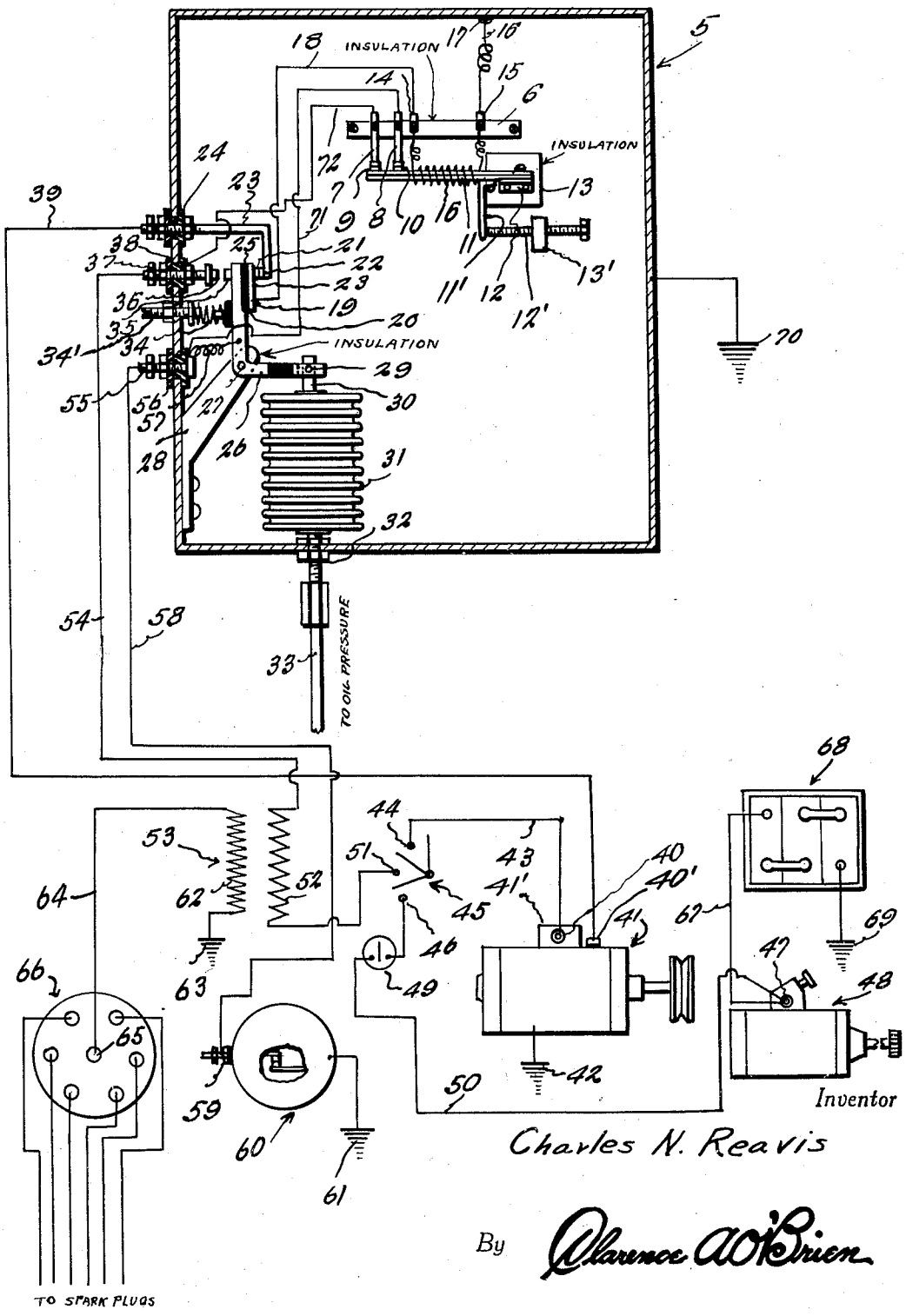
Dec. 28, 1943. C. N. REAVIS 2,337,838

MOTOR IGNITION CUTOFF

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Fig. 1.

