No. 878,645. PATENTED FEB. 11, 1908.

W. L. LINDSAY.

RIVETING TOOL OR ENGINE.

APPLICATION FILED MAY 9, 1905.

3 SHEETS—SHEET 1.

Fig. 1.

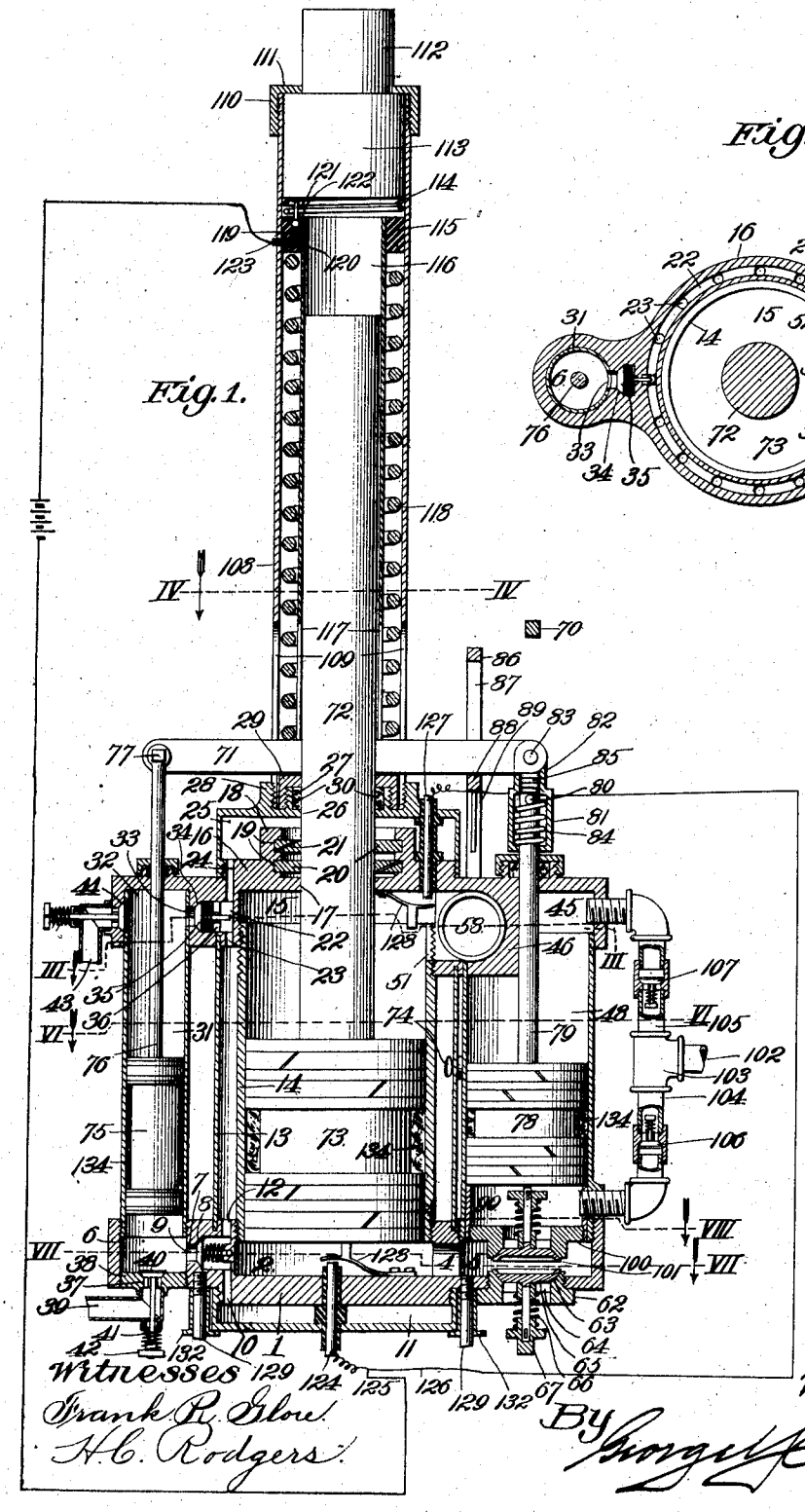


Fig. 3.

