

July 28, 1936.

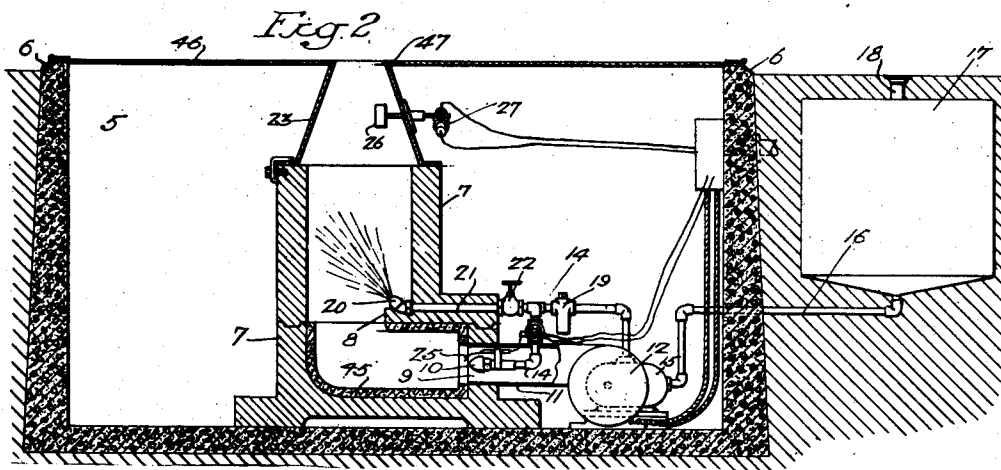
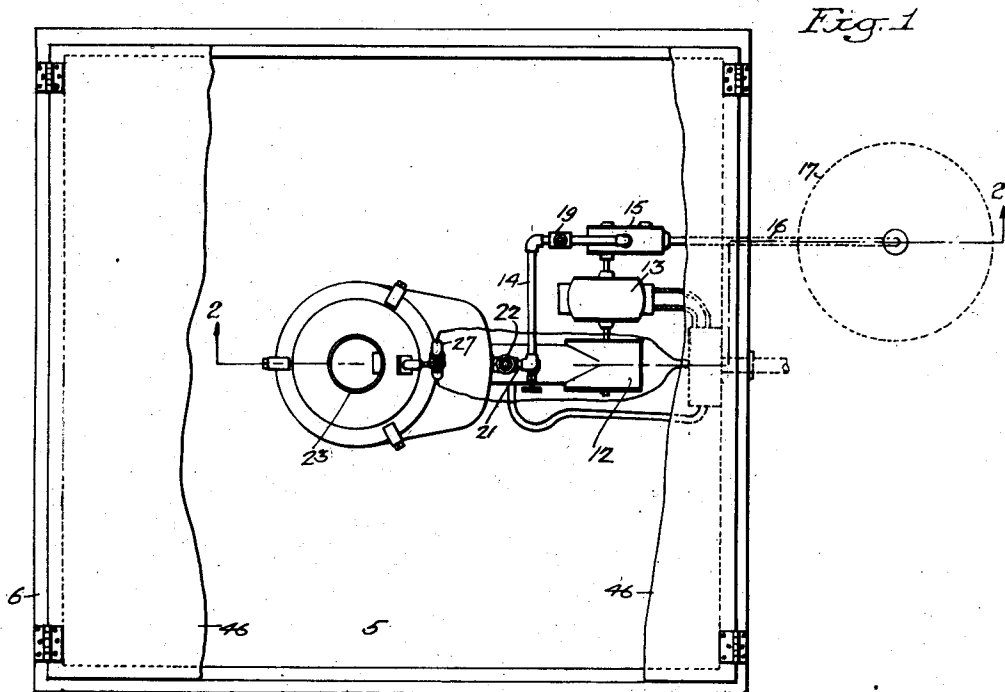
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2,048,997

