

Sept. 8, 1936.

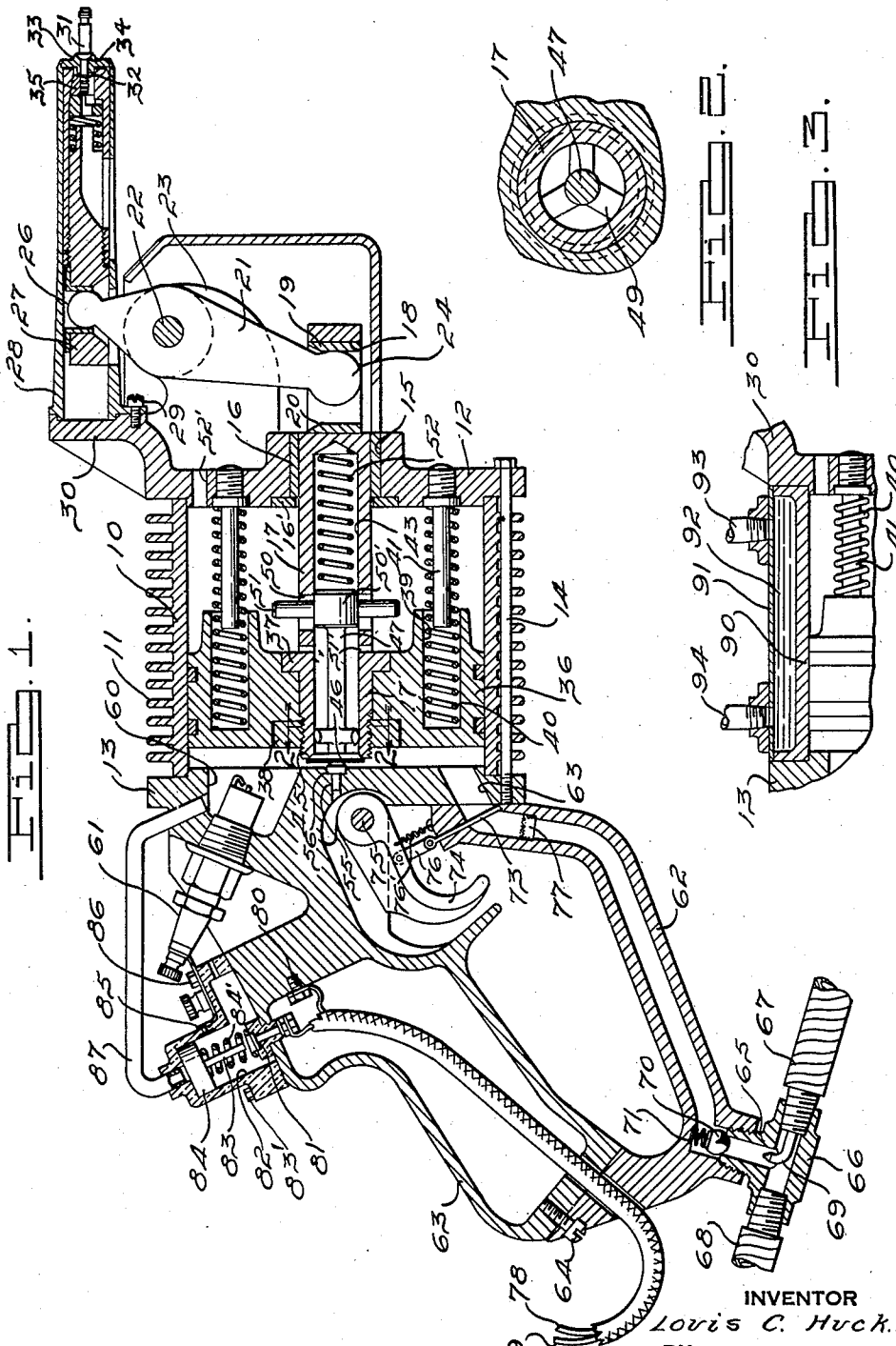
L. C. HUCK

2,053,720

RIVETING MACHINE

Filed May 28, 1932

2 Sheets-Sheet 1



INVENTOR
Louis C. Huck.
BY
Harnes, Hickney, Pierce & Harnes
ATTORNEYS.

Sept. 8, 1936.