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3 SHEETS—SHEET 2.

Fig. 2.

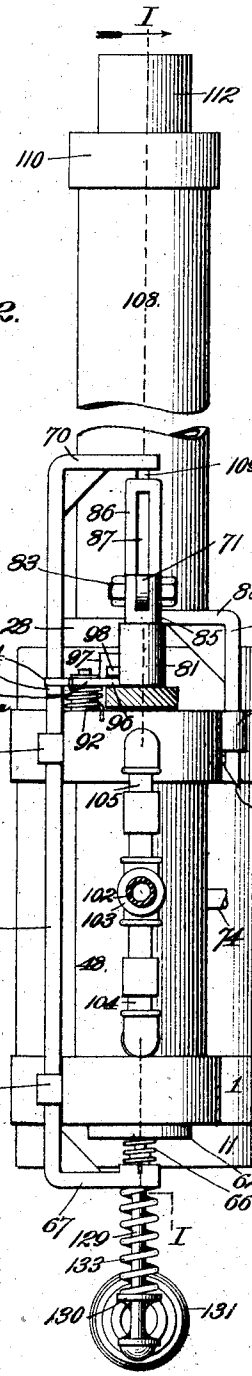


Fig. 4.

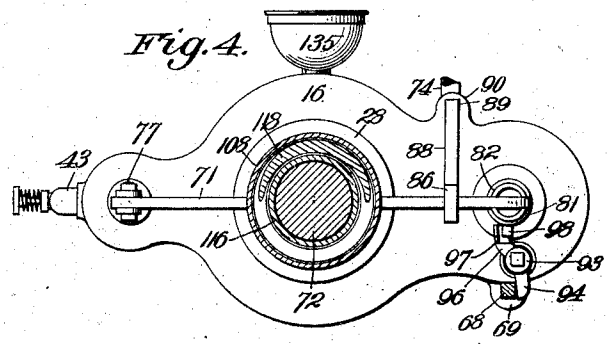
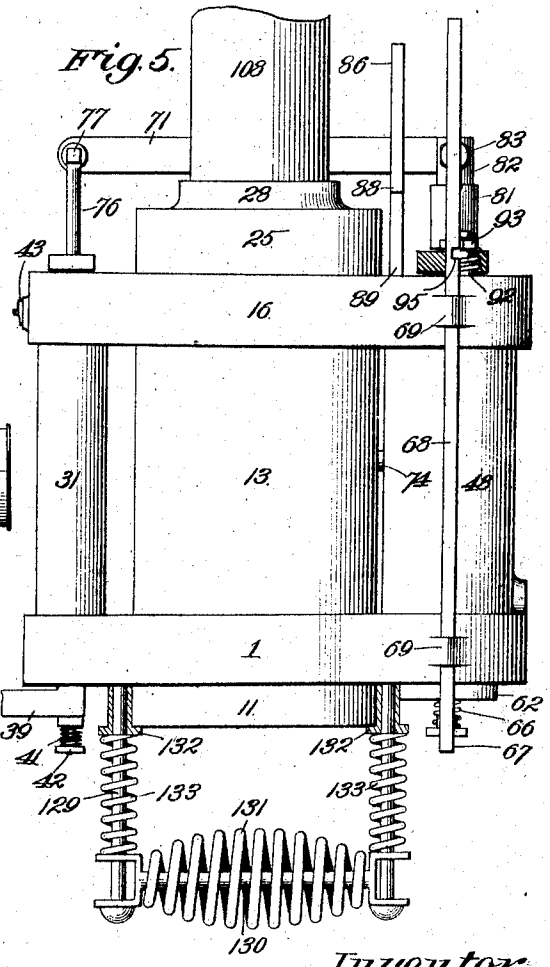


Fig. 5.