SIGNALING DEVICE

Filed Sept. 21, 1932

2 Sheets-Sheet 1



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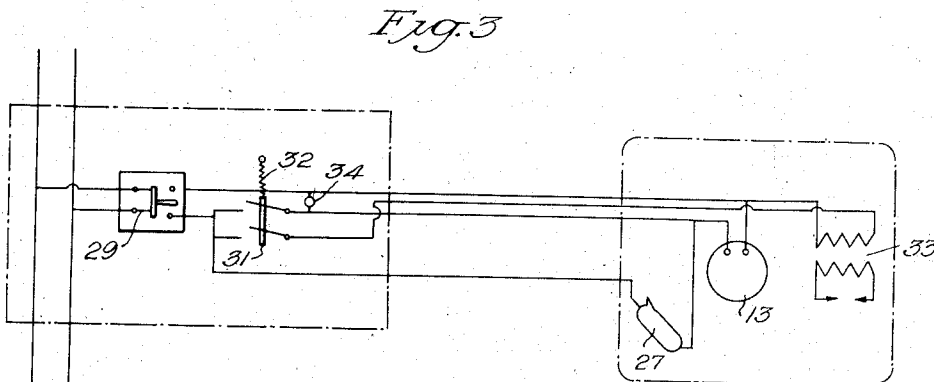
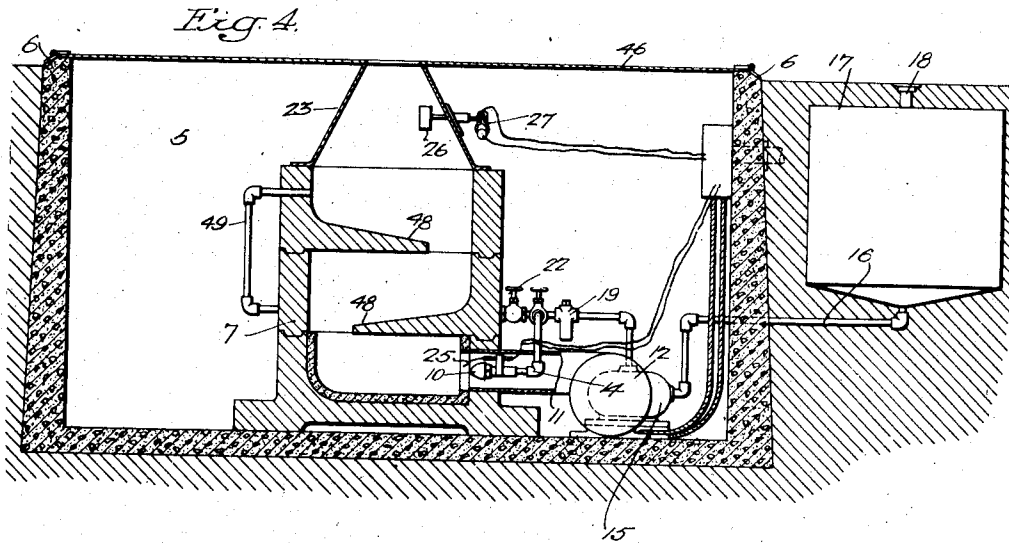
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UNITED STATES PATENT OFFICE

2,048,997

SIGNALING DEVICE

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9 Claims. (Cl. 158-4)

This invention relates to improvements in devices for indicating to aviators the direction and approximate force of air currents at the surface of the ground.

One object of the invention is to provide means for clearly indicating the direction and approximate intensity of ground air currents.

Another object of the invention is to provide an indicating device of the stated character which shall be characterized by extreme sensitiveness and which will indicate clearly changes both in the direction and approximate intensity of air currents adjacent the ground surface.

Still another object of the invention is to provide a device of the stated character which shall clearly and positively indicate an absence of air currents at the ground surface.

A still further object of the invention is to provide a device of the stated character which shall be capable of efficient operation over extended periods of time without attention or observation.

Another object of the invention is to provide in a device of the stated character means for controlling the operation of the device from a remote point, removed, for example, from the landing field in which the device normally would be installed, thereby avoiding hazard to attendants who otherwise would be required to go onto the landing field in starting or stopping the device.

The invention further contemplates the provision of a device of the stated character which shall be capable of operating entirely from a single and inexpensive grade of liquid fuel.

Still another object is to provide means for controlling the color of the smoke to insure a sufficient color contrast between the vapor and its background as viewed from above.

The invention further resides in certain novel structural and mechanical features and details hereinafter set forth and illustrated in the attached drawings, in which:

Fig. 1 is a plan view of the smoke-generating apparatus;

Fig. 2 is a section on the line 2-2, Fig. 1;

Fig. 3 is a diagrammatic view illustrating the electrical system of control, and

Fig. 4 is a sectional view similar to that of Fig. 2 but illustrating a modification within the scope of the invention.

The indicator comprises a device for generating and emitting a column of smoke or vapor, this generating device being preferably sunk beneath the ground level. In practice, the smoke or va-

por emitted from the generator at the ground surface will tend to rise in a vertical column and will do so when there is no wind at the ground surface. The column, however, is immediately displaced by any wind or air current adjacent the ground surface, and the degree of displacement and the velocity of the vapor affords an indication of the force of the displacing air current. Any air current of substantial strength carries the smoke or vapor directly over the surface of the ground, and in any event the streamer or column of smoke may be readily discernible from the air and will afford an accurate indication not only of the direction of the wind at the immediate ground surface, in which the aviator is primarily interested, but also the approximate intensity thereof, this latter indication being a property of velocity of the vapor or of the angle formed by the smoke streamer with the ground surface.

