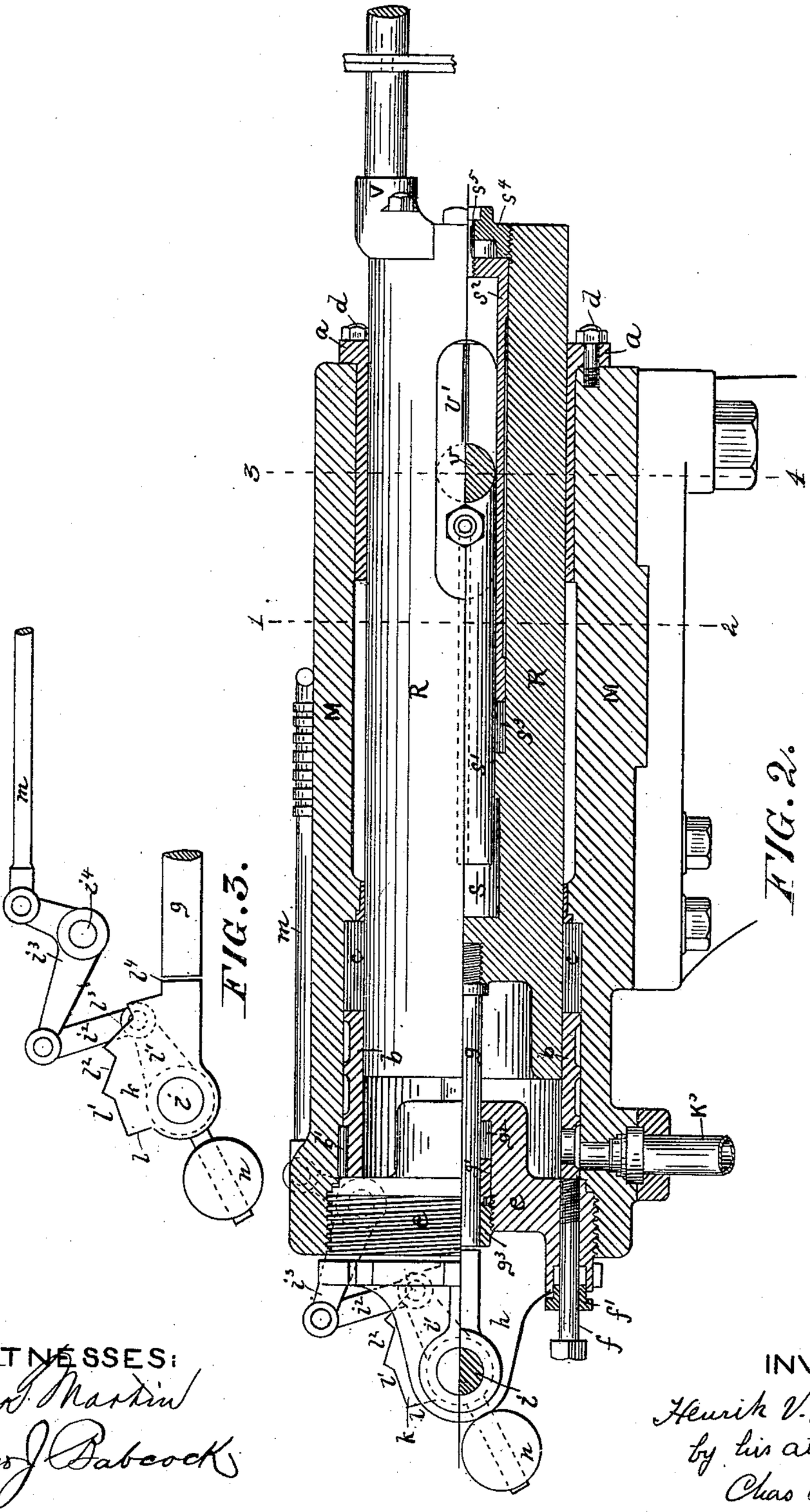

FIG. 2.

FIG. 3.

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HYDRAULIC RIVETING MACHINE.

No. 496,059. Patented Apr. 25, 1893.

