W. L. LINDSAY.

RIVETING TOOL.

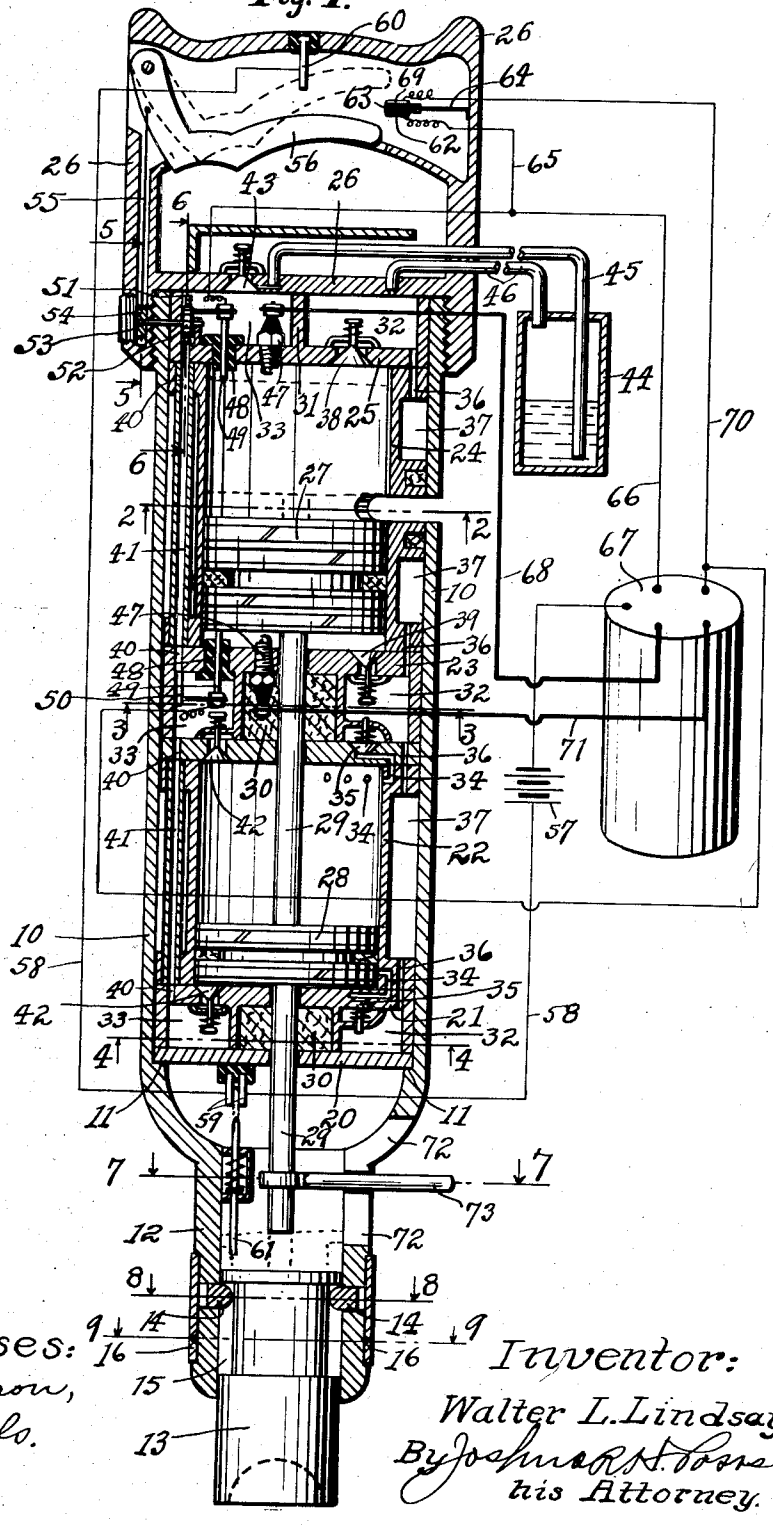
APPLICATION FILED FEB. 12, 1913.

1,223,407.

Patented Apr. 24, 1917.

2 SHEETS—SHEET 1.

Fig. 1.



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Inventor:
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2 SHEETS—SHEET 2.

Fig. 2.

