

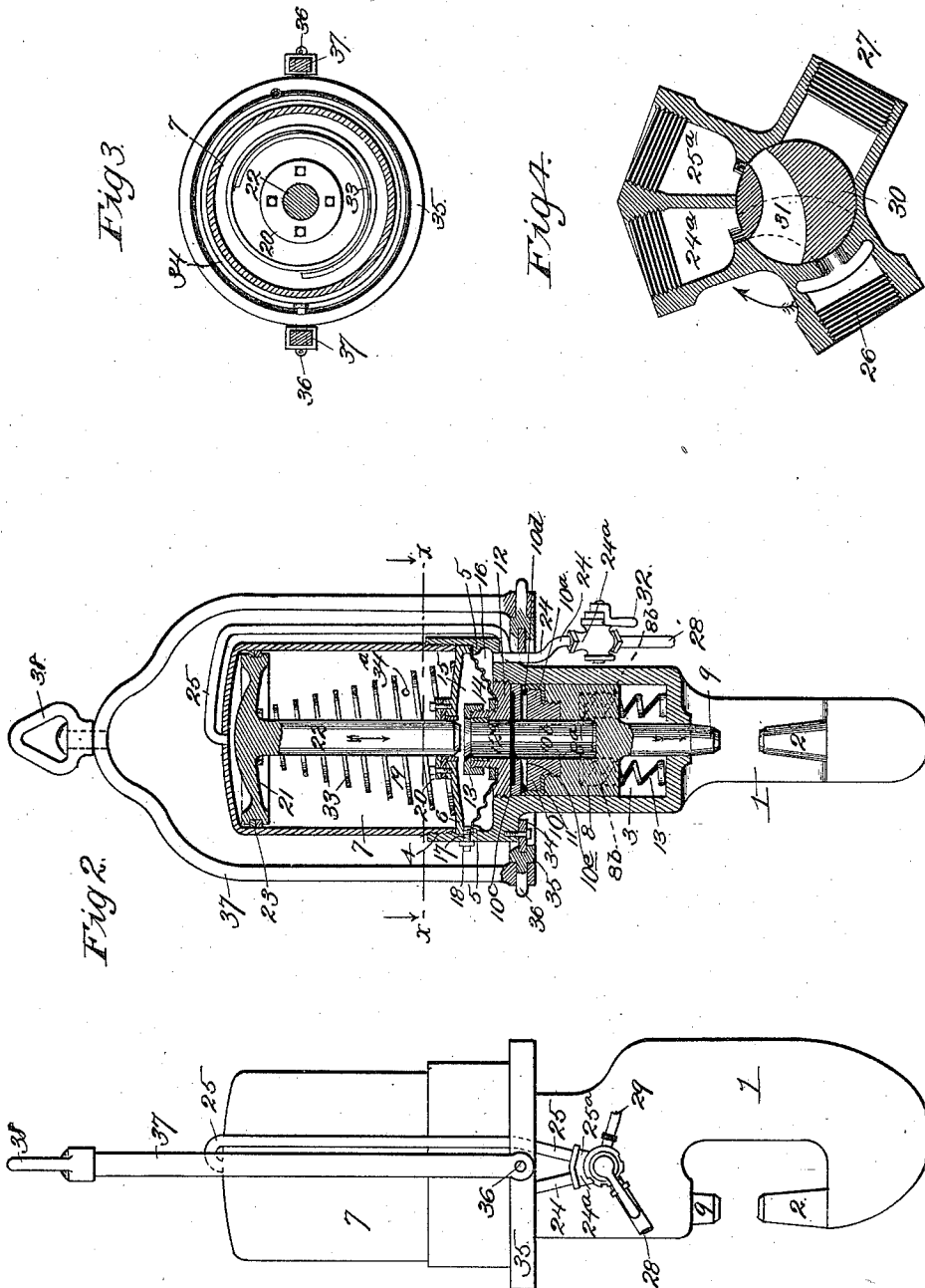
(No Model.)

3 Sheets—Sheet 1.

A. PARFITT.
RIVETING MACHINE.

No. 579,441.

Patented Mar. 23, 1897.



Witnesses:

P. G. Fischer
W. J. Proyer

Fig. 1.