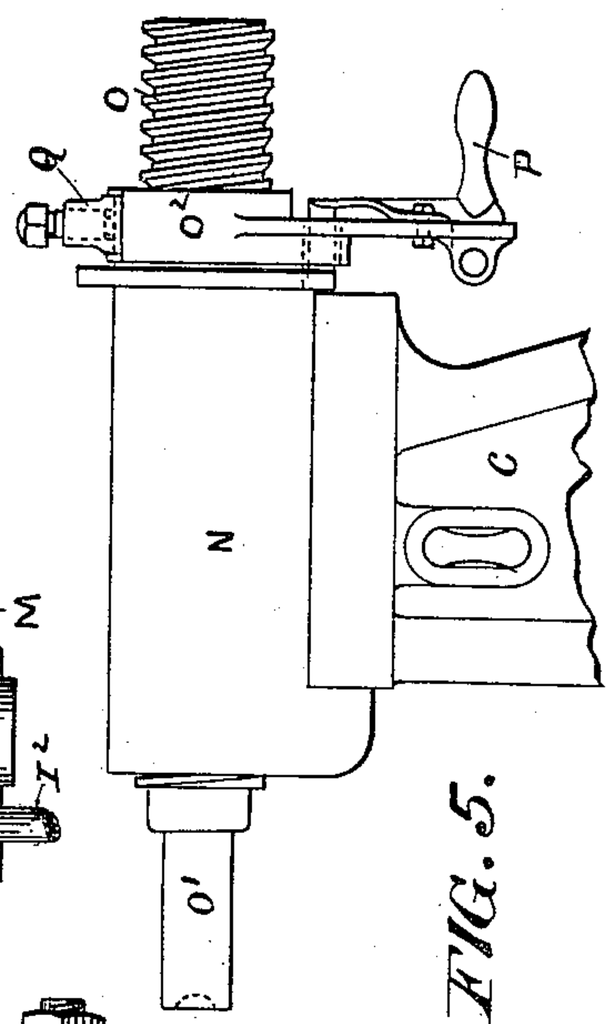

FIG. 5.

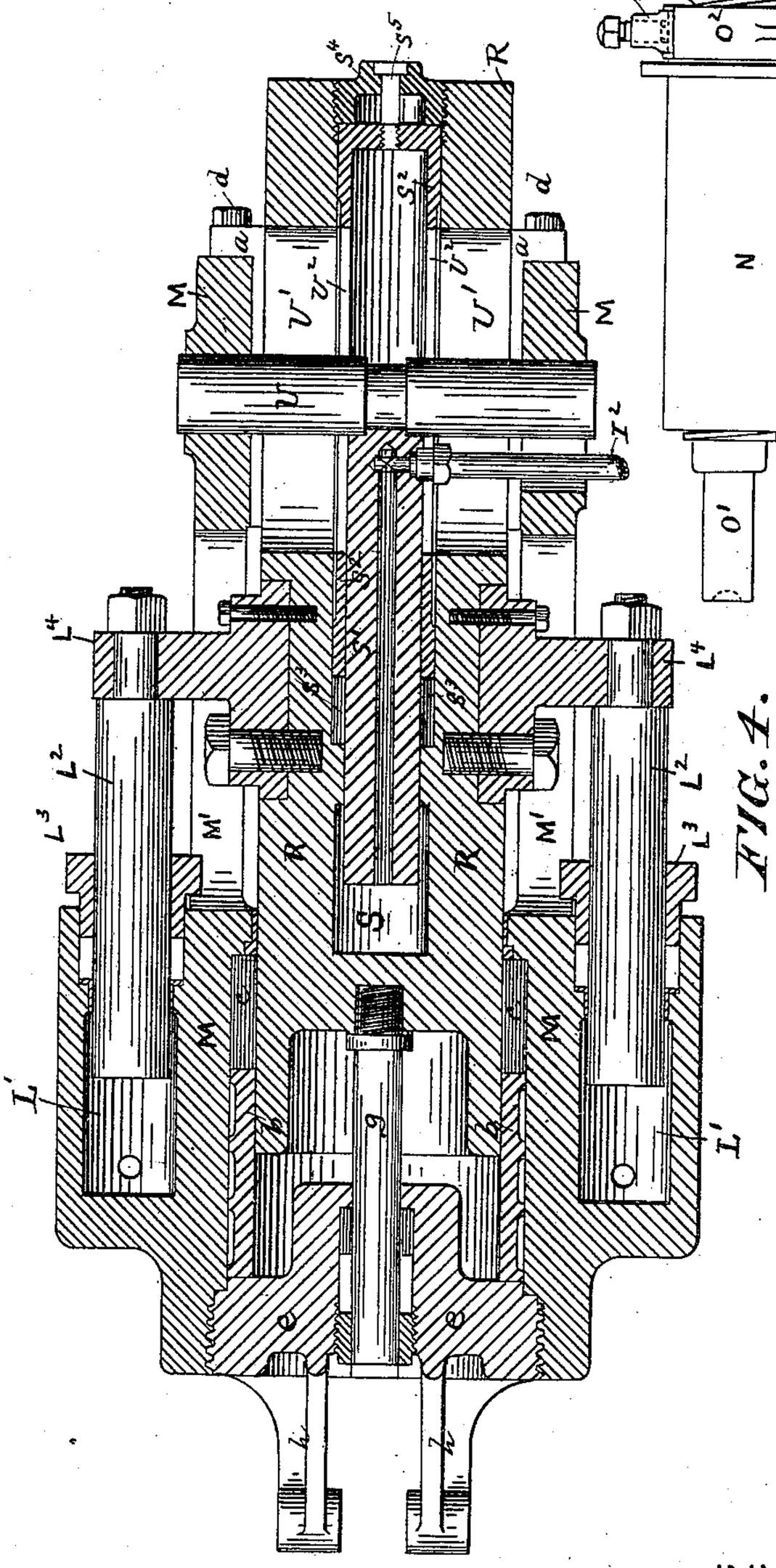

FIG. 4.

