J. A. HEANY.

INTERNAL COMBUSTION ENGINE TOOL.

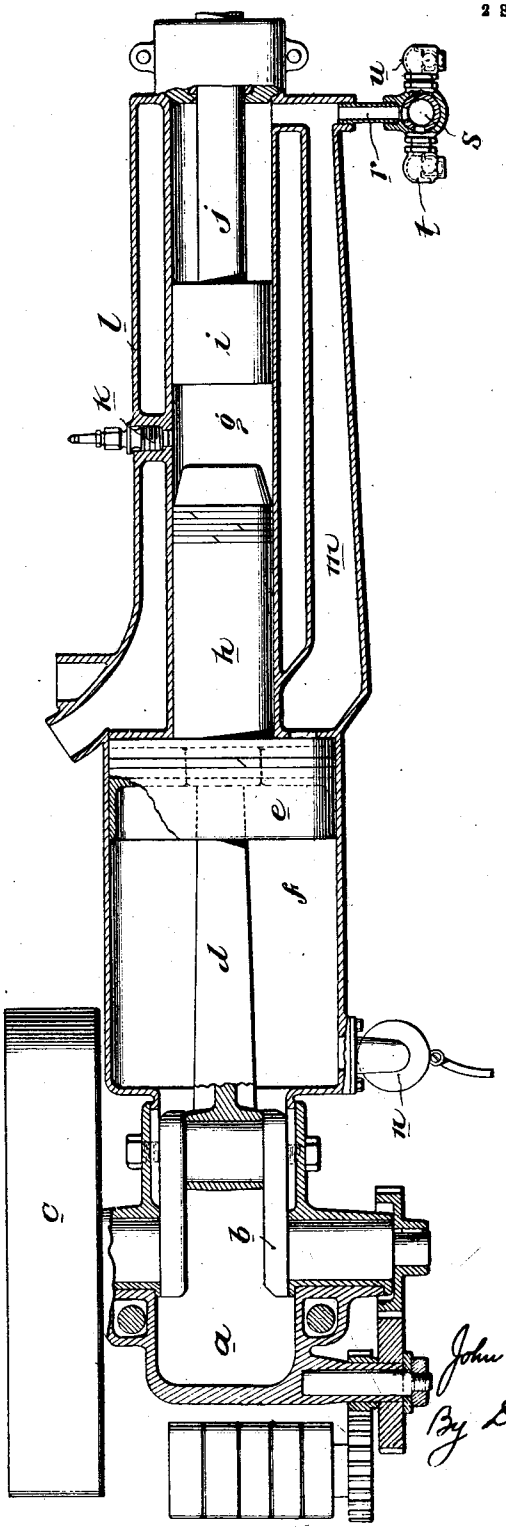
APPLICATION FILED JAN. 27, 1912.

1,076,283.

Patented Oct. 21, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

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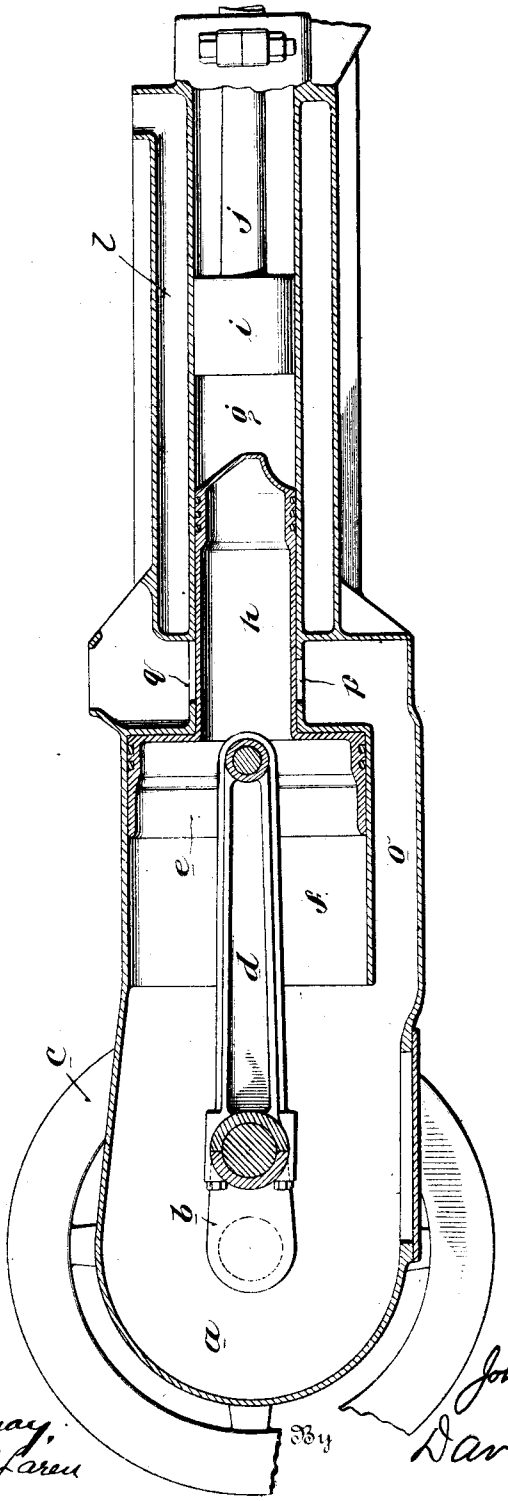
2 SHEETS—SHEET 2.

