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D. B. ADAMS.

AUTOMATIC ALARM AND STOPPING DEVICE FOR ENGINES.

APPLICATION FILED SEPT. 30, 1903.

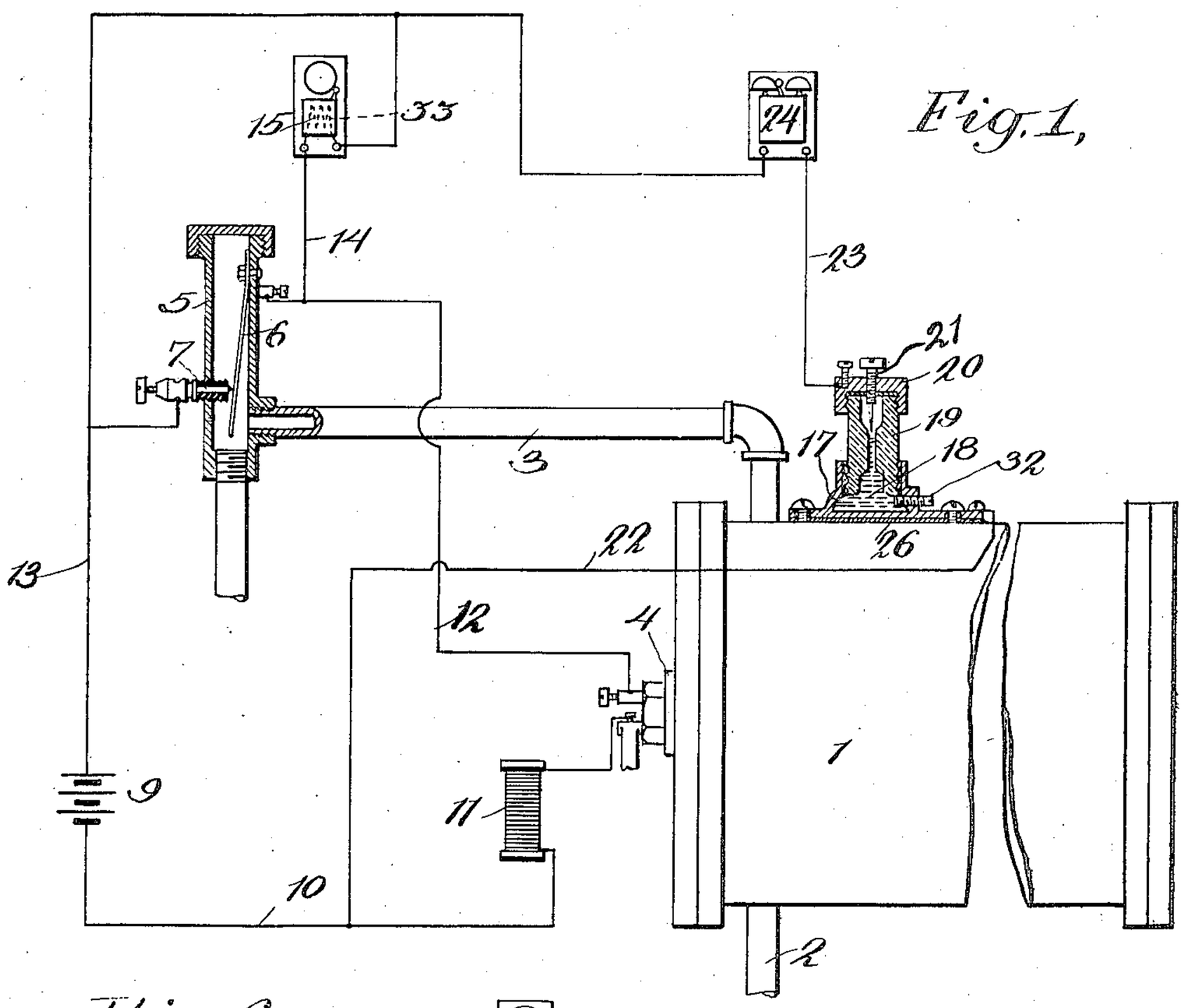


Fig. 1,

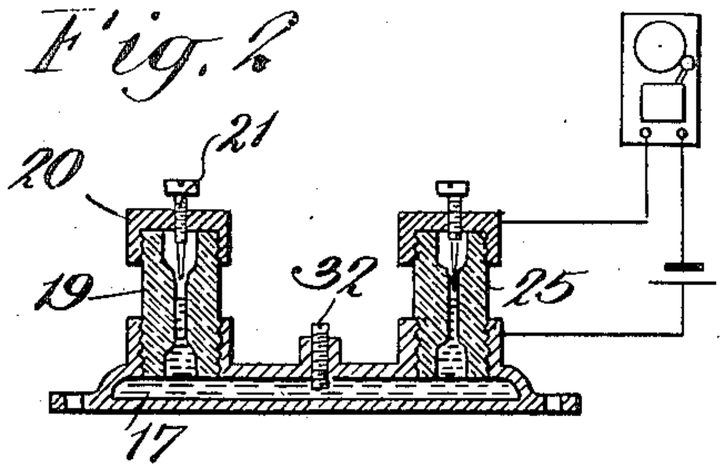


Fig. 4,

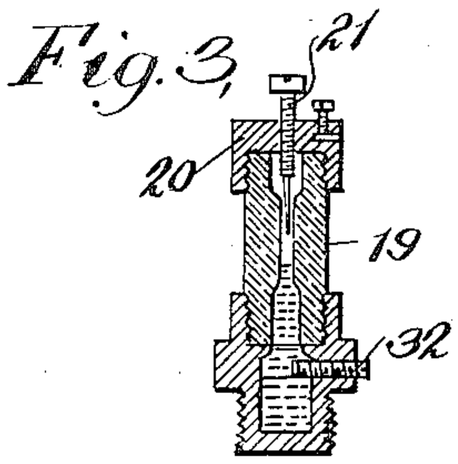
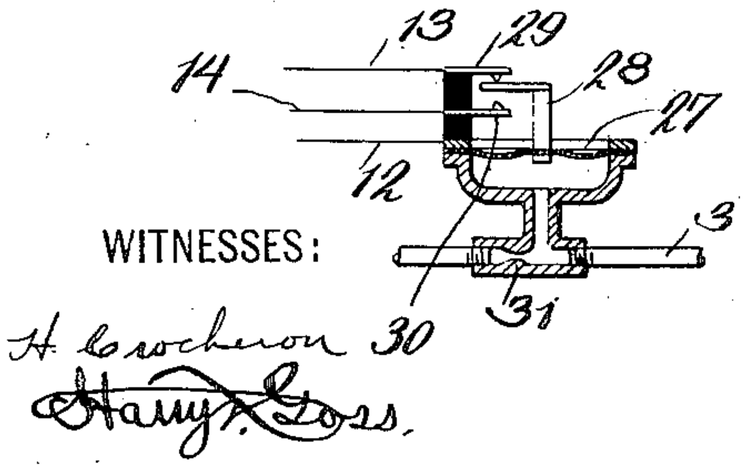
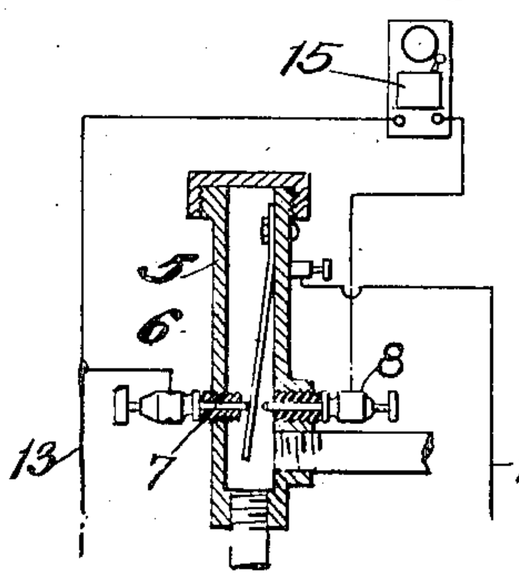


Fig. 5,





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AUTOMATIC ALARM AND STOPPING DEVICE FOR ENGINES.

No. 827,698. Specification of Letters Patent. Patented Aug. 7, 1906.

Application filed September 30, 1903. Serial No. 175,173.

To all whom it may concern:

Be it known that I, DANIEL B. ADAMS, a citizen of the United States, residing at Summitville, in the county of Sullivan and State of New York, have invented certain new and useful Improvements in Automatic Alarms and Stopping Devices for Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to automatic alarms and stopping devices for internal-combustion engines—such, for example, as oil and gas engines.

My invention consists in means for operating an alarm from the ignition-circuit, in automatic means for short-circuiting the ignition-circuit around the igniter to stop the engine, and in other features of invention hereinafter set forth, and particularly pointed out in the claims.

The objects of my invention are to improve and simplify automatic alarms and stopping devices for internal-combustion engines and other machines having cylinders which require to be cooled, to improve the construction of the contact devices employed, to indicate to the eye the temperature of the engine-cylinder, to simplify the wiring and reduce the number of batteries required, and to render the apparatus reliable, efficient, and comparatively inexpensive.