L. C. HUCK

2,053,720

RIVETING MACHINE

Filed May 28, 1932

2 Sheets-Sheet 2

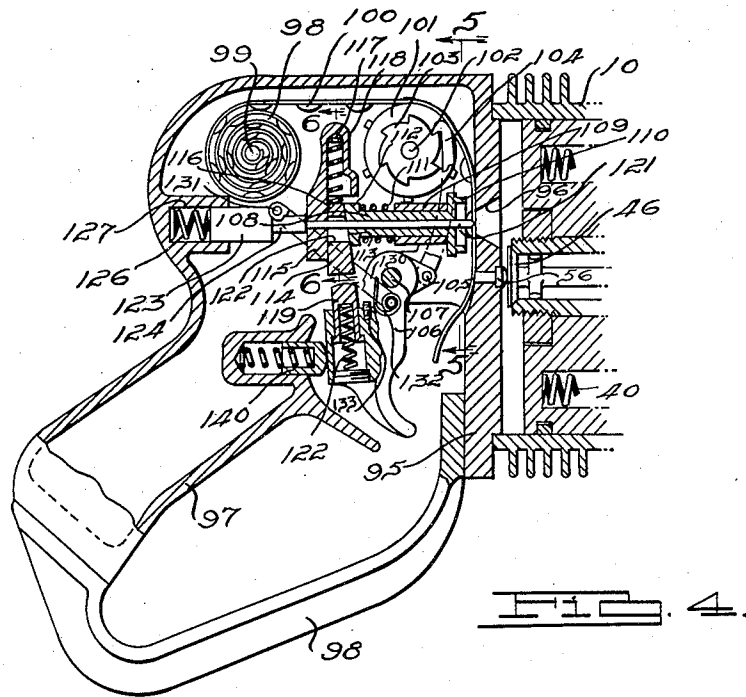


FIG. 4.

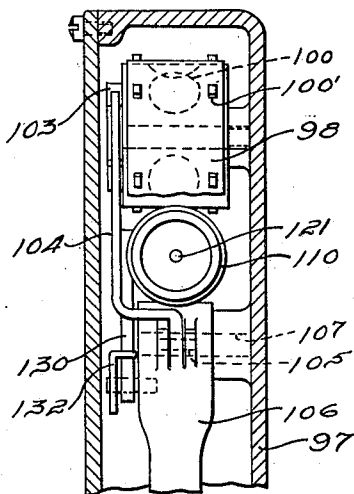


FIG. 5.

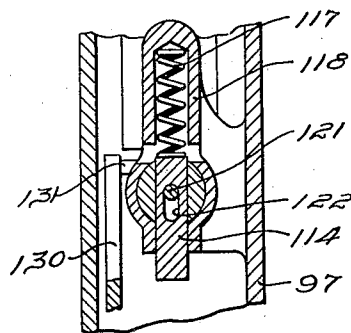


FIG. 6.

INVENTOR
Louis C. Huck.

BY

Harness, Wickers, Price & Blanton
ATTORNEYS

UNITED STATES PATENT OFFICE

2,053,720

RIVETING MACHINE

Louis C. Huck, Grosse Pointe, Mich., assignor to
Huxon Holding Corporation, Detroit, Mich., a
corporation of Michigan

Application May 28, 1932, Serial No. 614,097

21 Claims. (Cl. 218—19)

The invention relates to fastening mechanisms and it has particular relation to an apparatus for applying rivets to structural elements for securing them together.

5 The machines illustrated and hereinafter described particularly are adapted to set rivets of the general type shown and described in my co-pending application for patent relating to rivets, Serial No. 545,004, filed June 17, 1931. A rivet of
10 this general character may comprise a tubular female member having a tubular body portion and a rivet head preferably initially formed at one end thereof, which cooperates with a male or shank member extending longitudinally there-
15 through and which has a head at one end engaging that part of the female member opposite the head thereon. The rivet as thus assembled may be inserted through openings in a plurality of structural elements to be connected thereby, until
20 the rivet head on the female member engages the side of the structure adjacent thereto. The shank of the male member projects outwardly from the rivet head of the female member and by pulling
25 this part of the shank and pulling the male member through the female member in a direction outwardly from the head of the latter, and applying the reactionary force of such manipulation to the head of the female member, the wall of the body
30 portion of the latter at the opposite side of the structure may be formed with a head of bulbed character.

