I. N. BENJAMIN & C. LYNCH.

AUTOMATIC TEMPERATURE REGULATOR FOR EXPLOSION ENGINES.

APPLICATION FILED DEC. 18, 1914.

1,170,730.

Patented Feb. 8, 1916.

2 SHEETS—SHEET 1.

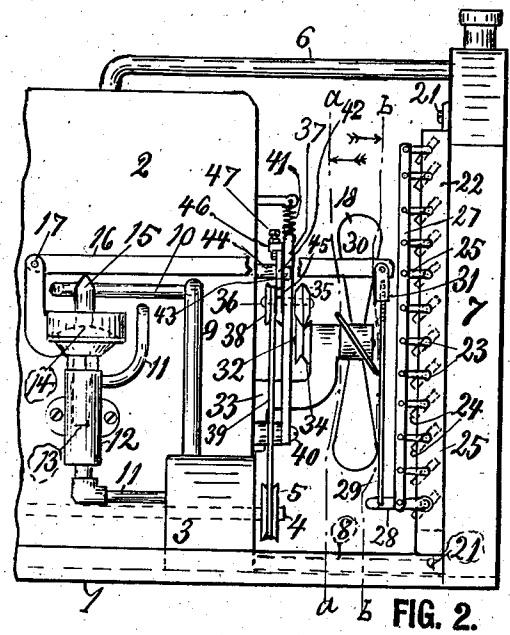

FIG. 2.

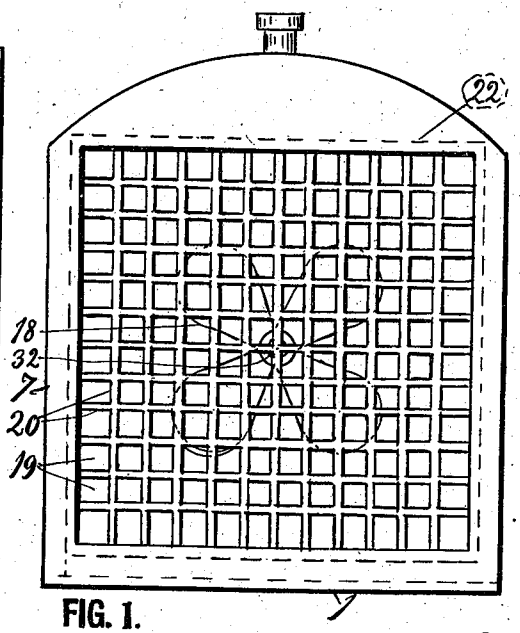

FIG. 1.

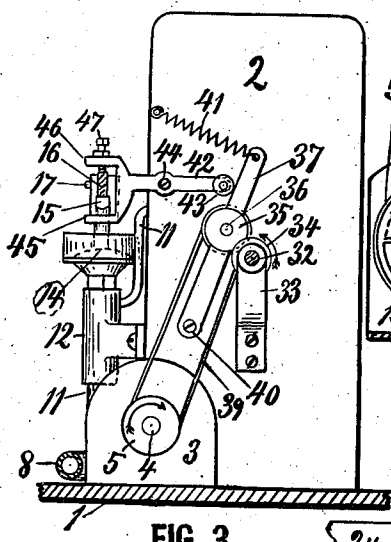

FIG. 3.

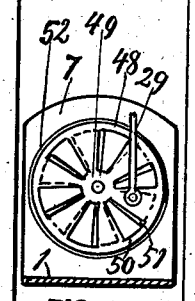

FIG. 6.

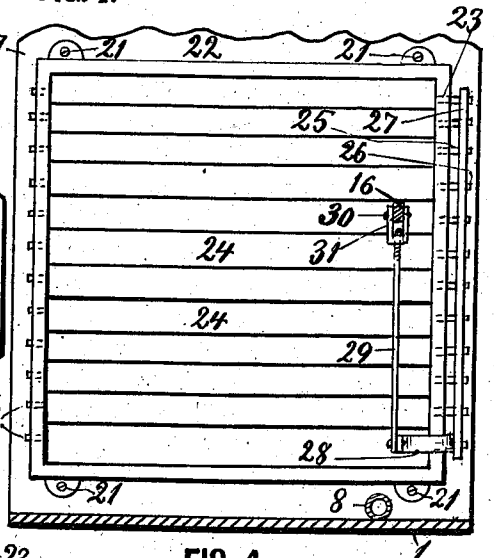

FIG. 4.