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3 SHEETS—SHEET 3.

Fig. 6.

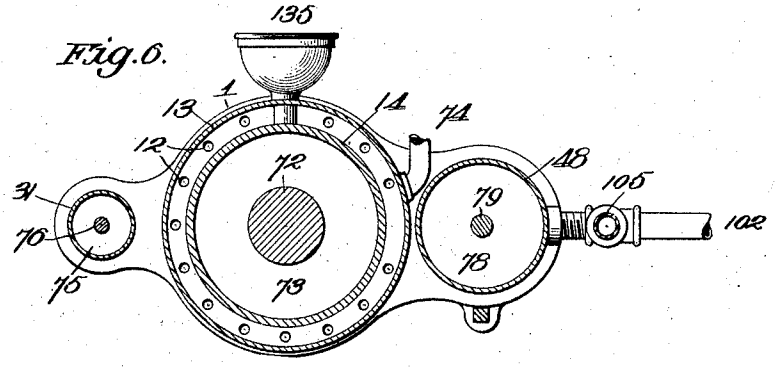


Fig. 7.

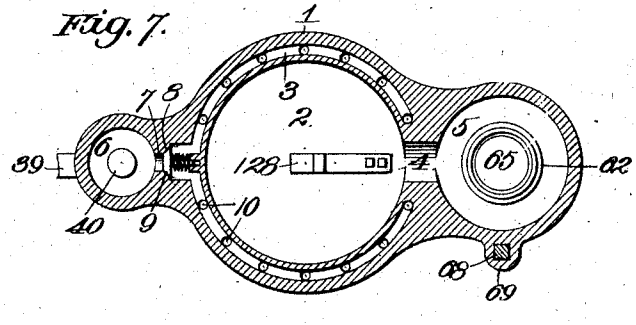


Fig. 8.

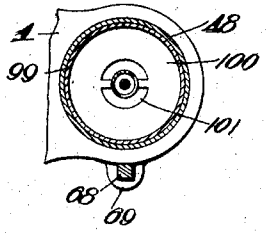


Fig. 9.

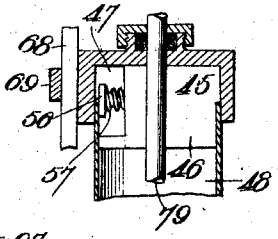
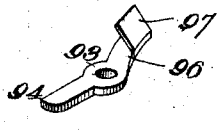


Fig. 10.



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UNITED STATES PATENT OFFICE.

WALTER L. LINDSAY, OF KANSAS CITY, KANSAS.

RIVETING TOOL OR ENGINE.

No. 878,645. Specification of Letters Patent. Patented Feb. 11, 1908.

Application filed May 9, 1905. Serial No. 259,610.

To all whom it may concern:

Be it known that I, WALTER L. LINDSAY, a citizen of the United States, residing at Kansas City, in the county of Wyandotte and State of Kansas, have invented certain new and useful Improvements in Riveting Tools or Engines, of which the following is a specification.

My invention relates to riveting engines, and my object is to produce a gasolene riveting engine or tool which can be operated with perfect safety and will perform its function reliably and efficiently.

A further object is to produce a riveting machine which can be operated more economically than the pneumatic riveting machines in common use.

Other objects of the invention will hereinafter appear and be pointed out in appended claims and in order that it may be fully understood reference is to be had to the accompanying drawings, in which—

Figure 1, is a central longitudinal section taken substantially on the line I—I of Fig. 2. Fig. 2, is an edge view of the same with the explosive mixture supply pipe in section. Fig. 3, is a section taken on the line III—III of Fig. 1. Fig. 4, is a section taken on the line IV—IV of Fig. 1, with the bolt omitted which secures one of the pistons to the cross bar carried by the main piston. Fig. 5, is a side view of a portion of the engine with certain parts shown in section. Fig. 6, is a section taken on the line VI—VI of Fig. 1. Fig. 7, is a section taken on the line VII—VII of Fig. 1. Fig. 8, is a section on the line VIII of Fig. 1. Fig. 9, is a section on the dotted line IX of Fig. 3. Fig. 10, is a detail perspective view of a dog forming a part of the machine.