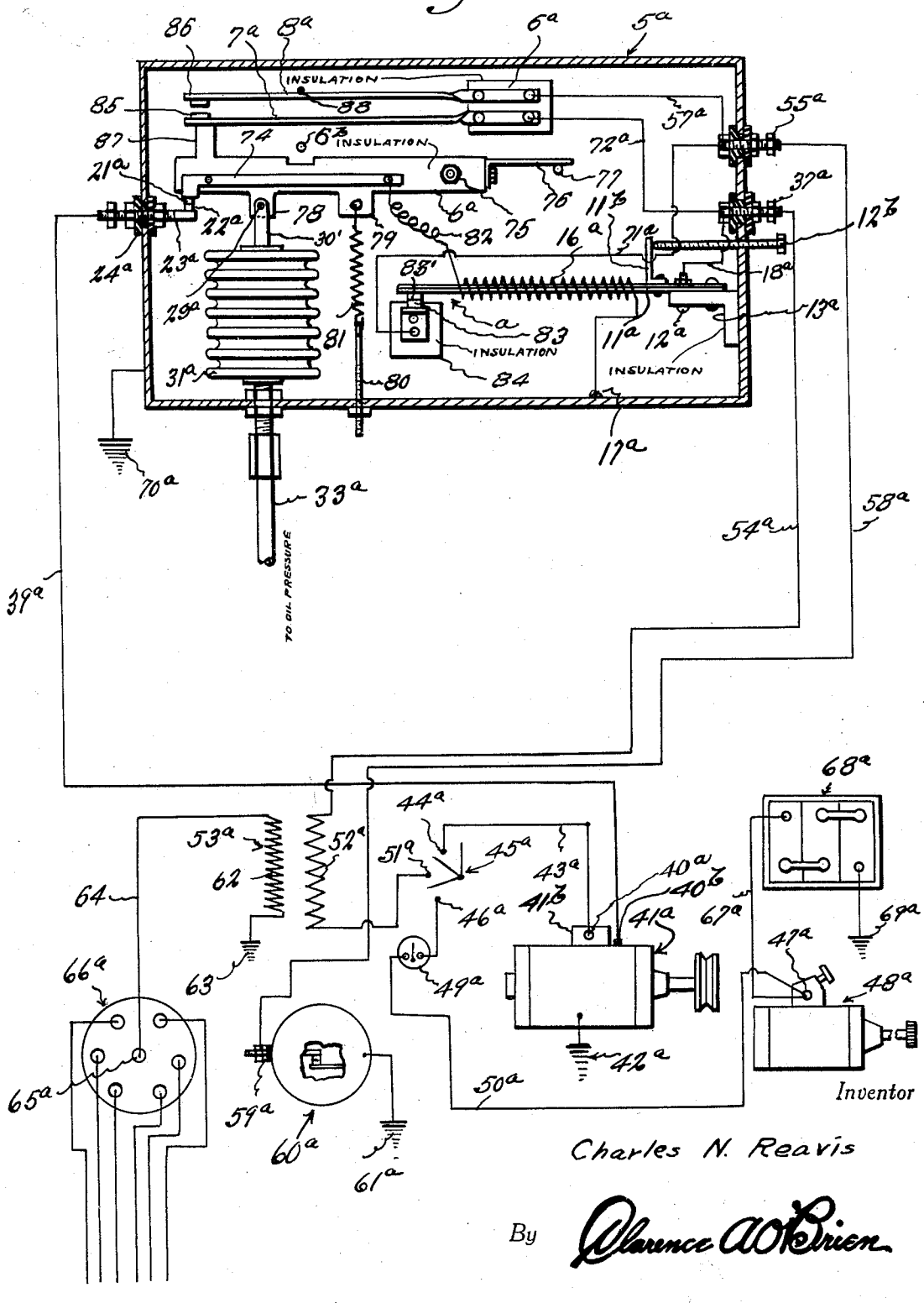


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Fig. 2



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UNITED STATES PATENT OFFICE

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MOTOR IGNITION CUTOFF

Charles N. Reavis, Raleigh, N. C.

Application July 31, 1940, Serial No. 348,798

11 Claims. (Cl. 123—198)

My invention relates to improvements in means for opening the ignition circuit of an internal combustion engine upon a failure of the lubricating oil pressure due either to a lack of oil in the crankcase or to the breaking of an oil line, and the primary object of my invention is to provide simple and efficient arrangements of this character which are effectively connected in the battery generator portion of the ignition circuit of the internal combustion engine.

