No. 872,039. PATENTED NOV. 26, 1907.

D. B. ADAMS.

AUTOMATIC ALARM AND STOPPING DEVICE FOR ENGINES.

APPLICATION FILED SEPT. 30, 1903.

2 SHEETS—SHEET 1.

Fig. 1.

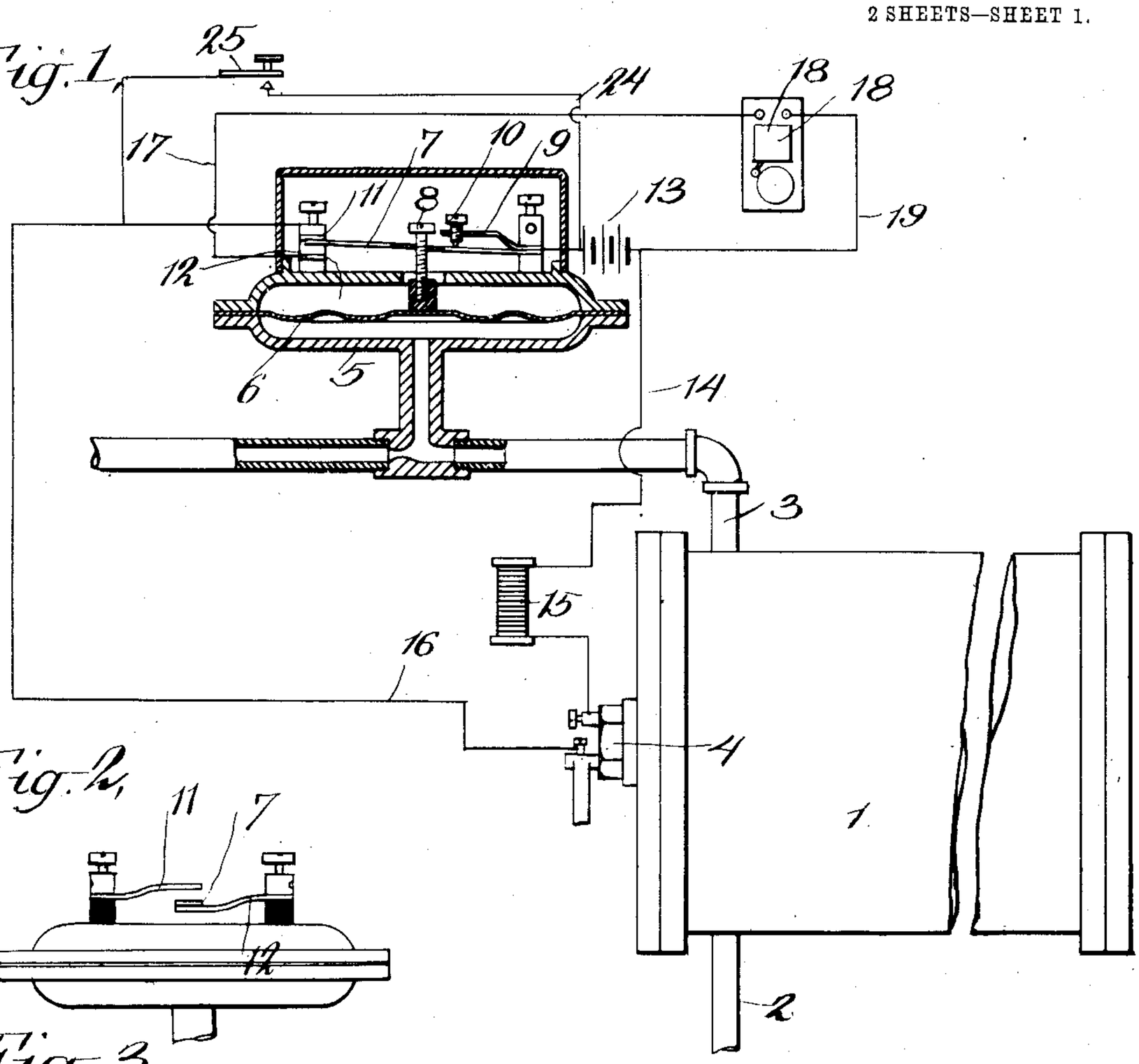
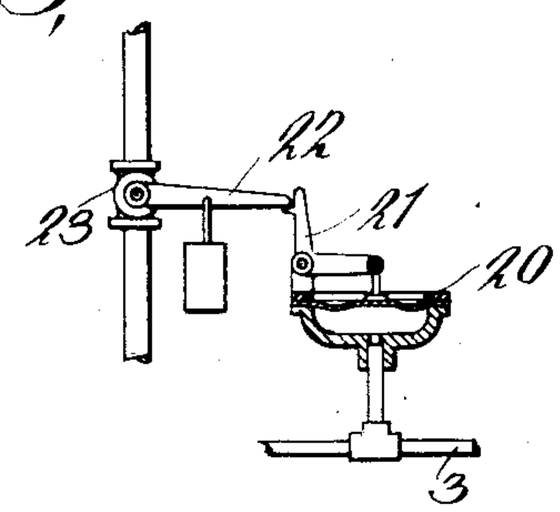


