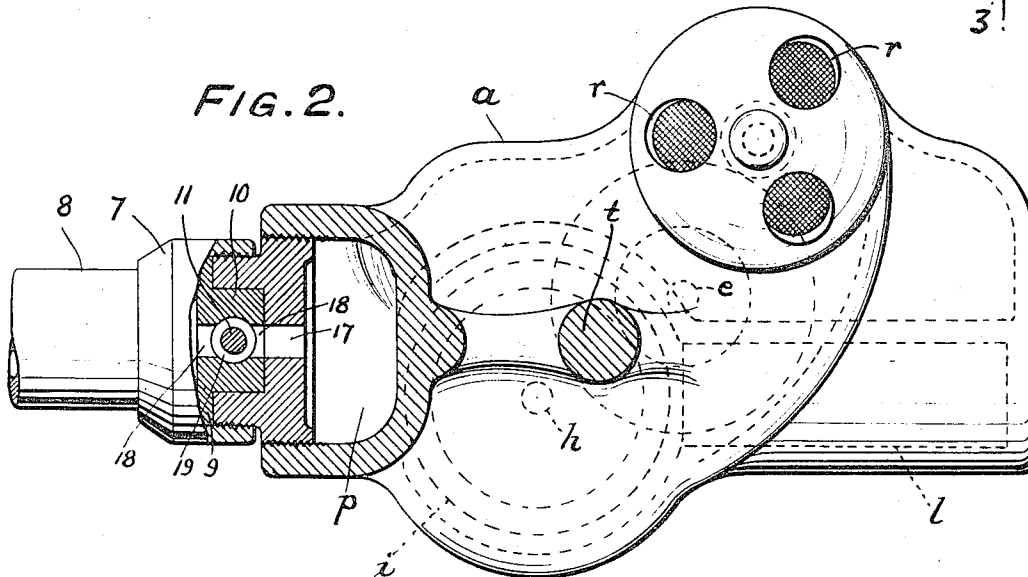
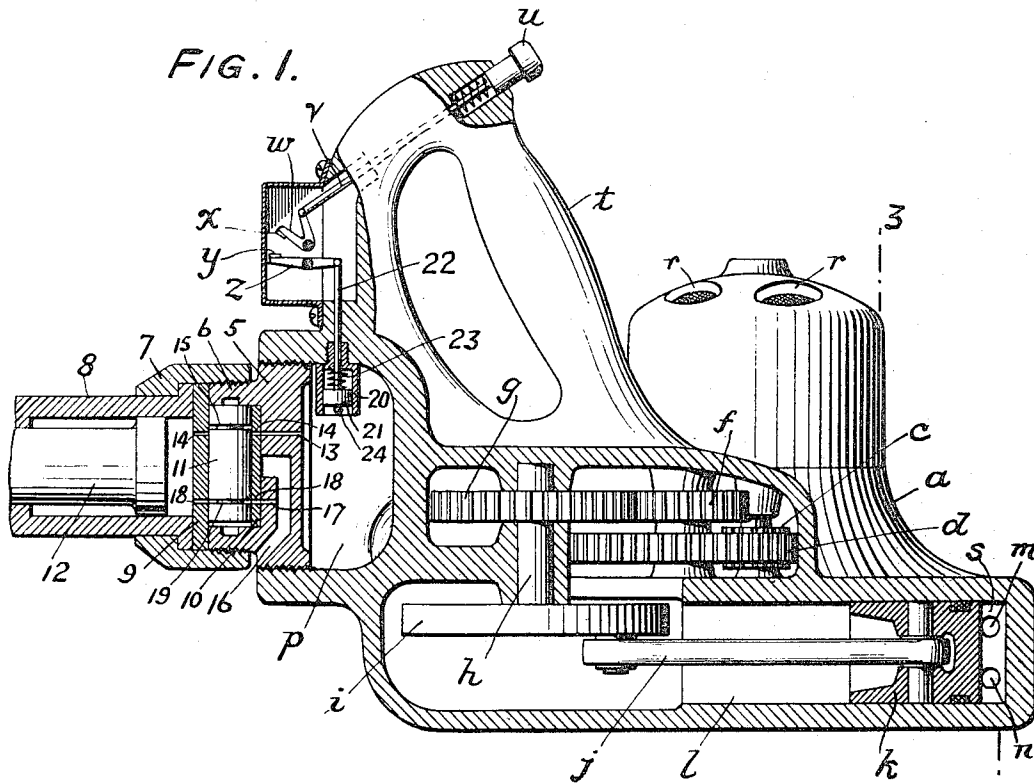