The generating and emitting apparatus is shown in Figs. 1 and 2. The device in its simplest form consists of a pit 5, the walls and bottom of which may be formed of concrete. Preferably the tops of the side walls of the pit rise slightly above the surface of the ground, as indicated at 6, and the ground surface is sloped slightly away from the pit in order to effectively exclude surface water from the pit. Suitable drains may be provided in the pit if necessary. Mounted in the bottom of the pit is a pot 7 having in the side thereof and below the lowermost baffle an opening 9 for access to the interior of the pot of a flame generated in the present instance by an oil burner. A type of burner found suitable for the purpose comprises an atomizing nozzle 10 which is mounted in the interior of a pipe 11, one end of this pipe being mounted in the opening 9 of the pot 7 and the other end connecting with the casing of a suitable blower 12. This blower is operatively connected with the shaft of an electric motor 13. The nozzle 10 is connected through a pipe 14 with a fluid pump 15, also operatively connected as illustrated with the electric motor 13. The pump 15 is connected through a pipe 16 with a tank 17 located as shown in Fig. 2 below the ground surface and having a feeder pipe 18 opening at the surface of the ground through which the tank may be filled, as required, with oil or other suitable liquid fuel. The pipe 14 is provided with a pressure regulator 19 which insures that oil discharged into the pipe 14 by the pump 15 shall pass to the atomizing nozzle 10 at a predetermined minimum pressure. This valve 19 also functions to close the pipe 14

when the pump 15 is either inoperative or fails to deliver the oil from the tank to the pipe 14 at the aforesaid minimum pressure. Extending from the pipe 14 is a pipe 21 which as shown in Fig. 2 passes through the side of the pot 7. This pipe is provided with a valve 22 through which the amount of oil discharged through the pipe 21 may be regulated as required. The pipe 21 terminates in a nozzle 20 located at the upper side of a ledge 8 projecting into the interior of the pot. Through the pipe 21 and nozzle 20 oil is introduced into the pot in the form of a semi-atomized spray and is projected preferably upwardly, as shown, from the combustion chamber in the bottom of the pot.

In operation, sufficient heat is generated by the oil burner in the bottom of the pot to immediately and continuously vaporize the oil injected as described from the nozzle 20, the vapor thus generated passing upwardly through a frusto-conical hood 23 at the top of the casing and passing from the top of this hood to form the column or streamer of smoke previously described. It will be noted that in the present instance the device utilizes the same fluid medium for forming the smoke or vapor as is used in the heat-generating unit.

For remote control of the device, I provide an electric igniter including a spark gap 25 positioned adjacent the nozzle 10 and a thermostatic regulator 26 located in the interior of the hood 23 and operatively connected with a mercury switch 27 located exteriorly of the hood 23 as illustrated. The electrical control system is illustrated in Fig. 3. Current is drawn from a suitable remote source of potential through the line 28 and through a service switch 29 connected therewith. Flow of current to the control circuit is regulated by a normally open switch 31 and the switch 27 previously mentioned, which latter switch is also open during such periods as the vapor emitter is inoperative. Assuming that the device is inoperative, operation is instituted from the remote control point by momentarily closing the switch 31, which switch is normally held open by a spring 32. Closing of the switch 31 permits flow of current to a transformer 33 operatively connected with the spark gap 25 as illustrated, and also permits flow of current to the electric motor 13. Energization of the motor 13 and of the igniting device 33-25 causes oil to be fed by the pump 15 to the nozzle 10 and ignition of the atomized vapor passing from the nozzle. Oil is also passed through the pipe 21 to the nozzle 20 and thence to the interior of the pot, and this oil is vaporized by the heat generated from the nozzle 10, the vaporized oil passing upwardly through and out of the hood 23. Emission of vapor indicates that the device is operating normally, and pressure on the switch 31 is thereupon released, permitting this switch to open. The heat generated in the pot 7 and by the vapor passing from the pot acts upon the thermostat 26 to actuate and to close the mercury switch 27. When this switch is closed, current is continuously supplied to the motor 13, maintaining operation of that element of the device after the switch 31 has been opened. Opening of the switch 31, however, breaks the circuit through the igniting device 33-25. A pilot light 34 is provided in a shunt circuit around the motor 13. This pilot light burns continuously while the motor is in operation, and when extinguished indicates that the motor circuit has been broken. Operation of the device

may be interrupted from the remote control position by opening the switch 29.