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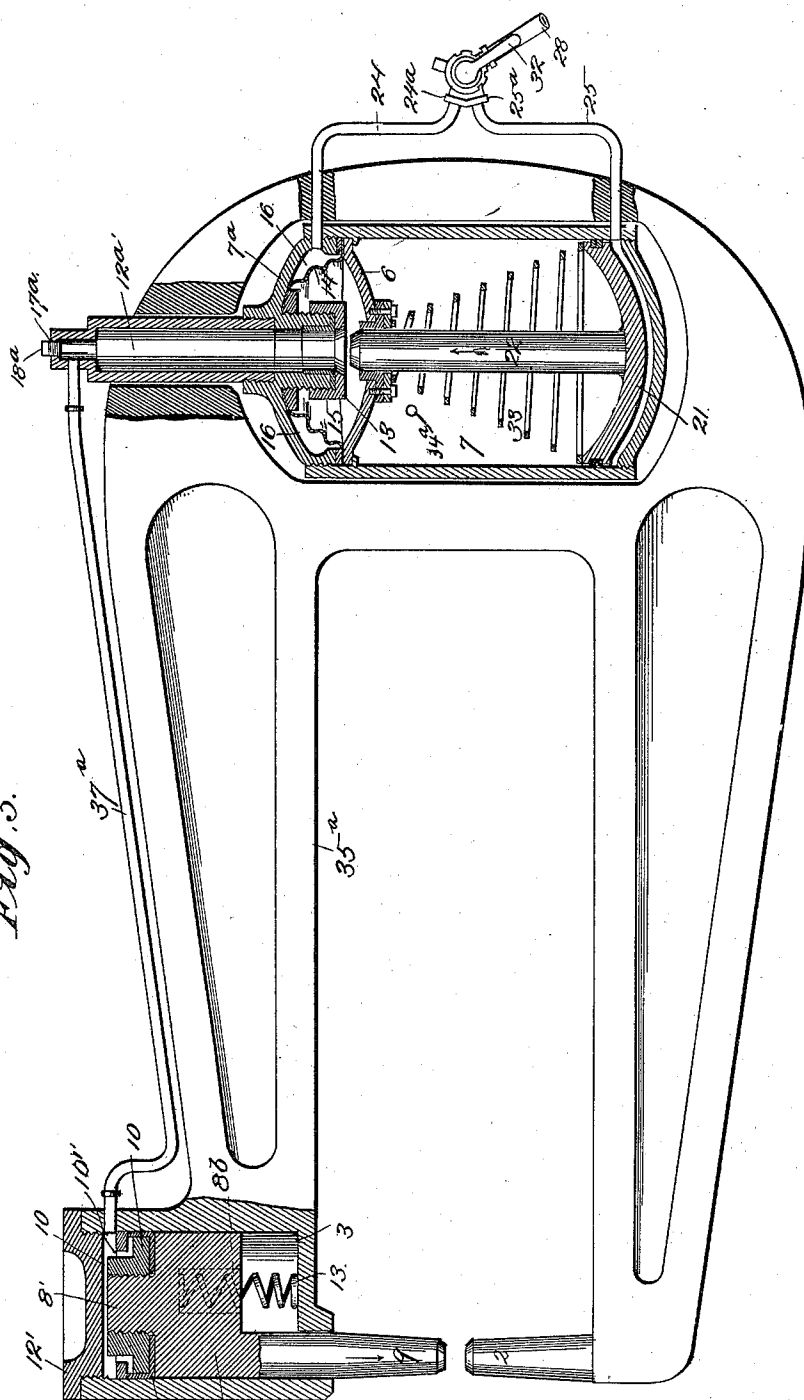
(No Model.)

3 Sheets—Sheet 2.

A. PARFITT.
RIVETING MACHINE.

No. 579,441.

Patented Mar. 23, 1897.



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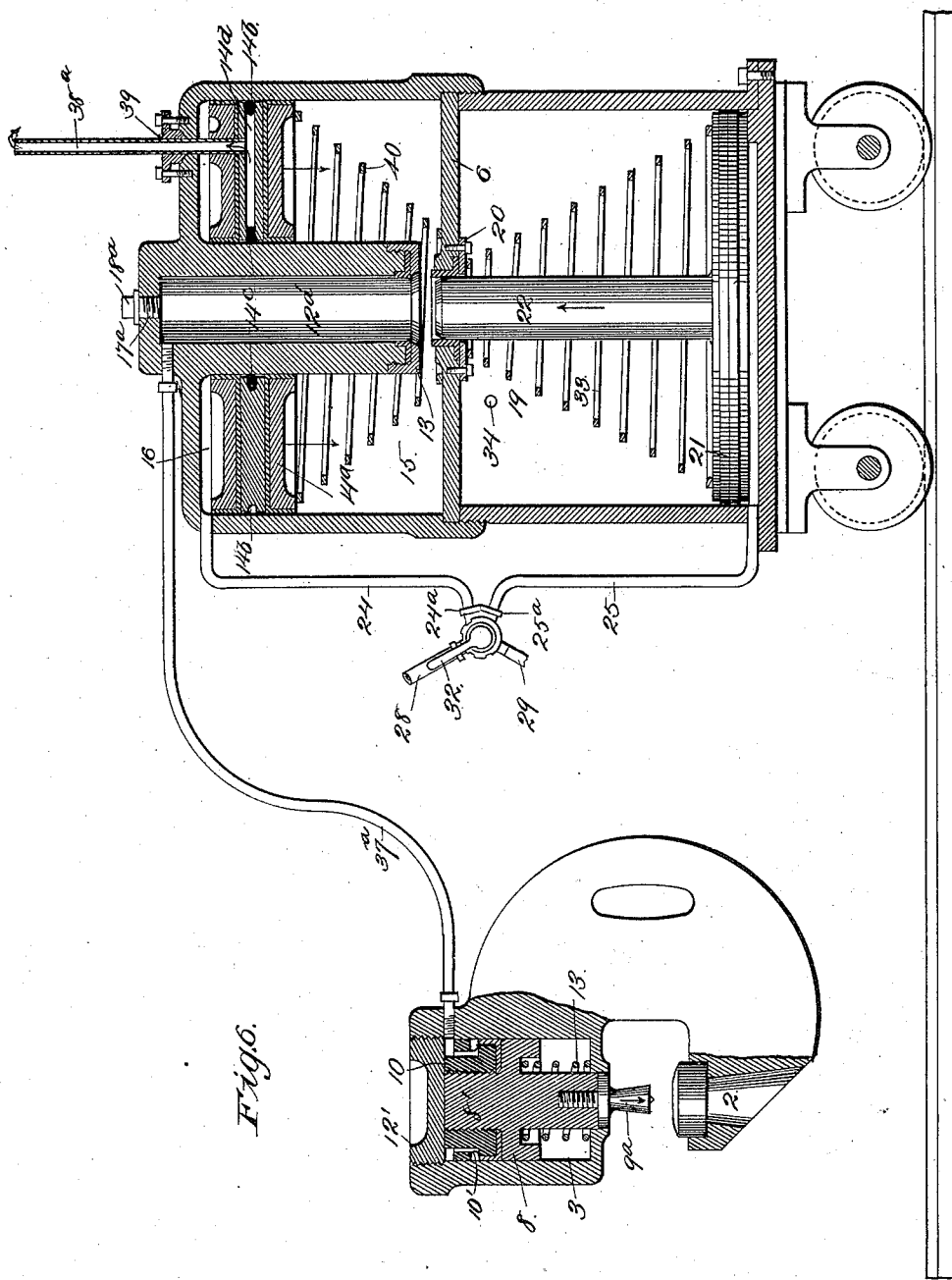
(No Model.)