I will now proceed to describe my invention with reference to the accompanying drawings, illustrating certain forms of my invention, and will then point out the novel features in claims.

In the said drawings, Figure 1 is a diagrammatic view showing a portion of the cylinder of a gas or oil engine having my improved alarm and stopping devices applied thereto, showing likewise one system of wiring which may be employed, the hydraulic and thermostatic contact devices being shown in section. Fig. 2 shows a central vertical section of an alternative form of thermostatic contact device which may be employed. Fig. 3 shows a second alternative form of thermostatic contact device which may be employed. Fig. 4 shows a vertical section of a diaphragm contact device which may be substituted for the hydraulically-operated swinging-plate contact device shown in Fig. 1. Fig. 5 indicates an alternative arrangement of the alarm-circuits which may be employed.

I will describe my invention as applied to a gas or oil engine having a water-jacketed cylinder. From such description the application of the invention to internal-combustion engines having other systems of cooling and to other machines having cylinders which require to be cooled will be obvious to those skilled in the art.

In the operation of water-cooled explosive or internal-combustion engines it sometimes happens that the circulation of cooling-water ceases or becomes deficient. This may be due to a variety of causes, such as failure of the water-supply, the accidental closing of a valve, the derangement of a circulating-pump, a leak in the water-supply pipe or the jacket, an obstruction in the water pipes or jacket, and a variety of other causes well known to those having experience in the use of such engines. If the engine is allowed to run after the circulation ceases or becomes deficient, the cylinder becomes overheated, and this may result in burning out the gasket between the cylinder and cylinder-head and in scoring, burning, or cracking of the cylinder. It is important, therefore, that provision be made for stopping the engine automatically in case the circulation of cooling-water ceases or becomes deficient; but it is important also that warning shall be given somewhat in advance of the actual stopping of the engine that the engine it about to be stopped, so that the load of the engine may be thrown off to facilitate restarting of the engine and to permit the engine attendant, if possible, to remedy the trouble in the circulating system in time to avoid stopping the engine.

In the automatic alarm and stopping device herein described I provide means actuated directly by diminution in water-pressure in the circulating system for operating an alarm to give warning that the engine is about to be stopped, and I provide means actuated by rise of temperature of the engine cylinder or jacket for stopping the engine. Such rise in temperature necessarily occurs somewhat after the alarm begins to ring, opportunity being thus given to overcome the trouble in the circulating system, if possible, and to throw off the load of the engine.

Referring now to the drawings and at first to Fig. 1, said figure shows an engine-cylinder 1, provided with a water-supply pipe 2 and a water-discharge pipe 3. It is also provided with an igniter 4, only the external portion of which is shown. To the pipe 3 is attached a contact device operated by diminution of the water-pressure of the engine and consisting of a casing 5, in which the pipe 3 terminates, said casing carrying within it a flexible spring-plate 6, a portion of which is opposite the mouth of pipe 3, said plate adapted normally to be held against a contact-point 7 by the stream of water issuing from pipe 3, but arranged to spring away from said contact-point when the flow of water through pipe 3 ceases or decreases seriously. This hydraulically-operated contact device is included in the ignition-circuit of the engine. In Fig. 1 I have indicated an ignition-circuit such as may be employed with the touch-spark system of ignition, in which the igniter has a movable contact-point actuated by some moving portion of the engine. The said circuit includes a battery 9, a wire 10, leading from one terminal thereof through a spark-coil 11 to one terminal of the igniter 4, another wire 12, leading from the other terminal of the igniter to casing 5, and so to spring 6, and a third wire 13, leading from contact-point 7 back to battery. A branch circuit 14 leads from wire 12 through a bell 15 to wire 13, such circuit including resistance 33 sufficient to prevent ringing of the bell when contact is closed between points 6 and 7, such resistance being ordinarily merely the magnet-coils of the bell, the resistance of which is usually sufficient for the purpose.

So long as the circulation of water continues with sufficient volume the plate 6 will be held in contact with point 7 and the bell will not ring, being short-circuited by the circuit of less resistance through contacts 6 and 7; but when the flow of water ceases or becomes deficient the plate 6 leaves contact 7, thus shunting the ignition-circuit through bell 15 and causing the bell to ring. I preferably employ a bell of the single-stroke variety—viz., a bell having no vibrating spring-reed and contact-points operated thereby—the bell being caused to ring when the igniter-circuit is completed by the engine-igniter; but I do not limit myself to the use of this type of bell, but may use any other type of bell or alarm which is convenient or suitable.