Fig. 2.

Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4,

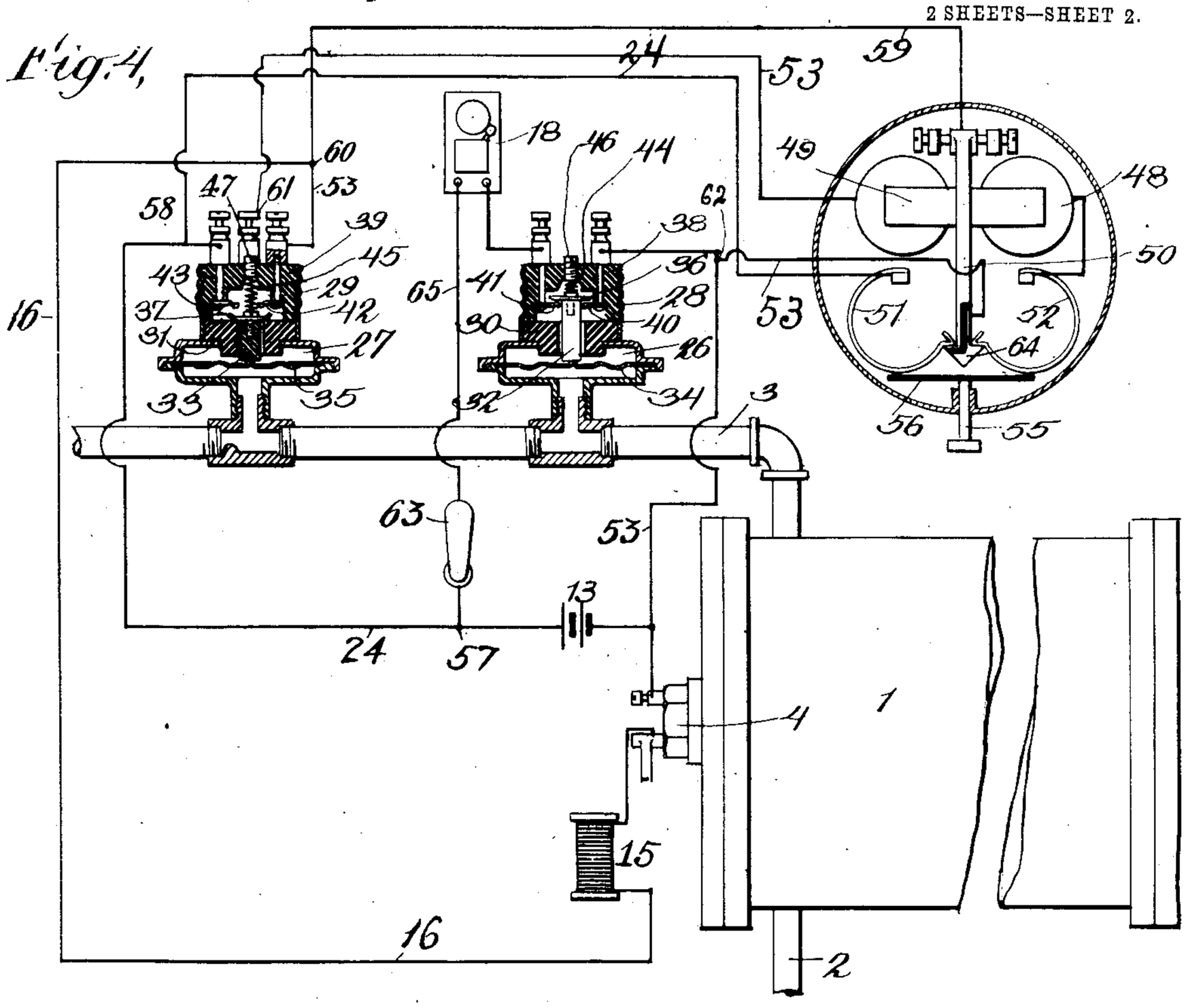
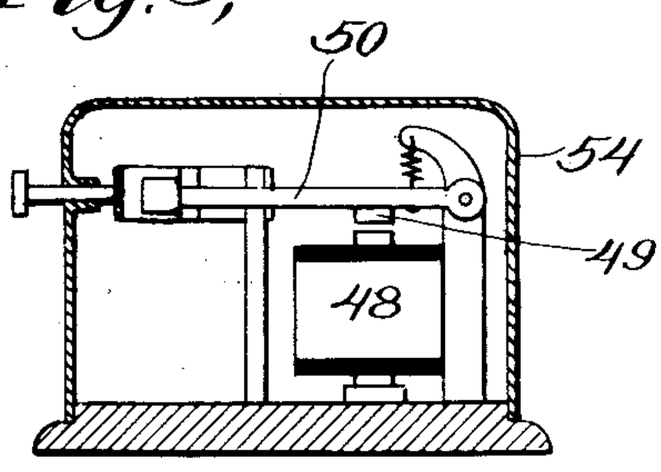


