

E. B. HOYTE.
 CONTROL DEVICE FOR INTERNAL COMBUSTION ENGINES.
 APPLICATION FILED OCT. 23, 1919.

1,338,017.

Patented Apr. 27, 1920.

Fig. 1

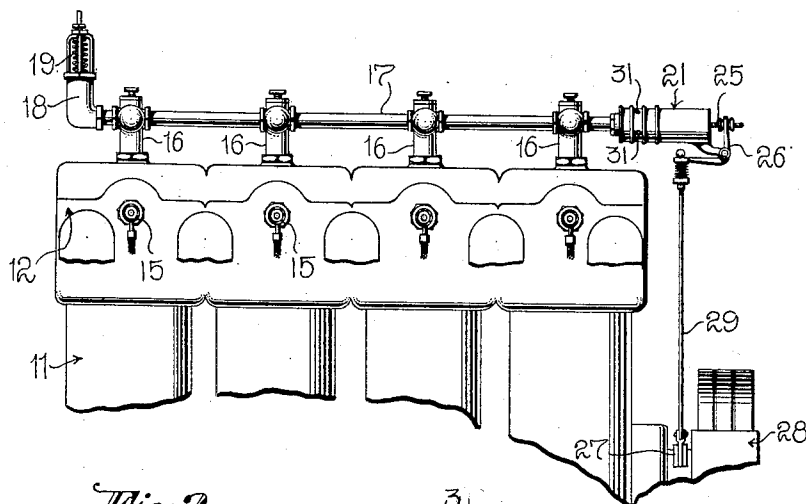


Fig. 2

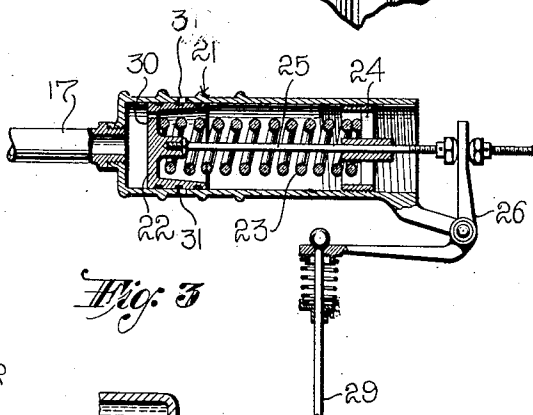
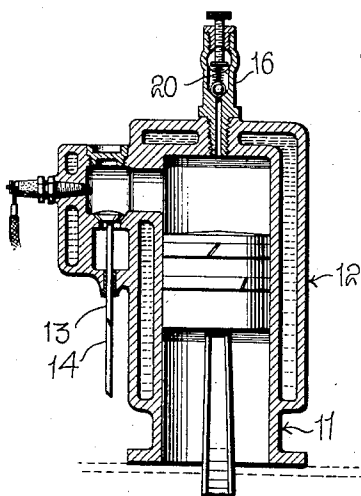


Fig. 3

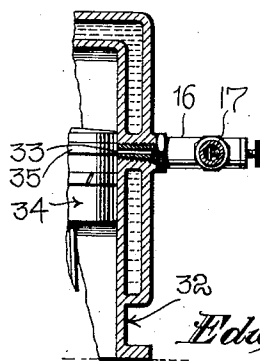


Fig. 4

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CONTROL DEVICE FOR INTERNAL-COMBUSTION ENGINES.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, EDWARD B. HOYTE, a citizen of the United States, residing at Nashville, in the county of Davidson, State of Tennessee, have invented an Improvement in Control Devices for Internal-Combustion Engines, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to internal combustion engines of the type wherein the fuel charge is first compressed and then ignited and burned in the working cylinder, and is particularly adapted to multi-cylinder engines provided with electric ignition.

The object of the invention is to eliminate knocking and pounding in the cylinder due to pre-ignition of the fuel charge, and the invention consists in connecting the combustion chamber of each cylinder with a relief valve set to open when the pressure in the cylinder exceeds the maximum allowable for safe working conditions.