3 Sheets—Sheet 3.

A. PARFITT.
RIVETING MACHINE.

No. 579,441.

Patented Mar. 23, 1897.



Witnesses:

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UNITED STATES PATENT OFFICE.

ALFRED PARFITT, OF TOPEKA, KANSAS.

RIVETING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 579,441, dated March 23, 1897.

Application filed April 17, 1896; Serial No. 588,015. (No model.)

To all whom it may concern:

Be it known that I, ALFRED PARFITT, of Topeka, Shawnee county, Kansas, have invented certain new and useful Improvements in Riveting-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to riveting-machines, and more especially to machines for riveting boiler and other metallic plates together; and it consists in certain novel and peculiar features of construction and combinations of parts hereinafter described and claimed.

The object of the invention is to produce a machine of this character, either of a stationary or portable type, which is positive and reliable in operation and comparatively simple, strong, durable, and inexpensive of construction, and which is under the perfect control of the operator, manipulating only a single valve.

In order that the invention may be fully understood, reference is to be had to the accompanying drawings, wherein—

Figure 1 represents a side elevation of a riveting-machine embodying my invention. Fig. 2 represents a vertical section of the same. Fig. 3 represents a cross-section taken on the line *x x* of Fig. 2. Fig. 4 represents a cross-section of the four-way valve. Fig. 5 is a view, partly in vertical section and partly in elevation, of a modified form and construction of riveting-machine. Fig. 6 is a vertical section of a still further modified form of the riveting-machine.

Like numerals refer to corresponding parts in all of the figures.

Referring now particularly to Sheet 1 of the drawings, 1 designates a hook-shaped casting or frame which is provided with an upwardly-extending arm or anvil 2 and with a cylindrical cavity or chamber 3 in its upper end. At the upper end of said cylindrical chamber the casting is diametrically enlarged and internally screw-threaded, as at 4. Said enlargement, at a suitable point, is provided with an annular internal flange or shoulder 5, whereon a head 6 rests and is clamped firmly and tightly by means of the inverted open-ended cylinder 7, which screws into the upper end of the enlargement 4, as shown

clearly in Fig. 2. Arranged to reciprocate vertically within the chamber 3 is a riveting piston or plunger 8. Said piston or plunger is provided with a vertically-depending stem or arm 9, which projects through an opening in the bottom of the cylinder portion of the casting 1, and is adapted, in conjunction with the riveting arm or anvil 2, to upset the rivet and clamp the plates to be secured firmly together in the customary manner. Said piston or plunger 8 is of peculiar construction, that is to say, it comprises the body portion, from which the stem 9 depends, a top portion 10, and a packing-ring 11. The packing-ring 11 is of rubber or equivalent material and comprises a horizontal portion which rests upon the upper end of the body portion of the piston or plunger, and a vertical portion or flange which projects upwardly and fits snugly against the wall of the cylindrical chamber 3. The top portion fits snugly within said chamber upon the upper margin of the packing-ring and is diametrically diminished at two points to form a shoulder 10^a, which bears against the inner side of the vertical portion and upon the upper side of the horizontal portion of the ring, and a depending threaded portion which projects through said ring and engages corresponding threads in the upper end of the body portion, which connection clamps the packing-ring firmly and reliably in place. The body portion is provided with a central cavity 8^a, which registers with a central opening 10^b through the top portion, and said opening of the top portion at its upper end is diametrically increased, so as to form a shallow chamber 10^c, the object of which is hereinafter explained. The top portion just opposite the upper end of the vertical flange of the packing-ring is provided with an annular groove 10^d, which communicates by means of a number of radial passages 10^e with the opening 10^b, whereby a fluid entering said opening may pass through said passages into said annular groove and thereby expand and hold said packing-ring firmly in contact at all times with the wall of the chamber 3, so that it will be impossible for such fluid to leak down or otherwise obtain access to said chamber below the piston or plunger, as will be readily understood.