In the said drawings, 1 indicates a metallic head of steel or other suitable material and provided at its inner side with a circular chamber 2 and with a segmental channel 3, almost wholly surrounding said chamber.

4 is a passage connecting chamber 2, with an offsetting chamber 5, of an extension of the head, and 6, is a smaller chamber formed in the extension of the head diametrically opposite the first-named extension. Chamber 6 communicates through passage 7, with channel 3 and where it opens into said channel is enlarged to form a valve seat 8, for the yieldingly closed valve 9, of the construction shown or of any other suitable or preferred type.

10 are vertical passages connecting channel 3 with a chamber 11, formed at the outer side of head 1, and 12 are similar passages connecting the channel with the interior of the water jacket cylinder 13, concentrically surrounding cylinder 14, secured to the head and communicating with and projecting from chamber 2.

15 is a chamber formed in the inner side of a metallic head 16, secured to the end of cylinder 14, and water jacket 13, in any suitable manner, and said head is provided with a central passage 17, and an outwardly projecting flange 18, of greater diameter than the passage and provided with internal grooves 19 to receive the metallic packing rings 20, which are split as at 21, so that they may be sprung inward sufficiently to enter flange 18, and then released to permit them to assume the position shown and provide holes corresponding in diameter with passage 17.

22 is a channel in head 16, nearly surrounding chamber 15, and 23 passages connecting the channel with the water jacket, similar passages 24 connecting the channel with the hollow chamber 25 at the outer side of head 16. The cap forming said chamber is provided with a central passage 26, and outwardly projecting concentric flanges 27 and 28, the former being externally and the latter internally threaded, and engaging the former is a nut 29, a suitable packing 30, being held by the nut inward of flange 27.

31 is a cylinder secured to the head 1 and communicating at one end with chamber 6 thereof, and at its opposite end with chamber 32 of the extension of head 16, and said cylinder communicates through opening 33, with channel 22, said opening being enlarged to form a valve seat 34, for engagement normally by a yieldingly advanced valve 35, of the type shown or of any other suitable or preferred type, the stem of said valve being guided in a skeleton partition 36, or it may be supported like the corresponding part of valve 9.

Communicating with chamber 6, through a passage 37 in the screw-plug 38, closing an opening in one extension of head 1, is a water supply pipe 39, and 40 is a valve normally closing the passage 37, under the pres-

sure of a spring 41, surrounding the stem of the valve and bearing at its opposite ends against pipe 39 and the nut 42 on the stem. A similar or equivalent water supply pipe 43 communicates with chamber 32 at the opposite end of the cylinder 31 through a passage 44 in the extension of the head, and a valve mechanism similar in all respects to or the equivalent of the valve mechanism closing passage 37, is employed to yieldingly close passage 44.

Head 16 is provided with an extension forming a chamber 45 in alinement with chamber 5, and said head is formed with a projection 46, having a passage 47, communicating with chamber 45, and with the upper end of a cylinder 48 connecting the longitudinally alined extensions of the heads. The opposite end of passage 47 communicates with the passage 49, enlarged to form a valve seat 50, and communicating with passage 51, communicating with chamber 15, in the upper end of cylinder 14. Head 16 is also provided with a passage 52, communicating at one end with the atmosphere and at its inner end with passage 51, its inner end being enlarged to provide a valve seat 53 contiguous to and directly opposite valve seat 50. A valve 54 normally seated on seat 50, has a stem extending through the skeleton guide 55, and is provided with a collar or nut 56, and with a spring 57 bearing at its opposite ends against the skeleton guide and the collar or nut to hold the valve yieldingly seated and therefore closing communication between the upper ends of cylinders 14 and 48. A similar valve 58, for valve seat 53, has a stem extending through a skeleton guide 59, and is provided with a collar 60, and a spring 61, bearing at its opposite ends against the skeleton guide and the collar to hold said valve normally on its seat 53.