Fig. 5,



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AUTOMATIC ALARM AND STOPPING DEVICE FOR ENGINES.

No. 872,039. Specification of Letters Patent. Patented Nov. 26, 1907.

Application filed September 30, 1903. Serial No. 175,174.

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 same, 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, and for other machines having cylinders which require to be cooled.

My invention consists in the novel hydraulically-operated contact device adapted, when the flow of cooling water ceases or decreases, to stop the engine and operate an alarm; in the use of a diaphragm, operated by pressure in the circulating system of the engine or machine, for stopping such engine or machine when the water pressure decreases; and in various 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 stopping devices and alarms for internal combustion engines and other machines having water-cooled cylinders, and to render the same light, compact, free from liability to derangement, and relatively 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 device applied thereto. Fig. 2 is a detail view, taken at right angles with respect to Fig. 1, showing the arrangement of contact points. Fig. 3 is a detail view illustrating the use of a diaphragm for operating a fuel valve mechanically. Fig. 4 is a diagrammatic view showing another form of hydraulically-operated alarm and stopping device, and showing also an automatic switch for breaking the shunt-circuit used in starting the engine, after the engine is started. Fig. 5 shows a side view and partial section of the said automatic switch.

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. It is desirable, also, that warning shall be given when the engine is so stopped, so that the cause of its stopping shall be known immediately, thus avoiding the necessity of looking the engine over to discover the reason for its stopping.

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 diaphragm chamber or casing 5, connected preferably to the discharge pipe 3, and provided with a diaphragm 6. This diaphragm I preferably arrange to operate contact points controlling some electric circuit, such as the ignition circuit, the breaking or completing of which controls the operation of the engine. To this end, a flexible spring contact piece, 7, is secured to the diaphragm casing, and is pro-

vided with a screw 8, resting against the diaphragm and arranged to be moved thereby. To insure that this contact piece 7 shall always follow the diaphragm, I further provide a flat spring 9, fixed at one end, and provided at the other end with an adjusting screw 10 the point of which rests against the contact piece 7. Said contact piece, near its end, works between two spring contact pieces, 11 and 12, insulated from each other, and from the contact piece 7 except when in contact therewith, and arranged, the one to make contact with contact piece 7 when the diaphragm is distended by pressure behind it, the other to make contact with contact piece 7 when the pressure behind the diaphragm has decreased to such extent that said diaphragm is pressed inward by the spring 9. Circuits which may be used with this contact device are shown in Fig. 1, said circuits being the ignition circuit of the engine, which said contact device is arranged to break when operated, and a bell circuit arranged to be completed when the ignition circuit is broken. The ignition circuit shown is one which 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 13, a wire 14 leading from one terminal thereof through a spark-coil 15 to one terminal of the igniter 4, another wire 16 leading from the other terminal of the igniter to contact piece 11, and a wire connecting the contact spring 7 with the other terminal of the battery. This circuit is complete so long as water pressure in pipe 3 keeps contact spring 7 in contact with contact piece 11; but if for any reason the water pressure decreases to such extent that the circulation is insufficient to keep the engine cylinder at proper temperature, the spring 9 will press spring 7 and the diaphragm inward, breaking the ignition circuit, thus stopping the engine, and completing a circuit from the battery through contact springs 7 and 12, conductor 17, bell 18, and conductor 19 back to battery, thus causing the bell to ring. It is preferable to apply this stopping device and alarm to the water discharge pipe, rather than to the water supply pipe, because there may be considerable water pressure in the supply pipe without water being present in the jacket, in sufficient quantity. Thus, there may be a stoppage in the water supply pipe, or in the jacket, or there may be a leak in the jacket, or the jacket drain-cock may be open. In all of these cases, a stopping device attached to the supply pipe may not stop the engine, while one attached to the discharge pipe will do so.