In certain respects the machines disclosed according to the present invention have certain structural and operating parts similar to structural and operating parts of the rivet setting machine disclosed and illustrated in the application for patent of Louis C. Huck and Ralph A. Miller, relating to rivet setting machines, Serial No. 608,682, filed May 2, 1932. This similarity of parts
35 will be considered more in detail hereinafter.

One object of the present invention is to provide a mechanism for setting rivets of the general type described above in which rivet setting forces required to set the rivet, are developed by ig-
45 niting a combustible material or fluid.

Another object of the invention is to provide a machine of this character, in which the rivet setting forces are developed by using the internal combustion principle and control means for governing the operation so that combustion of the fuel may be controlled by the operator of the machine.

55 Another object of the invention is to provide a rivet setting machine which utilizes explosive

cartridges for developing the rivet setting power required.

Another object of the invention is to provide a machine of the above mentioned types which is of repeating character so that rivets may be set in succession merely by manipulation of a trigger
5 or the like by the operator.

Other objects of the invention will be apparent from the following description taken in conjunction with the drawings, and from the claims
10 hereinafter set forth.

For an understanding of the invention, reference may be had to the accompanying drawings forming a part of the specification, wherein:

Figure 1 is a longitudinal cross-sectional view
15 of a rivet setting machine constructed according to one form of the invention, wherein the explosive principle of the ordinary internal combustion engine is employed to develop the rivet setting power required.

Figure 2 is a cross-sectional view on a larger scale taken substantially along the line 2—2 of Fig. 1.

Figure 3 is a fragmentary cross sectional view of a cylinder that may be employed in the construction shown in Fig. 1, for the purpose of utilizing a water circulating system to cool the cylinder and associated parts of the machine.

Figure 4 is a fragmentary cross sectional view similar to that shown by Fig. 1, illustrating a
30 machine which utilizes explosive cartridges for obtaining the rivet setting forces required.

Figure 5 is a cross sectional view on a larger scale taken substantially along the line 5—5 of Figure 4.

Figure 6 is a cross sectional view on a larger scale, taken substantially along the line 6—6 of Figure 4.

Referring to Figure 1, a cylinder 10 provided with circumferentially extending cooling fins 11
40 is connected at its ends to the cylinder heads 12 and 13 by means of long bolts 14. The head 12 has a central opening 15 in which a bearing sleeve 16 is disposed, and the latter serves as a guiding support for a piston rod 17 projecting to the exterior of the head. Adjacent this sleeve and at the inner side of the cylinder head a hard metal ring 16' is provided which has a purpose to be set forth hereinafter. Outwardly of the head, the rod 17 has a vertically extending opening or slot
45 18 provided with bearing plates 19 and 20 at opposite ends, and such opening receives the lower end of an arm 21 pivoted as indicated at 22 between legs of a bifurcated projection 23 integral with the head 12 and projecting from the
55

outer side thereof. The lower end of arm 21 in the slot 18 is rounded as indicated at 24 so that upon reciprocation of the rod 17, the arm will move about the pivot 22 with minimum interference. It will be noted that the axial length of the slot 18 is greater than the diameter of the rounded portion 24 of arm 21 and the reason for this relation will be apparent hereinafter.

The upper end of arm 21 also has a rounded portion 26 which projects into a slot formed in a member 27 that is reciprocatory in a barrel 28 secured by bolts 29 to an upper and offset portion 30 of the head 12. The barrel 28 and the parts therein associated with the member 27 are more particularly described and illustrated in the co-pending application for patent of Louis C. Huck and Ralph A. Miller previously identified. It seems sufficient in this application for patent to only state that the rivet may comprise a tubular female member 31 and a male shank 32 and that the outer end of the barrel has an anvil plate 33 apertured at its center to receive that projecting portion of the male part of a rivet pulled, and a recess around such opening to seat the head on the female member. Also it may be added that inside the barrel adjacent the anvil, gripping means or jaws 35 are provided for gripping the projecting end of the male member which extends through the anvil, and that such jaws are so associated with the member 27 that when the latter moves to the left upon turning the arm 21 about its pivot 22, the jaws grip and then pull the male member while the anvil applies the reactionary force to the head on the female member.

