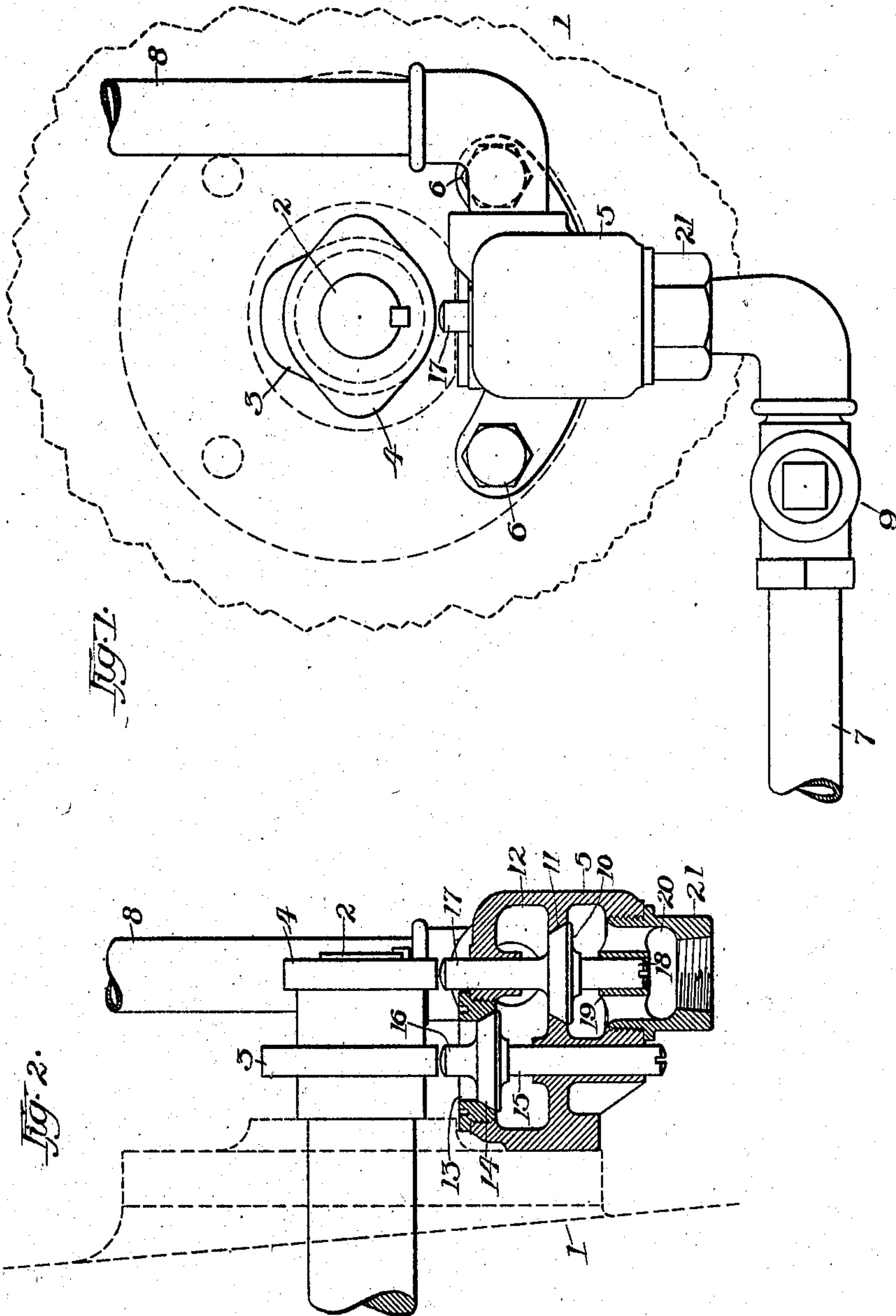


W. K. ANDREW.
 STARTING MECHANISM FOR GAS ENGINES.
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UNITED STATES PATENT OFFICE.

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STARTING MECHANISM FOR GAS-ENGINES.

No. 899,498.

Specification of Letters Patent.

Patented Sept. 29, 1908.

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To all whom it may concern:

Be it known that I, WILLIAM K. ANDREW, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Starting Mechanism for Gas-Engines, of which the following is a specification.

My invention relates to starting mechanism for gas engines in which compressed air or other fluid is confined under pressure and then admitted to the power cylinder by means of a supplemental valve mechanism under control of the operator, for the purpose of producing the initial strokes of the piston prior to the admission of explosive mixture with which the power cylinder is regularly supplied by any of the well-known means; and the objects of my invention are; first to provide a valve mechanism simple, and cheap to construct, and positive in action. I attain these objects by the mechanism illustrated in the accompanying drawing, in which—

Figure 1 is an elevation of a valve case, and an end view of a cam shaft forming part of a gas engine, and showing the manner in which I prefer to attach my invention thereto; and Fig. 2 is a cross section of Fig. 1, with the valve mechanism and case shown in section.

Similar reference numerals refer to like parts throughout the several views.

1 represents a portion of an engine bed shown in dotted lines; 2 one end of a cam shaft deriving motion from the engine shaft in the usual way, and mounted in suitable bearings carried by the engine bed, and provided with the supplemental valve operating cams 3 and 4, the cam 3 being single, and 4 double, for a purpose to be described later.