To provide in the discharge pipe the slight back pressure necessary to keep the diaphragm pressed out while the circulation continues, it may be advisable in many cases to provide, in the discharge pipe, beyond the point of connection of the diaphragm chamber thereto, a contraction 20.

It is obvious that various other circuits, which may be operated by the diaphragm contact device to stop the engine, may be employed. If the engine is provided with the jump-spark system of ignition, in which the ignition battery is in a primary circuit of an induction coil, the igniter being in the secondary circuit of such coil, the stopping device will be arranged to break the primary circuit of the coil, just as it breaks the ignition circuit shown in Fig. 1.

In starting the engine, it may be necessary to complete the ignition circuit around the automatic stopping device until circulation at the normal rate is established. This is necessary for example when circulation is produced by a circulating pump driven by the engine. For this purpose, I provide a branch circuit 24 bridging the automatic stopping device, and containing a key 25 which, when depressed, completes the branch circuit. In starting the engine, this key will be closed until the engine is in full operation. But instead of the key 25, I may use the automatic device shown in Fig. 4 for closing the branch circuit when starting the engine, and opening said branch circuit automatically at the proper time.

Instead of controlling the engine by its ignition circuit, the diaphragm may be caused to operate a fuel valve, to shut off the supply of fuel. Such an arrangement is shown in Fig. 3, in which the diaphragm, 20, is arranged, when the pressure behind it decreases, to operate a trip 21, releasing the weighted arm 22 of a fuel-valve 23 in the fuel-supply pipe of an engine, thus causing said valve to cut off the supply of fuel.

In Fig. 4 I show another form of hydraulically-operated device for automatically operating an alarm and stopping the engine. This device comprises two diaphragm chambers, 26 and 27, both connected preferably to the same water discharge pipe of the engine. These diaphragm chambers are provided with sockets 28 and 29, adapted to receive plugs 30 and 31 of insulating material. Each of these plugs is provided with a central bore adapted to receive a rod 32 or 33, normally resting on the diaphragm 34 or 35, and provided at its upper end with a flanged piece of copper or other electrically conductive material, 36 or 37. The sockets 28 and 29 further contain plugs 38 and 39 of insulating material, carrying binding posts and corresponding contact pieces adapted to make contact with the contact piece 36 or 37. The contact pieces, 40 and 41, of the diaphragm chamber 26, are below the flange of the contact piece 36, being so arranged that when said contact piece is in its lowermost position, it will connect contact pieces

40 and 41. This diaphragm device operates a circuit containing an alarm bell 18. The contact pieces 42 and 43 of diaphragm chamber 27, are arranged to make contact with contact piece 37 when said contact piece is raised by pressure behind the diaphragm. These contacts are in the ignition circuit of the engine, and correspond to contact pieces 7 and 11 of the device shown in Fig. 1. Springs 44 and 45, arranged to be adjusted by screws 46 and 47, tend to press rods 32 and 33 against their respective diaphragms.

