A. H. DALZELL.

STARTER FOR EXPLOSIVE ENGINES.

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1,002,372. Patented Sept. 5, 1911.

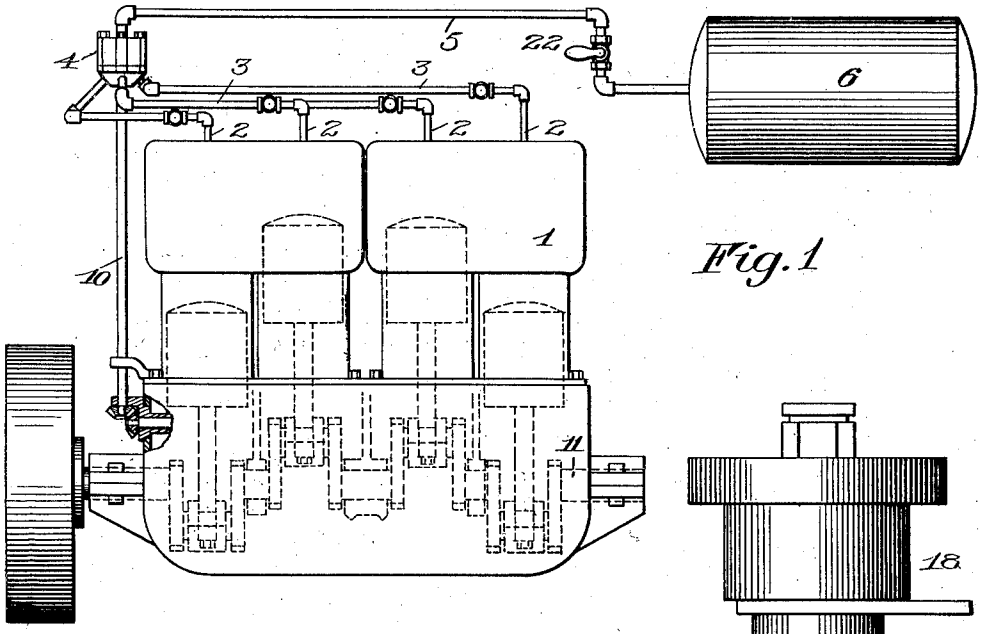
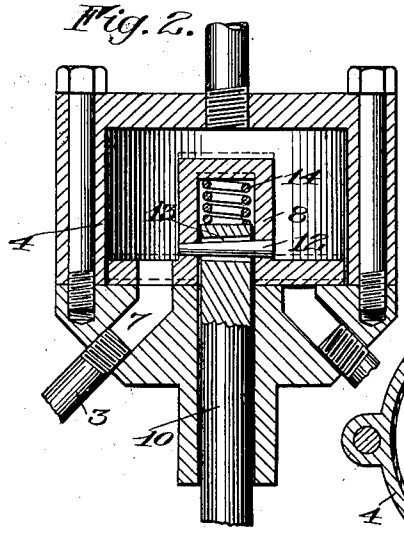


Fig. 1

Fig. 3.

Fig. 2.



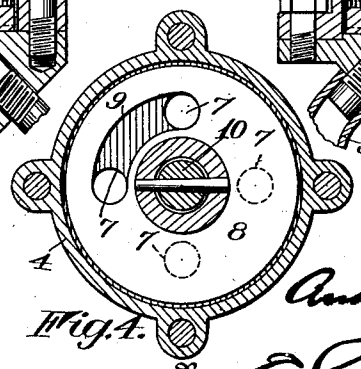
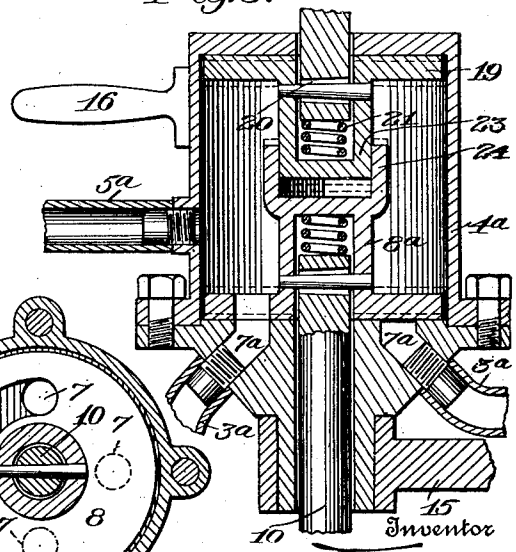


Fig. 4.



