(No Model.) 2 Sheets—Sheet 1.

T. W. HEINTZELMAN.

HYDRAULIC TUBE TESTING MACHINE.

No. 537,037. Patented Apr. 9, 1895.

FIG. 1.

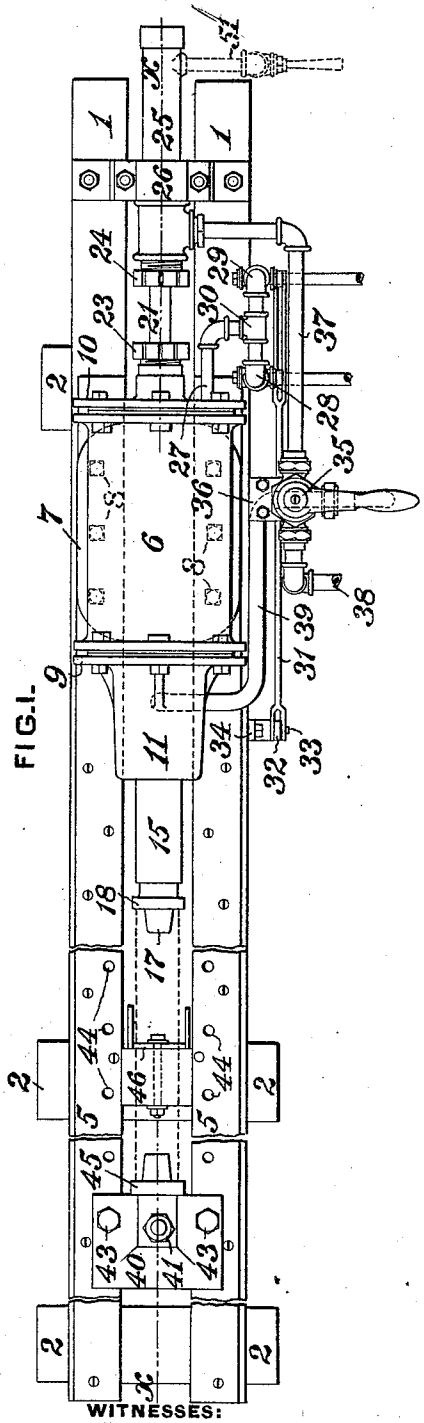
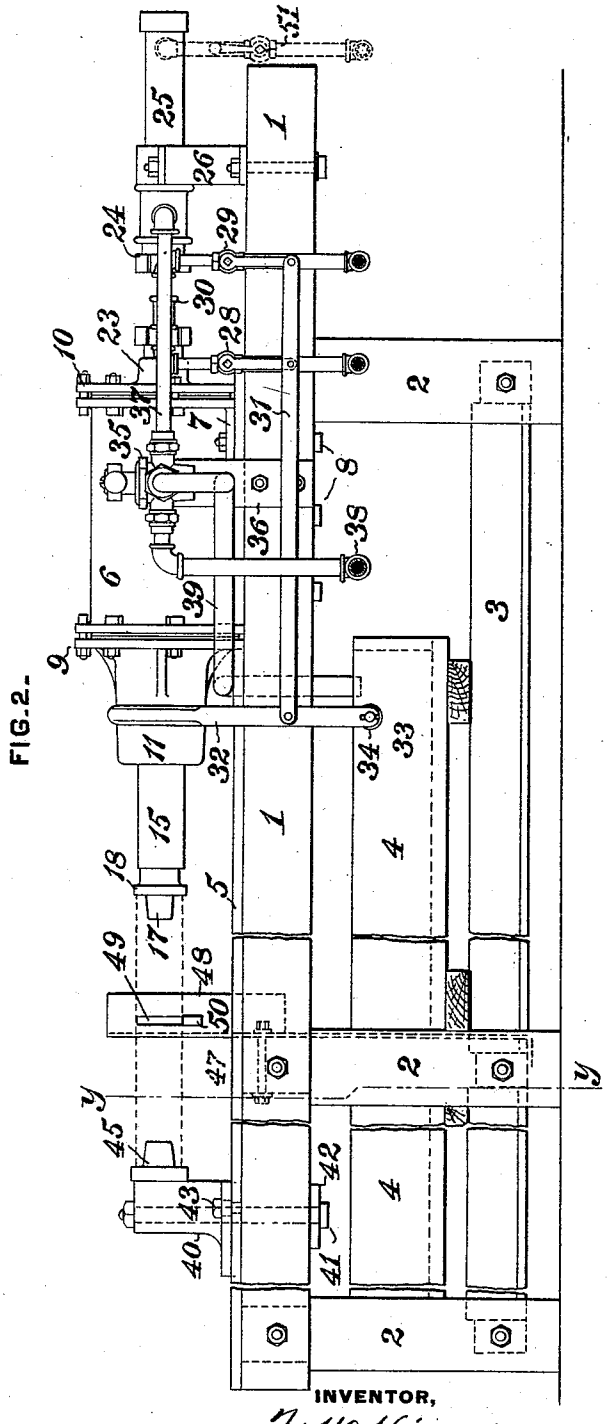


FIG. 2.