5 represents a supplemental valve case secured to the engine bed adjacent the cam shaft by means of bolts 6, communicating with a source of compressed air supply by means of a pipe 7, and with the power cylinder of the engine by means of a pipe 8 and any preferred form of a valve mechanism adapted to be adjusted in a manner to admit air from the starting device, or gas from a mixing chamber to the engine cylinder, at the will of the operator. A common form of valve 9 in the pipe 7 controls the admission of compressed air to the valve case, and a valve 10 controls an inlet port 11 communicating with the inlet pipe 7 and the outlet

pipe 8, said outlet pipe having its receiving end opening into an annular chamber 12 forming a part of the valve case above the valve 10. An exhaust port 13 opens out of the chamber 12, and 14 is a valve controlling said port and having a depending stem 15 guided by a bearing in the valve case, and an upwardly projecting stem 16 adapted to contact with the cam 3 in a manner to cause said cam to open said valve at proper intervals in the operation of the starting mechanism.

The inlet valve 10 is provided with an upwardly projecting stem 17 extending beyond the valve case and having a bearing therein, and adapted to contact with the cam 4, and a depending stem 18 having a bearing in a bridge piece 19 extending across the inlet opening 20 of the nipple 21, forming a connection between the supply pipe 7 and the valve case.

The device as shown is designed to operate in connection with an engine of the four cycle type, and one in which the cam shaft is given one revolution to two of the engine shaft, and is provided with the usual cams operatively connected with the regular exhaust and inlet valves, the exhaust valve being opened at each revolution of the cam shaft. The supplemental cam 3 is so located relative to the regular exhaust mechanism as to cause the supplemental exhaust valve 14 to open when two of the four cycles have been completed; that is, with the starting mechanism in operation, the engine would operate the same as one having the two cycle type. The double cam 4 will operate in a manner to open the inlet valve twice during each revolution of the cam shaft, or once during each revolution of the engine shaft, and the engine will operate precisely the same as a single acting steam engine wherein the steam is admitted at each backward stroke of the piston.

To start an engine equipped with my invention, communication between the source of gas supply and the power cylinder is first closed. Then the engine is turned until one of the cams 4 is in position to hold the valve 10 off its seat. Valve 9 is then opened and the compressed air flows through the port 11 into the chamber 12 and closes the exhaust valve 14 and is conducted to the power cylinder by means of the pipe 8, causing the engine piston to make its initial power stroke, at the end of which either the supplemental

exhaust valve 14 will be opened by the supplemental cam 3, or the regular exhaust valve will be opened by the regular means employed, depending upon their position 5 when the initial stroke is made; the double cam 4 operating the inlet valve twice during each revolution of the cam shaft, and the supplemental cam 3 the exhaust valve once. When a sufficient impetus has been imparted 10 to the engine the valve 9 is closed, shutting off the pressure of air in the valve case, and the regular supply of explosive mixture is allowed to flow to the power cylinder.

As soon as the valves 10 and 14 are relieved from the pressure of the air they drop 15 by gravity away from the cams 4 and 3 and will remain in such inoperative position until again required for use in starting the engine and the compressed air be admitted to the 20 valve case.

What I claim as my invention, and desire to secure by Letters Patent, is:

1. A starting mechanism for gas engines, including, in combination, a supplemental 25 valve casing having an annular chamber therein communicating with a supply of compressed air and the engine cylinder, an inlet valve controlling the admission of air to said chamber and opening against the pressure of air from the source of supply, a supplemental exhaust port communicating with 30 said chamber and the engine cylinder, a valve controlling said exhaust port and opening against the pressure of air in said chamber, said valves being opened by a moving part of the engine and closed by the pressure of air. 35

2. A starting mechanism for gas engines, including, in combination, a cam-shaft, a supplemental valve casing mounted below 40 said cam-shaft and having an annular chamber communicating with a supply of compressed air and the engine cylinder, an inlet valve controlling the admission of air to said chamber and opening against the pressure of 45 air from the source of supply, a supplemental exhaust port communicating with said chamber and the engine cylinder, a valve con-

trolling said exhaust port and opening against the pressure of air in said chamber, cams secured to said cam-shaft and operative to 50 open said valves at regular intervals, said valves being closed by the air pressure.

3. A starting mechanism for gas engines, including, in combination, a cam-shaft deriving motion from the engine shaft, a supplemental valve casing mounted below said 55 cam-shaft and having an annular chamber communicating with a supply of compressed air and the engine cylinder, an inlet valve controlling the admission of air to said chamber, a supplemental exhaust port communicating with said chamber and the engine cylinder, a valve controlling said exhaust port, a cam secured to said cam-shaft and adapted to open said exhaust port valve once 60 during each revolution of said cam-shaft, a cam secured to said cam-shaft and adapted to open said inlet valve twice during each revolution of said cam-shaft, said valves being closed by means of the pressure of air 70 within said valve casing.

4. A starting mechanism for gas engines, including, in combination, a cam-shaft deriving motion from the engine shaft, a supplemental valve casing mounted below said 75 cam-shaft and having an air chamber, an air conduit connecting said chamber with an engine cylinder, an air conduit connecting said chamber with a source of compressed air, a valve controlling the admission of air 80 to said chamber, a cam secured to said cam-shaft and operative to open said valve at proper intervals, an exhaust valve controlling a supplemental exhaust port communicating with said chamber and the engine cylinder, and a cam secured to said cam-shaft and operative to open said exhaust valve at 85 proper intervals, said valves being held in contact with said cams by means of the pressure of air within said casing.

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Witnesses:

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