Other important objects and advantages of my invention will be apparent from a reading of the following description taken in connection with the appended drawings, wherein for purposes of illustration I have shown preferred embodiments of my invention.

In the drawings:

Figure 1 is a sectional elevational schematic view showing the mechanical and electrical components of one form of the invention and showing the electrical connections between the electrical components, the ignition switch being shown open and the cut-off in an inoperative position.

Figure 2 is a view similar to Figure 1 of a modified form of the invention also showing the ignition switch in an open position and the cut-off in an inoperative condition.

Referring in detail to the drawings, and first to the form of the invention shown in Figure 1, the numeral 5 generally designates a suitable metal casing or enclosure adapted to be mounted in an out-of-the-way position on the automobile, such as on the front of the dashboard, the said casing or enclosure enclosing all of the working parts described below and itself forming a part of the ground circuit in addition to the frame of the automobile. On one wall of the said casing or enclosure there is mounted an insulated horizontal bar 6 on which are fastened at longitudinally spaced points, the depending contacts 7 and 8, respectively. A bi-metallic arm 11 has one end secured on a bracket 12 mounted on a block of insulation 13 under the insulated bar 6, the bi-metallic arm having longitudinally spaced contacts 9 and 10, respectively, aligned with and opposed to the depending contacts 7 and 8. A binding post 14, and another binding post 15 are laterally spaced on the insulated bar 6 and to these binding posts are connected the opposite ends of an electrical heating coil 16 which is circumposed on an intermediate part of the bi-metallic arm 11.

Fixed to the lower side of the bi-metallic arm is a dependent spring 11' with the free end of which is engaged the end of an adjusting screw 12' mounted in an insulated bracket 13' fixed on the back of the casing. The screw 12' is adjustable to increase or relax the tension of the bi-metallic arm and to predetermine the gap between the contacts 7 and 8 and the arm in the warped condition of the arm, and consequently the time interval of operation of the arm.

The binding post 15 on the bar 6 is connected by a wire 16 by soldering or other suitable means indicated by the numeral 17 whereby this wire is grounded to the casing or enclosing 5 and hence to the frame of the automobile. Connected to the binding post 14 is the wire 18 whose opposite end is connected at 19 to the short conductive plate 20 on the upper arm of the bellcrank 26, the plate 20 having the upper contact 21 for engagement with the companion contact 22 on a recumbent L-shaped conductive bar or rod 23. The rod 23 passes supportably through an insulating grommet 24 extending through the adjacent side wall of the casing 5 and is locked in place by nuts pressing on opposite sides of the grommet. The short insulated plate 20 is mounted on a block 25 of insulation secured to the upper arm of the bellcrank, the bellcrank being of conductive metal and pivoted at 27 on the upper end of a bracket 28 which projects from the said adjacent side wall of the casing. The free end of the foot portion of the bellcrank or horizontal arm thereof is pivotally connected at 29 to the element 30 on the upper end of the oil pressure expansible bellows 31 which is mounted at 32 on the bottom wall of the casing 5 where an oil pressure line traverses said bottom and is connected to the lower end of the bellows, the oil pressure line leading from the oil pressure system of the automobile.

An expansible helical spring 34 is compressed between the said adjacent side wall of the casing and an intermediate part of the upper arm of the bellcrank 26 with the effect of keeping the upper arm over toward the right to engage the contacts 21 and 22 while the bellows is in a collapsed condition, such as would exist when the oil pressure was absent or unduly low. Adjusting means 34' for the spring 34 is provided to predetermine the operating pressure. In the right hand position of the bellcrank the contact 35 on the left hand side of the upper arm is spaced from the adjustable stationary contact 36 which is mounted on or is a part of the binding post 37 which traverses the said adjacent side wall of the casing through an insulating grommet 38. The contact 22 on the recumbent

L-shaped rod or bar 23 is electrically connected by means of the said bar and a wire 39 with a point between the output terminal 40' of the generator 41 and the cut-out or voltage regulator 41'. The remaining side of the generator is grounded at 42. A wire 43 is connected between the remaining terminal 40 of the cut-out or voltage regulator 41' to the contact 44 of the three arm ignition switch 45. Another contact 46 of the ignition switch is connected at 47 to the switch of the starter motor 48, with the ammeter 49, interposed in the wire 50, making this last-mentioned connection. The remaining contact 51 of the ignition switch is connected to one end of the primary winding 52 of the ignition coil 53, the remaining end of the said primary winding being connected by a wire 54 with the binding post 37 of the mentioned contact 36.