Inside the cylinder 10, the rod 17 projects through a piston 36 and such rod is rigidly associated with the piston by means of a collar 37 at one side of the piston, and a nut 38 threaded on the rod at the opposite side of the piston. At circumferentially spaced points, the piston is provided at that side thereof adjacent the head 12, with axially extending openings 39 which house helical springs 40, which extend beyond the right side of the piston and encircle pins 41 threaded into the cylinder head 12. Each spring normally is under compression even with the piston at the left end of its stroke and consequently the several springs employed normally tend to return the piston to such position with the pins 41 serving as guides and supports for the springs. The rod 17 has a bore 43 open to the space at the left side of the piston, and at such end of the rod, it is provided with a tapered seat 45 for engagement with a valve disc 46 integral with a valve stem 47 extending longitudinally in the bore. For guiding movement of the stem in the bore, the former is provided as shown particularly by Fig. 2, with circumferentially spaced, radially disposed projections 49 which substantially and slidably contact with the side wall of the bore and guide the movement of the stem and valve disc. At the right side of the piston, the rod 17 also is provided with diametrically disposed slots 50 to accommodate the ends of a pin 51 extending through a head 50' on the inner end of the valve stem and openings 51' to allow gas to exhaust from the bore to the right side of the piston. It will be noted that the axial length of the slot is greater than the diameter of the pin 51. Between the head 51' and the inner end of the bore, a helical spring 52 is provided which normally is under some compression so that it tends to open the valve. An exhaust port 52' in cylinder head 12 is provided to allow the gas to exhaust from the left of the piston when the valve is open.

In alignment with the piston rod and valve disc 46, a pin 55 is secured to the inner side of the head 13 and this pin has a head 56 projecting inwardly to engage the valve disc 45 when the piston approaches the left end of its stroke. This cooperative relation of the valve disc and pin will be explained more fully hereinafter.

As indicated at 60 the head 13 is provided with a combustion chamber 60 and at this point a spark plug 61 is provided which is threaded through the cylinder head. For supplying a fuel mixture to the cylinder and combustion chamber 60 at the left side of the piston 36, a cast conduit portion 62 is secured to a handle 63 integral with the head 13, by means of bolts 64 and additional bolts may be employed to secure it to the head 13 at their points of engagement. The conduit portion 62 communicates with the cylinder 10 by means of an opening 63 in head 13 and with a fuel mixing device 66 into which are threaded respectively, a fuel line 67 and an air line 68, the air line being connected to a suitable supply of air under compression. That end of the fuel line 67, in the fuel mixing device may have a fuel jet 69 by means of which fuel will be drawn into the conduit 62, as air from the conduit 68 flows past the open end of the jet and into the conduit. A ball check valve 70 may be at the lower end of the conduit 62, which is normally urged toward closed position by means of a spring 71 so that any fuel or gas in the conduit cannot flow back into the mixing device. At the opposite end of the conduit 62, a gate valve 73 may be employed which is operable by means of a trigger 74, pivoted as indicated at 75 to the outer wall of the cylinder, and which is connected to the valve by means of a link 76 and normally held in the gate closed position by a spring 76'. Between the gate valve and the valve 70, a screen 77 is employed to prevent any ignition of fuel between the valves 70 and 73 and if desired the conduit around the screen may be provided with any kind of cooling means such as fins or a water circulating system to prevent excessive heating of the conduit.

For igniting the fuel mixture in the cylinder, electrical conductors 78 and 79 may extend through a hollow portion of the handle and one terminal may be grounded as indicated at 80 to the casting and hence to the outer terminal of the spark plug 61. The other terminal is connected to a contact 81 disposed in a casing 82 secured as by bolts 83' to the handle. This contact is adapted to be engaged by a pin 83 secured to a piston like element 84 reciprocatory in the casing and normally pressed upwardly by a spring 84'. The casing 83 preferably is composed of insulating material, and one side wall thereof has a contact 85 exposed inside of the casing to contact with the piston 84, and which at its outer side is connected by means of a conductor 86 to the central terminal of the spark plug. Above the piston 84 the casing 82 is connected by means of a conduit 87 to the combustion chamber 60 so that any gas or fuel pressure in the combustion chamber and hence at the left side of the piston will also act on the piston element 84.