A. M. IRVINE.
POWER ACTUATED HAND TOOL.
APPLICATION FILED JULY 30, 1912.

1,052,824.

Patented Feb. 11, 1913.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

FIG. 3.

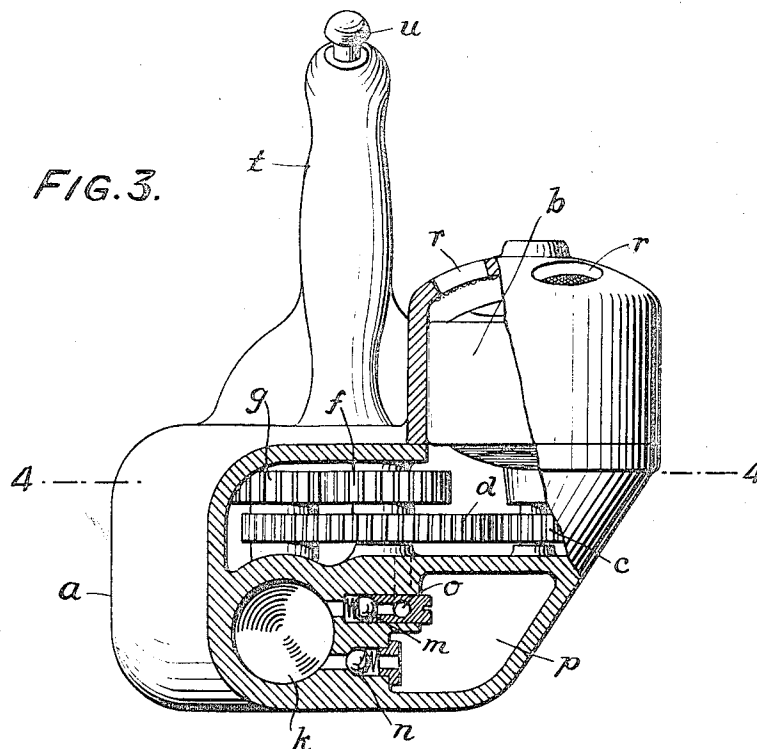
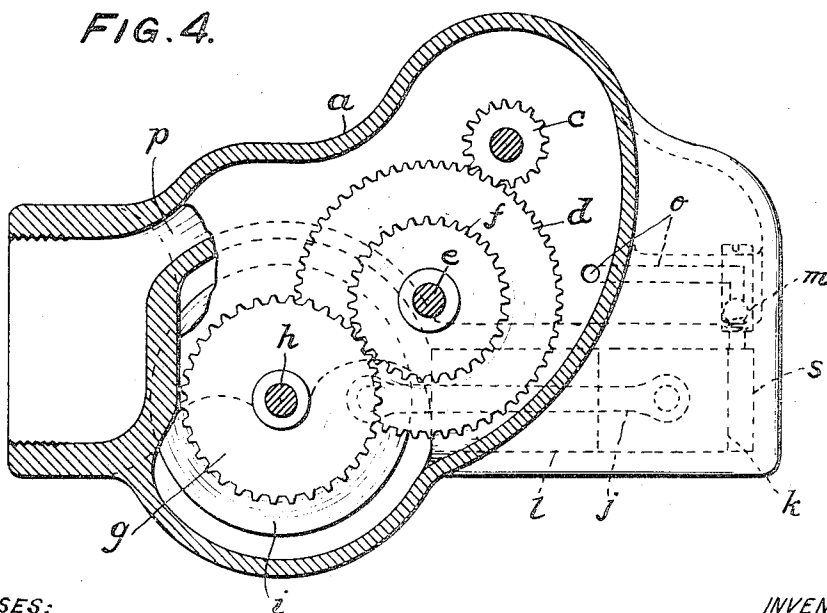


FIG. 4.



