Dec. 23, 1930. F. W. SMITH 1,786,034

INDICATOR FOR INTERNAL COMBUSTION ENGINES

Filed June 21, 1929

Fig. 1.

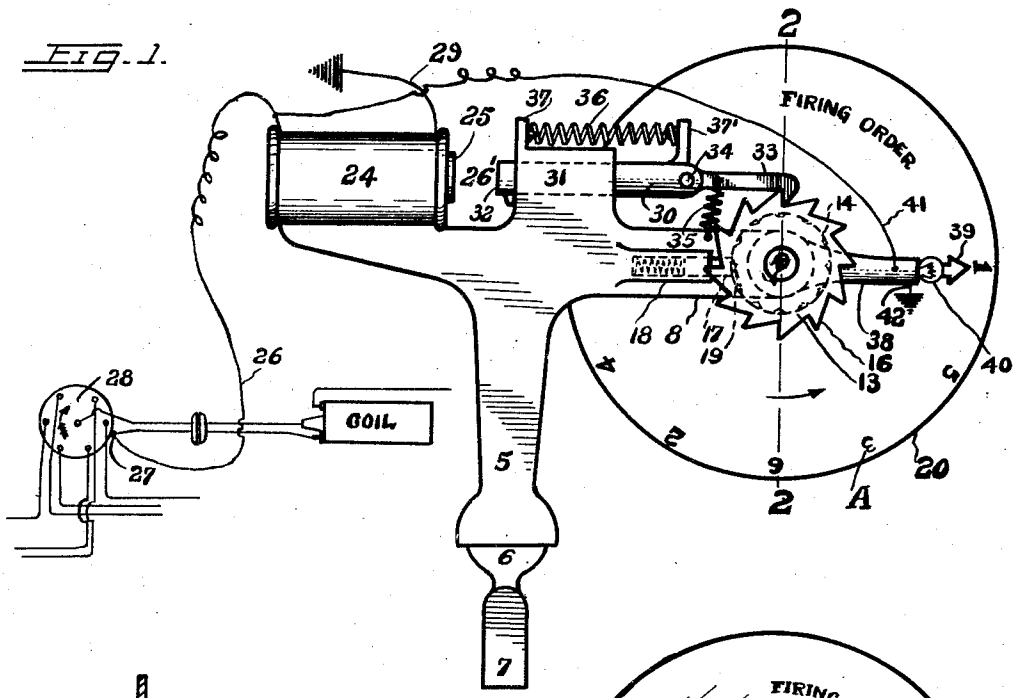
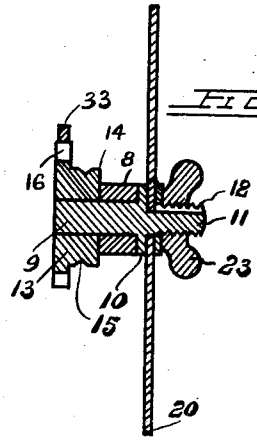


Fig. 2.



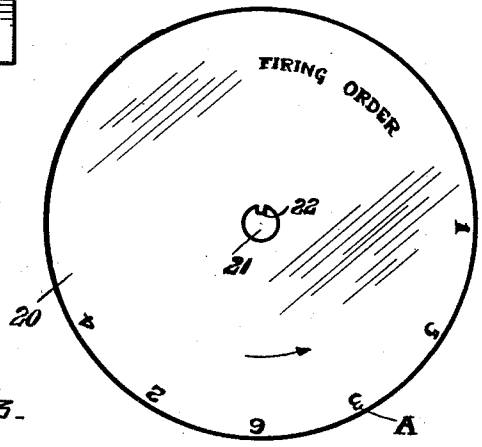


Fig. 3.

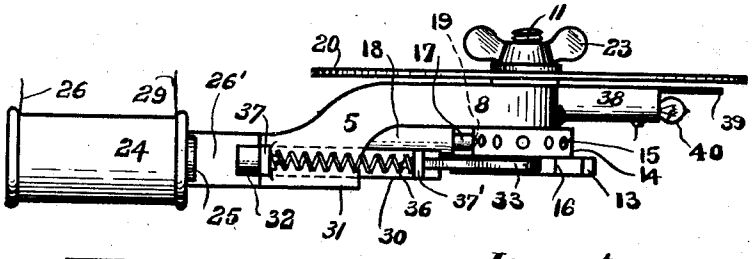


Fig. 4.

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UNITED STATES PATENT OFFICE

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INDICATOR FOR INTERNAL-COMBUSTION ENGINES

Application filed June 21, 1929, Serial No. 372,791, and in Canada June 5, 1929.

The invention relates to improvements in indicators for internal combustion engines as described in the present specification and shown in the accompanying drawings which form part of the same.