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Att'y.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

T. W. HEINTZELMAN.

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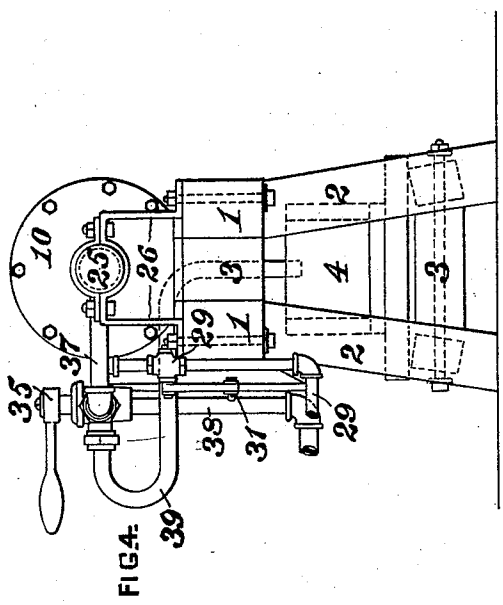

FIG.4.

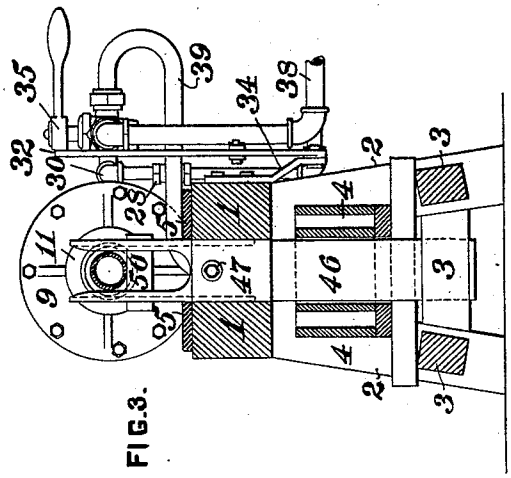

FIG.3.