62 is a screw ring secured in the lower end of the right hand extension of head 1, and provided with a valve seat 63, and a skeleton partition 64. 65 is a valve engaging said seat and held yieldingly thereon by the spring 66 pressing against the skeleton partition at one end and against the arm 67 of the slide frame 68, said arm being secured rigidly to the stem of said valve. The slide frame is mounted in guide loops 69 formed integral with the heads, and at its free end is provided with an arm 70 projecting into the path of cross bar 71, secured rigidly to and preferably extending through the stem 72 of a double-headed piston 73, adapted to reciprocate in cylinder 14, said stem extending slidingly through passage 17, passage 26, and the stuffing box contiguous thereto, and also through the spring rings 20, the latter preventing water from entering the cylinder 14, and the stuffing box preventing water from escaping through passage 26, the discharge pipe for the water being numbered 74, and leading by preference back to the source of supply of pipes 39 and 43.

75 is a double-headed piston in water cylinder 31, and 76 the stem of said piston extending through the extension of head 16, with a water-tight joint and connected as at 77 to one end of cross bar 71.

78 is a double headed piston in cylinder 48, and 79 the stem of said piston, said stem extending up through the other extension of head 16 with a gas tight relation, and having a cross pin 80, at its upper end. Fitting telescopically on the upper end of said stem is a tube consisting of the lower portion 81 and the upper smaller portion 82, the latter being bolted as at 83, to the contiguous end of cross bar 71. The parts are so related that the lower end of the upper portion 82 of the tube is limited in its downward movement on stem 79 by striking pin 80, and the upward movement of the tube independent of the stem 79 is limited by the retractile spring 84 encircling the upper end of stem 79, and bearing at its opposite ends against pin 80 and the lower end of tube portion 81.

Interposed between stem 79 and bar 71 and fitting snugly in tube portion 82, is an expansive spring 85. This telescopic construction of the stem of piston 78, is provided in order that the back stroke of piston 78 may cease just before the corresponding stroke of piston 73 ends and also to allow the last-named piston to continue its forward stroke after the corresponding stroke of the piston 78 is ended.

A substantially stair-shaped bracket, consists of the longitudinal arm 86, having a longitudinal slot 87, through which bar 71 projects, a laterally projecting arm 88, and a longitudinal arm 89 mounted in the guide loop 90, of head 16, and terminating in a beveled or cam end 91 for engagement with the outwardly projecting stem of valve 58, so as to unseat said valve at times and hold it unseated against the resistance of spring 61.

92 is a boss projecting from head 16, and pivoted thereon is a dog 93 having an arm 94, adapted for engagement with a notch 95 of slide frame 68, and an arm 96 having a beveled shoulder 97 adapted for engagement at times by the pin 98, of the tubular portion 81, of valve stem 79, the arrangement being such that said pin in its downward movement shall operate said dog against the resistance of its spring 93ª—upon said boss 92 and projecting at one end into head 16 and at the other pressing against said dog,—and thus release the slide-frame, for a purpose hereinafter explained.

99 is a ring secured in the lower end of the cylinder 48, and 100 a screw plug secured in the lower end of said ring and provided with a valve 101, of the same type of construction as and directly opposite to valve 65 herein-

before described, that is to say, said valve 101 is held with a yielding pressure against its seat so as to close communication between chamber 5 and the lower end of cylinder 48.

102 is a pipe leading from a carbureter or other source of explosive gas supply, not shown, and connected by a coupling 103, to pipes 104 and 105 communicating with the ends of cylinder 48 and said pipes are provided respectively with check valves 106 and 107 of the type shown or of any other suitable type which will automatically close to prevent gas from passing back through said pipes into pipe 102.

108 is a sleeve screwed or otherwise rigidly secured at its lower end in flange 28 and disposed concentrically of piston stem 72, and provided with longitudinal slots 109, to permit of the reciprocation of cross bar 71 extending through said slots.