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POWER-ACTUATED HAND-TOOL.

1,052,824.

Specification of Letters Patent.

Patented Feb. 11, 1913.

Application filed July 30, 1912. Serial No. 712,230.

To all whom it may concern:

Be it known that I, ALBERT M. IRVINE, a citizen of the United States, residing at Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Power-Actuated Hand-Tools; of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

The object of my invention is to produce a tool for riveting, calking, chipping, etc., in which the striking hammer-piston will be operated pneumatically but which will be primarily actuated electrically. It is well known that electrically operated tools of this character possess certain advantages both with respect to cost of installation and economy and also that pneumatically operated hammers are usually of greater efficiency.

The more specific object of my invention is to provide a tool carrying a motor for generating the power required to reciprocate the hammer and by means of said motor compressing air which serves to propel the hammer forward against the chisel or other tool to be actuated.

A preferred embodiment of my invention is shown in the accompanying drawing, in which—

Figure 1 is a longitudinal section through the machine, the front part of the piston chamber being omitted; Fig. 2 is a plan view partly broken away; Fig. 3 is a transverse section on the line 3—3 of Fig. 1; Fig. 4 is a horizontal section on the line 4—4 of Fig. 3.

The motive power for the machine is furnished by an electric motor *b* which rotates on a vertical axis turning in bearings within the main casing *a*. The shaft of the motor carries a pinion *c* which drives a gear *d* on the shaft *e*. The shaft *e* has a pinion *f* which drives a gear *g* on the shaft *h*. The shaft *h* carries a crank disk *i* which is connected, by means of a connecting rod *j*, with a piston *k* reciprocable within a cylinder *l* forming part of the main casing. The rear end of the wall of the cylinder *l* has two check valves *m* and *n*. The check valve *m* opens inward into the cylinder and communicates through a conduit *o* with the interior of that part of the casing inclosing the motor *b*. The check valve *n* opens outward from the cylinder and communicates with a compressed-air reservoir *p* extending

from the rear of the casing *a* to the front end thereof. The top wall of that part of the casing inclosing the motor is provided with openings *r*, thereby permitting atmospheric air to pass through the motor, the conduit *o*, the check-valve *m*, and into the compression chamber *s* back of the piston *k*. This current of air performs also the useful function of cooling the motor.

The front of the casing is bell-shaped, the mouth of the bell opening forwardly. Secured to or integral with the casing is a handle *t*. Slidable on the handle is a spring pressed thumb-piece *u*, which takes the place of the throttle valve of an ordinary pneumatic hammer. This thumb piece is connected, by means of a rod *v*, with a bell-crank lever *w*, which carries a contact *x*. The contact *x* is adapted to contact with the contact *y* on the normally stationary lever *z*. The electrical connections are not shown, it being sufficient to state that when the thumb-piece *u* is depressed by the operator, contact *x* engages contact *y* and closes the circuit to the motor.

When the motor is in operation it effects, through the gearing described, the reciprocation of the piston *k*. As the piston moves toward the rear (to the right, Fig. 1) it compresses the air in the compression chamber *s*, thereby causing the valve *n* to open and forcing the compressed air into the reservoir *p*. As the piston moves toward the front (to the left, Fig. 1) the valve *n* closes and the valve *m* opens, drawing atmospheric air through the openings *r*, the motor *b*, the conduit *o*, and the valve *m*, into the compression chamber *s*, which air, on the next rearward movement of the piston, is in turn compressed and forced into the reservoir *p*.