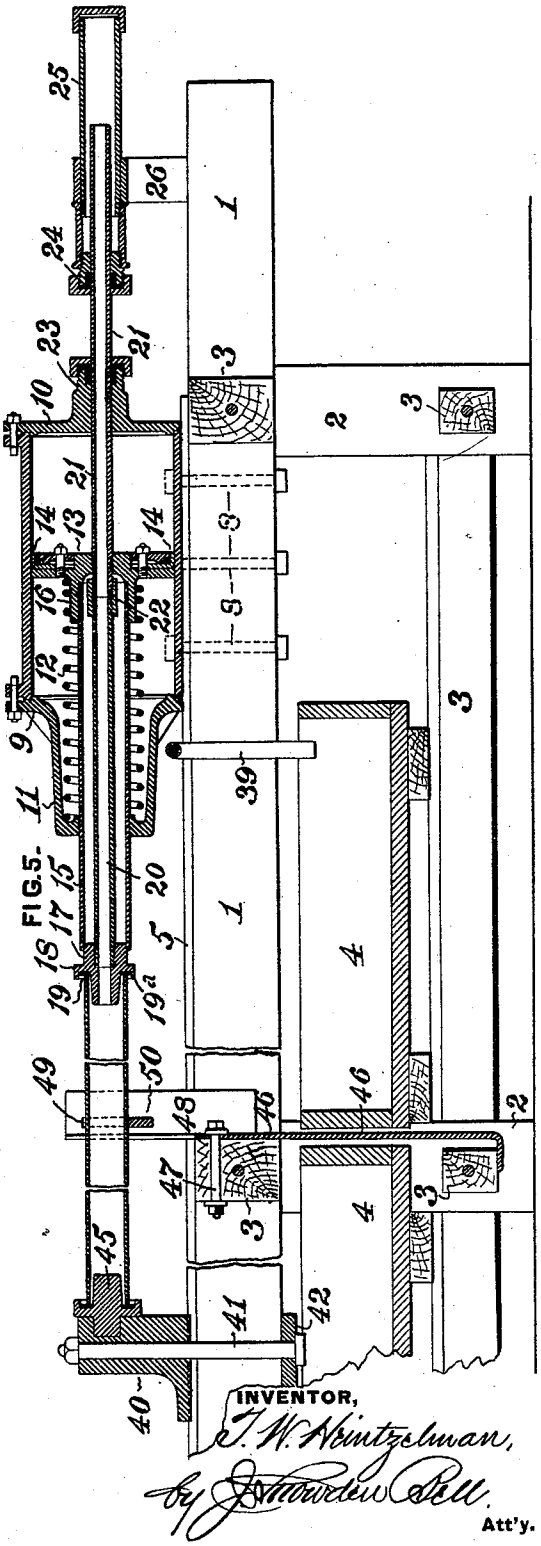

FIG.5.

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UNITED STATES PATENT OFFICE.

TAYLOR W. HEINTZELMAN, OF SACRAMENTO, CALIFORNIA.

HYDRAULIC TUBE-TESTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 537,037, dated April 9, 1895.

Application filed October 16, 1894. Serial No. 526,017. (No model.)

To all whom it may concern:

Be it known that I, TAYLOR W. HEINTZELMAN, of Sacramento, in the county of Sacramento and State of California, have invented a certain new and useful Improvement in Hydraulic Tube-Testing Machines, of which improvement the following is a specification.

My improvement relates to the class of machines, for testing steam boiler flues and other tubes, wherein the tube to be tested is subjected to an internal hydraulic pressure sufficient to indicate and locate any leakage, due to defective welding or other causes; and its object is to provide an apparatus for testing tubes by hydraulic pressure, by means of which the tube to be tested can be readiiy placed and firmly held in position until the desired test has been made and then readily removed; also to provide an apparatus wherein the flow of pressure can be accurately regulated by means of cocks or valves, so located upon the apparatus as to permit of its being transported and set up in any locality, without the necessity of special fittings other than simple pipe connections.

A further object of my invention is to provide an apparatus for testing tubes by hydraulic pressure, that can be operated in shops that are not equipped with hydraulic pressure systems.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a plan or top view of an apparatus embodying my invention, the tube to be tested being shown in position by dotted lines; Fig. 2, a side view, in elevation, of the same; Fig. 3, a transverse section, on the line *y*, *y*, of Fig. 2, looking toward the rear of the machine; Fig. 4, an end view of the machine as seen from the rear, and Fig. 5, a vertical longitudinal section, on the line *x*, *x*, of Fig. 1.

In the practice of my invention I provide a main or supporting frame, which consists of two parallel longitudinal stringers 1, supported upon short posts or legs 2, which are braced by means of longitudinal and transverse braces 3, and the whole structure is firmly secured together by means of bolts thus forming a substantial support for the apparatus. A trough 4 is located longitudinally below the stringers 1, for the purpose of carrying off the water which is exhausted from the apparatus, but this is not an essential of the apparatus, as it may, if preferred, be dispensed with and discharge pipes be substituted. Upon the upper sides of the stringers 1 are secured protecting plates 5, of iron or other metal, which extend nearly the entire length of the frame, and are held in position on the stringers 1 by means of wood screws.

An air or other fluid pressure cylinder 6, provided with transversely projecting flanges 7, formed integral with its lower side, rests upon the protecting plates 5, near one end of the stringers 1, and is held firmly in position by vertical bolts 8 which pass through the flanges 7, protecting plates 5, and stringers 1. Heads 9 and 10 are secured to the front and rear ends of the air cylinder 6, by bolts in the usual manner. The front cylinder head 9 has an outwardly projecting spring pocket 11 formed integral with it, for the reception of a helical release spring 12, which bears against the front side of a piston head 13, which is fitted to move in the air cylinder 6, and serves to return it to normal position when the pressure upon its rear side has been sufficiently reduced. The piston head 13 is provided with a suitable packing ring 14, to prevent leakage, and with a forwardly projecting hollow piston rod 15, which is secured in a socket 16, formed on its front side, and projects through and for some distance beyond the cylinder head 9. If preferred, the releasing spring may be dispensed with and the return of the piston be effected by fluid under pressure admitted to and exhausted from the space between the piston and the head 9 by a proper valve or valves.