12 designates a head which is screwed into

the upper end of the chamber 3 and thus limits the upward movement of the piston caused by means of one or more springs 13, interposed between the bottom of said chamber 3 and the opposing face of the lower end of the piston or plunger. Said springs at their upper ends preferably engage cavities 8^b in said piston, so as to be held reliably in their proper positions. Said head 12 is provided centrally with a threaded boss or neck which projects upwardly into the enlargement of the cylinder and is provided centrally with a vertical passage 12^a, which registers with the opening 10^b of the piston and also extends through said boss. An annular packing-ring fits upon and within said neck or boss and is clamped firmly in such position by means of the threaded cap 13, which cap is also provided with a registering and preferably a flaring opening which communicates with the passage 12^a. The chamber formed between the heads 6 and 12 is divided by means of a flexible partition 14 into an upper chamber 15 and a lower chamber 16. The upper chamber communicates with the opening in the cap 13 and is provided with a hole or inlet-passage 17 for the supply of the fluid employed as an agent in the operation of the machine, which opening is normally closed by means of a screw-plug 18. The head 6 is provided with a central opening which is lined with an annular packing-ring 19, clamped firmly in position by means of a cap-plate 20, bolted firmly in position.

21 designates a piston, and 22 a vertically-depending ram or stem thereof. Said ram or stem fits snugly in the opening of the head 6 at all times and prevents liquid from the chamber 15 escaping upward into chamber 7. The piston 21 is provided, preferably, with the usual packing-ring 23.

24 designates a pipe which communicates with the chamber 16, and 25 a similar pipe communicating with the chamber 7 above the piston 23. Said pipes at their lower ends screw into passages 24^a and 25^a, respectively, of a four-way coupling, and said coupling is also provided with passages 26 and 27, with which communicate the supply-pipe 28 and discharge-pipe 29, respectively.

30 designates a valve which controls the passage of air, steam, or water, as the case may be, through said pipes to and from said chambers. In order to accomplish this, it is provided with a tapering passage 31 and with a handle 32, by which the operator manipulates it.

In practice the air or other agent employed is first caused to pass from the supply-pipe 26 to the chamber 16. To accomplish this, the valve is set as indicated by dotted lines in Fig. 4. The movement of the valve is then continued in the direction indicated by the arrow until communication is established between the supply-pipe and passage 25^a, whereby the air or other agent under pressure is supplied to chamber 7, and the escape of air

from chamber 16 is prevented by reason of the fact that the valve closes chamber 24^a. After these operations have taken place and the rivet is secured the movement of the valve is continued in the same direction until the enlargement in the valve-passage communicates simultaneously with passages 24^a and 25^a and the small end with the discharge-passage 27. This operation permits the spring 33, interposed between the head 6 and the piston 21, and the spring 13 to raise their respective pistons to their original positions.

In order that this machine may be adjusted bodily to the position of the plates to be riveted together, I preferably secure to the downwardly-disposed shoulder, formed by enlarging the cylinder 3, the annular ring 34, and said ring in turn fits rotatably in an annular groove of the surrounding ring 35. Said ring 35 at diametrically opposite points is provided with trunnions 36, which pivotally engage openings in the lower end of the bail 37, swiveled at its upper end to a link 38, carried by a swinging crane. (Not shown.) By this means it is obvious that the machine may be located at any point desired by the proper operation of the crane, may be adjusted rotatably in the bifurcated or grooved ring 35, and may be adjusted to any preferred inclination by pivotally operating it upon the trunnions 36, as will be understood.

To prepare the machine for operation, water or oil, preferably a non-freezing oil in cold weather, is introduced into the chamber 15 by way of the opening 17 after plug 18 is removed. After a sufficient quantity is introduced, which is when the vertical chamber formed by the recesses 8^a and the passages 10^b and 12^a is filled, together with the chamber 10^a at the top of the piston, the annular groove 10^d, and the radial passages 10^e of the same, the plug 18 is replaced, so as to make it absolutely impossible for any of the liquid to escape at that point. The plates to be riveted together are arranged, with the rivet for securing them, upon the arm or anvil 2 of the frame, and valve 30 is adjusted to afford communication between the supply-pipe 26 and the pipe 24, whereby a fluid, preferably air, is introduced under heavy pressure into the chamber 16. Consequently, as the liquid in the chamber 15 is non-elastic, the elevation or upward distention of said flexible partition 14 displaces a quantity of said liquid, which displacement is accommodated by the downward movement of the piston 8. This preliminary pressure is sufficient in most cases to completely upset the rivet and fasten the plates reliably together, but for securing boiler-plates together I do not rely upon this preliminary pressure alone, but employ an auxiliary or intensifying pressure to complete the riveting operation, which pressure is produced by the descent of the piston 21, occasioned by simply throwing the valve around until it affords connection between the supply-pipe and the pipe 25, and at the same time

