

A. D. EBERLY.
 AUTOMATIC ENGINE STARTING AND STOPPING MECHANISM.
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 2 SHEETS—SHEET 1.

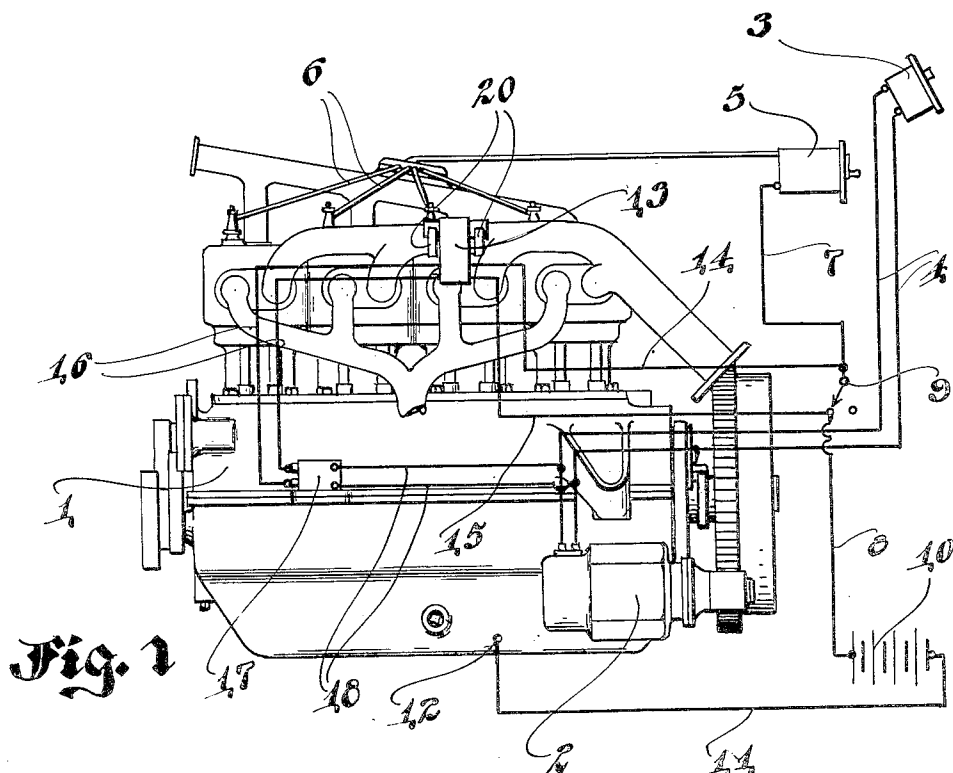


Fig. 1

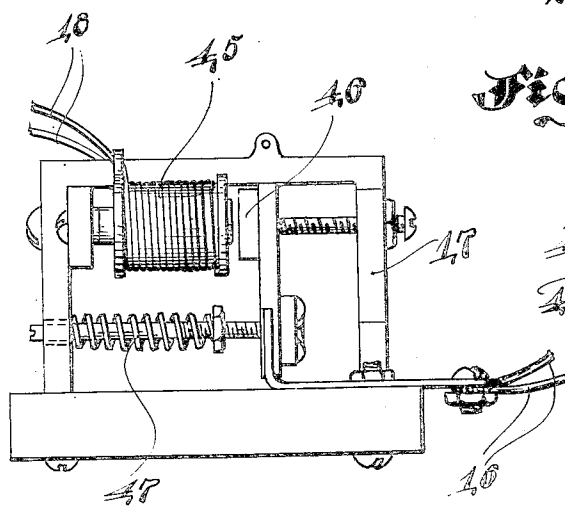
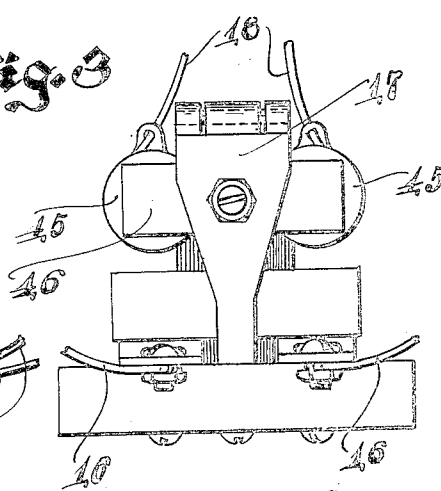