With the parts shown in their relative positions in Fig. 1, and when the rivet is to be set, the latter may first be inserted through anvil 33 and between jaws 35 and then the machine moved to insert the rivet in the structural openings of the structure to be riveted. Now upon pulling the trigger 74, the gate valve 73 is opened and this allows air under pressure to flow through

the conduit 68 and mixing valve 65 and to simultaneously carry along with it the proper quantity of fuel from the conduit 67. The ball 70 of course opens against the air pressure and allows the fuel to flow through the conduit 62 and into the cylinder at the left side of the piston. The pressure of the mixture then in the cylinder may be sufficient to move the piston 36 to some extent to the right against the action of the spring 40 but if this occurs the arm 21 will not pivot about its pivot 22 because of the axial length of the slot 18 which permits movement of the piston and piston rod a certain distance without a thrust engagement of the bearing plate 20 in the slot with the rounded end 24 of the arm. While the pin and head 56 initially hold the valve 46 in closed position, the introduction of the fuel in the cylinder under pressure will also assist in maintaining the valve in closed position and should the piston move to the right as mentioned previously, this pressure will be sufficient to hold the valve closed against the action of spring 52 in the bore of the piston rod. As the pressure in the cylinder builds up and reaches a certain amount this pressure will be sufficient to move the piston element 84 in the casing 82 downwardly against the action of the spring 84' and at a certain pressure the pin 83 will engage the contact 81 and complete an electric circuit through the spark plug 61. When this occurs the charge in the cylinder will explode and move the piston to the right and pivot the arm 21 about its pivot 22 to set the rivet. It may be stated in this connection that the male rivet member may have an undercut or portion of reduced diameter intermediate its ends which permits breaking thereof after the rivet is set so that as the piston moves to the right it first sets the rivet and then breaks the male member off thus permitting separation of the machine from the structure being riveted and the rivet applied thereto. In the copending application above identified it has been set forth and shown that the broken male member part retained by the jaws or gripping means in the barrel 28 will pass rearwardly through the barrel and finally be ejected through an opening in the barrel and that this movement of the broken male member may be effected by inserting additional rivets.

When the piston has moved sufficiently to the right in the cylinder to effect the rivet setting operation and breaking of the male member, the pin 51 on the valve stem will engage the ring 16' on the inner side of the head 12 and a further movement of the piston will cause the valve to open. As the valve opens, it is apparent that the burned gases at the left of the piston will escape past the valve through the bore of the piston rod, through the openings 51', into the space at the right of the piston and finally exhaust through the opening 52' in the cylinder head 12. When this occurs the springs 40 will return the piston to its initial position thereby further causing the discharge of burned gases from the left side of the piston and finally when the piston approaches the left end of its stroke, the valve 45 engages pin 56 and closes.

Should the operator not relieve the trigger 74 at the time the charge in cylinder has been ignited, and the gate valve 73 remains open at the time of the ignition, it is apparent that any burning mixture could not flow through the screen 77 and hence the fuel mixture in the conduit between the screen and ball valve 70 could not be ignited. However, even if this were

ignited, the ball valve 70 would prevent any ignition beyond this point. It is, however, necessary that the trigger be released before the burned gases exhaust or else fuel will immediately flow into the cylinder and escape. In operation the trigger will be released at the time of firing and then upon the return of the parts to their initial positions, the apparatus may be placed in a condition for the next riveting operation. It will be understood, of course, that the electrical conductors 78 and 79 will be connected to a suitable source of electricity to supply an electrical current for igniting the charge in the cylinder.

The construction shown by Fig. 3 illustrates a cylinder 90 having a jacket 91 for receiving water or other cooling fluid 92 which may flow into and out of the jacket through conduits 93 and 94. In other respects the construction shown by Fig. 3 may be identical to that shown by Fig. 1.

