H. E. KYBURG.

TEMPERATURE CONTROLLING APPARATUS FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED APR. 28, 1915.

1,219,646.

Patented Mar. 20, 1917.

2 SHEETS—SHEET 1.

Fig 1

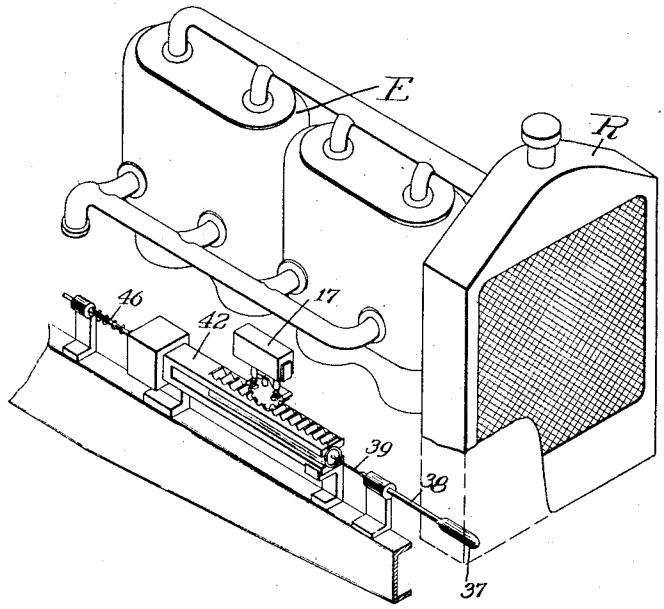


Fig 2

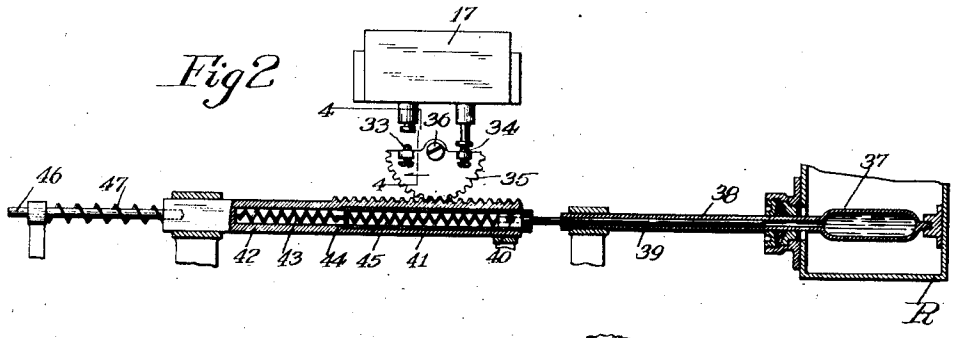
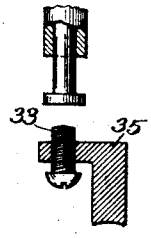


Fig 4



Inventor:
Henry E. Kyburg
By his attorneys
Putnam Putnam & Bell

H. E. KYBURG.

TEMPERATURE CONTROLLING APPARATUS FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED APR. 28, 1915.

1,219,646.

Patented Mar. 20, 1917.