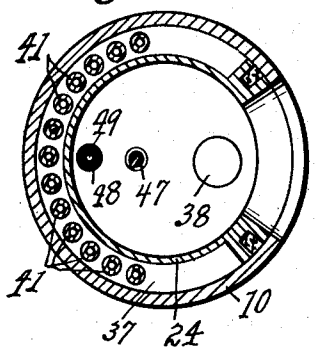



Fig. 5.

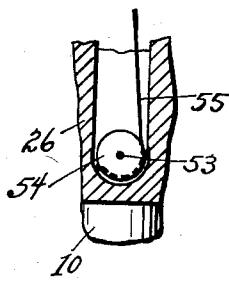



Fig. 6.

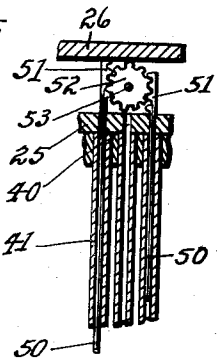



Fig. 3.

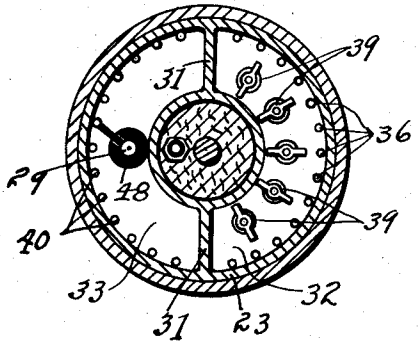



Fig. 7.

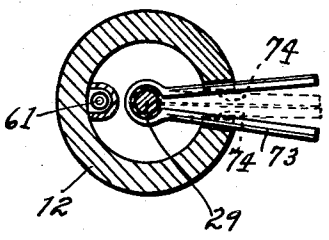



Fig. 4.

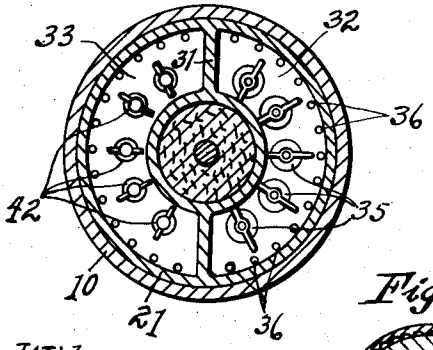



Fig. 8.

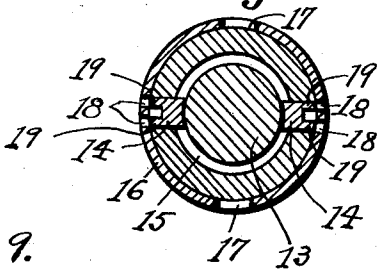
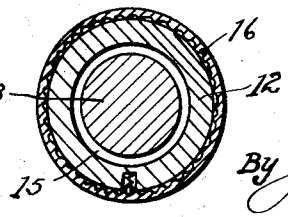



Fig. 9.




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# UNITED STATES PATENT OFFICE.

WALTER LEON LINDSAY, OF CHICAGO, ILLINOIS.

## RIVETING-TOOL.

1,223,407. Specification of Letters Patent. Patented Apr. 24, 1917.

Application filed February 12, 1913. Serial No. 747,869.

*To all whom it may concern:*

Be it known that I, WALTER LEON LINDSAY, a citizen of the United States, and a resident of the city of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Riveting-Tools, of which the following is a specification.

My invention relates to riveting tools and particularly to the class of such tools which are operated by means of self-contained internal explosion engines. The object of this improvement is to provide a device of the character mentioned which will be simple in construction and efficient in operation. Other objects will appear hereinafter.

The invention consists in the combinations and arrangements of parts hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings forming a part of this specification, and in which,

Figure 1 is a central vertical section of a riveting tool showing the electric circuit in diagram, such device embodying my invention, and

Figs. 2, 3, 4, 5, 6, 7, 8 and 9 are sections taken on lines 2—2, 3—3, 4—4, 5—5, 6—6, 7—7, 8—8, and 9—9, respectively in Fig. 1.