110 is a collar secured to the upper end of sleeve 108 and provided with an inwardly projecting flange 111 embracing the reduced end 112 of a tappet 113, fitting in the sleeve, said tappet being normally held against said flange by means of the spring 114 bearing at its opposite ends against the tappet and the insulating ring 115 secured rigidly in the sleeve and holding concentrically therein the upper end of the inner guide sleeve 116, fitting snugly upon the piston stem 72, and provided with guide slots 117 for the movement of cross bar 71, a helical spring 118 fitting between the inner and outer sleeves and bearing at its opposite ends against the insulating ring 115, and cross bar 71, serving principally as a means for holding the piston in substantially the position shown when the machine is not in use.

119 is a recess in insulating ring 115, and seated in said recess upon a spring 120 therein, is the enlarged end of a pin 121, a plate 122 secured to the insulating ring and in contact with neither of the guide sleeves nor spring 114, preventing spring 120 forcing pin 121 into engagement with the tappet when the latter occupies the position shown, and said spring and therefore said pin is connected by the insulated conductor 123 to a battery or other suitable source of electric current supply.

124 is a contact pin projecting into chamber 2 but insulated from the head or frame and connected electrically by wire 125 with the battery. A similar contact pin 127 projects into the chamber 15 and is connected with the battery by the wire 126 which is shown as joined to the wire 125.

Secured to the heads of cylinder 14 are spring contacts 128 held normally by the spring action, out of contact with their respective pins 124 and 127, and adapted alternately to be struck by the piston 73, and forced nearly into contact with said pins.

For the purpose of permitting the operator to support the heavy end of the machine properly and at the same time largely absorb the "kick" or vibratory action and promote his comfort and convenience, I provide a pair of headed bars 129 projecting from the head 1, and joined by a connecting bar 130, mounted on said bars and provided with a helical spring handle 131.

132 are headed sleeves upon the headed bars and 133 are expansive springs upon the bars and bearing at their opposite ends against said headed sleeves and the ends of the connecting bar 130. With this type of handle it will be apparent that the "kick" of the tool will be absorbed by springs 133 and that spring 131 will also yield to some extent to absorb a portion of the vibration and it will also be understood that by reason of the skeleton formation of the handle portion 131, air is free to circulate around it and therefore tends to prevent it getting too hot to hold, by conduction from the engine.

For the purpose of keeping the pistons properly lubricated, the pistons are of the double-headed type as hereinbefore explained and a suitable packing 134 is fitted around the reduced portion of each piston between its heads. The oil-cup 135—shown only in connection with the main cylinder—is secured to the cylinder about midway its length so that its discharge end is always covered by one of the heads of the piston or the packing between said heads, the heads fitting so tightly as to cut off the supply of oil, so that practically all of the oil that enters the cylinders will be that which is absorbed by the packing and is distributed on the interior faces of the cylinders by such packing during the reciprocation of the pistons.

In the practical operation of the machine we will assume that the parts are in the position shown, that is, that a charge of gas or explosive mixture is compressed in chamber 2, that the pressure thus produced holds valves 65 and 101 closed, and that the depressed stair-shaped bracket holds valve 58 off its seat and through such valve locks valve 54 closed. Also that bottom contact pin 124 and plate 128 are close together and contact pin 121 is out of engagement with tappet 113.

Assuming now that the operator with one hand grasping the handle and the other sleeve 108, presses the tappet against the rivet to be upset, not shown, and thereby causes said tappet to move back almost to the insulating ring 115, so as to be within striking distance of the piston stem 72. When the tappet is brought back against the pin 121, the circuit from the battery is completed through the metal parts of the machine to the plate 128 and the pin 124 so that when the piston moves the plate springs in

ward and a spark is produced between said plate and pin to cause the explosion of the gas or explosive mixture and drive the piston 73 forcibly upward, the upper end of its stem striking the tappet and driving the same upward with great force upon the rivet. The upward movement of the piston is of course accompanied by like movement on the part of piston 75 and piston 78, but in view of the telescopic construction of the stem of the last-named piston, the latter does not make as long a stroke as piston 73.