The invention further consists in connecting the combustion chamber of each cylinder with a device in operative relation with the electric ignition device of the engine, so that an excessive pressure in the working cylinder will operate to delay the ignition of succeeding charges.

Further objects and details of the invention appear hereinafter in connection with the description of the form of the invention shown in the accompanying drawings, and as set forth in the claims.

In the drawings, wherein like reference characters are used to designate similar parts throughout the several views—

Figure 1 is a side elevation of the device as applied to a four cylinder internal combustion engine of a usual type provided with a magneto for effecting ignition;

Fig. 2 is a cross section on the axis of a cylinder on the line 2—2 in Fig. 1 looking in the direction of the arrows;

Fig. 3 is an axial section drawn to a larger scale of the piston and cylinder which actuate the ignition retarding means, showing the piston in moved position; and

Fig. 4 is a view similar to Fig. 2 showing a modification of the invention wherein the cylinder is provided with a relief valve

opening through its side wall near the end of the stroke of the piston.

Referring to the drawing, the engine comprises cylinders 11 having a head 12 integral therewith containing inlet and exhaust valves 13 and 14, and the spark plugs 15 of well known construction.

In the end of the cylinder wall is a threaded opening for receiving an adjustable check valve 16 of any suitable type. The check valves of the several cylinders are connected by a pipe 17 which is provided with an adjustable relief valve 18 of any suitable type. The relief valve is provided with a heavy spring 19 and is adjusted to open at a pressure which is excessive but not dangerous to the safe operation of the engine. Each check valve 16 is provided with a light spring 20 and is adjusted to open under a pressure in the cylinder of but a few pounds in excess of that in the pipe 17.

The pipe 17 leads to a control cylinder 21 containing a piston 22 which is normally held at the head end of the cylinder by a spring 23. The tension of the spring may be adjusted by turning the spider 24 which is screwed into the open end of the cylinder and serves as a guide for the piston rod 25. The end of the piston rod projects out of the cylinder and operates a bell crank lever 26 which is mounted upon the cylinder casing. The other arm of the bell crank lever is connected to the timer or distributor 27 of the magneto or other ignition device 28 by means of a rod 29 whereby movement of the piston 22 away from the closed end of the cylinder will delay the operation of the ignition device and will cause the ignition of the compressed fuel charge in the next working cylinder to occur at a later point in the stroke of the piston thereby avoiding pre-ignition and excessive pressure in the working cylinder.

A spring connection is provided between the bell crank lever 26 and the timer control rod 29 so that there will be no interference with any of the usual hand operated or automatic means for delaying the time of ignition upon starting the engine.

The pressure controlled piston 22 is provided with a small orifice 30 near the circumference of its face to relieve excessive pressure in the cylinder 21 and permit the piston to return to its normal position at

the head end of the cylinder as soon as the excessive pressure in the working cylinders is relieved. The orifice 30 is closed by the end wall of the cylinder 21 in the normal position of the piston 22, thereby retaining the normal working pressure in the pipe 17. The cylinder 21 has openings 31 through its side wall toward the open end which are uncovered by the piston 22 at the end of its movement, thereby relieving further increase in pressure in the cylinder.

In the modified form of the invention shown in Fig. 4 the check valves 16 are placed in the side of the cylinder wall of each cylinder 32 instead of the top of the combustion chamber as in the form shown in Figs. 1 and 2. The opening 33 from the cylinder to the check valve is located near the end of the compression stroke of the piston 34 so that the first piston ring 35 covers it at the end of the compression stroke. This arrangement prevents any loss of pressure upon the explosion of the fuel charge at the end of the compression stroke; but in case of pre-ignition and an excessive pressure in the cylinder before the end of the compression stroke this pressure will be relieved.