In the construction shown by Fig. 4, the same type of cylinder shown in either Figs. 1 and 3 may be employed and the piston, piston rod, discharge valve, and rivet setting parts may be used that are employed in the construction shown in Fig. 1. However, in this construction it is proposed to employ explosive cartridges or caps for producing fluid pressure at the left side of the cylinder sufficiently to set the rivet. In this construction a cylinder head 95 of somewhat different character as compared to the cylinder head 13, is employed, and this head has the pin 56 for closing the valve 46. The head also has an opening 96 for allowing the cartridge to explode into the cylinder and preferably this opening is conical with its smaller end at the outer side of the head. A handle 97 may be integral with the head 95, and may have an additional support 98 secured to the lower end of the handle and the lower side of the head. A reel of cartridges or caps of the paper clip type indicated at 98 may be employed and rotatably disposed on a pin 99 in the handle, and it will be understood that this tape or paper will have at longitudinally spaced points caps or charges of explosive indicated at 100 sealed by suitable housing means such as paper covers or the like. At the sides of the caps, the paper may have openings 100' shown by Fig. 5 by means of which a toothed wheel 101 rotatable on a pivot 102 may move the paper clip periodically. The material forming the clip is sufficiently strong that the wheel may move it downwardly along the outer side of the head 95 without appreciable wrinkling, so that the caps or cartridges 100 may be successively moved over the opening 96 in the cylinder head. For moving the wheel 101 and hence feeding the cartridges or caps, the wheel is provided with a ratchet portion 103, the teeth of which are adapted to be engaged by a pawl 104 pivoted as indicated at 105 to a trigger 106 in turn pivoted as indicated at 107 to the handle. In alignment with the opening 96 in the cylinder head, a centrally apertured breech 108 is slidably mounted in a bearing 109 fixed to the handle and such breech at its end adjacent the cylinder wall or head has a cup-shaped wall 110. When the breech is moved against the cylinder head, the wall of the cup engages the paper of the cartridge tape, around one of the caps or cartridges 100 and so houses the cap or cartridge over the opening 96 in the cylinder head, that when the explosive is discharged the resulting expansion of gases will flow through the opening 96 and into the cylinder and against the piston and not outwardly of

the cylinder head past the breech. Normally the breech is urged away from the cylinder head by means of a helical spring 111 encircling the breech and engaging the end of the bearing 109 at one end, and an enlarged portion 112 at the outer end of the breech. The end face of such enlarged portion 112 is inclined with respect to the axis of the breech as indicated at 113 and normally contacts with a wedging element 114 movable between such inclined surface, and a projection 115 fixed to the handle and which has a surface 116 substantially perpendicular to the axis of the breech and adapted to contact with a similar surface on the wedge. Normally the wedge 114 is urged downwardly by means of a spring 117 located in the housing portion 118 integral with the projection 115 so that the breech may normally be positioned in spaced relation to the cylinder head. The wedge 114 is adapted to be moved upwardly between the projection 115 and the end surface 113 of the breech by means of the trigger 106 which has a plunger 119 thrust upwardly by means of a spring 120 which is initially loaded or normally under compression.

For discharging the cap or cartridge, a firing pin 121 is slidably mounted in the central opening in the breech, and is adapted to hit the cap or cartridge and discharge the latter. This firing pin extends rearwardly through a slot 122 in the wedging element 114 so that the latter may move upwardly and downwardly the proper amount without interference from the firing pin, and such pin also slidably projects through an opening in the projection 115 and then is connected to a plunger 123 having a reduced portion 124. Normally the firing pin is urged to the right by means of a spring 126 located in a housing 127 of the handle and in which also the plunger 123 is adapted to reciprocate. The spring 126 normally will retain the firing pin in its position shown where it may slightly project into the opening 96 in the cylinder head. For moving the firing pin rearwardly against the action of spring 126, a link 130 is pivotally connected to the trigger 106 at its lower end and at its upper end it is provided with a pin 131 adapted to rest on the reduced portion 124 of the plunger 123, and engage the shoulder or larger part of the plunger. This link normally is so urged that the pin is urged against the plunger, by means of a spring 132 connected to the trigger and looped over a part of the link. Adjacent the lower end of the link, the trigger is provided with a small adjustable stud 133 adapted to engage the link during a phase of the trigger operation to be hereinafter set forth. In a construction of this character, the pin 131 if desired might engage the lower side of portion 124, and be urged upwardly by spring 132 in a reversed position, thus urging link 130 upwardly, and a stud like 133, might be used on the casting above the link, so that upon pulling the trigger, the link would first move the firing pin to the left, and then engage the stud and be forced downwardly away from portion 124 to release the firing pin.

