Nov. 6, 1951 J. P. HEFNER 2,574,103

GASOLINE DRIVEN HAMMER

Filed Aug. 30, 1948 2 SHEETS—SHEET 1

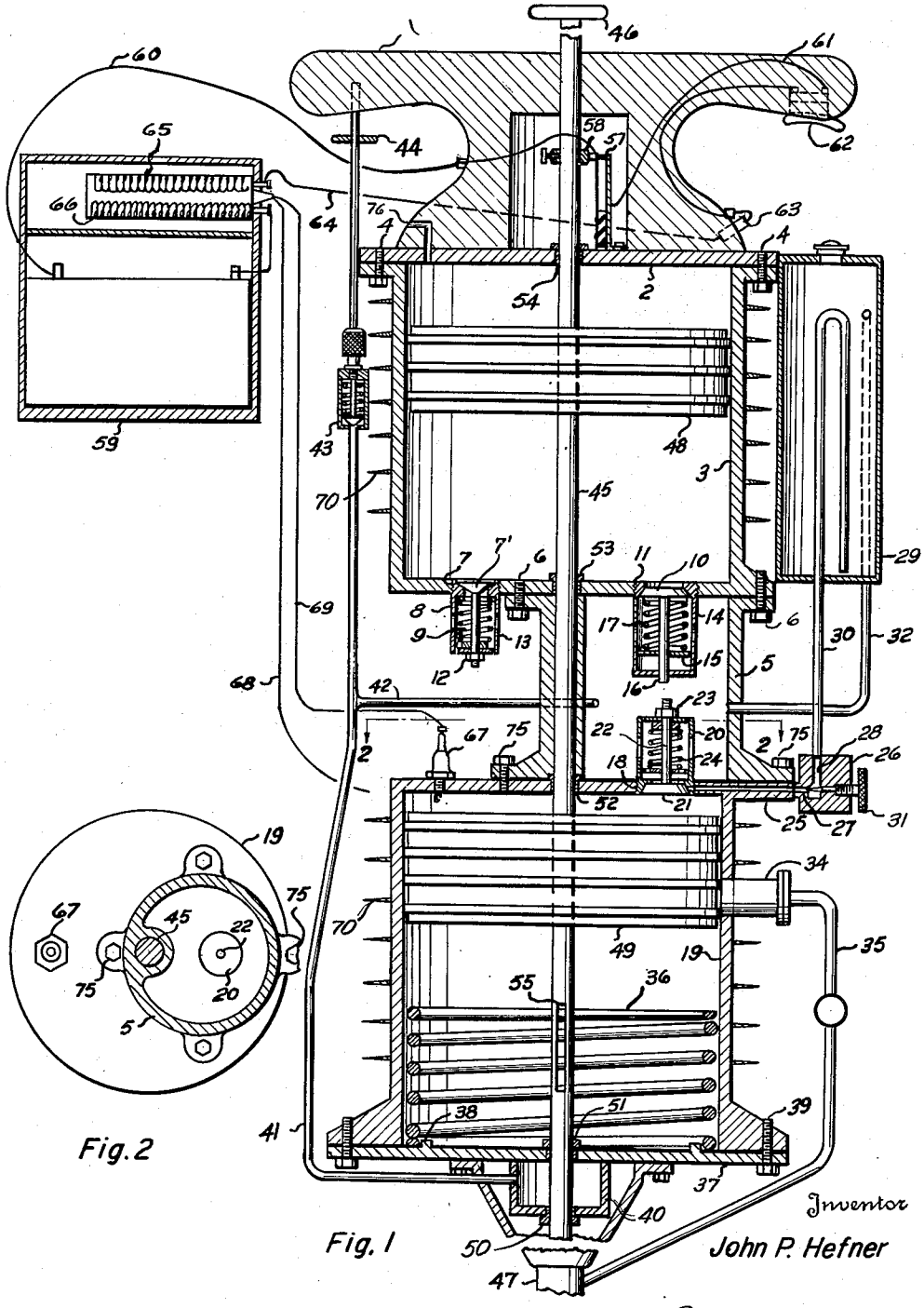

Fig. 2

Fig. 1

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GASOLINE DRIVEN HAMMER

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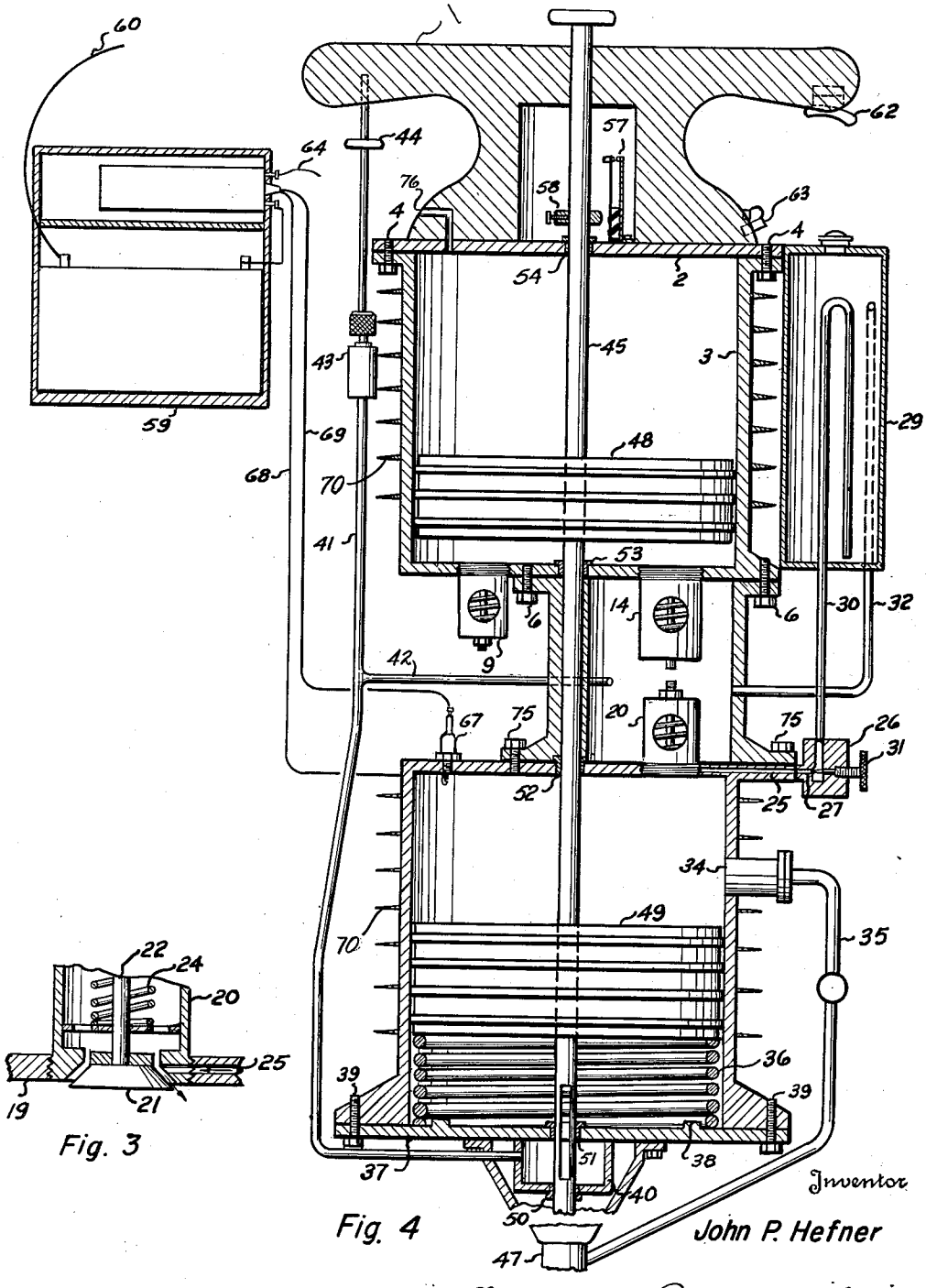

Fig. 3

Fig. 4

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GASOLINE DRIVEN HAMMER

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3 Claims. (Cl. 123—7)

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This invention relates to a new and useful improvement in a gasolene driven hammer.

One object of the invention is to provide a portable hammer, operated by gasolene and having a novel means of carburetion.

Another object of the invention is to provide a portable gasolene driven hammer having novel means for compressing air to be introduced into the combustion chamber.

Another object of the invention is to provide a portable hammer having novel means for relieving pressure built up beneath the combustion piston.

Another object of the invention is to provide a portable gasolene driven hammer having an air compressing piston and a combustion piston operated simultaneously off of one shaft.

The above and other objects will be apparent from the following description and illustrated in the accompanying drawings, wherein:

Figure 1 is a front elevational view, in section, showing the pistons in firing position.

Figure 2 is a top plan view, partly in section, taken on the line 2—2 of Figure 1.

Figure 3 is an enlarged sectional view of the mixing valve which opens into the combustion chamber, and

Figure 4 is a front elevational view, in section, showing the pistons at the end of the firing stroke.