cuts off communication between the valve and the pipe 24, and thereby prevents any back-flow or escape of air from chamber 16. As soon as the air under pressure is introduced into the upper end of chamber 7 above the piston 21 of greater superficial area than the first-named piston said piston 21 is caused to move downwardly without applying pressure upon the rivet until the ram 22 enters the passage 12^a and comes in contact with the liquid in the chamber 3, the level of which of course has been lowered by the downward movement of the piston 8, already described. As soon as this contact takes place, of course, as the liquid cannot escape upwardly out of said chamber by reason of the packing-ring at the upper end of the passage 12^a, and because of the fact above stated that it is non-elastic, the pressure applied upon the piston 21 is transferred to the piston 8, and consequently the latter under this additional and greater pressure is caused to completely upset the rivet and secure the boiler or other plates firmly and reliably together. It is obvious that during the preliminary application of power to force the piston 8 downward and also during the intensified pressure caused by the descent of the piston 21 the pressure upon the liquid within and upon said piston 8 causes the vertical arm of the packing-ring 11 to expand, and consequently prevent the escape of any of said liquid to the bottom of the chamber 3, but, on the contrary, keeps it always above said piston. After the rivet is thus firmly secured the valve is adjusted to afford communication simultaneously between pipes 24 and 25 and discharge-pipe 29 to permit the air or other agent employed to escape and permit the springs 13 and 33 to elevate their respective pistons, the liquid displaced by the upward movement of the lower piston overflowing back into the chamber 15. When another rivet is to be secured, the operation described is repeated. When riveting boiler-plates, it is very important that the full power of the machine shall be brought to bear upon the rivets, and as it is impossible usually to ascertain this satisfactorily from an inspection of the plates themselves I have provided a telltale hole 34^a in the chamber 7, and have found in practice that if the piston 21 moves downwardly within the chamber 7 a sufficient distance to permit the air or other agent employed for forcing it downwardly to escape through said hole or aperture, which is located near the lower end of said chamber, the full power of the piston 21 has not been applied upon the rivet, and the reason for such failure is made obvious, which is that there is an insufficient quantity of oil or liquid within and upon the piston 8. Consequently the ram 22 of the piston 21 has moved for the greater part of its stroke without exerting enough pressure upon the piston 8 and thereby upon the rivet. To remedy this, it is necessary to reverse the position of the valve and introduce more

water or oil into chamber 12^a, and consequently into and upon the piston 8, and then adjusting the valve, as before, complete the riveting operation. In practice when a proper quantity of water or oil is in and upon the piston 8 the power-intensifier piston moves downward only a short distance, and said telltale hole is so disposed relative to the stroke of the said piston that if the air or other agent escapes through said hole the operator knows that the riveting operation is not as thorough and complete as it should be, and consequently puts an additional supply of water or oil in the machine, as before described.

Referring now to Fig. 5, it will be noticed that instead of the casting or frame 1 I employ the usual long bifurcated frame 35^a, corresponding in function to casting 1, but adapted especially for projecting into boilers when upsetting rivets and securing boiler-plates together. It will also be noticed that the principle of this structure is precisely the same as that already described, the principal difference being that the chambers 3 and 7 are not superposed relative to each other. In this case the chamber 3 is disposed at the outer end of the upper arm of the frame, while the chamber 7 is disposed in an opening in said frame inward of the bifurcation of the same. In this case the upper end of the chamber 3 is closed, as before, by a cap 12', corresponding to the cap 12, except that it is not provided with any hole or passage-way through it, but completely closes the upper end of the chamber 3. In this case also the form of the plunger is changed somewhat, as it is not necessary or desirable that it be provided with the recess 8^a or 10^b, as before, though said recess or opening may be provided without affecting in the least the operation of the said piston. In this case I preferably provide a body portion with an upwardly-projecting threaded stem 8', surround the same with the packing-ring 11, and screw down upon said threaded extension and upon said packing-ring the top section 10 of the piston. In this case the top section, instead of having the annular groove and radial passages communicate with a central hole, is provided with an annular groove 10' of right-angle form in cross-section, which communicates with a shallow chamber formed between the top of the plunger and the bottom of the cap in order that the actuating agent may spread out over and have a wide or extended bearing upon the top of the plunger.

Referring now to the chamber 7, it will be noticed that it is precisely the same in all respects as that already described, except that in this connection it is inverted, so as to dispose the chambers 14 and 15 at its upper end, and in lieu of the liquid-receiving chamber, formed by the passages 12^a, 10^b, and 8^a, said chamber is formed by means of a central tube 12^{a'}, which screws at its lower end into the cap 7^a, forming the upper wall of the

chamber 16, which cap is provided also with a registering passage provided with packing-ring and a cap 13 to hold it in place. In this case also the water or oil is introduced into chamber 15 by way of an opening 17^a in the upper end of the tube 12^{a'}, and said opening is normally closed by the plug 18^a. The upper end of said tube is also connected by means of the pipe 37^a with the shallow chamber above the piston 8. The valve-coupling is also connected, as before, by pipe 24 with the chamber 16 and by pipe 25 with the chamber 7, in this case below the piston 21 instead of above. The spring 33 in this case is also illustrated, but in practice will probably not be needed, as when the pressure is removed from said piston it will gravitate to the bottom of the cylinder. The spring may be desirable, however, in order to insure positiveness and rapidity of operation.

In operation after the requisite quantity of water or oil is poured into the tube 12^{a'} to fill chamber 15 and said tube the valve is operated to permit air under pressure to enter chamber 16, and, acting upon the flexible partition 14, as above described, displace or force a quantity of the liquid through the pipe 37^a and into the chamber 3 above the piston, which latter is consequently moved downward, as before explained. The further movement of the valve then intensifies the pressure upon the rivet caused by the downward movement of the piston 8 by introducing air below the piston 21 and causing the ram or stem of said piston to move upwardly into the tube 12^{a'}, and by displacing a further quantity of said liquid force piston 8 downwardly a corresponding distance and complete the riveting operation. This frame 35^a may also be suspended from a crane in the customary manner.