The preferred form of construction as illustrated in the accompanying drawings comprises a tubular shell 10 having a shoulder 11 formed in its lower central portion and with its lower end 12 constricted. In the constricted portion 12 is slidably mounted a rivet set 13 and maintained in said restricted portion by means of detents 14 riding in an annular groove 15. The detents 14 are maintained in position by means of a band 16. Said band is formed with perforations 17 sufficiently large for the detents 14 to pass through and is adapted for use in placing or removing the detents 14 from their position. When it is desired to remove the rivet set 13 from the constricted portion 12 the annular band 16 is moved until the small perforations 18 register with the tongues 19 formed on the detents 14 to allow the detents 14 to move laterally to permit the head of the rivet set 13 to pass between such detents and out of the constricted portion 12.

Resting against shoulder 11 in the tubular member 10 is a disk 20 on which rests a hollow cylinder head 21 forming the lower cylinder head of the compression cylinder 22. Immediately above the compression cylinder 22 is a hollow cylinder head 23 separating the compression cylinder 22 and working cylinder 24. Above and closing the upper end of the working cylinder 24 is a hollow cylinder head 25. A handle portion 26 closes the hollow cylinder head 25 and maintains the cylinders and their heads in the tubular member 10 against the shoulder 11.

Mounted in the working cylinder 24 is a working piston 27 and in the compression cylinder 22 is mounted a compression piston 28 which is connected with the working piston by means of a piston rod 29. Said piston rod 29 also extends downwardly into a position adapted to operate the rivet set 13 upon its reciprocations. The hollow cylinder heads 21 and 23 are provided with packing material 30 around the piston rod 29 and serves the ordinary function of such material. Each of the cylinder heads 21, 23 and 25 are divided by means of partitions 31 into semi-circular chambers 32 and 33. The chambers 32 of the cylinder heads 21 and 23 are connected with the compression cylinder 22, by means of passages 34 and in said passages are provided valves 35 to limit the communication through such passages. The passages 34 are disposed around the ends of the compression cylinder 22 and open thereinto at the sides adjacent the ends of such compression cylinder substantially as shown in Fig. 1 so that the piston head 28 as it reaches its terminals of movement will be cushioned by means of fluid compressed between the openings of the passages 34 into the compression cylinder 22 and the ends thereof to deaden the effect of the contact of said piston head with the cylinder heads, as will be readily understood. All of the chambers 32 are connected together by means of a plurality of passages 36 through the cylinder heads and the annular grooves 37 around the cylinders, as is clearly indicated, to permit free circulation from chambers 32 in cylinder heads 21 and 23 to the chambers 32 in the cylinder heads 23 and 25. An intake valve 38 is formed in the upper end of the working cylinder 24 and an intake valve 39 is formed in the lower end of working cylinder 24 to feed fuel to said working cylinder.

The semi-circular chambers 33 are connected together by means of passages 40

through the cylinder heads 21, 23 and 25 and pipes 41 connecting said cylinder heads, as is clearly shown, to permit the passage of fuel and air from the chamber 33 in cylinder head 25 to the chambers 33 in cylinder heads 21 and 23. Valves 42 are provided to control the passage of fuel from the chambers 33 to the compression cylinder 22. A valve 43 is formed in the lower end of handle 26 to permit air to enter chamber 33 in cylinder head 25. Fuel is brought from the fuel container 44 through pipe 45 and introduced into the seat of valve 43 so that said fuel will be fed into chamber 33 in head 25 only when valve 43 is open.

A pipe 46 is connected with the chamber 32 in cylinder head 25 to allow a portion of the mixed fuel and air to re-enter the fuel container 44 to afford pressure to drive the fuel through pipe 45. A spark plug 47 is provided in each end of the working cylinder 24 and provided to produce the usual functions of such devices. Adjacent each spark plug 47 is a primary circuit closing device which is adapted to co-act with the piston head 27 to effect closing of its circuit. Each of said circuit closing devices consists of an insulating base 48 secured in a cylinder head, as shown, and provided with a slidably mounted conductor member 49. Said conductor members 49 are each carried by a rod 50 and said rods are provided with rack bars 51 at their upper ends in mesh with a gear 52. The rack and gear arrangement is provided to slide the conductor members 49 in their mountings to contact with the piston head 27 at different positions in its movement to effect timing of the explosions in the working cylinder 24. The gear 52 is carried on a shaft 53 which is provided with a pulley 54 and said pulley 54 is operated by means of a cord 55 connected to a manually operable lever 56 in the handle 26 in a manner that upon upward swinging of the lever 56 the conductor members 49 will be moved farther into the cylinder 24.