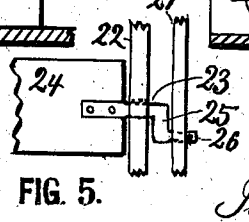

FIG. 5.

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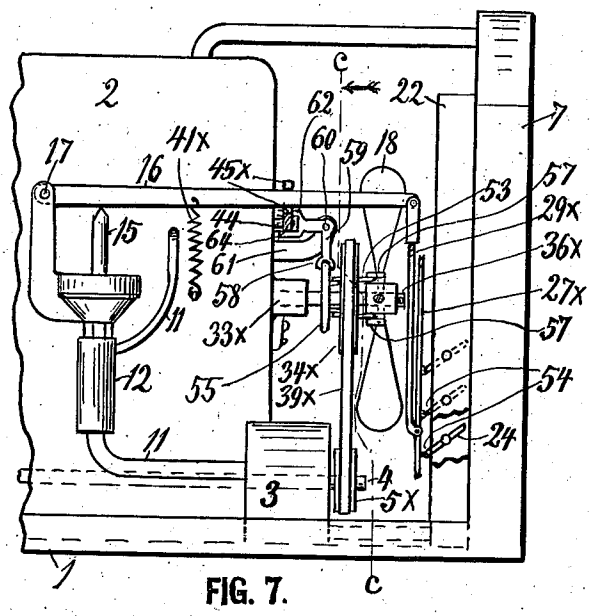

FIG. 7.

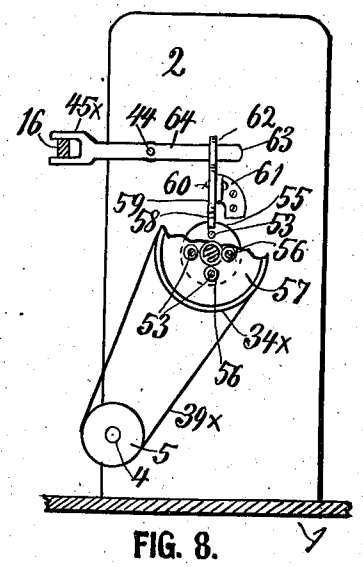

FIG. 8.

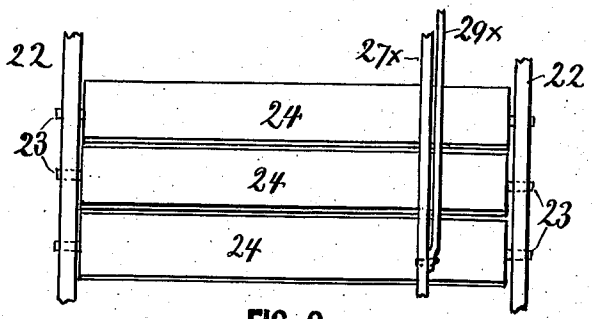

FIG. 9.

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UNITED STATES PATENT OFFICE.

ISAAC N. BENJAMIN AND CHARLES LYNCH, OF ST. PAUL, MINNESOTA.

AUTOMATIC TEMPERATURE-REGULATOR FOR EXPLOSION-ENGINES.

1,170,730. Specification of Letters Patent. Patented Feb. 8, 1916.

Application filed December 18, 1914. Serial No. 877,889.

To all whom it may concern:

Be it known that we, ISAAC N. BENJAMIN and CHARLES LYNCH, citizens of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented a new and useful Automatic Temperature-Regulator for Explosion-Engines, of which the following is a specification.

Our invention relates to temperature regulators for explosion engines and is especially adapted for the engines of automobiles, auto trucks, auto boats, flying machines and other moving engines, but may also be applied to stationary engines.

The objects of the invention are: first, to automatically prevent overcooling of the radiator of the engine and thereby make the saved heat available for other heating purposes; second, to automatically stop the fan which induces circulation of cooling air through the radiator when its rotation is not required, and thereby to save the power and fuel otherwise wasted on the useless running of the fan; a third object is to economize on fuel by keeping the engine automatically and thereby at all times at the proper temperature.