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HYDRAULIC RIVETING MACHINE.

No. 496,059. Patented Apr. 25, 1893.

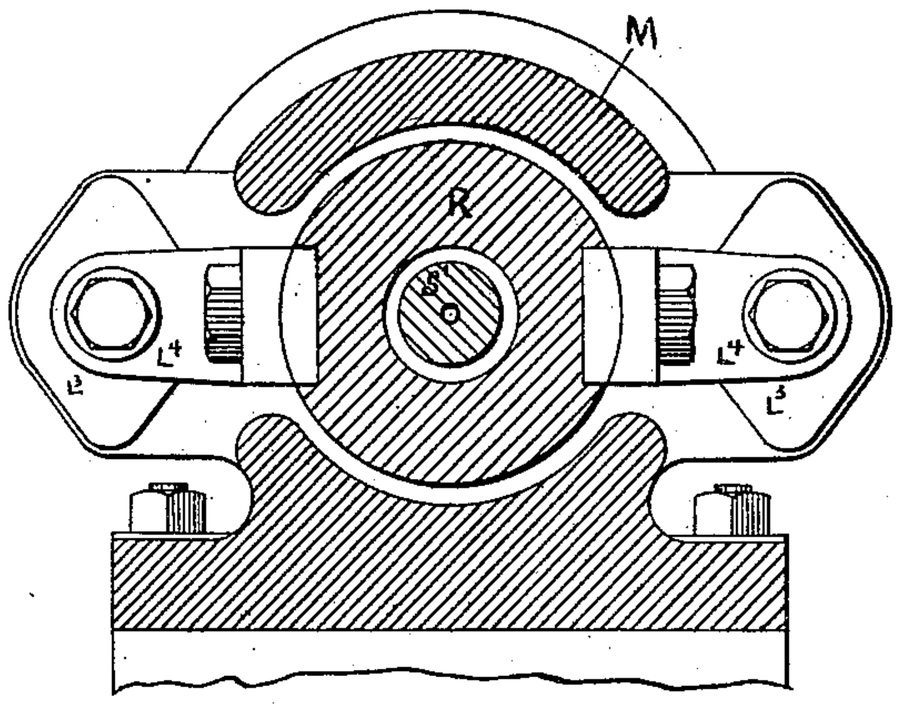

FIG. 6.

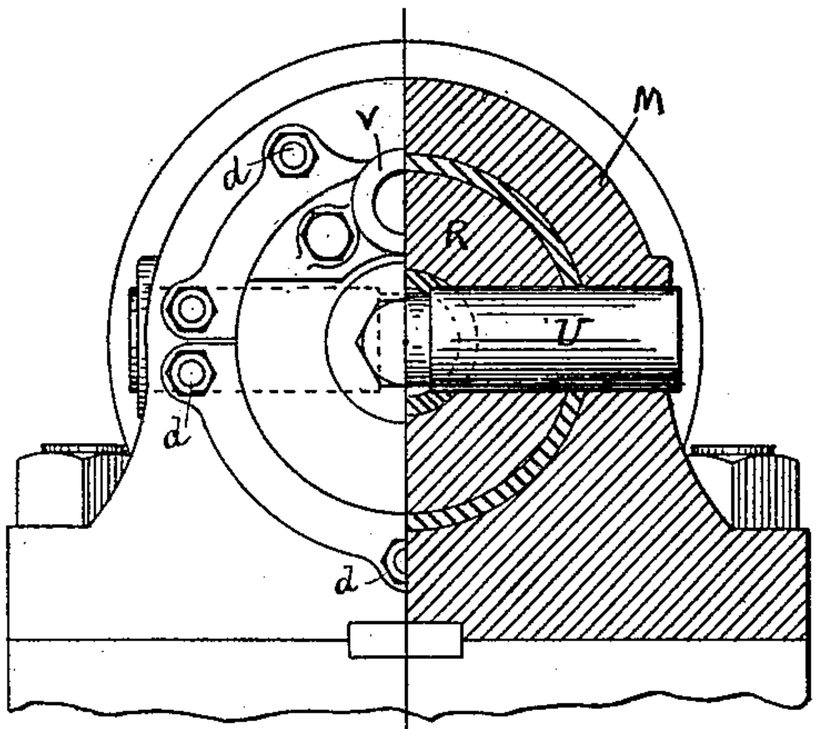

FIG. 7.