An electric bell or alarm has the advantage that it may be located at a distance from the engine—as, for example, in the office of the shop or mill to which the engine supplies power—this being very desirable when, as often happens, the engine does not have constant supervision. If it is not desired to extend the igniter-circuit to a distance, a relay may of course be substituted for the bell in the circuits above described and caused to close the circuit of a separate bell-circuit, the extension of an alarm-circuit by means of a relay in this manner being a familiar expedient.

Instead of employing the circuit arrangement above described I may employ that shown in Fig. 5, in which the circuits are the same, except that the casing 5 has a back contact 8, the bell 15 being located in a branch circuit 16, leading from contact 8 to wire 13. When the flow of water ceases or becomes deficient, plate 6 breaks contact with point 7 and springs back into contact with point 8, thus shunting the ignition-circuit through the bell.

The above circuits and apparatus are employed to give warning that the engine is about to be stopped. For stopping the engine I employ a device actuated by the rise in temperature of the engine-cylinder which follows the stoppage or serious diminution of the flow of water. This I do because it is not necessary to stop the engine instantly when the flow of cooling-water ceases or becomes deficient. A few minutes will elapse before the water remaining in the jacket will have evaporated and the cylinder heated to such a temperature as to endanger the gasket or the cylinder itself, and it is desirable to be able to utilize the intervening time in endeavoring to overcome the difficulty in the circulating system, if possible, and to throw off the load on the engine before it stops and also when the engine drives machinery through a line-shaft to throw off the load on the line-shaft and stop the machinery in such fashion that it may be started again without difficulty. Various forms of devices actuated by rise in temperature may be employed; but the one which I prefer consists of a base 17 of material, such as metal which will conduct heat readily, said base having a chamber 18, containing mercury or other expansible fluid which is also a good electrical conductor. In a socket in said base is secured a tube 19, of glass or other suitable electrical insulating material, and upon said tube is a cap 20, carrying a contact-screw, the point of which projects into the bore of tube 19, and carrying also a binding-screw for an electric wire. Packing material, such as leather, is interposed between the cap and the top of the tube to exclude air and prevent escape of the mercury. The cap may screw upon the top of the tube, and said tube may be screwed into the base, as in Fig. 3, or may be secured in place in the base by plaster or other cement, as shown in Fig. 1. The tube preferably has at each end an enlargement of its bore, the intervening portion of the bore being of small diameter. A displacement-screw 32 is provided for regulating the level of the mercury. The height of the mercury column should be so regulated that in normal

operation when the engine is running at proper temperature the mercury will rise into the contracted portion of the bore of the glass tube 19, so as to be visible therein, but will not rise into the upper enlargement of the bore so as to make contact with the contact-screw 21; but when the temperature of the engine-cylinder rises too high the mercury rising still farther in the tube will make contact with contact-screw 21, so as to complete an electric circuit. In the arrangement of circuits shown a wire 22 leads from wire 10 of the ignition-circuit to the base of the thermostatic stopping device, and another wire 23 leads from the top cap of said device to the return-wire 13 of the ignition-circuit through a bell 24. Therefore when contact is completed between the mercury and the contact-screw 21 the igniter is short-circuited and the engine will stop.

It is obvious that instead of stopping the engine by short-circuiting the igniter the stopping device may operate by the closing of its circuit to cause the operation of other means for stopping the engine. A bell is preferably included in the circuit of the thermostatic stopping device, because some resistance is preferably employed in said circuit to avoid running down the ignition-battery while the igniter is short-circuited and because the bell, while serving as such resistance, also rings continuously to announce that the engine has stopped. Such bell may be located, when desired, at a point distant from the engine where some person is continuously employed.

The stopping device above described, besides acting to stop the engine before the same becomes seriously overheated, serves to give visual indication of the temperature at which the engine is running and to assure the engine attendant that the circulating system is operating efficiently, the mercury being always in sight in the tube while the engine is running normally.

Instead of locating the alarm-bell 24 in the circuit through which the ignition-current is short-circuited it may be located in a separate circuit, as shown in Fig. 2, the thermostat having a second tube 25, exactly similar to tube 19. In such case the contact-screw of the second tube may, when desired, be set to make contact with the mercury before the corresponding screw of tube 19 makes contact, so that the bell will be rung somewhat in advance of the stopping of the engine.

The thermostats shown in Figs. 1 and 2 are adapted to be screwed to the jacket of the engine, but to be insulated electrically therefrom by insulating material 26, Fig. 1, such as mica, which will not interfere materially with the transmission of heat. When insulation of the thermostat from the engine is not required, the thermostat may be arranged to screw into a suitable hole in the engine-jacket. Such a thermostat is shown in Fig. 3.