A hollow and slightly tapering mandrel head 17 is secured in the front or projecting end, of the hollow piston rod 15, and is provided with a collar 18, and groove 19 near its central portion, for the reception of an annular gasket 19^a, of leather or other suitable material. A tube 20 of a diameter equal to about one half of that of the hollow piston rod 15, is screwed into the rear face of the mandrel head 17 and passes back and through the hollow piston rod 15 to a point near the piston head 13, where it is connected to a tube 21 of similar diameter, screwed through the piston head 13, by means of the union 22.

The tube 21 passes rearwardly through the rear cylinder head 10 and a stuffing box 23 formed thereon, and thence through a stuffing box 24 into a water chamber 25. The water chamber 25 is cylindrical in form, and of such a length as will permit of the piston head 13 to which is secured the tube 21, being forced forward the full length of its stroke without withdrawing the tube 21 from the water chamber. The water chamber 25 is in line axially with the cylinder 6, and is supported upon a bracket 26, which rests upon the upper side of the stringers 1, near their rear ends, and is secured thereto by bolts.

To the rear cylinder head 10 there is connected a pipe 27 for the supply and discharge of air under pressure to and from the cylinder 6; the supply and discharge of fluid under pressure being regulated, respectively, by means of two service cocks 28 and 29, which are connected to the pipe 27 by means of a T connection 30. The service cocks 28 and 29 are regulated by means of downwardly projecting handles which are pivotally connected to a link 31, which extends to a point near the front end of the cylinder 6, and is there pivotally connected to a vertical lever 32, which has its lower end journaled on a bearing 33 formed upon the lower end of a downwardly projecting bracket 34, secured to the outside of one of the stringers 1. The service cocks 28 and 29 are set at different angles, and, therefore, when the lever 32 is thrust either forward or backward one of the cocks will be opened and the other closed, thus regulating the supply and discharge of fluid under pressure to and from the cylinder 6.

The supply and discharge of hydraulic pressure to and from the water chamber 25 are regulated by means of a three way cock 35, secured to one of the stringers 1, near the center of the cylinder 6, by means of a bracket 36, and communicating with the water chamber 25 by a pipe 27. The three way cock 35 also communicates with pipes 38 and 39 for the supply and discharge of hydraulic pressure respectively.

Near the outer ends of the stringers 1, and in line with the cylinder 6 is secured an upright stop bracket 40, which rests upon the protecting plates 5 on the stringers 1, and is held firmly in position by means of a long vertical bolt 41 which passes through it and has secured to its lower end a transverse plate 42, which bears against the lower sides of the stringers 1. The stop bracket 40 is prevented from rotating about the bolt 41 by means of short set screws 43, which pass through the base of the bracket, and screw into holes 44, tapped at intervals into the protection plates 5. By loosening the bolt 41 and set screws 43, the stop bracket 40 can be moved to any desired distance from the cylinder 6, to suit different lengths of tubes to be tested. A mandrel head 45 of similar construction to the mandrel head 17, except that it is solid instead of tubular, fits in a socket formed in the upper part of the inner face of the stop bracket 40, and in line with the mandrel head 17.

The tube to be tested is supported at its center by means of a supporting bracket, consisting of a vertical plate 46, which rests against one of the upper transverse braces 3 and is secured thereto by a bolt 47. The lower end of the vertical plate 46 is bent at right angles to the vertical portion and engages the under side of the corresponding lower transverse brace 3. The vertical plate extends above the mandrel heads 17 and 45, and has within it a vertical slot, of a width sufficient to admit the tube to be tested, and is also provided with two rearwardly extending lateral wings 48, which project from it at right angles. The wings 48 are provided with vertical slots 49 for the admission of a transverse bar 50, which serves as a rest for the tube to be tested.

In the operation of the apparatus, one end of the tube to be tested is fitted against the gasket in the mandrel head 45, the middle portion of the tube resting upon the transverse bar 50 of the bracket 46. Air or other fluid under pressure, say about sixty to eighty pounds to the square inch, is then admitted to the rear of the piston head 13 in the cylinder 6, through the medium of the service cock 28 and supply pipe 27, which causes the piston head 13, hollow piston rod 15 carrying the mandrel head 17, and hydraulic supply pipes 20 and 21 to move forward, compressing the spring 12 until the mandrel head 17, abuts against the opposite end of the tube to be tested, and holds it firmly in position, the gaskets in the mandrel heads 17 and 45, preventing any escape of hydraulic pressure. The three way cock 35 is then opened, and hydraulic pressure of from two to three hundred pounds to the square inch, more or less, is admitted through the pipe 37, water chamber 25, pipes 21 and 20, and hollow mandrel head 17 into the tube to be tested, thus indicating what, if any, defects exist. When the test has been concluded, the three way cock 35 is reversed, shutting off the hydraulic supply and allowing that in the apparatus to escape through the pipes 37 and 39 into the trough 4 or any other convenient receptacle. The cock 28 is then closed and by the same movement of the lever 32, the cock 29 is opened, allowing the fluid under pressure to escape from the rear of the piston 13, which will then, together with the hollow piston rod 15, mandrel head 17 and hydraulic supply pipes 20 and 21, be returned to normal position by means of the expansion of the spiral spring 12, or by fluid pressure admitted on that side of the piston if the spring is not employed. The tested tube is then removed, and the apparatus is in readiness for another test.