After piston 78 ceases to move upward, the spring 84 yields to permit of further movement of piston 73, the spring being compressed between cross pin 80 and the bottom of tube 81, as will be readily understood. Now as the upward strokes of the piston occur, the explosive mixture above piston 78 is compressed and seats check valve 107, and the air above piston 73 is forced through passage 51, and passage 52 to the atmosphere and shortly before the upward movement of piston 73 ceases, cross bar 71 reaches the forward end of slot 87 and pushes the stair-shaped bracket upward so as to permit spring 61 to close valve 58 against its seat, the seating of said valve being accompanied by the unseating of valve 54 under the pressure of the explosive mixture in the upper end of the cylinder 48 assisted by that of spring 57. When the valve 54 is unseated the explosive mixture enters chamber 15 until the pressure in the upper ends of the two cylinders is equalized when the continued advance of the piston 73, produces a preponderance of pressure in cylinder 14 and effects the closure of valve 54 about the same instant the upward movement of bar 71 by engagement with arm 70 moves the slide-frame 68 and unseats valve 65, and the piston 73 presses the upper contact plate 128 close to the juxtaposed pin 127, these last-named events occurring at about the same instant that piston stem 72 strikes the tappet as hereinbefore explained, it being understood in this connection that the piston stem can never strike the tappet until the latter by engagement with the rivet to be upset has been pressed back into engagement with pin 121. Because of this there is no danger of the tappet being accidentally driven forward against the flange 111 of ring 110, which is simply employed to prevent accidental loss of the tappet and is not intended to sustain the impact thereof.

The advance movement of the piston is resisted by spring 118, employed for a purpose hereinbefore explained, and as the advance movement of the piston ceases, a spark is produced between the upper plate 128 and pin 127 to explode the gas or explosive mixture in chamber 15. It will also be understood that when the slide frame 68, is raised to unseat valve 65, said valve is adapted to press against the superposed valve 101, said valve being locked in such relation by means of the arm 94 of the spring-actuated dog, which enters notch 95, of the slide-frame and locks said valve in the position described. It will also be noticed that the advance of the piston 78, not only compresses the explosive mixture in front of it, but that it draws gas into the lower end of cylinder 48 so that as the explosion in chamber 15 takes place and drives the pistons downward the gas in the lower end of cylinder 48 shall be compressed at the same time that the dead gas in cylinder 14 is forced out of said cylinder and the communicating chamber 5 through the exposed passage or opening of valve 65.

When the back stroke of the piston has been nearly completed the bar 71 reaches the bottom of slot 87, and slides the stair-shaped bracket downward so that its beveled lower end (see Fig. 2) shall engage the stem of valve 58 and force the same from its seat, and at the same time the pin 98 of the tubular portion of the stem of piston 78; by engagement with the beveled or cam end of the pivoted dog trips said dog from the notch of slide-frame 68, so that the pressure of the explosive mixture in the lower end of cylinder 48 shall unseat valve 101 by moving it downward, and reseat valve 65 by moving it in the same direction, this movement of the valve 65 being aided by the spring 66 around the stem of the same. As the valves are moved gas from the lower end of cylinder 48 passes into chamber 5 and the communicating end of cylinder 14 until the pressure is equalized, which is of course almost instantaneously. When this occurs the downward movement of piston 78 ceases, piston 73 continuing downward because of the yielding resistance offered by spring 85, pressing at its opposite ends against bar 71 and stem 79. This continued movement of piston 73 creates a preponderating pressure, which assisted by the spring on its stem, insures the instant reseating of valve 101 and at the same moment said piston 73 causes the lower plate 128 to approach the pin 124 and produce a spark—provided the tappet is repressed and in engagement with pin 121—the result being an explosion in chamber 2, which again causes the advance movement of the pistons.