The bell-shaped front end of the casing *a* (which incloses the front end of the reservoir *p*) is closed by means of a head *5*, which is threaded into the mouth of the bell. This head has a forwardly extending annular flange *6*, which is threaded into a sleeve *7*. The sleeve *7* has an inwardly projecting portion which embraces a shell or piston-casing *8* inclosing the piston chamber. The shell *8*, at its rear end, has an outwardly extending annular flange; and this flange, together with a flange *9* on a block *10*, is confined between the flange *6* of head *5* and the inwardly projecting front end of the sleeve *7*. The body of the block *10* extends within the

recess formed by the flange 6 on the head 5 and is confined against said head. The block 10 is recessed to receive a transversely extending reciprocable valve 11. A piston 12 is reciprocable in the piston chamber.

The ports and passages whereby the valve controls the piston and the piston the valve are not fully shown, as the same form no part of my invention. It will be understood that any of the known arrangements of ports and passages, such as characterize the ordinary pneumatic hammer, and which are well known to those skilled in the art, may be adopted. I have, however, shown an inlet port 13 in the head 5; inlet ports 14 in the block 10, alining with the port 13; and a groove 15 in the valve 11 adapted, at one stroke of the valve, to register with the ports 14. Thus when the valve is at one end of its stroke, pressure fluid is admitted from the reservoir *p*, through ports 13 and 14 and groove 15, into the upper end of the piston chamber, where it acts upon the piston 12 to propel it forwardly against the tool (not shown) inserted in the mouth of the casing 8. I have also shown an exhaust passage 16 in the head 5, communicating direct with the atmosphere; a port 17 in the head 5, communicating with the exhaust passage 16; ports 18 in the block 10, alining with the port 17; and a groove 19 in the valve 11 adapted, at the other end of the valve's stroke, to register with the ports 18. Thus when the valve is at the other end of its stroke, the air will exhaust, from the rear of the piston chamber, through groove 19, ports 18 and 17, and passage 16 to the atmosphere.

As is well known, when the ordinary pneumatic hammer is withdrawn from the work, the reciprocation of the piston ceases. Under these conditions, it is desirable that the operation of compressing air shall immediately cease. Under ordinary circumstances, this will occur by reason of the operator purposely or naturally releasing the thumb-piece *u*. At once the switch *x-y* is opened, shutting off the current to the motor. In case, however, the pressure upon the thumb-piece should be retained, the following means are provided to automatically open the switch. Within the casing *a* is a cylinder 20 having a piston 21 one side of which is open to the interior of the reservoir *p*. The piston rod 22 is connected to one end of the normally stationary lever *z* carrying the contact *y*. A spring 23 is confined between the closed end of the cylinder 20 and the piston head 21 and forces the latter against a stop 24. This spring is strong enough to counterbalance the normal maximum pressure in the reservoir *p* and thus the lever *z* is held in its normal stationary position. If, however, the thumb-piece *u* should be held depressed after the hammer is withdrawn from the work, the motor *b*

will continue to actuate the air-compressing piston *k*. The air compressed thereby and forced into the reservoir *p* having no outlet, the pressure within the reservoir will rise until it overcomes the spring 23, and actuates the piston 21 to move the lever *z* so as to withdraw the contact *y* from the contact *x*, thus opening the circuit to the motor and stopping the operation of the machine.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:

1. In a power-actuated hand tool, the combination with a main casing, of an electric motor, an air compressing member and connections between the motor and said member whereby the latter is reciprocated, and a compressed air reservoir adapted to receive and store the air compressed by the air compressing member, all arranged in said casing, a piston casing connected with the main casing, a hammer-piston therein adapted to be actuated by the air in the reservoir, a handle on the main casing, and a switch controlling the current to the motor.

2. In a power-actuated hand-tool, the combination with a main casing, of an electric motor, an air compressing member and connections between the motor and said member whereby the latter is reciprocated, and a compressed air reservoir adapted to receive and store the air compressed by the air compressing member all arranged in said casing, a piston chamber connected with the main casing, a hammer-piston therein, a valve controlling the admission of air from the reservoir to the piston chamber, a handle on the main casing, and a switch controlling the current to the motor.