Referring now to Fig. 6, it will be noticed that I have arranged the intensifier to operate in connection with a punch or a small riveting-machine which can be held in one's hand. In this case also I have mounted the intensifier upon wheels, so as to be conveniently portable from place to place. The principle of construction in this case is precisely the same as in the structures already described, and the parts are correspondingly numbered, except that instead of the flexible partition I have employed a mechanical equivalent of the same in the shape of an adjustable piston or partition 14^a. This partition or piston is circular and embraces loosely the tube 12^{a'} and fits snugly within the cylinder forming the chambers 15 and 16, and is adapted to diminish and increase the capacity of said chambers, respectively, as it moves downwardly in operation, and consequently displaces the liquid in chamber 15 and forces it through the pipe 37^a into chamber 3 to cause the preliminary operation of the riveting or punching stem 9 or 9^a, respectively, of the piston 8. Said piston 14^a preferably comprises three sections, and between the same are interposed two packing-rings, which fit

snugly against the wall of the cylinder and the external surface of the tube 12^{a'}. The middle section is provided peripherally and internally with annular grooves 14^b and 14^c, which are connected by one or more radial passages 14^d, and communicating in turn at its lower end with one of said radial passages, and secured rigidly to the piston is a vertical pipe 38^a, which reciprocates with the plunger and extends through the stuffing-box 39 to permit the escape of the air, steam, or other agent employed under pressure to force downwardly the said piston and thereby cause the preliminary operation of the riveting or punching piston 8. In case the air or other agent employed leaks partially through or past said piston it enters said annular grooves and said radial passages and is permitted to escape freely up through the escape-pipe 38^a, this construction thereby insuring against the mixing of the piston-actuating agent with the liquid or power-transmitting agent in chamber 15, as will be readily understood.

By manipulating the valve as hereinbefore described the preliminary riveting operation first takes place, and then the pressure thus completed is intensified by the movement or operation of the second piston. In this construction it is necessary to employ a spring 40 or other means for reëlevating the piston after each operation, though it is to be understood that I may employ any other power to accomplish the same purpose. For instance, I may introduce air or steam under pressure to reëlevate said piston and also reëlevate piston 21 in sheet 1 and piston 8, if found desirable.

It is obvious, of course, that the principle of construction herein described and illustrated by the accompanying drawings—viz., the employment of a piston for preliminary engagement with the rivet, in combination with an auxiliary piston or pressure-intensifier for acting upon the first-named piston, and thereby increasing the pressure or force with which it bears upon the rivet—may be used in other connections. For instance, I contemplate using this principle in connection with shears or devices for cutting or trimming metal plates, in connection with hydraulic jacks for lifting derailed locomotives or cars back upon the track and in various other connections not necessary to mention herein.

While I have described and illustrated this machine as provided with only a single intensifier or auxiliary piston, it is to be understood, of course, that I may compress or intensify the pressure upon the liquid a plural number of times, if found desirable or necessary.

It is to be also understood that changes in the form, proportion, and organization of the parts may be resorted to without departing from the spirit or scope or sacrificing any of the advantages of my invention, nor will the substitution of equivalents be considered a departure from the same.

cuts off communication between the valve and the pipe 24, and thereby prevents any back-flow or escape of air from chamber 16. As soon as the air under pressure is introduced into the upper end of chamber 7 above the piston 21 of greater superficial area than the first-named piston said piston 21 is caused to move downwardly without applying pressure upon the rivet until the ram 22 enters the passage 12^a and comes in contact with the liquid in the chamber 3, the level of which of course has been lowered by the downward movement of the piston 8, already described. As soon as this contact takes place, of course, as the liquid cannot escape upwardly out of said chamber by reason of the packing-ring at the upper end of the passage 12^a, and because of the fact above stated that it is non-elastic, the pressure applied upon the piston 21 is transferred to the piston 8, and consequently the latter under this additional and greater pressure is caused to completely upset the rivet and secure the boiler or other plates firmly and reliably together. It is obvious that during the preliminary application of power to force the piston 8 downward and also during the intensified pressure caused by the descent of the piston 21 the pressure upon the liquid within and upon said piston 8 causes the vertical arm of the packing-ring 11 to expand, and consequently prevent the escape of any of said liquid to the bottom of the chamber 3, but, on the contrary, keeps it always above said piston. After the rivet is thus firmly secured the valve is adjusted to afford communication simultaneously between pipes 24 and 25 and discharge-pipe 29 to permit the air or other agent employed to escape and permit the springs 13 and 33 to elevate their respective pistons, the liquid displaced by the upward movement of the lower piston overflowing back into the chamber 15. When another rivet is to be secured, the operation described is repeated.