With the parts in inoperative position as shown, when the trigger is initially pulled, it immediately causes movement of the firing pin rearwardly and then through the pawl 104 and ratchet 103, causes a feeding of the cartridge or cap paper until one of the caps is disposed near the opening 96. Further movement of the trigger, through the plunger 119, causes the wedge 114 to move upwardly and hence causes move-

ment of the breech toward the cylinder head. At about the time the cap is properly disposed over the opening 96, the breech has moved against the cylinder head to hold the paper around the cap in position and to house the cap for the subsequent explosion, and then the stud 133 engages the link 130 sufficiently to lift the pin 131 from the reduced portion 124 of the plunger thereby allowing the spring 126 to quickly move the firing pin against the cap or cartridge to explode it. When this explosion occurs, the piston will move to the right to set the rivet, and after setting the rivet, the valve 46 will open and allow the burned gases to exhaust as in the manner shown by Fig. 1. Then the piston will return to its initial position for the next rivet setting operation. The taper of the wedge 114 and the surface 113 on the breech are such that when the explosion occurs the wedge cannot be loosened by any tendency of the breech to move rearwardly as a result of the explosive force. It should be apparent when the wedge is in proper position, upon pulling the trigger, that the trigger can be moved still farther by reason of the plunger 119 without moving the wedge, and hence that the firing pin can be moved rearwardly a still further amount to compress the spring 126 to get a quick and forceful movement of the pin after the pin 113 on link 130 is moved from locking engagement with the plunger 123. Upon release of the trigger it automatically returns to its initial position as a result of a spring pressed plunger 140 on the handle and the breech moves to the left and the wedge downwardly into the position shown. Furthermore, the pin 131 will return to its position of engagement with the end of plunger 123 over the reduced portion 124, and it may be noted that such reduced portion when the pin fires the cartridge will engage the projection 115 and hence the plunger will be in proper position for engagement with the pin 131 upon release of the trigger.

In either of the constructions illustrated and described, it is apparent that an efficient machine has been provided for setting rivets or the like and particularly rivets of the character described, which operates by igniting fuel or explosives. It is apparent also that the ignition of the fuel or discharge of the cartridge or cap is effected by pulling a trigger which is conveniently located for manipulation by the hand of the operator gripping the machine or gun. It is apparent that in either construction, rivets may be set successively and repeatedly, without other manipulation than pulling the trigger and inserting the rivet in the machine and in the structure to be riveted and that either machine may be considered as a repeating gun which operates merely by pulling a trigger for each rivet setting operation. It might be stated in this connection that the use of the explosive power may be instrumental in providing an automatic rivet feed for inserting rivets in the gun anvil automatically.

Although more than one form of the invention has been illustrated and described, it will be apparent to those skilled in the art that various modifications may be made without departing from the scope of the appended claims.

What I claim is:

1. A machine for riveting plates or the like by means of a rivet comprising a tubular member and a shank extending therethrough, which comprises a movable member for moving the shank, an anvil for applying the reactionary force to the tubular member, and means for igniting

combustible material and applying the force of combustion to such movable member.

2. A machine for riveting plates or the like by means of a rivet comprising a tubular member and a shank extending therethrough, which comprises a movable member for moving said shank, means for moving said member including means for effecting combustion of a combustible material, and means for applying the reactionary force to the tubular member.

3. A machine for riveting plates or the like by means of a rivet comprising a tubular member and a shank extending therethrough, which comprises a movable member for moving said shank, means for moving said member including means for effecting combustion of a combustible material, means for applying the reactionary force to the tubular member, and manually operable means for controlling the combustion.

4. A machine for riveting plates or the like comprising rivet gripping and pulling means, a piston operatively connected to the gripping means, a cylinder for the piston, and manually controllable means for introducing and igniting a combustible material to the cylinder to move the piston.

5. A machine for riveting plates or the like comprising rivet gripping and pulling means, a fluid pressure responsive member operatively connected to the gripping means, and means for effecting combustion at one side of the fluid responsive means for effecting movement of the gripping means.

6. In combination, means for gripping and pulling a rivet, movable means for controlling said means, and means for effecting a discharge of a cartridge or the like and moving said movable means.

7. In combination, means for gripping and pulling a rivet, movable means for controlling said means, and means for effecting ignition of a combustible material and moving said movable means.

8. In combination, rivet setting means, fluid pressure responsive means operatively connected to the first means, means for effecting discharge of an explosive cartridge for moving said fluid responsive means, and mechanically operable means for replacing the exploded cartridge with an unexploded cartridge.

9. In combination, rivet setting means, fluid pressure responsive means operatively connected to the first means, a cartridge clip, means for effecting explosion of a cartridge to move the fluid responsive means, and means for ejecting the exploded cartridge and placing an unexploded cartridge in position for explosion to move the fluid responsive means.