These and other objects we attain by the construction and combination of parts hereinafter described and pointed out in the claims, and illustrated in the accompanying drawing, in which—

Figure 1 is a front end elevation of an automobile, showing mainly its water-cooling radiator and a rotary fan in the rear thereof. Fig. 2 is a side elevation of the front part of an automobile, showing mainly the parts thereof to which our invention is applied. Fig. 3 is a vertical section on the line *a*—*a* Fig. 2, with some piping omitted. Fig. 4 is a section on the line *b*—*b* Fig. 2. Fig. 5 is an enlarged fragmentary detail view showing how the shutter blades and their cranks in Figs. 2 and 4 may be constructed. Fig. 6 is a modification of what is shown in Fig. 4, on a greatly reduced scale. Fig. 7 is a portion of Fig. 2 modified. Fig. 8 is a section on the line *c*—*c* Fig. 7. Fig. 9 is a face view of a portion of the shutters in Fig. 7.

Referring to the drawing by reference numerals, 1 designates the front portion of the bottom of an automobile, and mounted thereon is an explosive, or explosion, or internal combustion engine, of which 2 designates the water jacket or jackets in which the cooling water is circulated about the cylinders of the engine, to prevent them getting too hot; said water being circulated by a suitable pump 3 having a shaft 4 and a pulley 5 fixed thereon; the shaft having operative connection (not shown) with the engine so as to be driven by it.

In order to keep the water at the desired temperature it is circulated from the top of the engine or jacket 2 through a pipe 6 into a suitable radiator 7, from which it returns through a lower pipe 8 to the pump 3 and thence into the lower portion of the jacket through branching piping 9, 10, (shown in Fig. 2). Some of the water from the pump also passes to the jacket through piping 11. In the latter piping is inserted a thermostat, preferably composed of a shell 12 through which the water circulates and heats a thin metal pocket 13 (see Fig. 2) which contains alcohol, ether or other fluid which when heated will readily evaporate and form gas pressure. The gas thus produced being inclosed will bulge the top plate 14 of the pocket upward and thus raise its central stem 15 and thereby a lever 16, which is fulcrumed at 17 and operates to regulate the air current through the radiator and the stopping and starting of a fan 18 by which such current is induced. The mechanisms through which the lever 16 acts may be of any suitable constructions, all of which it would be impossible and unnecessary to illustrate in our drawing which merely shows one or two ways of embodying the invention in an explosion engine.

The radiator 7 may be of the type shown, having air cells or ducts 19 between flat tubes 20 through which the water circulates, or any other suitable type of radiator. Upon either the front or the rear side of the radiator is secured at 21 an open frame 22, in which are journaled the end stems 23 of a series of shutter plates 24. The stems in one side of the frame are provided with cranks 25 (best shown in Fig. 5), whose crank pins 26 are retained in apertures in a bar 27. One of the cranks is provided with an arm 28, from which an operating rod 29 extends upward to the front end of the lever 16, to which it is pivotally connected at 30 by a clevis 31, which is threaded upon the rod so as to be adjustable up and down on the same.

The fan 18 has a short shaft 32 journaled in a bracket 33 and provided with a grooved friction pulley 34. Said pulley is driven by a friction pulley 35 having a V-shaped face. The latter pulley is fixed on a short shaft 36, journaled in a lever 37 and fixed in a pulley 38, which is driven by a belt 39 and the pulley 5 on the pump shaft, or any other driven shaft. Said lever 37 is pivoted on a stud 40, which is positioned in a straight line between the shafts 4 and 36. A spring 41 tends to throw the lever 37 with its friction pulley 35 away from the pulley 34 on the fan shaft. Another function of the spring is to raise the end of a lever 42 having an antifriction pulley 43 bearing against the inclined edge of the lever 37 so as to thereby aid in bringing the lever 16 downward; said lever 42 being fulcrumed at 44 and provided with two fingers, 45, 46, engaging respectively the lower and upper edges of the lever 16 when in contact therewith. The upper finger 46 carries an adjustment screw 47, whose lower end contacts with the lever 16 and regulates its play between the two fingers. This feature aids in the adjustment and regulation of the operation, which is as follows: When the water in the radiator gets heated above the predetermined proper temperature, its heat when reaching the thermostat causes the production of pressure therein, whereby the lever 16 is raised and by its rod 29 will rotate all the plates 24 and open spaces between them for cooling air to rush in through the radiator and thus cool it. If the radiator is in motion through the air the current caused thereby may suffice to cool the radiator without the assistance of a fan; but if such air current is insufficient, as may especially be the case in warm weather or with stationary engines, then the thermostat will continue to raise the lever 16 until the shutter plates are more fully open and the lever 42 is tilted so as to throw the lever 37 with the pulley 35 into frictional contact with the pulley 34 on the fan shaft, thus starting the fan and thereby increasing the air current in the radiator. Whenever the air current cools the radiator below the desired temperature the thermostat will naturally lower its actuating stem 15 and thereby allow the spring 41 to pull the friction pulley out of contact with the fan pulley, thus stopping the fan and saving the power and fuel necessary to run it. If this does not suffice to maintain or restore the proper temperature in the radiator, then the lever 16 will fall lower still and thereby more or less, or even entirely close the plates 24 against any and all cooling air current.