Referring now more particularly to the drawings, the numeral 1 indicates a handle which is integrally secured to the cylinder cover 2 which is bolted to the outwardly flared upper end wall of the cylinder 3 by means of suitable bolts as 4, 4. The cylinder 3 is secured to the air storage chamber 5 by means of the bolts 6, 6. An intake valve 7 extends through the bottom plate of the cylinder 3 and is suitably mounted therein as by means of the internally threaded port 7. A valve cage 8 supports the valve 7' in position in the cylinder wall and a spring 9 maintains the valve normally closed. An adjusting nut 12 is mounted on the valve stem 13 of the valve 7' to control the intake of air into the cylinder 3. The cage 8 is, of course, open, to permit air to flow therethrough, when the valve 7' is open. Mounted in the port 11 in the bottom wall of the cylinder 3, is the valve cage 14 having the outlet valve 10 mounted therein. The valve stem guide 15 guides the valve stem 16 in said cage 14 and the spring 17 maintains said outlet valve normally in closed position. The port 18 in the upper wall of the combustion cylinder 19, which is secured to the air storage

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chamber by means of the bolts 75, 75, is internally threaded to receive the valve cage 20 in which the intake valve 21 is mounted. The valve stem 22 on said valve 21 has a suitable adjusting nut as 23 on the free end thereof, by means of which the amount of air introduced into the cylinder 19 may be controlled. A spring 24 maintains the valve 21 normally in closed position.

A port 25 extends horizontally through the upper wall of the cylinder 19 and opens into the valve seat of the valve cage 20. A fuel valve housing 26 is mounted on the outside wall of the cylinder 19 and has a port 27 therein in alignment with the port 25. A port 28 in said fuel valve housing permits fuel from the storage tank 29 to flow through the conduit 30 into the port 25 through the port 27. Suitably mounted in said housing 26, is a needle valve 31 which seats in the port 27 to control the flow of fuel through the port 27 into the port 25. A conduit 32 extends from the air storage chamber 5 to the fuel tank 29 to place the fuel therein under pressure.

The cylinder 19 has an exhaust outlet as 34 to which a hose as 35 may be attached to direct the flow of exhaust to any desired point, such as to the tool being used (not shown) for the purpose of blowing away the debris as the work progresses.

A coil spring, as 36, is mounted on the bottom plate 37 of the cylinder 19 and is maintained in position by means of suitable studs as 38, 38. The plate 37 is secured to the cylinder 19 by any suitable means, such as by the bolts 39, 39.

A recoil chamber 40 is axially mounted on the plate 37 and a conduit 41 is mounted therein and extends therefrom to the handle 1. A conduit 42 extends laterally from the conduit 41 and terminates in the compression chamber 5. A relief valve as 43 is mounted in said conduit 41 above said lateral conduit 42, for the relief of excess pressure in the compression chamber 5. This valve 43 is of conventional construction, of a nature that it may be readily adjusted to the desired pressure relief point. A finger control, as 44, may be mounted adjacent the handle 1 to permit control of the relief valve by the operator without stopping the hammer or removing the hand from the handle 1.

A shaft 45 extends axially through the handle 1, the cylinders 3, 19 and the recoil chamber 40. A knob 46 is mounted on the upper end of said shaft and a conventional tool holder 47 is suitably mounted on the outside of the cylinder plate

37 through which the lower end of said shaft extends, terminating against the conventional anvil (not shown). The piston 48 in the cylinder 3 and the piston 49 in the cylinder 19 are also fixedly mounted on said shaft. Suitable packing means, as the bushings 50, 51, 52, 53, 54 permit the shaft 45 to operate through the various cylinders and chambers. An elongated port 55 in the shaft 45 permits the equalization of air pressure beneath the piston 49 through said port into the recoil chamber 40 and conduit 41 upon completion of the downward stroke of the piston 49.

A chamber 56 in the handle 1 houses the contact points 57, 58, the contact point 58 being adjustable and mounted on the shaft 45. A suitable source of power such as the conventional storage battery 59 provides a current to the contact points 57, 58, when said points are in closed position, through the line 60, points 58, 57, line 61, switch 62 into the jack 63 through the line 64 to the coil 65, 66, which energizes said coils 65, 66, stepping up the voltage and passing a charge of electricity through the line 69, firing a spark plug 67, which is mounted in the upper wall of the cylinder 19, said current being grounded through the line 68 which is terminated in the outer wall of the cylinder 19.