2 SHEETS—SHEET 2.

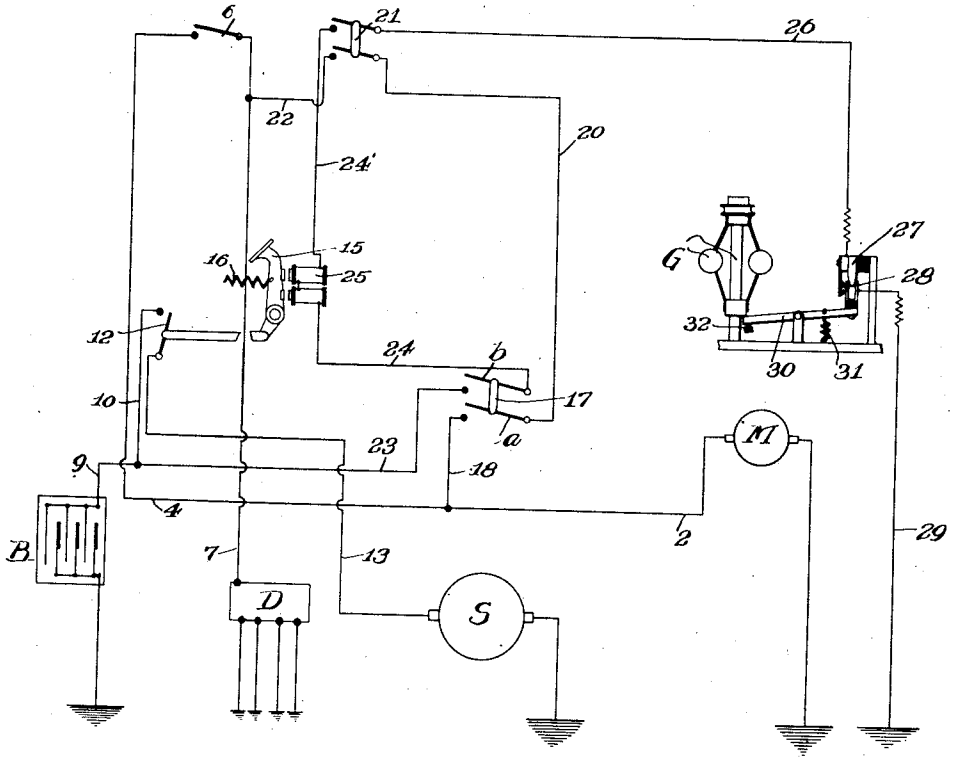


Fig 3

Inventor:
Henry E. Kyburg
By his Attorneys
Putnam Putnam & Bell

UNITED STATES PATENT OFFICE.

HENRY E. KYBURG, OF SPRINGFIELD, MASSACHUSETTS.

TEMPERATURE-CONTROLLING APPARATUS FOR INTERNAL-COMBUSTION ENGINES.

1,219,646. Specification of Letters Patent. Patented Mar. 20, 1917.

Application filed April 28, 1915. Serial No. 24,601.

To all whom it may concern:

Be it known that I, HENRY E. KYBURG, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented certain Improvements in Temperature-Controlling Apparatus for Internal-Combustion Engines, of which the following description, in connection with the accompanying drawings, is a specification, like reference characters on the drawings indicating like parts in the several figures.

This invention relates to internal combustion engines and is of special utility in automobiles operated by engines of this character.

Most internal combustion engines, particularly those used in automobiles, have a water cooling system designed to carry heat away from the engine cylinders. In operating engines of this character in cold weather it is necessary to adopt some measures to prevent the water in the cooling system from freezing when the engine is allowed to remain idle for any considerable length of time. It is a common practice to use for this purpose a certain percentage of alcohol in the cooling water or to heat the building in which the engine is installed or in which the automobile is left when not in use. These measures, however, involve a certain amount of expense and inconvenience and are dependent for their success upon the care and watchfulness of some attendant. The non-freezing mixture of alcohol and water tends to become diluted as the engine is operated and there is always danger that the engine may be left out of doors when the weather is sufficiently severe to freeze a diluted mixture or to freeze up the cooling system if water only is used.

The chief object of the present invention is, broadly stated, to devise means for overcoming the difficulties that have been found to exist in following the practices above mentioned. More specifically the invention aims to utilize the action of the engine itself to prevent the freezing of its water cooling system and to devise means that will enable the engine to effect this result automatically.

An illustrative embodiment of the invention will now be described, reference being made to the accompanying drawings, in which—

Figure 1 is a perspective view showing parts of an internal combustion engine of a type ordinarily used in automobiles, with certain parts of an apparatus embodying this invention attached thereto;

Fig. 2 is a sectional view of the parts of the apparatus shown in Fig. 1;

Fig. 3 is a diagram showing a controlling system for the engine constructed in accordance with this invention; and

Fig. 4 is a sectional view showing a detail of construction.

In the drawings E indicates an engine of the internal combustion type having the usual water cooling system including a radiator R, the arrangement being such that the hot water from the cylinder jackets flows into the top of the radiator, then down through the radiator and back into the lower portions of the jackets in a manner well understood by those skilled in this art. As shown in Fig. 3, the current for the ignition system of the engine is supplied by a magneto M which is driven by the engine and is connected through conductors 2, 4, a hand switch 6 and conductor 7 with the distributer D by which the current is delivered to the spark plugs. One side of the magneto, of course, is grounded. The engine is started by an electric motor indicated in Fig. 3 at S, current being supplied to this motor from the storage battery B. One terminal of the motor and the battery is grounded and the other terminals are connected together through the conductors 9 and 10, switch 12 and conductor 13. The switch 12 is operated by a starting lever 15 which usually is arranged not only to control the circuit between the battery B and the starting motor S but also to throw a clutch or some equivalent device mechanically connecting the motor and the engine. A spring 16 normally maintains the starting lever 15 in its inoperative position in which it holds the switch 12 open.

The arrangement so far described is substantially like that which may be found on many automobiles, the details of the ignition and starting mechanisms varying somewhat but being substantially alike in all essential respects.