In the operation of this device, supposing the engine to be in full operation, if the water pressure in the discharge pipe decreases seriously, both diaphragms 34 and 35 will be pressed inward by said springs, and thereby contact piece 37 will break contact with contact pieces 42 and 43, thus breaking the ignition circuit and stopping the engine, and contact piece 36 will make contact with contact pieces 40 and 41, thus closing the alarm circuit. For starting the engine I provide, as in Fig. 1, a branch circuit 24 to complete the ignition circuit around the automatic stopping device until the engine is in full operation; and in this branch circuit is an automatic switch illustrated diagrammatically in Fig. 4, which breaks the branch circuit as soon as contact is established between contact piece 37 and contact pieces 42 and 43. The said switch comprises a magnet 48 having an armature 49 and armature lever 50; and two contact springs 51 and 52, adapted to make contact with said armature lever. The switch is inclosed in casing 54, through which projects a button 55, having at its inner end a T-head 56, of insulating material, adapted to press in both springs 51 and 52. The end of the armature lever and the ends of these springs are so formed that when said springs are pressed inward by the push button, they spring into engagement with the head 64 of the armature lever; and when the magnet 48 is energized by the completion of the circuit through it, and its armature drawn down, the head of the armature lever drops below the springs 51 and 52, thus releasing them and permitting them to fly out. The circuits shown in the drawings in connection with this switch may be traced as follows: from battery 13, through wire 24, junction points 57 and 58 and through the contact spring 51 of the switch, and the armature lever 50, and through wire 59 to junction point 60 and thence through wire 16, sparking coil 15 and the igniter back to battery 13. This circuit is short-circuited between points 58 and 60, through contact pieces 43—37—42 of diaphragm contact device 27, when water circulation through the engine jacket has been established sufficiently to raise diaphragm 35. Another circuit, completed when diaphragm 35 is raised, passes from 58, through contacts 43, 37, and a contact similar to 42, but hidden in the drawing by spring 45, to binding post 61, and thence by wire 53, through the magnet 48 of the automatic switch, spring 52 of that switch and insulated end section 64 of the armature, and through a continuation of wire 53 back to battery. This last circuit is broken when magnet 48 attracts its armature and breaks contact between 52 and 64.

In starting the engine, the operator presses in the button 55, so as to complete the ignition circuit from battery 13 through wire 24, past point 58, and through spring 51, armature lever 50 and wires 59 and 16, sparking coil 15 and the igniter, back to battery, and then starts the engine in the ordinary way. As soon as circulation is fully established, contact piece 37 of diaphragm contact device 27 is raised into contact with contact pieces 42 and 43, and thereby the ignition circuit is completed around the automatic switch, and at the same time the circuit through wire 53 and the magnet 48 of that switch is completed, thus energizing said magnet and causing it to attract its armature, releasing contact springs 51 and 52, and thereby breaking the circuit through the magnet and the ignition circuit first established through contacts 50 and 51. I ordinarily provide in the circuit 65 of the alarm bell 18, a switch 63 which may be opened by hand to prevent continuous operation of the bell while the engine is not running.

The automatic stopping and alarm operating devices above described, embody certain features illustrated, described and claimed in prior applications for Letters Patent filed on May 23, 1902, Serial No. 108,630, and on August 29, 1902, Serial No. 121,416; also certain features covered by a companion application, filed September 30, 1903, Serial No. 175,173; and by another application filed Nov. 30, 1903, Serial No. 183,112, a division of application, Serial No. 108,630, above mentioned.

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.

What I claim is:—

1. The combination with an internal combustion engine having a water-cooled cylinder, a water pipe therefor, electric igniting means comprising an ignition circuit, a diaphragm chamber connected to said water pipe, and a diaphragm arranged to be operated by variation in water pressure in said pipe, of contact points operated by said diaphragm, and controlling said ignition circuit.

2. The combination with an internal com-

bustion engine having a water-cooled cylinder, a water pipe therefor, electric igniting means comprising an ignition circuit, a diaphragm chamber connected to said water pipe, and a diaphragm arranged to be operated by variation in water pressure in said pipe, of contact points operated by said diaphragm and arranged when the water pressure decreases to break said ignition circuit.

3. In an engine-stopping device, the combination with fluid-pressure-operated means comprising a pressure chamber, and a water-passage connected with said chamber having a contraction beyond the point of connection of said chamber thereto in the direction of flow of the water, of means operated by said fluid-pressure-operated means for controlling the operation of the engine.

4. In an engine-stopping device, the combination with a diaphragm chamber, a diaphragm therefor, and a water-passage connected with said chamber, having a contraction beyond the point of connection of said chamber thereto in the direction of flow of the water, of means operated by said diaphragm for controlling the operation of an engine.

5. The combination with an internal combustion engine having an electric ignition circuit, of means for stopping the engine arranged to automatically break said ignition circuit, a branch circuit for use in starting the engine, bridging said automatic stopping means and therefore nullifying action of said stopping means during the starting of the engine, and automatic means for completing or breaking said branch circuit.

6. The combination with an internal combustion engine having an electric ignition circuit and a hydraulically-operated stopping device arranged to interrupt said ignition circuit, of a branch circuit for use in starting the engine, bridging said automatic stopping device and therefore nullifying action of said stopping means during the starting of the engine, and an automatic switch arranged to break such circuit when the engine is in operation.

7. The combination with an internal combustion engine having an electric ignition circuit, of automatic stopping means controlling said ignition circuit, a branch of said ignition circuit for use in starting the engine, bridging said automatic stopping means and therefore nullifying action of said stopping means during the starting of the engine, and a switch, arranged to complete such branch circuit and operated by said automatic stopping means, to break said branch circuit.