In setting the valves of an internal combustion engine it is essential that they be properly seated upon the valve facings before adjustment is made. At the moment of firing, the piston of a cylinder is at top dead centre and as a result it is in an ideal position for the setting of its valves. This position, however, cannot be readily determined, particularly when an engine is of multiple cylinder type such as used for automobiles. Hence it is the object of the present invention to provide an indicator for this purpose.

This indicator embodies an electro-mechanical arrangement for connection to the ignition circuit in order to signal the firing position of the piston and also to indicate the particular piston of a block brought to top dead centre.

By the use of this invention the firing positions of a multiple cylinder engine are successively indicated as the crankshaft is turned, thus enabling a mechanic to properly set the valves.

Referring to the drawings, Figure 1 is a side elevation of a practical embodiment of the invention together with a diagrammatic illustration of the part of the ignition system to which the invention is connected.

Figure 2 is a vertical section taken on the line 2—2 of Figure 1.

Figure 3 is a side elevation of a dial for a particular firing order.

Figure 4 is a plan view of Figure 1 omitting the diagrammatic illustration of the ignition system.

Like numerals of reference indicate corresponding parts in each of the figures throughout the drawings.

In the drawings, the reference numeral 5 denotes a frame for carrying the various parts of the invention. This frame is preferably in the form of a bracket for attachment to some part of an engine for convenient observation of the user. The frame is in the form of a bracket preferably having a universal joint 6 connected to a clamp 7 for attachment purposes. This clamp is not shown in detail since it is not a part of the invention, and, furthermore, there are various forms of clamps known to the art which may be equally well employed. A horizontal extension 8 of the bracket carries a transversely journalled shaft 9 shouldered at one end against the extension by a collar 10 and having a threaded extremity 11 slotted as at 12 to form a keyway. The other end of this shaft carries a ratchet 13, and upon the inner side of this ratchet is a ring 14 circumferentially indented as at 15 by conical indents. These indents are spaced corresponding to the pitch of the ratchet teeth 16. 17 is a spring-urged plunger mounted in a boss 18 of the extension 8 and having a pointed end 19 for engagement with the indents 15. This plunger, or detent, functions to preclude inadvertent movement of the ratchet.

20 is a dial consisting of a disc having a central opening 21 in order that it may be placed over the extremity 11 of the shaft 9. An integral keyway 22 fits into the keyway 12 in order to prevent independent rotation of the disc with respect to the shaft. 23 is a wing nut fitted on the extremity 11 for securing the disc to the shaft.

In practice it is proposed to have a number of these discs each of which corresponds to a particular firing order of an engine so that the set of discs will take care of the various firing orders and number of cylinders used on standard internal combustion engines. Each disc has a circumferential arrangement of numbers, as at A denoting the particular firing order, the angular spacing of these members corresponding to that of the teeth of the ratchet.

24 is an electromagnet rigidly supported on the bracket and having a core 25. This magnet has a conductor 26 for connection to the terminal 27 of the distributor 28, thus securing it to the secondary circuit of the ignition system. It is of course understood that some form of clip will be provided on the end of the wire in order to adapt it for convenient attachment. A further wire 29 is grounded to the engine so that upon the crankshaft be-

ing turned the electromagnet will be energized upon any piston reaching its firing position. Needless to say the switch must be turned on.

30 is a plunger slidably mounted in a boss 31 of the bracket and having an end 32 positioned adjacent to the core 25 of the electromagnet, the spacing constituting a gap 26', which gap corresponds to the pitch of the ratchet teeth. The other end of the plunger carries a pawl 33 pivoted at 34 and designed to engage the teeth of the ratchet for turning it in an anti-clockwise direction; see Figure 1.

35 is a spring for holding the pawl in engagement with the ratchet. 36 is a compression spring positioned between the lugs 37, 37' for yieldably holding and returning the plunger to its outer position.

38 is an arm rigidly extending from the extension 8 of the bracket and carrying an arrow head 39 positioned to coincide with the figures A as the disc is turned. Adjacent to the arrow head is a lamp consisting of a bulb 40 fitted in a socket formed integral with the arm 38 and electrically connected to the conductor 26 by a wire 41, the other wire of the circuit being grounded as at 42.

In the operation of the invention the electromagnet is connected in circuit with the ignition system of an engine and the disc or dial 20 is so set that upon turning the crankshaft until the first piston reaches dead centre the electro-magnet will be energized thus attracting the plunger 30 and drawing it into contact with the core 25. This sliding movement causes the pawl to rotate the ratchet a distance of one tooth thus bringing the numeral 1 of the dial into register with the arrow head 39. Coincidentally with the energization of the magnet the bulb 40 is illuminated and raises a visual signal.