In the modification shown in Fig. 6 the rod 29 oscillates a disk 48, which is rotatably mounted on a central stud 49 and provided with apertures 50 adapted to register more or less with air passages 51 in the radiator, or they may be in a plate 52 either at the front or rear side of the radiator and arranged to cover all its air passages.

In Figs. 7 and 9 is shown how the shutter plates 24 may have no cranks at their ends, the bar 27^x being jointed at 54 to each plate and the rod 29^x pivotally connected to said bar.

In Figs. 7 and 8 is further shown that the result of starting and stopping the fan 18, namely to render it alternately effective and ineffective, may also be attained by a modification in which the fan shaft 30^x is either fixed or rotatable in the bracket 33^x, and the pulley 34^x is fixed to the fan and driven by the belt 39^x and pulley 5^x on the shaft 4. Upon the fan shaft is also placed a rotatable and slidable collar 55, which by rods 53, passed through apertures 56 in the web 57 of the pulley 34^x, are connected to rocker arms 57 at the base ends of the wings; said ends being journaled either in the hub or on round spokes radiating therefrom.

The collar 55 is engaged to be moved by the forked arm 58 of a bell-crank-lever 59, fulcrumed at 60 on a bracket 61 and having its upper arm provided with a fork 62, which straddles the arm 63 of a lever 64 fulcrumed on the stud 44 and having at its opposite end a fork 45^x engaged by the lever 16. In this modification the fan is rendered effective when the thermostat raises the lever 16 and thereby causes the wings of the fan to turn into effective position, and when the radiator gets cool the themostat will allow the lever 16 to fall, or be drawn downward by a spring 41^x, which motion will close whichever form of shutter device is employed and will at the same time cause the wings of the fan to turn edgewise into a substantially true plane and will thereby stop the draft or current caused by the fan, and also stop practically all expense of fuel and power required to run the fan when the wings are in operative or effective position.

We claim:

1. The combination with an explosion engine and a water cooling system including a radiator, of piping and jackets about the cylinders of the engine, a fan having wings arranged to rotate about axes radiating from the hub of the fan and to cause a cooling air current through the radiator when the fan rotates, a thermostat inserted in the water system, a driven shaft having operative connection with the engine, means for transmitting power from the driven shaft to the fan, and means operated by the thermostat for automatically rendering the fan more or less effective and ineffective by tilting its wings about their axes more or less edgewise in the direction of their movement about the axis of the fan.

2. The combination with an explosion engine having a water-cooling system compris-

ing a water-cooling radiator, a fan arranged to induce a cooling current of air through the radiator, a thermostat in the water system, a shaft having operative connection with the engine by which said shaft is driven; means for transmitting power from the driven shaft to the fan, means operated by the thermostat for automatically rendering said fan effective and ineffective; means for regulating or even shutting off the air current through the radiator, and operative connection between the thermostat and the means for regulating the air current, whereby said current regulating means is automatically operated.

In testimony whereof we affix our signatures, in presence of two witnesses.

ISAAC N. BENJAMIN.
CHARLES LYNCH.

Witnesses:
SYLOBO E. HESS,
ISADOR LEVINSOHN.