10. A fastener setting mechanism comprising a movable member, fluid pressure responsive means operatively connected to said member, means for igniting a combustible material at one side of the fluid pressure responsive means, means for allowing discharge of the gases after combustion and movement of the fluid pressure responsive means, and means controlled by movement of the last mentioned means for governing the operation of the discharge controlling means.

11. A fastener setting mechanism comprising a movable member, a movable fluid pressure responsive member, means operatively connecting the fluid pressure responsive member to the movable member, a discharge opening in such fluid pressure responsive member, a valve for opening and closing such opening, means for applying

fluid pressure to one side of the fluid pressure responsive member and to hold the valve closed during consequent movement of the latter member, and means for opening the valve against the pressure during movement of such pressure responsive member, to allow the fluid to exhaust therethrough.

12. A fastener setting mechanism comprising a movable member, a movable fluid pressure responsive member operatively connected to the first member, means normally urging the pressure responsive member in one direction, means for introducing fluid under pressure at one side of the member to move it in the other direction, a discharge opening in the pressure responsive member, a valve therefor, normally maintained closed by the fluid pressure, means for opening the valve during movement of the pressure responsive member by the fluid, and means for closing the valve during return of the responsive member to its initial position.

13. A fastener setting mechanism comprising a movable fastener setting member, fluid pressure responsive means operatively connected thereto, a cartridge magazine, means for exploding a cartridge to move the fluid pressure responsive means and means for successively introducing unexploded cartridges and ejecting the exploded cartridges, to enable repeating operation of the mechanism.

14. A fastener setting mechanism comprising a movable fastener setting member, fluid pressure responsive means operatively connected thereto, a cartridge magazine, means for exploding a cartridge to move the fluid pressure responsive means, and means for successively introducing unexploded cartridges and ejecting the exploded cartridges, to enable repeating operation of the mechanism, said last mentioned means being manually controlled.

15. In a machine for setting a rivet comprising a tubular member and a male member extending therethrough, in which the male member is adapted to be pulled and the reactionary force is applied to the tubular member during setting of the rivet, wherein the machine comprises a cylinder, a piston movable in the cylinder, means operatively connected to the piston for pulling the male rivet member, means operatively connected to the cylinder for engaging the tubular rivet member, means for supplying fluid under pressure to one side of the piston, and means for automatically releasing the fluid under pressure after the piston has been moved a predetermined distance in the cylinder.

16. A rivet setting machine comprising means for gripping a rivet pin, fluid pressure responsive means for moving the gripping means in one direction to pull the pin, means for applying the reactionary force of the pull to the structure being riveted, and a spring for moving the fluid pressure responsive means in the opposite direction.

17. A rivet setting machine comprising means for gripping a rivet pin, fluid pressure responsive means for pulling said means, means for applying the reactionary force of the pull to the structure riveted, and means increasingly resistant as the fluid pressure responsive means is moved in the direction of pull for quickly returning the latter after the rivet setting operation.

18. A rivet setting machine comprising means for gripping a rivet pin, fluid pressure responsive means for pulling said means, means for applying the reactionary force of the pull to the struc-

ture riveted, and means increasingly resistant as the fluid pressure responsive means is moved in the direction of pull for quickly returning the latter after the rivet setting operation, said last
5 mentioned means comprising a spring engaging the fluid pressure responsive means.

19. A rivet setting machine comprising means for gripping a rivet pin, fluid pressure responsive means for moving the gripping means in one di-
10 rection to pull and break the pin, means for applying the reactionary force of the pull to the structure being riveted, and means increasingly resistant to the movement of the fluid pressure responsive means for cushioning the latter when
15 the pin is broken.

20. A machine for setting rivets of a type including a tubular member and a pin extending therethrough, power operated means for gripping

and pulling the pin, means for applying the reactionary force to an end portion of the tubular member, and means for rendering said power operated means ineffective automatically after a predetermined movement thereof.

21. A machine for setting a rivet of a type including a tubular member and a pin extending therethrough wherein after setting the rivet the pin is adapted to be broken, which comprises power operated means for gripping and pull-
10 ing the pin, means for applying the reactionary force to an end portion of the tubular member, and automatically operated means for rendering such power operated means inoperative after a predetermined movement thereof and
15 after breaking of the pin.

LOUIS C. HUCK.