3. In a power-actuated hand tool, the combination with a main casing, of an electric motor, an air compressing member and connections between the motor and said member whereby the latter is reciprocated, and a compressed air reservoir adapted to receive and store the air compressed by the air compressing member, all arranged in said casing, a piston chamber connected with the main casing, a hammer-piston therein, inlet ports communicating respectively with the rear of the piston chamber and with the reservoir, exhaust ports communicating respectively with the rear of the piston chamber and with the atmosphere, a valve adapted to alternately connect the inlet ports and the exhaust ports, a handle on the main casing, and a switch controlling the current to the motor.

4. In a power-actuated hand tool, the combination with a main casing, of an electric motor, an air compression chamber, a piston therein, connections between the motor and the piston whereby the latter is reciprocated, and a compressed air reservoir, all arranged in the casing, a valve adapted

to admit air into the compression chamber in the suction stroke of the piston, a valve adapted to admit air into the reservoir from the compression chamber in the compression stroke of the piston, a piston casing connected with the main casing, a hammer piston therein adapted to be actuated by the air in the reservoir, a handle on the main casing, and a switch controlling the current to the motor.

5. In a power-actuated hand-tool, the combination with an electric motor, a piston, and a gearing between the motor and piston adapted to actuate the latter; of a main casing having formed therein chambers for the motor and gearing, a compression chamber on one side of the piston, a compressed air reservoir, a conduit connecting the motor chamber and the compression chamber, and openings through the casing into the motor chamber; a valve between said conduit and the compression chamber adapted to open on the exhaust stroke of the piston, a valve between said reservoir and the compression chamber adapted to open on the compression stroke of the piston, and a hammer piston adapted to be actuated by the air in the reservoir.

6. In a power-actuated hand tool, the combination with a main casing, of an electric motor within the casing, an air compressing member, connections between the motor and said member whereby the latter is reciprocated, a compressed air reservoir adapted to receive and store the air compressed by said member, a handle formed on the casing, a switch controlling the current to the motor, a spring pressed thumb piece on the handle, and means connecting the thumb-piece and the switch.

7. In a power actuated hand tool, the combination with a main casing, of an electric motor within the casing, an air compressing member, connections between the motor and said member whereby the latter is reciprocated, a compressed air reservoir adapted to receive and store the air compressed by said member, a switch controlling the current to the motor, means to manually open the switch, a piston open to the pressure fluid in the reservoir and

adapted to be actuated thereby when the pressure rises beyond the desired maximum, and means actuated by the piston and adapted to open the switch.

8. In a power-actuated hand tool, the combination with a main casing, of an electric motor within the casing, an air compressing member, connections between the motor and said member whereby the latter is reciprocated, a compressed air reservoir adapted to receive and store the air compressed by said member, a normally stationary switch contact, a handle formed on the casing, a spring-pressed thumb piece on the handle, a second switch contact connected with the thumb piece and adapted to be moved thereby into contact with the first switch contact, a spring-pressed piston open to the pressure fluid in the reservoir, and means connecting the piston and the first switch contact and adapted when operated to move the latter away from the second switch contact.

9. In a power actuated hand tool, the combination with an electric motor, a switch controlling the current to the motor, a piston, and gearing between the motor and piston adapted to actuate the latter; of a main casing having formed therein chambers for the motor and gearing, a compression chamber on one side of the piston, and a compressed air reservoir; a handle on the main casing, a switch controlling the current to the motor, a valve establishing communication between the compression chamber and the atmosphere adapted to open on the exhaust stroke of the piston, a valve between said reservoir and the compression chamber adapted to open on the compression stroke of the piston, a casing forming a piston chamber connected to the main casing, and a hammer piston in said chamber adapted to be actuated by the air in the reservoir.

In testimony of which invention, I have hereunto set my hand, at Philadelphia, on this 26th day of July, 1912.

ALBERT M. IRVINE.

Witnesses:

M. M. HAMILTON,
E. E. WALL.