8. The combination with an internal combustion engine having an electric ignition circuit, of automatic stopping means controlling said ignition circuit, a branch of said ignition circuit bridging said automatic stopping means, and a switch controlling such branch circuit, arranged to be operated by hand to complete the same, and to be operated by said automatic stopping means to break the same.

9. The combination with an internal combustion engine having a water-jacketed cylinder and means for conveying water thereto and therefrom, comprising, with the jacket, a circulating system, said engine having also an electric ignition circuit, of automatic stopping means, operated by water flowing through the circulating system, controlling said ignition circuit, a branch of said ignition circuit bridging said automatic stopping means, and a switch, arranged to complete such branch circuit and operated by said automatic stopping means, to break said branch circuit.

10. The combination with an internal combustion engine having a water-jacketed cylinder and means for conveying water thereto and therefrom, comprising, with the jacket, a circulating system, said engine having also an electric ignition circuit, of automatic stopping means, operated by water flowing through the circulating system, controlling said ignition circuit, a branch of said ignition circuit bridging said automatic stopping means, and a switch controlling such branch circuit, arranged to be operated by hand to complete the circuit and to be operated by said automatic stopping means to break such circuit.

11. The combination with an internal combustion engine having an electric ignition circuit, and an automatically operated switch for interrupting said circuit, of a branch of said ignition circuit bridging said switch, a switch arranged to complete such branch circuit and comprising electrically operated means for breaking said branch circuit and means for operating said last named switch.

12. The combination with an internal combustion engine having an electric ignition circuit, and an automatically operated switch for interrupting said circuit, of a branch of said ignition circuit bridging said switch, a switch arranged to complete such branch circuit and comprising electrically operated means for breaking said branch circuit, and a circuit controlling said last named switch and controlled by said first named switch.

13. The combination with an internal combustion engine having an electric ignition circuit and an automatically operated switch for breaking said circuit, of a branch of said ignition circuit bridging said switch, and an automatic switch for breaking such branch circuit, comprising contacts through which said branch circuit may pass, hand-operated means for closing said contacts, an

electro-magnet and means operated thereby for causing said contacts to separate, and a controlling circuit for said magnet.

14. The combination with an internal combustion engine having an electric ignition circuit, and automatic stopping means controlling such circuit, of a branch of said ignition circuit bridging said automatic stopping means, an automatic switch controlling such branch circuit, and comprising a controlling magnet, a movable armature therefor, contacts for said branch circuit operated by said armature, and hand-operated means for closing both said contacts; and a controlling circuit for said magnet, completed by said automatic stopping means when the ignition circuit is completed therethrough, whereby the switch is operated and the said branch circuit is broken.

15. The combination with an internal combustion engine having an electric ignition circuit, and automatic stopping means controlling such circuit, of a branch of said ignition circuit bridging said automatic stopping means, an automatic switch controlling such branch circuit and comprising a controlling magnet, a movable armature therefor having shouldered portions, one insulated from the other, two contact springs arranged each to be pressed into engagement with one of said shoulders and to be released therefrom by movement of the armature, and means for pressing said springs into engagement with such shoulders; and a controlling circuit for said magnet passing through one of the contacts of the switch and arranged to be completed by said automatic stopping means when the ignition circuit is completed through said automatic stopping means.

16. The combination with an internal combustion engine and automatic stopping means therefor, of a starting device arranged to render said automatic stopping device ineffective when starting the engine, and means for rendering said starting device ineffective after the engine is in full operation.

17. The combination with an internal combustion engine having a water jacketed cylinder, and automatic stopping means operated by diminution in the flow of cooling water to stop the engine, of a starting device adapted to be operated to render said automatic stopping device ineffective when starting the engine, and means for rendering said starting device ineffective after the engine is in full operation.

18. In connection with a water cooled explosion engine provided with means for supplying cooling water to it, a sparking circuit, an alarm circuit, and switching means actuated by varying pressure in the cooling circuit, arranged to break the ignition circuit and to complete the alarm circuit upon diminution of pressure in the cooling circuit.

19. In connection with water pipes arranged to convey cooling water to an explosive engine, a sparking circuit, an alarm circuit, a switch and means actuated by varying pressure of water in the cooling circuit, for shifting the switch between the sparking circuit and the alarm circuit, substantially as described.

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

DANIEL B. ADAMS.

Witnesses:
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MINERVA PAPE.