FIG. 8.

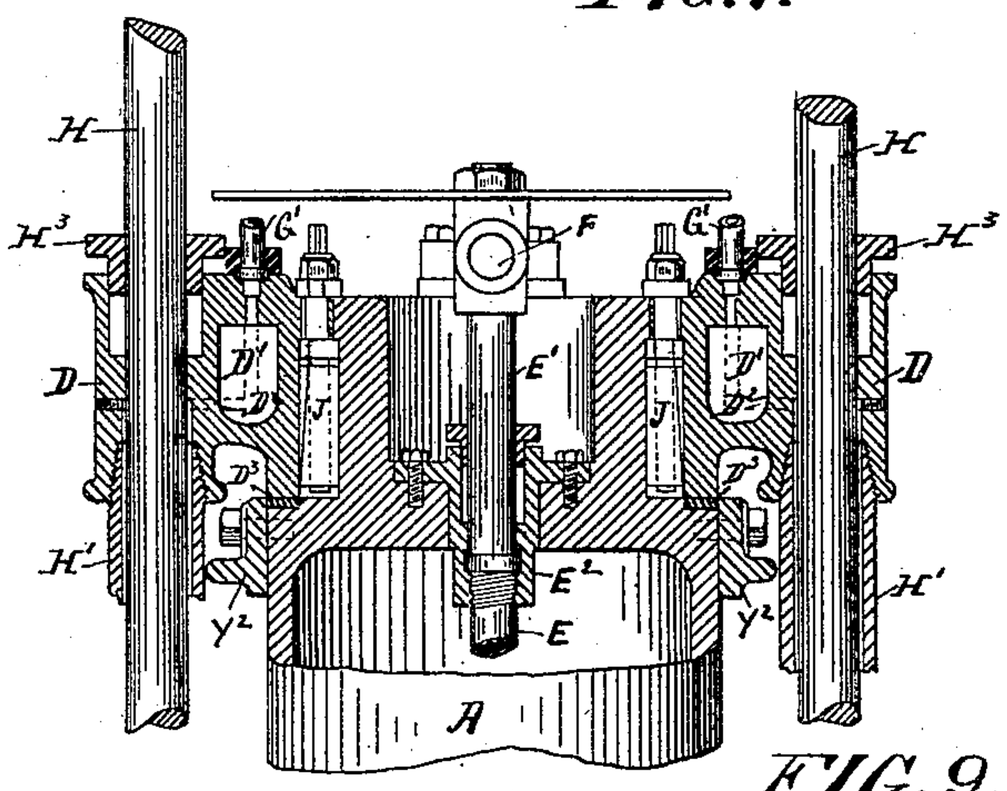

FIG. 9.