Upon setting the valves of this piston the crankshaft is rotated thus deenergizing the magnet and allowing the plunger to return. A further movement of the crankshaft results in a recurrent operation with the result that the dial registers the next piston brought to its firing position and at the same time the signal lamp is lit. In this manner it will be seen that as the crankshaft is turned the firing order of the pistons will be successively indicated by the arrow head 39 and the visual signal.

What I claim is:

1. An indicator of the class described comprising a rotatably mounted dial bearing indicia denoting the firing order of an internal combustion engine, indicating means coacting with said indicia, and electro-mechanical means for electrical connection to the ignition system of the engine and adapted to operate said dial to successively bring its indicia into register with the indicating means.

2. An indicator of the class described comprising a rotatably mounted dial having indicia denoting the firing order of an internal combustion engine, indicating means coacting with said indicia, and electro-mechanical means for electrical connection to the ignition system of the engine and so adapted that as the crankshaft is turned said dial will be intermittently operated so as to successively bring its indicia into register with the indicating means.

3. An indicator of the class described comprising a rotatably mounted dial bearing indicia denoting the firing order of an internal combustion engine, indicating means coacting with said indicia, a ratchet mechanism connected to the dial, and electro-mechanical means for electrical connection to the ignition system of the engine in order to operate said ratchet to successively bring the indicia of the said dial into register with the indicating means.

4. An indicator of the class described comprising a rotatably mounted dial bearing indicia denoting the firing order of an internal combustion engine, indicating means coacting with said indicia, a ratchet mechanism connected to the dial, a plunger adapted to actuate said ratchet mechanism, and an electromagnet for electrical connection to the ignition system of the engine and controlling the plunger whereby the dial is intermittently operated to bring its indicia into register with the indicating means.

5. An indicator of the class described comprising a frame, a dial rotatably mounted thereupon, said dial having circumferentially arranged indicia denoting the firing order of an internal combustion engine, indicating means borne by the frame for coacting with said indicia, and electro-mechanical means for electrical connection to the ignition system of the engine and adapted to operate said dial to successively bring its indicia into register with the indicating means.

6. An indicator of the class described comprising a frame, a detachable dial rotatably mounted thereupon, said dial having circumferentially arranged indicia denoting the firing order of an internal combustion engine, indicating means borne by the frame for coacting with said indicia, and electro-mechanical means for electrical connection to the ignition system of the engine and adapted to operate said dial to successively bring the indicia into register with the indicating means.

7. An indicator of the class described comprising a frame, a shaft therein, a disc removably keyed to the shaft, said disc having circumferentially arranged indicia denoting the firing order of an internal combustion engine to constitute a dial, a wing-nut threadedly engaging the shaft to secure the disc, indicating means borne by the frame for coacting with said indicia, and electro-mechani-

cal means for electrical connection to the ignition system of the engine and adapted to operate the shaft to successively bring the indicia of the dial into register with the indicating means.

8. An indicator of the class described comprising a frame, a dial rotatably mounted thereupon, said dial having circumferentially arranged indicia denoting the firing order of an internal combustion engine, an arrow head borne by the frame and disposed to coact with said indicia, and electro-mechanical means for electrical connection to the ignition system of the engine and adapted to operate said dial to successively bring its indicia into register with the aforesaid arrow head.

9. An indicator of the class described comprising a rotatably mounted dial bearing indicia denoting the firing order of an internal combustion engine, indicating means coacting with said indicia, a ratchet mechanism connected to the dial, means for precluding accidental movement of the dial, and electro-mechanical means for electrical connection to the ignition system of the engine in order to operate said ratchet to successively bring the indicia of the dial into register with the indicating means.

10. An indicator of the class described comprising a rotatably mounted dial bearing indicia denoting the firing order of an internal combustion engine, indicating means coacting with said indicia, a ratchet mechanism connected to the dial, a ring movable with the ratchet and having indents corresponding in angular spacing to the teeth thereof, a plunger for engaging the indents of the ring, and electromechanical means for electrical connection to the ignition system of the engine in order to operate said ratchet to successively bring the indicia of the dial into register with the indicating means.

11. An indicator of the class described comprising a frame, a dial rotatably mounted thereupon bearing indicia denoting the firing order of an internal combustion engine, indicating means borne by the frame for coacting with said indicia, a ratchet connected to the dial, an electromagnet rigidly secured to the frame for electrical connection to the ignition system of the engine, a plunger slidably mounted in the frame for magnetic retraction, a spring holding the plunger in a normal advanced position, and a spring-urged pawl pivoted to the plunger and engaged with the ratchet aforesaid.

Signed at Niagara Falls, Ontario, Canada, the 20th day of May, 1930.

FREDRICK WILLIAM SMITH.