When it is desired to start the hammer, the knob 46 is depressed, moving the shaft 45 downwardly, and moving the pistons 3, 19 to lowermost position, and the knob 46 then released, the air pressure beneath the piston 49 forcing the pistons back to starting position. The downward movement of the pistons will open the valve 10, forcing air into the air storage chamber 5, which will supply air pressure to the fuel tank 29 and will supply compressed air to the cylinder 19 through the valve 21. The valve 31 may be adjusted to permit the desired amount of fuel to pass through the valve 21 into the combustion chamber of the cylinder 19 upon downward stroke of said shaft 45. When the shaft 45 has carried the pistons 48, 49 to the end of the downstroke, air pressure trapped beneath the piston 49, assisted by the air in the chamber 5, will return said pistons to the starting position, the spring 36 cushioning the termination of the downward movement of the piston 49, and on the upstroke of said piston 49, the fuel and air mixture that has entered the combustion chamber of the cylinder 19 during the downstroke will be compressed by the piston 49 and upon the shaft 45 completing the upstroke, the contact points 57, 58 will be brought into contacting relation and the compressed fuel fired, bringing about a repetition of the cycle. Upon a downward stroke of the shaft 45, the elongated port 55 in said shaft below said piston 49, will pass into the recoil chamber 40 and permit the air pressure beneath said piston 49 to become equalized with that of the air storage chamber 5 through the conduit 41, to thus force the piston 49 upwardly. If desired, a flexible hose may be connected to the exhaust outlet 34 to permit the exhaust of the burned gases from the combustion chamber after the force of the explosion has been spent against said piston 49, to be directed against the work being performed to clear away loose debris.

Suitable radiating fins as 70, 70 extend from the outer surface of each of the cylinders 3, 19, are provided for cooling said cylinders.

A preferred method of construction provides a compression cylinder of greater diameter than the combustion cylinder, as shown in the drawings, to assure an adequate supply of air, and a series of ports, as the port 76, which extends through the end plate 2 and handle 1 to afford relief of air pressure above the piston 48.

The embodiments of the invention herein shown and described are to be regarded as illustrative only, and it is to be understood that the invention is susceptible to variation, modification and change within the scope of the appended claims.

What I claim is:

1. In a jack hammer, a pair of longitudinally aligned cylinders, an air storage chamber between said cylinders, means for compressing air from the atmosphere in one of said cylinders and supplying said storage chamber with compressed air, a fuel tank containing a combustible fuel, a conduit leading from said storage chamber to said fuel tank for placing fuel under pressure, a mixing valve leading from said storage chamber to said combustion cylinder, a conduit leading from said fuel tank to said mixing valve, means for controlling the flow of fuel into said mixing valve, ignition means for igniting said fuel in said combustion cylinder, a longitudinally movable shaft axially mounted through said cylinders, a piston fixedly mounted on said shaft in each of said cylinders, a source of electrical current, means on said shaft for completing and breaking a flow of electrical current through said ignition system upon termination of each upward stroke thereof, means for permitting the escape of exhaust fumes from said combustion cylinder, a chamber axially mounted on the lower end of said combustion cylinder, a conduit leading from said chamber to the air storage chamber, an elongated port in said shaft adapted to enter said chamber and permit the equalization of air pressure beneath the piston in the combustion chamber and the storage chamber upon the completion of each down stroke of said shaft, and a relief valve in said conduit having manually controlled means for adjusting said valve.

2. In a jack hammer, axially aligned combustion and compression cylinders, an air storage chamber between said cylinders, pistons in said cylinders, a shaft axially mounted on said pistons and extending through said cylinders and terminating at one end in a handle and adapted to engage an anvil at the other end, resilient means in said combustion chamber for partially absorbing the shock of the downward movement of said piston therein and means for further absorbing said shock and aiding in the return of the piston to firing position comprising a chamber in axial alignment with said cylinders beneath said combustion cylinder and through which said shaft extends, a conduit connecting said chamber with said air storage chamber, a port in said shaft adapted to pass into said chamber on downstroke of said pistons, equalizing the pressure beneath said piston with that of the air storage tank.

3. In a jack hammer, axially aligned combustion and compression cylinders, an air storage chamber between said cylinders, pistons in said cylinders, an axial shaft fixedly mounted on said pistons, means for drawing air into said compression chamber and compressing and forcing same into said storage chamber, a fuel storage tank, a fuel mixing valve, a conduit leading from said fuel storage tank into said valve, means for admitting mixed fuel and air into said combustion cylinder, means for igniting said fuel on upstroke of the piston and means for absorbing the shock of the piston upon extreme downstroke thereof, and

means for returning the combustion piston to firing position comprising a port in the shaft beneath said combustion piston, a chamber beneath said combustion cylinder through which said shaft operates, a conduit leading from said chamber to said air storage chamber said port in said shaft establishing communication between said chamber and said air storage chamber upon extreme down stroke to admit a flow of air under pressure from said air chamber to said piston to start the combustion piston on its return stroke.

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