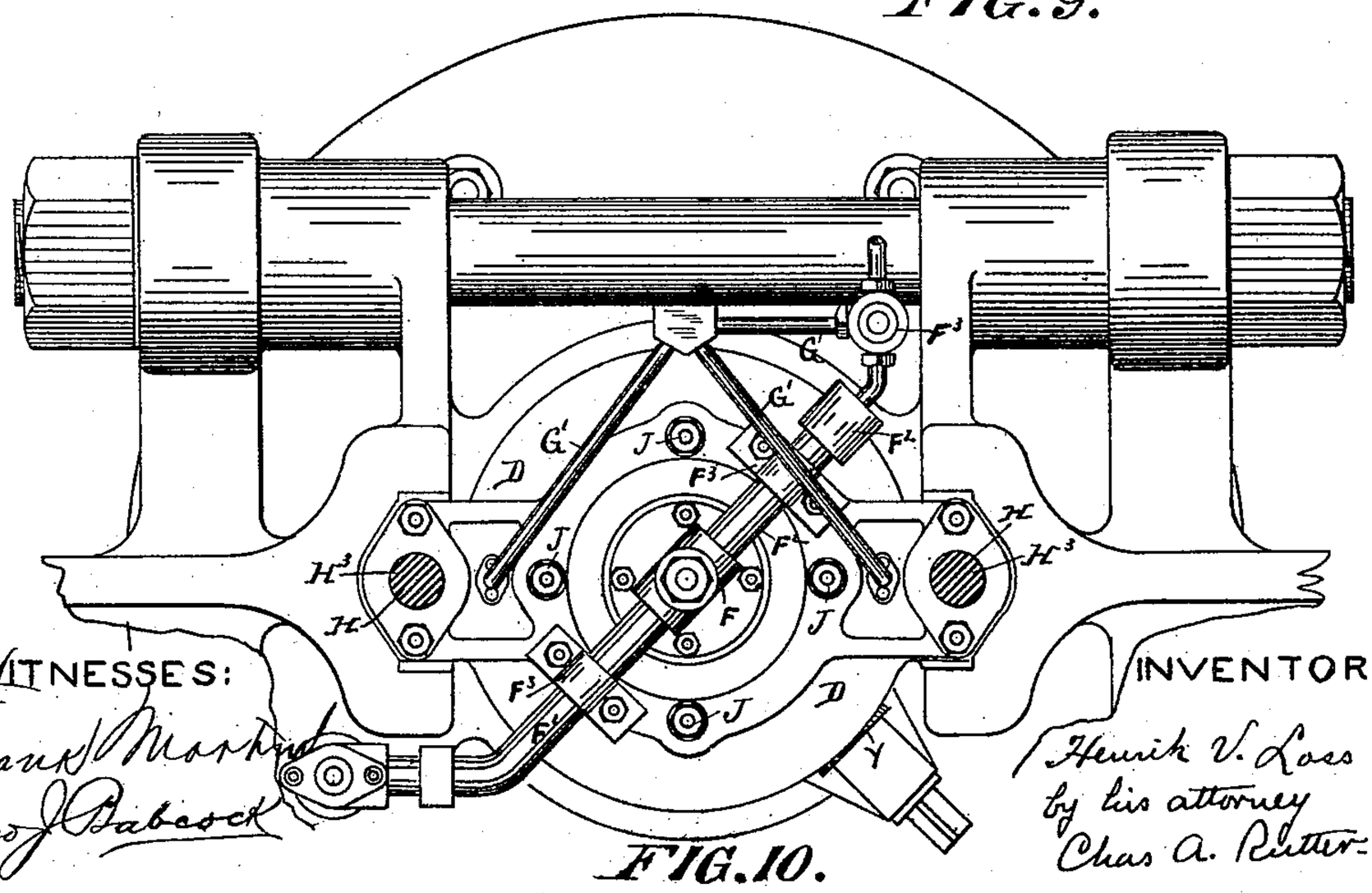

FIG. 10.

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HENRIK V. LOSS, OF PHILADELPHIA, PENNSYLVANIA.

HYDRAULIC RIVETING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 496,059, dated April 25, 1893.

Application filed March 10, 1892. Serial No. 424,374. (No model.)

To all whom it may concern:

Be it known that I, HENRIK V. LOSS, a citizen of the United States, and a resident of the city and county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Hydraulic Riveting-Machines, of which the following is a specification.

My invention relates to improvements in hydraulic riveting machines and consists in certain combinations and arrangements of parts, as fully described and claimed hereinafter.

In the accompanying drawings, forming part of this specification, and in which similar letters of reference indicate similar parts throughout the several views: Figure 1, is a side elevation, partly in section of my riveting machine; Fig. 2, a central vertical longitudinal sectional elevation through the main ram cylinder and its connected parts, the upper half of the main ram being shown in elevation; Fig. 3, a side elevation of device for limiting the backward movement of the main ram; Fig. 4, a central horizontal longitudinal sectional elevation through the main ram cylinder and auxiliary cylinders; Fig. 5, an enlarged side elevation of the head on the back stake, Fig. 1; Fig. 6, a vertical section of the main ram cylinder on line 1—2, Fig. 2; Fig. 7, a half front elevation of main ram cylinder, &c.; Fig. 8, a half section of Fig. 2, on line 3—4, Fig. 2; Fig. 9, a central sectional elevation through cross head on top of the central stationary hollow column which carries the riveting machine, showing hydraulic apparatus for vertically adjusting the riveting machine; Fig. 10, a plan of the cross head, Fig. 7, and its connected parts.

A. is a central stationary hollow column supported upon a suitable base B.

C. is a frame the lower or cylindrical part of which surrounds the column A. and which is held and guided by said column in its movements.

The upper end of column A. carries the hydraulic mechanism through which the frame C is raised and lowered. This mechanism is constructed and operates as follows:

E. is a water inlet pipe which passes up through the center of the stationary pipe A. The upper end of this pipe connects with a pipe E′—Fig. 9, which is connected with a T F. Figs. 1, 9 and 10.

E^2, Fig. 9, is a stuffing box on top of pipe A. through which lower end of pipe E′ passes, and into the bottom of which pipe E. is screwed as shown. The lower end of pipe E. is connected by suitable pipes with an accumulator, or pumps, not. shown. The water after passing through pipes E. E′ and the T—F., passes through pipe F′, Fig. 10, to the riveting machine proper, as hereinafter described, and through the pipe F^2 to a valve F^3, which can be opened or closed at will by the operator; thence through pipes G. G′—G′ to chambers D′ in the cross head D. which is carried by the upper end of the central stationary pipe A. Through the ends of the cross head D. plungers H. pass, the upper ends of which carry the frame C. and its connected parts.

H′ are pipes screwed into the under side of the cross head and into which the lower part of the plungers H. pass, Figs. 1 and 9. The lower ends of these pipes are closed by a plug H^2, Fig. 1.