Fig. 2.

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# UNITED STATES PATENT OFFICE.

JOHN ALLEN HEANY, OF WASHINGTON, DISTRICT OF COLUMBIA.

## INTERNAL-COMBUSTION-ENGINE TOOL.

1,076,283. Specification of Letters Patent. Patented Oct. 21, 1913.

Application filed January 27, 1912. Serial No. 673,935.

*To all whom it may concern:*

Be it known that I, JOHN ALLEN HEANY, a citizen of the United States, and a resident of Washington, in the District of Columbia, have invented certain new and useful Improvements in Internal-Combustion-Engine Tools, of which the following is a full and clear specification, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal sectional view showing the pistons in the position they occupy when the charge is compressed ready for explosion; Fig. 2 a similar view taken on a plane at right angles to the plane on which Fig. 1 is taken.

The object of this invention is to adapt the two-cycle type of explosive engine to directly actuate the tool piston and to provide a supplemental piston and cylinder which will serve the purpose of returning the tool piston to its initial or operative position, in which position it coöperates with the working piston of the engine to compress the charge in the working cylinder, as more fully hereinafter set forth.

In the drawing *a* designates the closed crank case in which is journaled a crank shaft *b* having affixed on one of its ends a fly wheel *c*. A pitman *d* is attached to this crank shaft, and attached to this pitman is a piston *e* which works in a cylinder *f* whose rear end is open to the crank case and whose forward end connects with the engine cylinder *g*. Attached to the forward face of the piston *e* is the work piston *h* which is somewhat elongated and is considerably smaller in diameter than the supplemental piston *e*.

The work piston *h* is adapted to reciprocate in the engine cylinder *g*, and in the same cylinder is mounted to reciprocate the tool piston *i* whose stem *j* extends out through a stuffing box *k'* mounted on the outer head of the engine cylinder. About mid-way the length of the work cylinder is a spark plug or other igniting device *k*. This cylinder is provided with a water jacket *l* of any suitable construction. An air conduit *m* connects the extreme forward end of the engine cylinder with the forward end of the supplemental cylinder *f*, and preferably this conduit *m* enlarges toward its point of connection with said supplemental cylinder. The fuel mixture is supplied to the rear end of the supplemental cylinder through a suitable carbureter *n*. The explosive mixture is conducted, as usual in this type of engine, from the crank case at a point back of the cylinder *f*, to the forward end of the work cylinder by means of a suitable conduit *o*, this conduit being connected to the engine cylinder by a port *p*, opposite which port is an exhaust port *q*.

It will be observed that the reciprocation of the supplemental piston draws the explosive mixture into the supplemental cylinder and crank case and compresses it therein; and that with each backward reciprocation of the engine piston a new charge will be permitted to flow into the engine cylinder and scavenge the cylinder in the usual way, the exhaust taking place at the exhaust port *q*, as usual in two-cycle engines. As the pistons *h* and *e* move forwardly, the air confined in the forward end of the supplemental cylinder and the conduit *m* will be compressed and forced into the engine cylinder at a point back of the piston *i* and thus serve to force said piston *i* inwardly and cause it to coöperate with the oppositely working piston *h* to compress the charge at a point coincident with the igniting device, whereupon the charge will be ignited by the usual timing and ignition circuits. Upon the explosion of the compressed charge, the tool piston will be driven forwardly to the forward end of the cylinder and the air behind this tool piston will be sucked forwardly into the supplemental cylinder by the rearward movement of the supplemental piston, the larger diameter of this piston as compared with the tool piston serving to immediately relieve the pressure back of the tool piston and thus permit the tool piston to quickly move forwardly under the action of the exploded charge. It will be seen also that by reason of the larger diameter of the supplemental piston, the forward stroke thereof will again compress the confined air and forcibly and quickly return the tool piston and thus cause it to coöperate with the working piston *h* to compress the charge.

It will be observed that it is important in this apparatus that a fly wheel be connected to the engine piston in order that sufficient power shall be stored up to make the forward compression stroke and to forcibly and quickly return the tool piston through the medium of the confined body of air or other elastic fluid medium. The fly wheel also insures the overcoming of the inertia

of the work piston and the supplemental piston on their backward stroke, so that these two pistons may if desired begin their return movement slightly prior to the moment the explosion pressure is exerted upon the tool piston, so that the pressure behind the tool piston shall be relieved before the exploded charge actually starts the tool piston on its working stroke. The timing of the ignition will of course be arranged to cause the explosion at the proper time with respect to the movement of the working piston, and this time of ignition will be determined of course by the volume of the compressed charge, the nature of the explosive mixture, the nature of the work being performed by the tool, the position of the igniter in the explosion chamber, etc.