When riveting boiler-plates, it is very important that the full power of the machine shall be brought to bear upon the rivets, and as it is impossible usually to ascertain this satisfactorily from an inspection of the plates themselves I have provided a telltale hole 34^a in the chamber 7, and have found in practice that if the piston 21 moves downwardly within the chamber 7 a sufficient distance to permit the air or other agent employed for forcing it downwardly to escape through said hole or aperture, which is located near the lower end of said chamber, the full power of the piston 21 has not been applied upon the rivet, and the reason for such failure is made obvious, which is that there is an insufficient quantity of oil or liquid within and upon the piston 8. Consequently the ram 22 of the piston 21 has moved for the greater part of its stroke without exerting enough pressure upon the piston 8 and thereby upon the rivet. To remedy this, it is necessary to reverse the position of the valve and introduce more

water or oil into chamber 12^a, and consequently into and upon the piston 8, and then adjusting the valve, as before, complete the riveting operation. In practice when a proper quantity of water or oil is in and upon the piston 8 the power-intensifier piston moves downward only a short distance, and said telltale hole is so disposed relative to the stroke of the said piston that if the air or other agent escapes through said hole the operator knows that the riveting operation is not as thorough and complete as it should be, and consequently puts an additional supply of water or oil in the machine, as before described.

Referring now to Fig. 5, it will be noticed that instead of the casting or frame 1 I employ the usual long bifurcated frame 35^a, corresponding in function to casting 1, but adapted especially for projecting into boilers when upsetting rivets and securing boiler-plates together. It will also be noticed that the principle of this structure is precisely the same as that already described, the principal difference being that the chambers 3 and 7 are not superposed relative to each other. In this case the chamber 3 is disposed at the outer end of the upper arm of the frame, while the chamber 7 is disposed in an opening in said frame inward of the bifurcation of the same. In this case the upper end of the chamber 3 is closed, as before, by a cap 12', corresponding to the cap 12, except that it is not provided with any hole or passage-way through it, but completely closes the upper end of the chamber 3. In this case also the form of the plunger is changed somewhat, as it is not necessary or desirable that it be provided with the recess 8^a or 10^b, as before, though said recess or opening may be provided without affecting in the least the operation of the said piston. In this case I preferably provide a body portion with an upwardly-projecting threaded stem 8', surround the same with the packing-ring 11, and screw down upon said threaded extension and upon said packing-ring the top section 10 of the piston. In this case the top section, instead of having the annular groove and radial passages communicate with a central hole, is provided with an annular groove 10' of right-angle form in cross-section, which communicates with a shallow chamber formed between the top of the plunger and the bottom of the cap in order that the actuating agent may spread out over and have a wide or extended bearing upon the top of the plunger.

Referring now to the chamber 7, it will be noticed that it is precisely the same in all respects as that already described, except that in this connection it is inverted, so as to dispose the chambers 14 and 15 at its upper end, and in lieu of the liquid-receiving chamber, formed by the passages 12^a, 10^b, and 8^a, said chamber is formed by means of a central tube 12^{a'}, which screws at its lower end into the cap 7^a, forming the upper wall of the

chamber 16, which cap is provided also with a registering passage provided with packing-ring and a cap 13 to hold it in place. In this case also the water or oil is introduced into chamber 15 by way of an opening 17^a in the upper end of the tube 12^{a'}, and said opening is normally closed by the plug 18^a. The upper end of said tube is also connected by means of the pipe 37^a with the shallow chamber above the piston 8. The valve-coupling is also connected, as before, by pipe 24 with the chamber 16 and by pipe 25 with the chamber 7, in this case below the piston 21 instead of above. The spring 33 in this case is also illustrated, but in practice will probably not be needed, as when the pressure is removed from said piston it will gravitate to the bottom of the cylinder. The spring may be desirable, however, in order to insure positiveness and rapidity of operation.

In operation after the requisite quantity of water or oil is poured into the tube 12^{a'} to fill chamber 15 and said tube the valve is operated to permit air under pressure to enter chamber 16, and, acting upon the flexible partition 14, as above described, displace or force a quantity of the liquid through the pipe 37^a and into the chamber 3 above the piston, which latter is consequently moved downward, as before explained. The further movement of the valve then intensifies the pressure upon the rivet caused by the downward movement of the piston 8 by introducing air below the piston 21 and causing the ram or stem of said piston to move upwardly into the tube 12^{a'}, and by displacing a further quantity of said liquid force piston 8 downwardly a corresponding distance and complete the riveting operation. This frame 35^a may also be suspended from a crane in the customary manner.

Referring now to Fig. 6, it will be noticed that I have arranged the intensifier to operate in connection with a punch or a small riveting-machine which can be held in one's hand. In this case also I have mounted the intensifier upon wheels, so as to be conveniently portable from place to place. The principle of construction in this case is precisely the same as in the structures already described, and the parts are correspondingly numbered, except that instead of the flexible partition I have employed a mechanical equivalent of the same in the shape of an adjustable piston or partition 14^a. This partition or piston is circular and embraces loosely the tube 12^{a'} and fits snugly within the cylinder forming the chambers 15 and 16, and is adapted to diminish and increase the capacity of said chambers, respectively, as it moves downwardly in operation, and consequently displaces the liquid in chamber 15 and forces it through the pipe 37^a into chamber 3 to cause the preliminary operation of the riveting or punching stem 9 or 9^a, respectively, of the piston 8. Said piston 14^a preferably comprises three sections, and between the same are interposed two packing-rings, which fit

snugly against the wall of the cylinder and the external surface of the tube 12^{a'}. The middle section is provided peripherally and internally with annular grooves 14^b and 14^c, which are connected by one or more radial passages 14^d, and communicating in turn at its lower end with one of said radial passages, and secured rigidly to the piston is a vertical pipe 38^a, which reciprocates with the plunger and extends through the stuffing-box 39 to permit the escape of the air, steam, or other agent employed under pressure to force downwardly the said piston and thereby cause the preliminary operation of the riveting or punching piston 8. In case the air or other agent employed leaks partially through or past said piston it enters said annular grooves and said radial passages and is permitted to escape freely up through the escape-pipe 38^a, this construction thereby insuring against the mixing of the piston-actuating agent with the liquid or power-transmitting agent in chamber 15, as will be readily understood.