It will be noted that the pot 7 is provided in its lower portion with a lining 45 of fireclay or other suitable refractory material protecting the pot from the effects of the flame projected from the nozzle 10. The pit 5 is provided with hinged cover-plates 46 which meet approximately at the center of the pit and which are provided with an opening 47 which registers with the open top of the hood 23. These cover-plates 46 are preferably made of heavy metal and are of sufficient strength to support any load which might reasonably be imposed upon them. In some instances, the vapor generated as described above may be so nearly the color of the ground as to be not readily discernible from above. This condition may be readily corrected by introducing with the vapor-producing material a coloring or dyeing medium producing a strongly contrasting color in the vapor column; or a vaporable material may be selected to produce a vapor of desired color.

The aforescribed device constitutes a simple relatively inexpensive and highly efficient means for indicating the direction and approximate intensity of ground air currents for airport purposes. The simple electrical circuit provides for complete control of the operation of the device from a remote point, and the device is capable of continuous operation over extended periods without attention. A marked simplification is also afforded by the utilization of a single fluid medium both as the smoke or vapor-generating medium and as the heating medium.

There may be modification in the structural and mechanical details and in the arrangement of elements without departure from the invention. In Fig. 4, for example, I have illustrated such a modification, wherein the pot 7 is provided with overlapping vertically spaced baffles 48 and wherein the oil or other vapor-forming medium is introduced into the pot through a pipe 49 at a point above the uppermost baffle. The baffles are heated by the oil burner, which as previously described projects a flame into the bottom of the pot, and the oil falling upon the heated baffles 48 from the pipe 49 is vaporized, the vapor passing from the pot as previously described. While this latter method of vapor generation may be employed, the method first described, in which the vaporable medium is introduced into the pot in the form of a spray, is desirable by reason of its relatively high efficiency and by the fact that its capacity for vapor generation is considerably greater than the method illustrated in Fig. 4.

I claim:

1. The method of producing visible vapor for signal purposes, which consists in forming a spray of a heat-vaporable substance, heating said spray to vaporization, and discharging said vapor into the atmosphere.
2. The method of producing visible vapor for signal purposes, which consists in heating an area to a predetermined temperature, injecting into said area a spray of a heat-vaporable substance whereby said substance is vaporized, and discharging said vapor into the atmosphere.
3. The method of producing visible vapor for signal purposes, which consists in passing heated gases through a flue, injecting into said flue in the form of a spray a substance vaporable at the temperature of said gases whereby the resultant

vapor is discharged from the flue to the atmosphere.

4. In a signaling device, the combination with a flue discharging to the atmosphere, of means for passing heated gases through the flue, and means for injecting into said flue a spray of a substance vaporable at the temperature of said gases.

5. In a signaling device, the combination with a combustion chamber and a flue extending therefrom to the atmosphere, of heating apparatus associated with said chamber, an atomizer associated with the flue, and means for feeding a heat-vaporable medium to said atomizer.

6. In a signaling device, the combination with a combustion chamber and a flue extending therefrom to the atmosphere, of a liquid-fuel burner associated with said chamber, an atomizer associated with the flue, and means for feeding fuel both to said burner and to the atomizer.

7. In a signaling device, the combination with a combustion chamber and a flue extending therefrom to the atmosphere, of a liquid-fuel burner associated with said chamber, said burner comprising a blower and a nozzle operatively associated therewith, an electric motor for actuating said blower to force air through the combustion chamber to the flue, a pump actuated by said motor connected with the nozzle and with a source of liquid fuel, and electrical igniting means for said burner, a duct entering said flue and

connected with said pump, a normally open manually-actuated switch controlling the circuits of the motor and of the igniting means, a second switch controlling the motor circuit alone, and a thermostat located in said flue and constituting an actuator for the second switch, said thermostat closing the switch when the temperature in said flue rises to a predetermined degree, to thereby maintain operation of the motor when the said manually-actuated switch is opened, and opening the switch when the temperature falls.

8. In a device of the character described, the combination with a heating element, of means for feeding a heat-vaporable material to said element, a heat generator operatively associated with said element and adapted for utilization of said vaporable material as the heat-generating medium, and means for discharging the vapor produced at said heating element to the atmosphere.

9. In a device of the character described, the combination with a source of a heat-vaporable material, of a heating element, a heat generator operatively associated with said element and adapted for utilization of the said vaporable material as the heat-generating medium, positive means for feeding said material from the source both to said heating element and to the generator, and means for discharging the vapor produced at said heating element to the atmosphere.

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