In the operation of the apparatus in shops that are not equipped with hydraulic pressure

systems, water may be allowed to flow by gravity into the water chamber 25, until the tube to be tested, the pipes 20 and 21, and the water chamber 25, are filled. The supply of water is then shut off, and air under sufficient pressure is admitted to the water chamber 25 by means of the pipe 51, shown by dotted lines in Figs. 1 and 2 of the drawings. This operation will be fully effective for locating defects in tubes in cases where direct hydraulic pressure is not available.

I am aware that tube testing machines provided with means for supporting and holding a tube in position by fluid under pressure, and means for applying hydraulic pressure to the interior of the tube while so supported and held, were known in the art prior to my invention, and said devices, severally, as well as their combination broadly, I therefore disclaim.

I claim as my invention and desire to secure by Letters Patent—

1. The combination, in a hydraulic tube testing machine of a supporting frame, a stationary mandrel head connected thereto, a fluid pressure cylinder, a piston fitted to move therein, a tubular piston rod, a tubular mandrel head fixed to the piston rod in line axially with the stationary mandrel head, means for controlling the admission and exhaust of fluid under pressure to and from the cylinder, a water chamber, a pipe connecting the tubular mandrel with the interior of said chamber, and means for controlling the admission and exhaust of water under pressure to and from said chamber, substantially as set forth.

2. The combination, in a hydraulic tube testing machine, of a supporting frame, a stationary mandrel head connected thereto, a fluid pressure cylinder, a piston fitted to move therein, a tubular piston rod, a tubular mandrel head fixed to the piston rod in line axially with the stationary mandrel head, means for controlling the admission and exhaust of fluid under pressure to and from one side of the piston, a releasing spring bearing on the opposite side of the piston, a water chamber, a pipe connecting the tubular mandrel with the interior of said chamber, and means for controlling the admission and exhaust of water under pressure to and from said chamber, substantially as set forth.

3. The combination, in a hydraulic tube testing machine, of a supporting frame, a stop bracket connected thereto, and longitudinally adjustable thereon, a stationary mandrel head fixed to said stop bracket, a fluid pressure cylinder, a piston fitted to move therein, a tubular piston rod, a tubular mandrel head fixed to the piston rod in line axially with the stationary mandrel head, means for controlling the admission and exhaust of fluid under pressure to and from the cylinder, a water chamber, a pipe connecting the tubular mandrel and the interior of said chamber, and means for controlling the admission and exhaust of water under pressure to and from said chamber, substantially as set forth.

4. The combination, in a hydraulic tube testing machine, of a supporting frame, a fixed and a movable tubular mandrel head for clamping and holding a tube to be tested, a fluid pressure cylinder fixed to the supporting frame, a piston working therein and having a tubular piston rod connected to the movable mandrel head, means for controlling the admission and exhaust of fluid under pressure to and from the cylinder, a water chamber, a pipe fixed to the piston rod and passing through adjacent heads of the cylinder and the water chamber, and means for controlling the admission and exhaust of water under pressure to and from said chamber, substantially as set forth.

5. The combination, in a hydraulic tube testing machine, of a supporting frame, a fixed and a movable tubular mandrel head for clamping and holding a tube to be tested, a fluid pressure cylinder fixed to the supporting frame, a piston working therein and having a tubular piston rod connected to the movable mandrel head, means for controlling the admission and exhaust of fluid under pressure to and from the cylinder, a water chamber, a pipe connecting the tubular mandrel with the interior of said chamber, means for controlling the admission and exhaust of water to and from said chamber, and a valve controlled pipe for the admission and exhaust of air under pressure to and from said chamber, substantially as set forth.

TAYLOR W. HEINTZELMAN.

Witnesses:
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CHAS. M. BECKWITH.