By manipulating the valve as hereinbefore described the preliminary riveting operation first takes place, and then the pressure thus completed is intensified by the movement or operation of the second piston. In this construction it is necessary to employ a spring 40 or other means for reëlevating the piston after each operation, though it is to be understood that I may employ any other power to accomplish the same purpose. For instance, I may introduce air or steam under pressure to reëlevate said piston and also reëlevate piston 21 in sheet 1 and piston 8, if found desirable.

It is obvious, of course, that the principle of construction herein described and illustrated by the accompanying drawings—viz., the employment of a piston for preliminary engagement with the rivet, in combination with an auxiliary piston or pressure-intensifier for acting upon the first-named piston, and thereby increasing the pressure or force with which it bears upon the rivet—may be used in other connections. For instance, I contemplate using this principle in connection with shears or devices for cutting or trimming metal plates, in connection with hydraulic jacks for lifting derailed locomotives or cars back upon the track and in various other connections not necessary to mention herein.

While I have described and illustrated this machine as provided with only a single intensifier or auxiliary piston, it is to be understood, of course, that I may compress or intensify the pressure upon the liquid a plural number of times, if found desirable or necessary.

It is to be also understood that changes in the form, proportion, and organization of the parts may be resorted to without departing from the spirit or scope or sacrificing any of the advantages of my invention, nor will the substitution of equivalents be considered a departure from the same.

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

1. A riveting-machine, comprising a frame 5 having an arm or anvil, a piston provided with an arm to engage a rivet; a liquid-chamber communicating with the piston-chamber above said piston, a movable partition to dis- 10 place a quantity of the liquid in said chamber, and thereby applying pressure upon the piston force it downwardly to engage the rivet, and a second piston or intensifier to op- 15 erate upon said fluid and thereby increase the pressure upon the first-named piston and consequently upon the rivet engaged by the same, substantially as described.

2. A riveting-machine, comprising a frame having an arm or anvil, a piston provided with an arm to engage a rivet, a liquid-cham- 20 ber communicating with the piston-chamber above said piston, a movable partition to dis- place a quantity of the liquid in said cham- ber, and thereby applying pressure upon the piston force it downwardly to engage the 25 rivet, a second piston or intensifier to operate upon said fluid and thereby increase the pres- sure upon the first-named piston and conse- quently upon the rivet engaged by the same, and means to return said pistons to their origi- 30 nal positions after the pressure upon them is removed.

3. A riveting-machine, comprising a suit- able frame having an anvil or arm, and pro- 35 vided with a piston-chamber, a piston therein provided with a stem to act in conjunction with said arm upon the rivet to be upset, a liquid-chamber in communication with the upper end of said piston-chamber, a movable 40 partition therein, a pressure-supply pipe com- municating with the liquid-chamber at the side of the movable partition containing no liquid, a second piston or pressure-intensifier, a pipe connecting the same with said supply- 45 pipe, and a valve, which when operated per- mits the pressure agent to first act upon and operate the movable partition and conse- quently operate the first-named piston and then to cause such pressure agent to act upon

the last-named piston and cause it to intensify the pressure of said first-named piston upon 50 said rivet, substantially as described.

4. A riveting-machine, comprising a suit- able frame having an anvil or arm, and pro- 55 vided with a piston-chamber, a piston therein provided with a stem to act in conjunction with said arm upon the rivet to be upset, a liquid-chamber in communication with the upper end of said piston-chamber, a movable 60 partition therein, a pressure-supply pipe com- municating with the liquid-chamber at the side of the movable partition containing no liquid, a second piston or pressure-intensifier, a pipe connecting the same with said supply- 65 pipe, a valve which when operated permits the pressure agent to first act upon and op- erate the movable partition and consequently operate the first-named piston, and then to 70 cause such pressure agent to act upon the last-named piston and cause it to intensify the pressure of said first-named piston upon said rivet, a discharge-pipe which may be put in communication by said valve with the pipes 75 leading to said chambers after the riveting operation is completed, and means to return said pistons to their original position, simul- 75 taneously with the escape of the pressure agent through the discharge-pipe, substan- tially as described.

5. The combination with a riveting-ma- 80 chine, of a ring secured thereto, a grooved ring slidingly embracing the same, and a bail pivotally carrying said grooved ring, sub- stantially as described.

6. The combination with a riveting-ma- 85 chine, of a ring secured thereto, a grooved ring slidingly embracing the same and pro- vided at diametrically opposite points with trunnions, a bail pivotally engaging said trun- 90 nions at its lower end, and a link swiveled to said bail substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ALFRED PARFITT.

Witnesses:

GEORGE W. SMITH,
A. G. F. JANES.