Fig. 2

Fig. 3



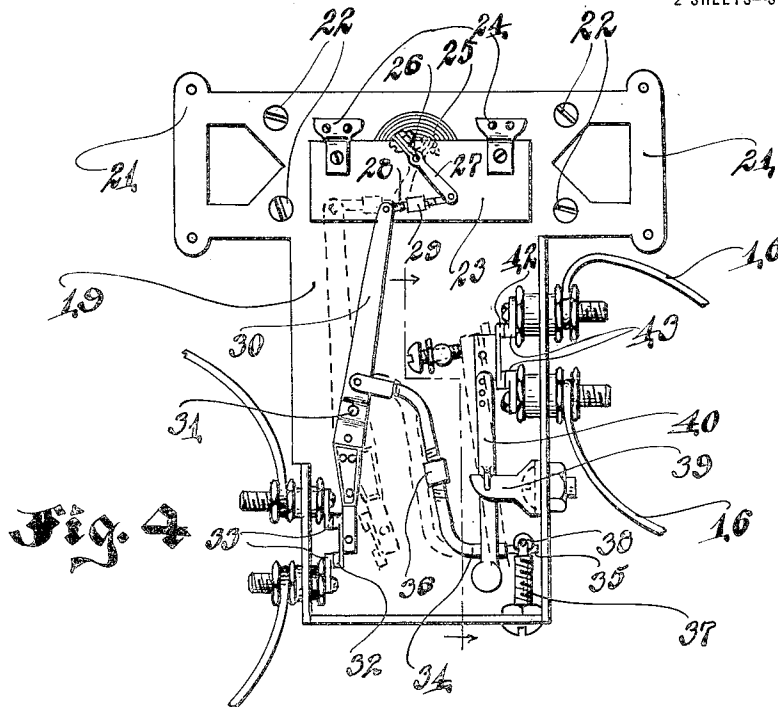
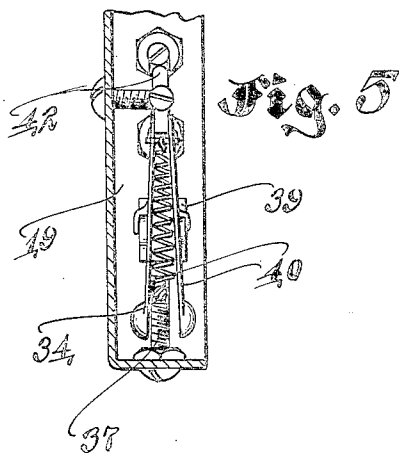
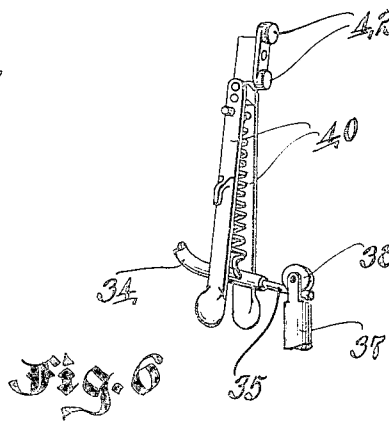
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UNITED STATES PATENT OFFICE.

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AUTOMATIC ENGINE STARTING AND STOPPING MECHANISM.

1,287,266.

Specification of Letters Patent.

Patented Dec. 10, 1918.

Original application filed March 4, 1916, Serial No. 82,194. Divided and this application filed October 2, 1916. Serial No. 123,368.

To all whom it may concern:

Be it known that I, AUSTIN D. EBERLY, a citizen of the United States, residing at Spokane, in the county of Spokane and State of Washington, have invented certain new and useful Improvements in Automatic Engine Starting and Stopping Mechanisms, of which the following is a specification.

My invention relates to improvements in automatic engine starting and stopping mechanisms, and more particularly to automatic circuit controlling mechanism for electrical self starters for automobiles.

The object of my invention is the provision of mechanism of the foregoing character which is especially intended and designed for use during winter weather to automatically effect starting of the engine when the same has cooled below a certain predetermined degree of temperature, say forty degrees; to automatically stop the engine when the temperature thereof has risen to or above said predetermined degree; and to automatically stop the starting motor after the engine is running under its own power.

Broadly, my invention comprises mechanism which may be readily installed for use in conjunction with electrical self starters of conventional type, and consists of a double acting thermal controlled and operated switch, conductors connecting the switch with the ignition circuit and the self starter circuit to automatically and simultaneously energize the starter and provide the ignition sparks for the engine, and then to automatically break the starter circuit after the engine is in operation under its own power, and, in addition, a magnetic switch of novel construction interposed in the circuit between the thermostatic switch and the starter to insure practical and effectual operation of the mechanism.