It will be understood that this apparatus may be employed for a great variety of purposes but its principal use will probably be that of drilling rock, coal, etc.

Should it be found in practice that the air or other fluid medium used for returning the tool shall leak, I may provide any suitable device for restoring the normal pressure therein. The degree of pressure can only be determined by experiment, it being essential that there shall be a sufficient quantity of the fluid medium confined in the apparatus to forcibly return the tool piston against the pressure of the charge of explosive mixture and also to quickly relieve the tool piston from pressure as the supplemental piston starts on its forward stroke. The nature of the work the tool is performing will also be a factor in determining the degree of pressure of the tool returning fluid medium.

To restore leakage of air from the conduit *m*, I attach to the same an inlet pipe *r*, which connects to the casing of a turn-plug cock *s*, which plug is provided with ports which by turning the plug can bring said inlet pipe *r* into communication with a valve *t* which opens inwardly, whereby the forward movement of the supplemental piston, will draw a quantity of air into the conduit *m*, after which the plug *s* may be turned to closed position. A supplemental outwardly opening valve *u* may be employed to entirely relieve the pressure behind the tool piston in case it is desirable that the tool shall not be returned when the supplemental piston is moved forwardly.

I have shown the tool piston *i* as being connected directly to the tool rod *j* but it will be understood that in some types of hammer tools this piston *i* may be unattached to any part but shall work freely in the cylinder and operate as a sort of hammer head. It will also be understood that it is within my invention to re-arrange the pistons and conduit *m* so as to greatly reduce the length of this conduit *m*, it being possible to design an engine in which this conduit will be a mere hole or very short passage leading into the cylinder back of the tool piston.

It will be observed that a novel feature of the invention lies in storing up the power of the engine not consumed in operating the tool in the movement of the fly wheel or other power storage means, whereby sufficient power is stored up to return the work piston and the supplemental piston on their compression stroke.

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

1. In an apparatus of the class set forth, an engine cylinder, a power piston working therein at one end of the cylinder, a tool piston working in the other end of the cylinder, means for supplying an explosive mixture to the cylinder at a point between the pistons and for igniting the same, and means whereby the reciprocation of the power piston on its compression stroke causes the tool piston to return to initial position, said latter means embodying fluid pressure devices.

2. In combination with a two-cycle internal combustion engine embodying a power-cylinder, a power-piston and means for supplying and igniting explosive mixture and for exhausting products of combustion, of a tool piston attached to a stem extending out through one end of the power cylinder, a supplemental cylinder and piston, and a conduit connecting the forward end of the supplemental cylinder to the power cylinder between the tool-end of the power-cylinder and the tool piston.

3. In an apparatus of the class set forth, a power cylinder, a power piston working therein, a tool piston working in the power cylinder, a supplemental cylinder of larger diameter than the power cylinder, a supplemental piston working therein and connected to the power piston, a conduit or passage connecting the supplemental cylinder to the power cylinder between the tool-end of the power-cylinder and the tool piston, a crank shaft connected to the supplemental piston and power piston, said crank shaft carrying a fly wheel.

4. In an apparatus of the class set forth, an engine cylinder, a power piston and a tool piston adapted to reciprocate in opposite directions in said cylinder, a power storage means connected to said power piston and adapted to actuate the same on its compression stroke by stored up energy, and means embodying a supplemental cylinder and piston whereby the tool piston shall be returned to initial position by the action of the supplemental piston and during the compression stroke of the power piston and from the same source of stored up energy.

5. In an apparatus of the class set forth,

an engine cylinder, a power piston and a tool piston adapted to reciprocate in opposite directions in said cylinder, a power storage means connected to the work piston and adapted to actuate the same on its compression stroke by stored up energy, and means whereby the tool piston shall be returned to initial position during the compression stroke of the power piston and from the same source of stored up energy, said means embodying fluid pressure devices.

6. In an apparatus of the class set forth, an engine cylinder, a power piston and a tool piston adapted to reciprocate in opposite directions in said cylinder, a power storage means connected to said power piston and adapted to actuate the same on its compression stroke by stored up energy, and means whereby the tool piston shall be returned to inital position during the compression stroke of the power piston and from the same source of stored up energy, said means embodying a supplemental piston and cylinder and a passage connecting the supplemental cylinder to the engine cylinder between the tool-end of the power-cylinder and the tool piston, and means to supply pressure medium lost by leakage.

7. In an apparatus of the class set forth, an engine cylinder, a power piston working therein, a tool piston also working in the power cylinder, a power storage means connected to said power piston and adapted to actuate the same on its compression stroke by stored up energy, said power storage means consisting of a crank shaft connected to the power portion and carrying a fly wheel, and means embodying a supplemental cylinder and piston larger in diameter than the aforesaid pistons whereby the tool piston is returned to initial position by the action of the supplemental piston and during the compression stroke of the power piston and from the same source of stored up energy.

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

JOHN ALLEN HEANY.

Witnesses:

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FRED. B. MCLAREN.