Witnesses

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STARTER FOR EXPLOSIVE-ENGINES.

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To all whom it may concern:

Be it known that I, ANDREW H. DALZELL, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Starters for Explosive-Engines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference-numerals marked thereon.

The present invention relates to starters for internal explosive engines and it has for an object to provide a construction utilizing fluid pressure for starting the engine without producing any great amount of friction when the starter is not in use.

Another object is to provide a construction which will permit the starter shaft to be employed for operating the timer of the engine.

Still another object is to provide for the reversal of an internal explosive engine with a fluid pressure starter.

In the drawings: Figure 1 illustrates diagrammatically a gas engine having the present invention attached thereto; Fig. 2 is a section of one embodiment of the starting or fluid distributing valve; Fig. 3 is a section of another embodiment of said valve; and, Fig. 4 is a horizontal section of the valve casing showing the construction of the rotary member.

Referring more particularly to the drawings and to the embodiment shown in Figs. 1 and 2, 1 indicates a gas engine having a plurality of cylinders with the usual intake and exhaust valves and the other appurtenances of such machines. Leading to the intake of each cylinder 2 is one of a plurality of pipes or connections 3 adapted to receive fluid such as air from the valve casing 4 of the starting valve which in turn is supplied with air from a compressed air reservoir 6 by a pipe or connection 5 having therein a valve 22 which is employed for cutting off air to the starting valve.

The starting valve in the embodiment shown in Figs. 1 and 2 has its casing 4 provided with a plurality of discharge openings 7 each communicating with a connection 3 and controlled by a rotary member 8 preferably in the form of a disk provided with an opening or arcuate slot 9 adapted to register successively with the discharge openings 7. Preferably journaled loosely within the casing is a shaft 10 which may be driven from the engine shaft 11 and may be connected to the rotary member by a pin 12 and slot 13 permitting the rotary member to move toward and from the wall of the casing containing openings 7. It is seated against said wall by the pressure of the air within the casing in order to prevent the escape of air about the shaft 10 and after the pressure is reduced or the air from the reservoir is cut off from the starting valve the rotary member is moved away from its seat preferably by resilient means, such as a helical spring 14 arranged between the shaft 10 and the rotary member.

In the embodiment shown in Fig. 3 the parts are adjustable to permit the reversal of the engine. To this end the casing 2 has flexible connections 3^a leading to the engine and a flexible connection 5^a leading from the reservoir 6. It is also mounted to rotate about the axis of rotation of the member 8^a which controls the discharge from the casing so that the slot 9 may be made to reach the openings 7 at different times. To the end that the rotation of the casing may be effected the latter is journaled in a bracket 15 or other suitable support, and is provided with a laterally extending handle or grip 16 to facilitate its adjustment. Also turning loosely in the casing is a timer shaft 17 operating a timer 18 and carrying a disk 19 which is connected to the shaft 10 by a pin, a slot connection 20 permitting the disk to move toward and from the proximate inner wall of the casing to prevent the escape of air about the timer shaft, resilient means, such as helical spring 21 being arranged between the timer shaft and the disk and serving to move the disk from its seat when air is cut off to the valve casing from the reservoir. The timer shaft is connected to the starter shaft so as to be operated thereby and to this end the disk 19 carries a non-circular portion 23 which is received within a correspondingly formed pocket 24 in disk 8, permitting a relatively axial movement of the disk but causing them to rotate together.

