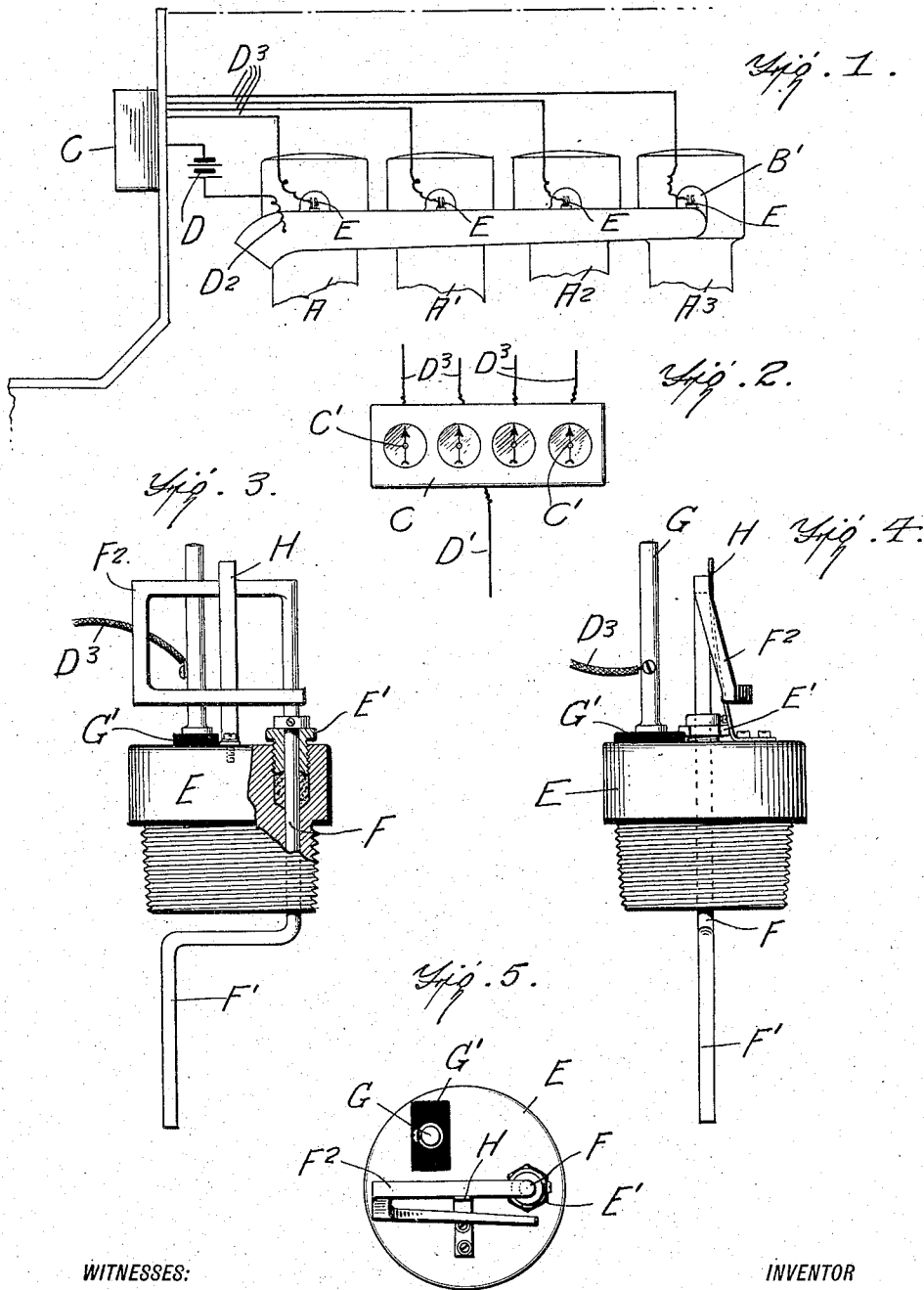


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EXPLOSION INDICATOR FOR INTERNAL COMBUSTION ENGINES.
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WITNESSES:

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EXPLOSION-INDICATOR 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, CHARLES T. HAAS, a citizen of the United States, and a resident of Tucumcari, in the county of Quay and State of New Mexico, have invented a certain new and useful Improvement in Explosion-Indicators for Internal-Combustion Engines, of which the following is a specification.

My present invention relates generally to indicators, and more particularly to indicators utilized in connection with automobile and other engines, for indicating the explosions of each of the several cylinders of a multi-cylinder motor, my object being to provide an indicator with means for operating the same under actuation of the exhaust gases from the several cylinders, whereby lack of full explosion of any of the several cylinders may be at once detected.

It is of course obvious that various defects of the several cylinders may bring about imperfect explosions, such as bad rings, bad pistons, lack of oil in the cylinder, or too much or not enough gas and proper air mixture for perfect combustion, lack of ignition, or improper ignition, and many other causes, all of which will be included in the failure of full combustion to be detected instantly by the use of my improved indicator.

My invention will be better understood by reference to the following specific description thereof, reference being made therein to the accompanying drawing, forming a part of this specification, and in which—

Figure 1 is a side elevation, more or less diagrammatic, of an automobile motor consisting of several cylinders. Fig. 2 is a face view of the indicator box. Fig. 3 is a detail side elevation, partly broken away and in section, of one of the exhaust pipe plugs. Fig. 4 is a similar view thereof, looking at right angles as compared to Fig. 3, and Fig. 5 is a plan view of the plug shown in Figs. 3 and 4.