H^3 are stuffing boxes on the upper part of cross head through which the plungers H. pass. The water from chamber D′ passes through passage D^2 in between the plungers H. and the pipes H′, and acting upon the bottoms of the plungers lift them and the frame C. and the parts carried by this frame to such a height as may be desired by the operator, the flow of water and consequently the movements of these parts being regulated by means of the valve F^3, Fig. 10.

The arrangement of the cross head is best shown in Fig. 9, from which it will be seen that the upper end of pipe A. is turned off to form a shoulder D^3 upon which the cross head rests and upon which it can revolve when it may be necessary to rotate this cross head, the frame and the riveting machine in order to drive rivets at any angle on the work. The pipe E′ into which water passes from the supply pipe E. as well as the T, F and pipes F′, F^2 are connected to the cross head by two bearings F^3 bolted to said cross head, one on each side of the T—F. and when rotating with the cross head can turn in the stuffing box E^2 which is carried by the upper part of sta-

tionary pipe A. By these arrangements the cross head D. and the parts carried thereby can be revolved upon the top of the central stationary pipe A.

Y. Fig. 1, is a pinion carried in suitable bearings on a casting Y^2 attached to the pipe A., said casting forming a stop for the upward movement of the lifting frame work, and Y', a partial gear wheel on the cross head D. meshing with said pinion. By revolving said pinion by a suitable crank, the gear wheel Y' and the cross head D. and its connected parts may be turned around ninety degrees.

J., Figs. 9 and 10, are clampings keys of which there may be four or any other number which operate to lock the cross head at any desired position on the pipe A.

From the T—F. a pipe F' conveys water to the cylinders which operate the rams for driving the rivets.

My riveting machine contains in all four cylinders; a main ram cylinder and main ram which does the actual work of driving the rivets; two auxiliary cylinders which are used to bring the main ram up against the work before the water is admitted under pressure to the main cylinder and a pull back cylinder which is centrally located within the main ram and the power of which is equal to one half the combined power of the two auxiliary cylinders above mentioned. The pressure of water in the pull back cylinder is at all times constant. The water from the pipe F' enters a gland I, Fig. 1, in the bottom of which is screwed a pipe I', the lower end of which is closed by means of a plug or other suitable device. I^2 is a pipe which passes down through gland I. and enters pipe I'; the lower end of this pipe is open and receives the water that enters gland I and pipe I' and its upper end is connected with a valve K, through which the water passes on its way to the main and auxiliary cylinders and by means of which the flow of this water is controlled and directly with the pull back cylinder, as hereinafter described. The gland I. and pipe I' are stationary fixtures while the pipe I^2 rises and falls with the frame C, and its connected parts, the gland I forming a water tight joint at all times to prevent escape of water during the movements of pipe I^2.

K', Fig. 1, is a lever by means of which the valve K. is operated, in order to start or stop the riveting machine. The first movement of this lever admits water to pipes K^2, which are connected with the auxiliary cylinders, L'. L', Figs. 1 and 4. These cylinders are furnished with pistons L^2, which pass through suitable stuffing boxes L^3 on the forward ends of the cylinders and are bolted or otherwise secured to a cross head or lugs L^4 which are suitably secured to the main ram R. and which extend out from the main ram, passing through slots M' in the main ram cylinder, M, as shown in Figs. 1 and 4. The auxiliary cylinders carry the main ram forward until the tool that forms the rivet head engages the work; at this time the operator gives a further movement to lever K' and water is admitted from valve K. to pipe K^3 and from this pipe to the main cylinder M., pushing forward the main ram R. and forming the head upon the rivet. During the operation of the auxiliary cylinders and while the main ram is being moved forward by them, the main cylinder is filled with exhaust water from the exhaust water tank K^4 Fig. 1 to which it is connected through the exhaust ports of the valve K. by the pipe K^5 shown in Fig. 1.

The efficiency of hydraulic riveters, working with an accumulator system, has heretofore been in ordinary bridge riveters from twelve to twenty-five per cent.; this efficiency is vastly increased by my arrangement of auxiliary cylinders. The pull back cylinder is best shown in Fig. 4. The center of the main ram is bored out, forming a cylinder S., and in this cylinder is placed a stationary piston or water way, S', which is connected by suitable water ways with the water pipe I^2, already described and shown in Fig. 1.

S^2 is a sleeve gland which is passed in through the forward end of cylinder S, this being bored out to receive it, and which gland surrounds the forward end of stationary piston or water way.

S^3 is a packing placed between rear end of sleeve gland S^2 and a shoulder formed at the end of cylinder which contains the sleeve.

S^4—S^5 are screws by means of which the sleeve gland and the packing may be adjusted.