In operation the valve 22 is opened to admit air to casing 4 and the air exerts its pressure on the disks 8 and 19 closing the openings about the shafts 10 and 17. From the casing the air passes through a connec-

tion 3 or 3ª to a cylinder of the engine causing the latter to move the shifting rotary member 8 or 8ª to another opening 3 or 3ª and causing the engine to operate. The air within the reservoir will be sufficient to drive the engine such a distance as to cause the engine to operate under the action of the explosive mixture, when the valve 22 should be closed permitting the disks 8ª and 19 to move away from casing wall in order that shafts 10 and 17 may rotate with little friction. To reverse the engine the casing 2 is turned until its openings 7ª are so positioned that the air enters the cylinders at a time to drive the crank shaft in the opposite direction.

I claim as my invention:

1. The combination with an explosive engine comprising a plurality of cylinders, of a starting valve comprising a casing provided with a plurality of discharge ports each connected to one of the engine cylinders and a rotary member driven by the engine and operating in the casing to open said ports, said casing being pivotally supported and capable of oscillatory adjustment relative to the rotary member to position its ports to effect a movement of the pistons to drive the engine in either a forward or a reverse direction and means for supplying fluid under pressure to the valve casing.

2. The combination with an explosive engine comprising a plurality of cylinders, of a starting valve comprising a casing adapted to receive fluid under pressure and provided with a plurality of discharge ports, flexible conduits leading from each of said ports directly to one of the cylinders, and a rotary member driven by the engine and operating in the casing to successively open said ports, said casing being adjustable relatively to the rotary member to alter the normal location of its ports in respect to said member for the purpose of effecting a movement of the pistons to start the engine either in a forward or reverse direction.

3. The combination with a gas engine embodying a plurality of cylinders, of a starting valve therefor comprising a rotatably mounted casing receiving compressed air from a suitable supply and provided with a plurality of discharge openings, a valve rotatable in the casing about the axis of rotation of the latter to open the discharge openings, and a shaft driven by the engine, turning in the casing and connected to the valve.

4. The combination with a gas engine embodying a plurality of cylinders, of a starting valve therefor comprising a valve casing receiving compressed air from a suitable air supply and provided with a plurality of discharge openings each connected to one of the cylinders and also a rotary disk seating in the casing and operating in the casing to open the discharge openings, a shaft driven by the engine, turning in the casing and connected to the rotary member, resilient means moving the rotary member away from its seat when the supply of air is cut off to the casing, a timer shaft turning in the casing and connected to the first named shaft, a disk turning with said timer shaft and seating against the wall of the casing about the said timer shaft, and resilient means moving said disk from its seat when pressure is reduced within the casing.

5. The combination with a gas engine embodying a plurality of cylinders, of a starting valve therefor comprising a valve casing adapted to receive fluid under pressure and provided with a plurality of discharge ports each connected to one of the cylinders of the engine, a rotary member operating in the casing to open the discharge ports, a shaft driven by the engine and connected at one end of the casing to the rotary member, a timer shaft journaled in the opposite end of the casing, and a connection between the timer shaft and the rotary member, said connection having longitudinal movement relatively to the timer shaft.

6. The combination with a gas engine embodying a plurality of cylinders, of a starting valve therefor comprising a valve casing adapted to receive fluid under pressure and provided with a plurality of discharge ports each connected to one of the cylinders of the engine, a rotary member operating in the casing to open the discharge ports, a shaft driven by the engine and connected to the rotary member, a timer shaft journaled in the casing, a member connected to the timer shaft and in locking engagement with the rotary member, both of said members having movement longitudinally of the shafts to which they are respectively secured.

7. The combination with a gas engine embodying a plurality of cylinders, of a starting valve therefor comprising a casing adapted to receive fluid under pressure from a suitable supply and provided with a plurality of discharge ports, a valve rotatable in the casing to open the discharge ports, a shaft driven by the engine, turning in the casing and connected to the valve, said casing being revolubly supported and adjustable relative to the rotatable valve.

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