Electrical current is supplied by a suitable battery 57 connected by a wire 58 through a switch 59 to a contact 60 in the handle 26. A spring held switch member 61 is positioned to be engaged by rivet set 13 to close the switch 59, as will be readily understood. Contact 60 coöperates with handle 56 which also coöperates with an electrical conductor member 62 on an insulating block 63 on a resilient member 64 in handle 26. Conductor member 62 is connected by means of wires 65—66 with an induction coil 67 of any suitable or desired construction. Induction coil 67 is connected by means of wires 68 and 71 with the spark plugs 47, as shown. Another conductor member 69 is mounted on the opposite side of insulating block 63 and is connected by means of wires 70 with the induction coil 67. This arrangement constitutes the ignition system of the construction, but any suitable ignition system may be employed, arranged to be operated by the rivet set.

A slot 72 is formed in the lower portion of the tubular member 10 and a compressible resilient handle 73 mounted to slide in said slot upon its being compressed from recesses 74 formed in the sides of the slot 72. Upon such compression of the handle 73 it firmly grips the lower end of piston rod 29 to effect a manual means for "priming" the device. This reciprocating of handle 72, piston rod 29 and cylinder heads 27 and 28 causes the fuel and air to be drawn into valve 43, passages 40 and pipes 41 to the semi-circular chambers 33 thence alternately through the valves 42 into the compression chamber 22 and after being compressed passed through passages 34 and valves 35 into the semi-circular chambers 32, thence through passages 36 to annular grooves 37 and alternately through valves 38 and 39 to the working cylinder to feed charges of compressed fuel into the working cylinder. Then upon introduction of the electric current into the proper parts, as already explained, the device is started and operated.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

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

1. A riveting tool comprising a working cylinder and a compression cylinder in axial alinement; pistons in said cylinders operatively connected together; a hollow head at the upper end of said working cylinder; a second hollow head between said cylinders; a third hollow head at the lower end of said compression cylinder; a partition in each of said hollow heads dividing the latter into two chambers, one of the chambers in each of said first and second mentioned hollow heads being in communication with said working cylinder, and both of the chambers in said second and third mentioned hollow heads being in communication with said compression cylinder; a communication between one of the chambers in each of said hollow heads; and a communication between the other chambers of said hollow heads, substantially as described.

2. A riveting tool comprising a working cylinder; a compression cylinder in axial alinement with said working cylinder; a piston in said working cylinder; a piston in

said compression cylinder and connected with the piston in said working cylinder; a hollow cylinder head inclosing two semi-circular chambers at the lower end of said compression cylinder; a second hollow cylinder head inclosing two semicircular chambers between said working and compression cylinders; and a third hollow cylinder head inclosing two semi-circular chambers at the upper end of said working cylinder; a chamber around said compression cylinder and a second chamber around said working cylinder, said chambers with one of the semi-circular chambers in each of said hollow heads forming a communication from said compression cylinder to said working cylinder; and pipes connecting the other semi-circular chambers with each of said hollow cylinder heads affording a passage to said compression cylinder, substantially as described.

3. A riveting tool comprising a working cylinder; a compression cylinder in axial alinement with said working cylinder; a piston in said working cylinder; a piston in said compression cylinder and connected with the piston in said working cylinder; a hollow cylinder head inclosing two semi-circular chambers at the lower end of said compression cylinder; a second hollow cylinder head inclosing two semi-circular chambers between said working and compression cylinders; a third hollow cylinder head inclosing two semi-circular chambers at the upper end of said working cylinder; a chamber around said compression cylinder and a second chamber around said working cylinder, said chambers with one of of the semi-circular chambers in each of said hollow heads forming a communication from said compression cylinder to said working cylinder; pipes connecting the other semi-circular chambers with each of said hollow cylinder heads affording a passage to said compression cylinder; and valves in said hollow heads controlling the communications to and from said compression cylinder and to said working cylinder, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WALTER LEON LINDSAY.

Witnesses:

JOSHUA R. H. POTTS,

HELEN F. LILLIS.