All future operations are repetitions of those described, and it will be noticed that as the piston 75 moves upward it draws water through pipe 39 into chamber 6, valve 40 of course opening under the pressure and valve 44 closing. The water in the upper end of the cylinder therefore causes valve 35 to unseat and passes into channel 22 and thence through passages 23 and 24 into water jacket 13 and chamber 25, a corresponding volume of water being forced out at the same instant through pipe 74.

As piston 75 moves downward each time

it draws water into the upper end of its cylinder through pipe 43, the entering water unseats the controlling valve, while the water previously collected in the lower end of the cylinder, unseats valve 9, and enters channel 3, passing thence through passages 12, into the water jacket and passages 10 into chamber 11, the surplus water being forced through the discharge pipe 74. It will also be seen that water is kept circulating at each end of the main cylinder so as to prevent the machine becoming too hot for safe and convenient operation.

This gasolene riveting tool obviously can be readily transformed into a gasolene motor or engine by dispensing with the tappet and its adjuncts and coupling the piston stem 72 to a shaft in a well known manner. The engine of course is adapted to be equipped with any suitable electric sparking or other gas explosion mechanism.

From the above description it will be apparent that I have produced a machine of the character described possessing the advantageous features enumerated and which is obviously susceptible of modification in its form, proportion, detail construction and arrangement of the parts without departing from the principle of construction involved.

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

1. The combination of a working cylinder, a fuel cylinder communicating directly with the working cylinder and arranged parallel therewith, pistons in the cylinders having their respective piston rods in parallel planes, an arm projecting laterally from the rod of the piston in the working cylinder, a pin in the end of the rod of the piston in the fuel cylinder, a tube secured to the end of the said lateral arm, fitting over the end of the fuel-cylinder piston-rod and arranged to impinge against the said pin, a spring coiled around the said piston-rod between the said pin and the lower end of said tube, means for admitting fuel to the fuel cylinder, and valves controlling the communication between the cylinders.

2. The combination of a working cylinder having an exhaust port at each end, inwardly-opening valves normally and automatically closing said ports, a working piston having its rod projecting through the end of its cylinder, slides upon the cylinder and bearing against said valves and means carried by the piston rod to actuate said slides and thereby operate the valves to open the ports.

3. The combination of a cylinder, a piston therein having its piston rod projecting through the end of the cylinder, a normally-closed exhaust-valve, a slide mounted on the cylinder and having an arm bearing against the stem of the valve, and an arm projecting from the piston rod and arranged to impinge upon said slide to actuate the same and open the valve.

4. The combination of a working cylinder, a fuel cylinder communicating with the working cylinder, pistons in the cylinders, exhaust valves for the working cylinder, slides mounted on the fuel cylinder and bearing upon said valves, an arm projecting from the rod of the working cylinder piston arranged to actuate said slides, and means controlled by the rod of the fuel cylinder piston for locking one of said slides.

5. The combination of a cylinder, a piston therein, a normally closed exhaust-valve therefor, a slotted slide bearing upon said valve, and an arm projecting from the rod of the piston and extending through the slot of the slide to impinge against the ends of the same whereby the movement of the piston will control the operation of the valve.

6. The combination of a working cylinder, a fuel cylinder, pistons therein, an exhaust valve, a notched slide mounted on the fuel cylinder and bearing upon the valve, an arm projecting from the rod of the working cylinder piston and arranged to actuate said slide, and a dog arranged to engage the notch in said slide and controlled by the piston in the fuel cylinder.

7. The combination of a working cylinder, a fuel cylinder, valves at the ends of the fuel cylinder normally closing the exhausts of the working cylinder, a piston and piston rod in the working cylinder, an arm projecting laterally from said piston rod, a spring-pressed slide on the fuel-cylinder having an arm projecting into the path of the arm on the piston rod, and a second slide mounted on the fuel-cylinder and having a slotted arm through which the said arm on the piston rod projects, said slides bearing upon said valves.

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

WALTER L. LINDSAY.

Witnesses:
H. C. RODGERS,
G. Y. THORPE.