The functioning of the device in the operation of the engine is as follows: Upon starting the engine, either by hand or by any of the usual electrical starting devices, the ignition point, which is delayed before starting, is advanced as the engine attains speed to its earliest firing position, thereby causing pre-ignition of the fuel charges and escape of gas past the check valves into the pipe 17. If the pressure in the cylinders is not reduced by throttling the engine, the control piston 22 will be moved and the time of ignition thereby delayed to the point where pre-ignition no longer occurs to an undesirable extent. In case of excessive pressures occurring in the cylinders and pipe 17, either the relief valve 19 will open or the control piston will move far enough to uncover the ports 31 and let out enough gas to prevent harmful knocking in the cylinders.

It is evident that modifications in the type and location of the check valves, relief valve and piston controlled device may be made to suit the various types of engines and conditions of operation met with in practice.

I claim the following as my invention:

1. An automatic pressure relief and ignition timing device for internal combustion engines having a plurality of working cylinders comprising a relief valve remote from and in communication with all of the working cylinders, and pressure operated means associated with said relief valve and in operative relation with the ignition device for delaying ignition of the fuel charge follow-

ing an excessive pressure in a working cylinder.

2. A safety relief device for multi-cylinder internal combustion engines comprising a pressure pipe in communication with the cylinders, a check valve between each cylinder and said pressure pipe, and a high pressure relief valve for said pressure pipe, said relief valve being provided with an adjustable spring adapted to be set to close said pressure pipe under normal running pressure whereby said check valves will open only under excessive pressure in the respective cylinders.

3. A safety relief device for internal combustion engines comprising a check valve in communication with a cylinder at a point in its side wall near the end of the compression stroke of the piston.

4. In combination with a multi-cylinder internal combustion engine provided with ignition means, a duct communicating with each cylinder and leading to a pressure controlled device having ignition means in association therewith, said pressure controlled device being normally inoperative but operating upon an increase in the pressure in said duct to delay ignition of succeeding fuel charges.

5. An anti-knocking device for internal combustion engines comprising an external adjustable relief valve in communication with the working cylinder by means of a duct opening into the combustion chamber, and a check valve in said duct for closing said opening at normal working pressures.

6. An anti-knocking device for internal combustion engines comprising an adjustable relief valve in communication with the working cylinder by means of a duct opening into the combustion chamber and a check valve in said duct, a pressure controlled device in communication with said duct between said check valve and relief valve, and means operated by said pressure controlled device for retarding the ignition of the fuel charge.

7. An anti-knocking device for internal combustion engines comprising an adjustable relief valve in communication with the working cylinder by means of a duct opening into the combustion chamber and a check valve in said duct, a pressure controlled device in communication with said duct between said check valve and relief valve, and means operated by said pressure controlled device for retarding the ignition of the fuel charge, said pressure controlled device being adjustable to operate upon the pressure in said duct exceeding a desired maximum.

8. An automatic pressure and ignition controlling device for internal combustion engines having a chamber in communication with a working cylinder of the engine,

an outlet port from said chamber, a movable pressure responsive element normally closing the outlet port from said chamber, said port being uncovered when said pressure control member is moved from normal position to permit the escape of pressure from said chamber, and connections between said pressure responsive element and the ignition means of the engine for delaying the time of ignition upon movement of said pressure responsive element.

9. An automatic ignition controlling device for internal combustion engines comprising a pressure responsive element in communication with the working cylinder of the engine and ignition means in association therewith, said element being ad-

justable to respond to pressures in excess of the normal working pressure to delay ignition of the fuel charge.

10. An automatic ignition controlling device for internal combustion engines comprising a pressure responsive element in communication with the working cylinder of the engine at a point near the end of the compression stroke of the piston, ignition means associated with said pressure responsive elements, said element being adjustable to respond to pressures in excess of the normal working pressure at said point to delay ignition of the fuel charge.

In testimony whereof I have signed my name to this specification.

EDWARD B. HOYTE.