The present application is a division of my application for patent for starting and stopping mechanisms for engines, filed March 4, 1916, Serial Number 82,194, in which patent is now sought covering the specific thermostatic switch mechanism just above referred to and to be hereinafter described. But no claim to the specific construction of said switch is made in this application as any other switch of similar character which will perform the same func-

tions may be used to provide this essential element of my invention.

The details of the construction, combination, and arrangement of the elements comprising my complete organization will be hereinafter fully described and the operation of the mechanism explained, recourse being had to the accompanying drawings forming a part of this application for patent, and in which—

Figure 1 is a side elevation of an automobile four cylinder internal combustion engine showing the application of my invention.

Figs. 2 and 3 are views of the magnetic switch which is a distinguishing feature of the invention.

Fig. 4 is a view showing a desirable and practical, operative embodiment of the double acting thermostatic switch which provides the necessary automatic control for both the starter and the engine ignition system.

Figs. 5 and 6 are enlarged detail views of one of the lever members of said thermostatic switch.

Referring specifically to the drawings in which like reference characters are used to indicate like parts in the several views, the numeral 1 designates the automobile engine to which my apparatus is applied, and by referring to Fig. 1 the disposition of the elements of the apparatus with respect to said engine, the self starter, and the ignition and starter circuits with which my mechanism is adapted to coöperate, may be had. In said illustration the numeral 2 indicates the self starter of usual type, 3 the starter switch, and 4 the conductors connecting said starter and switch, which latter may be conveniently disposed for operation by the driver.

A vibrator device 5 is connected by the wires 6 with the spark plugs, the wires 7 and 8 and the switch 9 connecting said vibrator with the battery 10 having the usual wire 11 which is grounded on the engine crankcase at 12.

A double acting thermostatic switch 13 is adapted to be secured to the exhaust manifold of the engine as shown in Fig. 1, said switch being electrically connected by means of the wire 14 with wire 7 and by wire 15 with wire 8, the purpose of this arrange-

ment being to bridge the switch 9 in the line from the battery to the vibrator to provide an ignition circuit to the spark plugs when said switch 9 is open, said circuit being adapted to be automatically completed under certain conditions through the medium of the thermostatic double acting switch 13.

Said thermal switch is also connected by means of the wire conductors 16 with the magnetic switch 17, (to be later described in detail), while the wires 18 which cut in on the starter conductor wires 4 serve to complete the automatically controlled circuit from the thermal switch to the starter.

Although I will hereinafter describe said switch elements of my apparatus in detail, I first desire to give a general idea of the operation and utility of the mechanism which may be readily understood with the foregoing general description in mind.

In cold weather when the engine has been stopped and the car stored away for the night or left standing, the starter switch 3 and the switch 9 in the ignition line are of course, left open. Assuming that the double acting thermostatic switch has been set to close the circuit through the wires 14 and 15 to the ignition wires 7 and 8, and the starter circuit through the wires 16 and 18 and the wires 4 with which they connect, when the engine has cooled to a temperature of or below forty degrees, when such temperature is reached the resultant circuits when completed by the switch will simultaneously provide ignition at the spark plugs, and by energizing the coils of the magnetic switch to close said switch provide the necessary current to the starter to turn over the engine.

When the engine is running on its own power the heat generated by the exhaust gases serves to quickly heat the exhaust manifold and consequently the thermostatic device is actuated at substantially the same time.

As said double acting thermal switch is designed to effect the breaking of the automatic starter circuit upon very slight actuation or movement of its circuit opening and closing members, said starter circuit will be first and quickly broken when the engine is running, and consequently the starter will cease to operate and the engine be left to run on its own power. This timely shutting off of the starter circuit serves to prevent wear of the starter mechanism and dissipation of the starter current.

On the other hand, said thermal switch is so designed that the automatic switch closures for the ignition circuit referred to will continue to contact to maintain said circuit until the heat of the engine has reached the predetermined and desired degree of temperature, and therefore will pro-

vide the necessary current to the spark plugs.

The foregoing described mode of operation serves to illustrate the broad principle which my invention involves, but in order that the actual, specific operation and co-ordination of the several elements may be clearly understood, I will now proceed to describe in detail two of said elements, namely, the automatic thermostatic switch and the magnetic switch.

As seen in Fig. 4, the thermostatic switch is composed of a frame or casing 19 which is secured by means of straps or clamps 20 to the exhaust pipe of the engine, and wing portions 21 are provided on the casing whereby said straps or clamps may engage the same. Set screws 22 are adjustably carried on the wing portions to enable the casing 19 to be drawn nearer or farther from the exhaust pipe, as may be desired.