Referring now to these figures, and more particularly to Fig. 1, it will be noted that in the motor shown, consisting of several cylinders A, A', A², and A³, there appears the usual exhaust manifold B, connected to the several cylinders by exhaust pipes or special fittings B'. In connection with a motor thus generally outlined, I propose to utilize an indicator consisting of a box C in which are several indicators C', one for

each of the cylinders of the motor. These indicating members, as shown in Fig. 2, may be in the form of pointers, electrically actuated when full explosions in each of the cylinders of the motor occur, through a circuit. One common lead D' extends from the box C through a battery D and is connected to the exhaust manifold at D² as shown in Fig. 1, or to one of the cylinders of the engine.

Several individual leads D³, one of which leads from each of the indicating members C', are extended to the several cylinders, one lead of course being for each cylinder, the number of which correspond, as above stated, to the numbers of the indicating members and the cylinders of the motor.

In the exhaust manifold B or in the exhaust pipe or special fitting B' leading from the cylinders of the motor are arranged devices, which upon full explosions in the cylinders, complete circuits through the several indicating members and cause their actuation, these devices being subject directly to the influence of the exhaust gases.

Each of the devices is in the nature of a plug E such as clearly shown in the detailed Figs. 3, 4, and 5 thereof, threaded either into the exhaust manifold or the exhaust pipe B' as above stated, and provided with vertical apertures, the upper outer ends of which are closed by a stuffing box E', which forms a bearing for an actuating member in the form of a rod F, the inner end of which is extended beyond the inner end of the plug E and is provided with an offset extremity F' projecting into the exhaust pipe or the exhaust manifold as the case may be, and thus subject to the direct action of the exhaust gases, whereby upon each explosion the rod F is forced to rotate by the rush of the exhaust against the offset inner end F'. The outer end of the rod F is bent angularly as indicated at F² so as to provide a portion movable into contact with an upright contact post G, mounted upon the plug E and insulated therefrom as at G'.

The contact upright G has attached thereto the end of its respective lead D³ from its respective indicating member C' above mentioned, and the angular portion F' at the outer end of the actuating rod F, is engaged by a spring H anchored upon the plug E and normally tending to hold the angular upper end of the post out of engagement with the upright contact G. Thus in action

a full explosion of each of the cylinders will cause movement of the several actuating rods F, forcing the upper ends of the latter into contact with the upright G and closing the several circuits through the indicating members C', which latter are in this way moved, indicating to the operator full explosions in the several cylinders. It is thus to be seen that upon failure of a full explosion in any cylinder, a pressure less than that required to overcome the tension of spring H, will be exerted upon the actuating rod F, and, assuming the spring H to be of the proper strength, the upper angular end F² of the particular actuating rod will fail of contact with the upright G. In this way lack of movement of the respective indicating member C' will indicate at once to the operator that a particular cylinder is missing fire or imperfectly exploding. Knowing this, and knowing the particular cylinder which is thus defective, the operator is materially aided in the matter of correction or repair.

I claim:—

1. The combination with an internal combustion engine, including a plurality of cylinders each having an exhaust pipe provided with a capped opening, of a plug threaded into said opening, an operating member in the form of a rod journaled through the plug and having an angular outer end and an offset inner end, the latter within the exhaust pipe and subject to the action of the exhaust gases, an upright carried by, and having an insulated connection with, the outer end of the plug, a spring engaging the outer angular end of the said operating member whereby to normally hold the same spaced from said contact upright, a source of current, and an indicator in circuit with said source of current and with the contact upright, for the purpose described.

2. The combination with an internal combustion engine including a plurality of cylinders each having an exhaust pipe provided with a capped opening, of a plug threaded into said opening, an operating member in the form of a rod journaled through the plug and having an angular outer end and

an offset inner end, the latter extending within the exhaust pipe and subject to the action of the exhaust gases, an upright carried by, and having an insulated connection with the outer end of the plug, a spring secured to the plug and engaging the outer end of said operating member whereby to normally hold the same spaced from said contact upright, a source of current, and an indicator having a plurality of indicating members corresponding in number to the cylinders of the engine, and each of which indicating members is in circuit with said source of current and with the contact upright of one of the cylinder plugs.

3. The combination with an internal combustion engine, including a plurality of cylinders, each having an exhaust pipe, of an electrical indicator having an indicating member for each cylinder, a source of current in circuit with said indicator and with the several exhaust pipes, spaced contact members adjacent each of the exhaust pipes, one of which is in circuit with its respective indicating member, and the other of which is movable into engagement with the first contact member and has a portion extended into the exhaust pipe and into the path of movement of the exhaust gases.

4. The combination with an internal combustion engine including a plurality of cylinders each having an exhaust pipe, of an indicator including an indicating member for each cylinder, and means controlled by the volume of exhaust in each exhaust pipe for actuating the respective indicating member.

5. The combination with an internal combustion engine including a plurality of cylinders each having an exhaust pipe, of an indicator including an indicator member for each cylinder, and means controlled by the volume of exhaust in each exhaust pipe for actuating the respective indicating member, said means including an operating member for each cylinder, one end of which is extended into the exhaust pipe thereof and directly acted upon by the exhaust gases.

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Witnesses:

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