For the purpose of the present invention a double pole switch 17, arranged to be operated by a thermostat, is connected with the other parts of the system above described so that one pole *a* is in parallel with the switch 6 and the other pole *b* is in parallel with the switch 12. That is, one termi-

nal for the blade *a* of the switch 17 is connected to the conductor 2 by a conductor 18 and the other terminal is connected to the conductor 7 by a conductor 20, one blade of a double pole switch 21 and a conductor 22. One terminal for the blade *b* of the switch 17 is connected to one side of the battery B by conductors 9 and 23, while the other terminal is connected through a conductor 24, an electromagnet 25, conductor 24′, switch 21 and conductor 26 to a stationary contact 27 which coöperates with a movable contact 28 connected by the conductor 29 to the ground and therefore to the opposite pole of the battery B. The electromagnet 25 is designed to operate the starting lever 15 with the same result that would be produced by its manual operation. The contact 28 is controlled by a speed governor G which may be driven by the starting motor S or by the engine E. This governor may be of any convenient form and as shown is arranged to move one end of the switch arm 30 downwardly against the tension of a spring 31 when the governor is stationary or is running at the very low speed at which the motor S is capable of operating the engine. At this time the governor holds the switch contacts 27 and 28 in engagement with each other but when the speed of the governor has been raised to a predetermined point its sliding sleeve will be lifted far enough to allow the spring 31 to separate the contacts 27 and 28 and thus to break the circuit through the conductors 26 and 29. The sleeve operates on the arm 30 through an adjusting screw 32 by means of which the point at which the contact between the switch parts 27 and 28 will be interrupted may be adjusted.

As above stated, the switch 17 is arranged to be operated by a thermostat. The particular type of thermostat used and the connections through which it operates may vary widely. One mechanism for accomplishing this result is shown in Figs. 1 and 2. In this arrangement the switch 17 is of the ordinary double pole, push button type, the buttons being operated by set screws 33 and 34 on opposite sides of a gear segment 35 mounted to swing about a pivot or rock shaft 36. The thermostat comprises a bulb 37 which may be made of metal and filled with mercury and is provided with a stem 38 that projects through a stuffing box in one wall of the radiator R. Preferably the bulb 37 is located in the bottom of the radiator since the coldest water in the circulating system is of course found at this point. A rod 39 fits snugly in the hollow stem 38 and carries at its outer end a head 40 slidable freely in a tube 41 which in turn is slidably mounted in a rack 42 that is supported in suitable guides and meshes with the teeth of the segment 35. A tension spring 43, mounted within the rack, acts to hold the inner end of the tube 41 normally against a shoulder 44 formed in the rack, while a compression spring 45, mounted within the tube 41, tends to hold the head 40 of the rod 39 against the outer end of the tube. A rod 36, forming an extension of the rack 42, is encircled by a compression spring 47 which tends to force the rack and the parts carried thereby toward the bulb 37.

It will now be evident that, as the temperature of the water in the radiator R drops and the mercury in the bulb 37 contracts, the spring 47 will force the rack 42 toward the bulb holding the end of the rod 39 against the column of mercury in the stem 38. The motion of the rack 42 produced in this manner will be transmitted through the segment 35 to the switch 17, throwing the switch at a certain point into its closed position. If the temperature drops materially below this point, the action of the atmosphere and the spring 47 tending to force the rod 39 farther into the stem 38 will be yieldingly resisted by the tension spring 43. As the temperature of the water in the radiator rises, the consequent expansion of the mercury will force the rod 39 outwardly and this movement will be transmitted through the stiff spring 45 to the rack 42, thus turning the segment 35 in the opposite direction and, at a predetermined point throwing the switch 17 into its open position. A further rise in temperature causes the mercury to force the rod 39 still farther outwardly but this movement is taken up in compressing the spring 45. It will be noted that this arrangement provides a lost-motion connection between the thermostat and the snap switch 17.

Assuming now that the switch 21 is closed and that the switch 17 has just been closed by the thermostat, the ignition circuit will be closed and rendered operative, current passing from the magneto M to the distributer D through the ground and through the conductors 2, 18 and switch blade *a*, conductor 20, switch 21, and the conductors 22 and 7. The closing of the switch 17 also completes the circuit from the battery B through the electromagnet 25 and the governor controlled switch 28. This energizes the electromagnet 25 causing it to move the starting lever 15 into its operative position, thus closing the switch 12 and allowing current from the battery B to flow through the starting motor S. The motor then turns the engine over and continues to turn it until it has begun to fire and has come up to a speed predetermined by the adjustment of the switch arm 30 with relation to the governor G, at which time the governor permits the spring 31 to open the switch 28 and thus interrupts the flow of current through

the electromagnet 25. As soon as this magnet is deënergized, the spring 16 operates through the starting lever 15 to open the switch 12 and thus to interrupt the action of the starting motor S. The stopping of the motor S thus is dependent on the starting of the engine and the attainment of a certain speed by the engine. The thermostat will hold the switch 17 closed until the temperature of the water in the circulating system has been raised above a predetermined point but will then open the switch 17, as above described, thus opening the ignition system and stopping the engine E. As soon as the temperature of the water has again dropped to a point somewhat above freezing temperature the switch 17 will be closed again and the cycle of operations above described will be repeated.