A pair of bearing plates or the like 23 are secured to the inner wall of the casing 19 by means of the brackets or the like 24 and suitably arranged between said bearing plates is a thermal expanding and contracting spring 25 which is designed to operate a shaft 26 which is also mounted in the bearing plates 23. Attached to the outer end of the shaft 26 is a lever 27, one end of which is engaged with a link 28, said link being provided intermediate of its ends with a turnbuckle 29. The opposite end of the link 28 is connected to a switch lever 30, the latter being fulcrumed intermediate of its ends at a point designated at 31. The lower end of the lever 30 is provided with a pair of contacts 32 which are designed and disposed to cooperate with a pair of contact posts 33 which are mounted in the side wall of the casing 19.

Pivotally connected to the lever 30 just above its fulcrum point is a linking lever 34 which has its ends compoundly curved, the lower end thereof being slightly reduced in cross-section as designated at 35. A turnbuckle 36 is also provided on the linking lever 34 to accommodate adjustment of said lever for obvious purposes. A post 37 is suitably mounted in the bottom of the casing 19 to extend vertically and has its upper end provided with an opening to receive therethrough the reduced lower end 35 of the lever 34. A roller 38 is provided at this upper end of the post to receive said reduced end 35 in contact therewith.

Mounted on the adjacent side wall of the casing 19 is a post 39 which is bifurcated and designed to act as a fulcrum for a forked lever 40, as clearly shown in Fig. 4. A spring member 41 has one end thereof connected to the lower end of the lever 34 and its opposite end is connected with the upper portion of the lever 40. The extreme upper portion of the lever 40 is provided

with a pair of contacts 42 which are designed for contact with a pair of contact posts 43, the latter being suitably mounted in the adjacent side wall of the casing 19.

5 Leading from the contact posts 43 are the wires 16 which connect with a pair of contacts on a magnetic switch 17, the latter being interposed between the thermal switch and the starter 2.

10 This magnetic switch consists of a pair of coils 45, armature 46 and a strong spring member 47 which normally tends, to retain the armature distant from the coils. When the contacts 32 are engaged with the con-
15 tacts 33, closing the switch shown in Fig. 4, the armature is drawn toward the coils 45, overcoming the tension of the spring 47, completing the circuit and operating the starter, whereby the engine is cranked.

20 This magnetic switch is interposed as described as the switch and contacts of the thermo are too light to carry the high voltage current necessary to effect the cranking of the engine and without such device said
25 contacts would arc or burn without giving the required service. In other words the magnetic switch is adapted to handle the current which it serves to cut in for effectual operation of the starter.

30 It will be readily understood that when the temperature is lowered to a predetermined degree and causes the contraction of the spring 25 the lever 30 will be operated to complete the circuit above mentioned to
35 effect the automatic starting of the engine. It will be seen from Fig. 1 that the connection between the magnetic switch and the starter is had through the medium of wires 18 which intersect the wires 4 beyond the
40 starting switch 3, so that the starting mechanism may be actuated through this mechanism regardless of the operation of said switch 3.

45 At the same time the lever 40 is, of course, actuated to engage the contacts 42 and 43. The contact posts 43' have the wires 14 and 15 leading therefrom, and the same respec-

tively engage wires 7 and 8 in the ignition line. Hence, at the time the starter 2 is operated, a spark is also caused to be made
50 in the engine, so that the operation of said starter serves to turn over the engine for operation under its own power.

It will thus be seen that the engine is set in operation automatically, and after run-
55 ning for a short length of time the heat communicated through the exhaust manifold will cause the spring 25 to expand, which obviously opens the circuits and stops the motor. The starter switch is opened by the
60 first expansion of the thermal spring by only a slight initial expansion of the spring so that this circuit is broken very soon after starting of the engine. On the other hand, the ignition switch remains in contact until
65 full expansion of the spring which is effected only after the engine has reached the desired temperature.

In order to afford a means for more effectively conveying or communicating the
70 heat to the thermal switch spring, a copper conductor (not shown) may be provided, said conductor being arranged for contact with the exhaust pipe of the engine.

Having described my invention, I claim:— 75

The combination with an internal combustion engine, its water cooling system and a starting motor having electrical supply circuits and a thermostatic mechanism responsive to the changes in the temperature of
80 the water in the cooling system comprising a switch lever actuated by contraction of the mechanism to close the circuit and start the motor and engine, and engaging contact means for said lever; and a second switch
85 lever and contact means therefor adapted to be actuated by expansion of the mechanism for opening the circuit to successively stop the motor and engine, and a link connecting the levers and a yieldable connection be-
90 tween said link and the second switch.

In testimony whereof, I affix my signature.

AUSTIN D. EBERLY.