U. is a pin the ends of which are held by the sides of the cylinder M. and which passes through slots U' in the ram R. and through slots U^2 in the sleeve gland S^2. The forward end of stationary piston S' bears against this pin and is by it kept from moving forward. There is a constant pressure of water from pipe I^2 and through stationary piston S' bearing against the rear end of cylinder S., and as soon as the pressure is taken off the main ram and the auxiliary rams this pressure immediately acts to drive the main ram backward. As before stated, the power of the pull back cylinder is equal to the power of one of the auxiliary cylinders and hence the combined power of the two auxiliary cylinders easily overcomes the resistance of the pull back cylinder when the forward stroke is being made.

The tool for driving the rivets is carried upon the upper forward end of the main ram R, as shown at V, Figs. 1, 2 and 7. The eccentric position of the riveting tool in relation to the central axis of the main ram is an important factor in accomplishing certain classes of work, but the unequal strains caused by such a construction have heretofore proved disastrous for heavy work. In my design these strains are properly well taken care of by long, large, continuous and easily renewable bearing surfaces. The effect of this eccentricity is a constant tendency for the ram to

cock up and wear out the bearings in the main cylinder in which it works; hence the removable sleeves at the front and rear ends of the main cylinder, which when worn may be removed with ease without having to dismantle the machine and without serious loss of time.

The bearings are best shown in Fig. 2; the front bearing preferably consists of two half sleeves turned outside to fit the bore of the main cylinder, and bored inside to receive the main ram. For the sake of compactness the bushings are shown located within the casting of the main cylinder, but if necessary, or preferred, they could be carried by the main frame of the machine and be entirely separate from the main cylinder. The rear bearing consists preferably of a continuous sleeve.

a, is the forward removable sleeve, *b*, the rear sleeve. The front sleeve *a*, is secured to the cylinder M. by means of screws or studs, *d*, and the rear sleeve is passed into the rear end of the cylinder which is afterward closed by means of a screw head, *e*.

f, Figs. 1 and 2 are screws of which there are preferably from three to six, situated at points equally distant from each other, which pass through the screw head *e*, and through stuffing boxes *f'* carried by the screw head *e*, so that there will be no leakage around them, and which bear against the rear end of the bearing *b*.

c, is the packing which prevents escape of water from the forward end of the main cylinder M. around the main ram R.; the forward end of the bearing *b*, bears against this packing and by means of screws, *f*, the sleeve bearing may be forced in to expand the packing *c*. The bearing *b*, thus acts as a gland. This sleeve bearing is prevented from rotating by a dowel pin *b'*, Fig. 2.

It will be observed that all the packings wherever used may be tightened readily from the outside by simply setting up the screws which are conveniently and accessibly located for this purpose, and further, that any packing may be renewed or replaced without having to dismantle the machine.

In order to economize time and save water in the use of my machine, I have devised a plan for limiting the backward movement of the main ram R. This device is illustrated in Figs. 1, 2 and 3. Where short rivets are to be driven, it is of course evident that it would be a waste of both time and power for the ram R. to make its full backward stroke, and in order to regulate the stroke for rivets of different lengths, I use the device shown in the figures above mentioned.

g. is a rod, the forward end of which is screwed or otherwise suitably secured to the central rear part of the main ram, as shown; this rod passes backward and through the center of the screw head *e*, in which is a gland, *g'* and packing g^2, as shown. g^3 is a screw through which rod *g* also passes and by means of which the gland *g'*, and packing may be tightened.

Upon a bracket *h*, carried by the rear end of main cylinder, is a rock shaft *i*, upon which is mounted tightly a plate *k*, upon the periphery of which are a number of cams, *l*—*l'*—l^2—, &c., each of which is at a different distance from the center of the shaft *i*. Fast to shaft *i* is a crank *i'*, to the free end of which is pivoted one end of a link i^2, the other end of which is pivoted to one arm of a bell crank lever, i^3, which is pivoted to a bracket i^5 (shown in Fig. 1), carried by the main cylinder or one of the auxiliary cylinders at i^4. To the other arm of this bell crank lever is pivoted one end of a rod *m*, which extends forward along the top or side of the cylinders, as shown. By shifting this rod forward or backward, any one of the cams *l*—*l'*—l^2,— &c., may be put into position to engage and limit the backward movement of the rod *g*, and the main ram R. *n*, is a counterweight, carried by the shaft *i*, which counterbalances the weight of crank *i'*, link i^2, bell crank i^3, &c.

In Figs. 1 and 5 the stationary head of the riveter is shown; this is carried by back stake of the frame C. corresponding to the arm which carries the cylinders. N. is a nut upon the top of arm C. and secured thereto in any suitable manner. O. is a screw passing through this nut, the inner end of which carries the tool O' which holds the rivet while the head is being formed on the other end by the tool carried by the main ram R. O^2 is a screw collar passing over rear end of screw O. P. is a handle attached to collar O^2 and Q. a set screw by means of which this collar may be connected with the threads of screw O. at any desirable point. This device is used to adjust the rivet holder O' for rivets or work of different thicknesses and being old and well known need not be further described here.