The setting of the thermostat should be such that it will initiate the operation of the engine before there is any danger of the water freezing and will stop the engine again when the temperature has been raised to the desired point. The engine, of course, would run only a very few minutes while standing still before the temperature of the water would be raised very substantially. By this arrangement the operation of the engine is rendered automatic so far as is necessary to keep the water in its circulating system from freezing and no attention on the part of an attendant is required other than to close the switch 21 when leaving the car. This switch, of course, will be opened when the car is in use so that the normal operation of the engine will not be interfered with by the thermostatically controlled mechanism. This switch enables the driver to render the thermostat operative to control the engine or inoperative as he desires.

In order to enable the driver or attendant to adjust the points at which the engine will be started and stopped the set screws 33 and 34 are adjustably mounted in the segment 35 as shown in Figs. 2 and 4. This adjustment of course causes the throw of the switch to take place at an earlier or later point in the movement of the rod 39 depending upon the direction in which the adjustments are made.

While the apparatus shown in the drawings and described in the foregoing specification is applicable to many cars, it is obvious that the same principles may be applied to other cars having different starting or ignition systems without departing from the spirit or scope of this invention. Accordingly it is desired that the present disclosure be regarded as merely illustrating one embodiment of the invention and it should be understood that the invention is not limited to this embodiment but is susceptible of much change and modification while still retaining its essential principles and characteristics.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. The combination with an internal combustion engine and a water cooling system therefor, of starting means for said engine, a thermostat responsive to changes in the temperature of the water in said system, connections by which the thermostat is enabled to cause said starting means to start the engine into operation when the temperature of the water has dropped below a predetermined point and is enabled to stop said engine when the temperature has been raised above a predetermined point, and means arranged to be operated by the engine to interrupt the operation of said starting means.

2. The combination with an internal combustion engine and a water cooling system therefor, of starting means for said engine, a thermostat responsive to changes in the temperature of the water in said system, connections by which the thermostat is enabled to cause said starting means to start the engine into operation when the temperature of the water has dropped below a predetermined point and by which the thermostat is enabled to open the ignition circuit of the engine when the temperature has been raised above a predetermined point, and means for automatically interrupting the operation of the starting means when the engine has attained a predetermined speed.

3. The combination with an internal combustion engine and a water cooling system, of electric starting means for said engine, a thermostat responsive to changes in the temperature of the water in said system, switching means controlled by the thermostat and enabling the thermostat to cause said starting means to start the engine into operation when the temperature of the water has dropped below a predetermined point, speed controlled means operative to interrupt the circuit through said starting means when the engine has attained a predetermined speed, and switching means arranged to be operated by said thermostat to open the ignition circuit of the engine when the temperature of the water has been raised above a predetermined point.

4. In an automobile, the combination with an internal combustion engine, and a water cooling system therefor, of electric starting means for said engine, a thermostat responsive to changes in the temperature of the water in said system, connections by which the thermostat is enabled to cause said starting means to start the engine into operation when the temperature of the water has dropped below a predetermined point and by which the thermostat is enabled to stop the engine when the temperature of the

water has been raised above a predetermined point, and means for automatically interrupting the operation of the starting means immediately after it has started said engine.

5. The combination with an internal combustion engine, an ignition system and a water cooling system therefor, of electric starting means for said engine, circuit connections for said starting means and ignition system including a switch, a thermostat responsive to changes in the temperature of the water in said cooling system connected with said switch to operate it, and additional automatic controlling means for the circuit of said starting means.

6. The combination with an internal combustion engine, an ignition system and a water cooling system therefor, of electric starting means for said engine, circuit connections for said starting means and ignition system including a switch, a thermostat responsive to changes in the temperature of the water in said cooling system, and a lost-motion mechanism connecting said thermostat and switch and enabling the thermostat to open and close said switch when predetermined changes in the temperature of the water in said system takes place.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY E. KYBURG.

Witnesses:
WINIFRED NELEN,
J. H. MCCREADY.