Instead of employing in the hydraulically-operated contact device a swinging contact-plate I may employ a diaphragm device, as shown in Fig. 4, the diaphragm 27, carrying a contact-piece 28, adapted to make contact with a contact-point 29 when the water is flowing properly and to make contact with a contact-piece 30 when the flow decreases or ceases. The wiring employed may be the same as that of Fig. 1 or Fig. 5. In employing the diaphragm device the water-pipe 3 is preferably provided with a contraction 31 just beyond the diaphragm device to provide the pressure necessary to operate the same.

In another application for Letters Patent, filed May 23, 1902, Serial No. 108,630, I have claimed the general construction of the hydraulically-operated contact device 5, comprising a casing, a swinging contact-plate located in the path of the water, and a contact-point adapted to make contact therewith; also, an automatic stopping device arranged to stop the engine by interrupting the igniter-circuit when the flow of cooling-water ceases or decreases; also, means for operating an alarm coincidently with diminution in water-pressure in the jacket. In a further application for Letters Patent, filed August 29, 1902, Serial No. 121,416, I have claimed the use of a thermostat located in proximty to the engine-jacket for breaking the ignition-circuit to stop the engine. Therefore I do not claim such inventions herein.

It is obvious that the devices described above are only particular embodiments of my invention and that the same is susceptible of many variations and modifications without departing from the spirit and scope thereof. I do not limit myself to the particular details of construction and arrangement herein illustrated and described.

The contact-screw 21 and also the binding-screw of cap 20 may have heads of insulating material to prevent possible shocks to the operator when adjusting the device.

In Fig. 1 the hydraulically-operated alarm-operating device and the thermostatic stopping device are shown in connection with the circuits of a touch-spark system of ignition. When these devices are to be fitted to an engine having a jump-spark system of ignition, in which the ignition-battery is in a primary circuit of an induction-coil, which circuit is arranged to be broken by a vibrator or interrupter operated by the engine or otherwise and the igniter-contacts are in a secondary circuit of the induction-coil, the alarm-operating device will be caused to shunt the primary circuit of the coil through the alarm when the flow of cooling-water diminishes, and likewise the thermostat will be

arranged to short-circuit the primary circuit around the terminals of the induction-coil to stop the engine.

What I claim is—

1. The combination with an internal-combustion engine having an electric ignition-circuit, of an electrically-operated alarm, and means automatically operated for operating the same from the ignition-circuit.

2. The combination with an internal-combustion engine having an electric ignition-circuit, of an electrically-operated alarm, and means automatically operated for switching the same into said ignition-circuit.

3. The combination with an internal-combustion engine having an electric ignition-circuit, and having also means for supplying cooling-water, of an electrically-operated alarm, and a hydraulically-operated switching device operated by diminution in flow of cooling-water, and arranged to switch said alarm into said ignition-circuit.

4. The combination with an internal-combustion engine having an electric ignition-circuit, of an automatic stopping device provided with means for short-circuiting said ignition-circuit.

5. The combination with an internal-combustion engine having an electric ignition-circuit, of a thermostatic stopping device provided with means for short-circuiting said ignition-circuit.

6. The combination with an internal-combustion engine having an electric ignition-circuit and having means for supplying cooling-water to its cylinder, of alarm-operating means arranged to cause operation of an alarm by said circuit upon diminution in the flow of cooling-water, and an automatic stopping device arranged to short-circuit said ignition-circuit.

7. The combination with an internal-combustion engine having an electric ignition-circuit, of a thermostat arranged to be affected by rise of temperature of the engine-cylinder, and comprising a chamber containing an expansible electrically-conductive fluid, and a contact member with which such fluid may make contact upon expansion, said fluid and contact member electrically connected to the ignition-circuit and arranged, when they make contact, to complete a shunt-circuit by which ignition is prevented.

8. The combination with an internal-combustion engine having an ignition-circuit, of an electrically-operated alarm connected to said circuit, and an automatic contact device arranged to complete or break a short circuit across the terminals of said alarm.

9. The combination with an engine-cylinder having means for supplying cooling-water thereto, an electric circuit, and an electrically-operated alarm connected thereto, of means automatically operated upon diminution in the flow of cooling-water, normally completing a short circuit across the terminals of said alarm, but arranged when operated to break said short circuit.

In testimony whereof I affix my signature in the presence of two witnesses.

DANIEL B. ADAMS.

Witnesses:

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