From Fig. 1, it will be seen that the frame C. is made in two pieces secured together by bolts, A'—A^2, and that in addition to its vertical movements upon the central stationary column A. it is also capable of a movement of rotation upon this column.

I do not desire to limit myself to the combination of my riveting machinery proper with a lifting and rotating frame, as the frame carrying the riveting machinery may be provided with lugs and bolted down to a solid foundation.

While I have described by riveting machine as hydraulic, it will be understood that many of the features of my machine may be used in riveting machines, the motive power of which is other than hydraulic.

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

1. The combination of a stationary column, a cylinder surrounding said column and capable of a vertical and a rotary movement thereon, a frame connected to said cylinder carrying at its upper ends a riveting machine, two or more cylinders connected with said column and pistons within said cylinders con-

nected to said frame and adapted to operate said frame and its connected parts vertically.

2. The combination of a stationary column, a cylinder surrounding said column and capable of a vertical and a rotary movement thereon a frame connected to said cylinder carrying at its upper ends a riveting machine, a cross head upon the upper end of said column adapted to have a rotary movement thereon, a vertical sliding connection between said frame and cross head, whereby the cross head is rotated with the frame, two or more cylinders connected to said cross head with pistons connected to said frame and adapted to operate said frame and its connected parts vertically, and ways through which the driving medium may be admitted to or drawn away from said cylinders in order to elevate or depress said frame and riveting machine.

3. The combination in a riveting machine of a frame upon which said machine is carried, a central stationary column adapted to support said frame and allow a vertical and rotary motion thereon, a rotatable cross head on said column and connected to said frame and adapted to move rotarily, but not vertically therewith, and lifting cylinders and pistons connecting said cross head and frame and adapted to move said frame vertically.

4. The combination of a cylinder, a head closing the rear end of cylinder, a continuous central cylindrical ram, a movable gland at rear end of cylinder, a longitudinal hole in ram terminating at its front end but closed at its back and a stationary piston or piston rod fitting and resting in said longitudinal hole in said ram and having its forward end butting against the stationary parts of the machine.

5. The herein described device for adjusting vertically the position of the riveting machine and the frame which carries said machine and in combination with said frame and machine, a central stationary pipe, a cross head carried by upper end of said pipe, plungers carried by said frame, stuffing boxes and hydraulic cylinders carried by said cross head which said plungers enter and pipes and mechanism carried by and connected to said cross head, through which water is admitted to said cylinders, and the flow thereof controlled in order to elevate or depress said plungers and their connected parts.

6. The combination with the main ram and cylinder of a hydraulic riveting machine of two auxiliary cylinders and rams and a cross head or lugs projecting from the main ram and connected to the outside ends of said auxiliary rams.

7. The combination with the main ram and cylinder of a hydraulic riveting machine of two auxiliary hydraulic cylinders and rams, a cross head or lugs projecting from the main ram and connected to outside ends of said auxiliary rams and slots in sides of main cylinder extension or frame through which said cross head or lugs may pass and move longitudinally.

8. The combination with a cylinder and a head for closing the rear head of said cylinder of a sleeve forming the lining of the rear end of said cylinder and being in immediate contact with the moving piston a packing one end of which butts against a shoulder on said cylinder and the other against the forward end of said sleeve, and set screws projecting through back end of said cylinder and bearing against back end of said sleeve, all substantially as and for the purpose set forth.

9. The combination with the main cylinder and ram of a hydraulic riveting machine of a cylinder contained by the main ram, a stationary piston within said cylinder and a stationary pin or cross head supported outside the movable main ram and butting against the stationary piston.

10. The combination with the main cylinder and ram of a hydraulic riveting machine of a cylinder bored upon the longitudinal axis of the ram a stationary piston within said cylinder, a pin carried by the main cylinder and extending through the ram and against which said stationary piston butts, a packing between said stationary piston and its cylinder and a gland by means of which said packing may be expanded from the front of the machine.

11. The combination with the main ram and cylinder of a hydraulic riveting machine of a rod projecting centrally back from the rear end of the ram and through the center of the rear head of the cylinder and stops whereby the backward movement of said rod and ram may be arrested in order to adjust the backward stroke of the machine.

12. The combination with the main ram and cylinder of a hydraulic riveting machine of a rod projecting centrally backward from the rear end of the ram and through an adjustable packing and gland centrally located in the rear head of the cylinder, a shaft carried upon brackets on the rear end of the cylinder and a plate carried by said shaft, having faces upon its periphery at different distances from its center, adapted to engage and limit the backward movement of said rod and ram, substantially as and for the purposes set forth.

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