Another binding post 55 also mounted in a grommet 56 on the side wall of the casing, but below the contact 36, is connected by the flexible wire 57 with the conductive bell-crank 26, the binding post 55 being connected by a wire 58 with the low tension terminal 59 of the circuit breaker 60, the last having its remaining side grounded at 61. The secondary 62 of the ignition coil has one side grounded at 63 and its remaining side connected by the wire 64 with the high tension central terminal 65 of the distributor 66. The primary circuit is completed through the wire 67 running from the remaining side of the starter switch to one side of the battery 68, the last having its remaining side grounded at 69.

The casing 5 is grounded at 70, to the frame of the automobile, as already indicated, and the depending contacts 7 and 8 on the insulated bar 6 are respectively connected to the binding post 55 by the wire 71 to the binding post 37 by the wire 72.

When the oil pressure subsides below the predetermined point, the bellows 31 collapses and swings the upper arm of the bellcrank. This action breaks the engagement between the contacts 35 and 36 and makes engagement between the contacts 21 and 22. The effect of the engagement of the contacts 21 and 22 is to connect the heating coil 16 with the cut-out or voltage regulator 41'. Should the generator be turning slowly, as when the car is at a standstill for a traffic light and the car engine is idling, insufficient current will be produced by the generator to close the cut-out or voltage regulator, and the engine will continue to run instead of being undesirably stalled at such a time due to the comparatively low oil pressure obtaining because of the slow speed of the engine and possible thinned out condition of the oil in the motor. However, at normal road speed, the generator puts out enough current to close the cut-out or voltage regulator and thereby establish a circuit to the heating coil 16, whenever the oil pressure fails and the contacts 21 and 22 close, whereby the heating coil will be energized to produce the warping of the bi-metallic arm 11 which effects disruption of the ignition circuit and protective stalling of the car engine.

Referring now to the embodiment of the invention shown in Figure 2, the numeral 5a generally designates the metallic casing or enclosure corresponding to the casing or enclosure of the first described embodiment but having a shape and dimension suitable to the present embodiment, this like the first embodiment being adapted to be mounted in a suitable place on the automobile and grounded to the frame thereof at 70a. While the present embodiment operates substantially similarly to the embodiment shown in Figure 1, the arrangements are more compact and preferable from a manufacturing standpoint.

In the present embodiment, the components corresponding to those existing in the first described embodiment have similar numerals applied thereto, distinguished by the letter *a*. Thus it appears that in the present instance the wire 39a leading from a point between the output terminal 40b of the generator 41a and the cut-out or voltage control is connected to a combined binding post and conductive rod 23a projecting through a grommet 24a in the side or end of the casing 5a and having a contact 22a on its upper side for engaging with a contact 21a on the lower side of a conductive bar 74 extending in a horizontal position and fixed longitudinally along an insulated bar 6a which is traversed by a pivot bolt 75 connected to the wall of the casing, with a spring finger 76 overlying a retaining pin 77 on the wall of the casing to resist yieldably upward swing of the left hand end of the insulated bar 6a. Intermediate the pivot bolt 75 and the left hand end of the bar 6a a depending lug 78 is pivoted at 29a to the upwardly projecting element 30' of the expansible bellows 31a which is mounted on the bottom of the casing 5a and has connected thereto the oil pressure line 33a which traverses the said bottom. A stop 6b on the casing above the arm 6a prevents undue upward movement of the arm 6a due to the expansion of the bellows. Intermediate the lug 78 and the pivot 75 another dependent lug 79 has stretched between it and an adjustable rod 80 a contractible spring 81 which helps to keep the insulated arm 6a in a depressed position and the contacts 21a and 22a engaged and predetermines the operating pressure of the device. The right hand end of the conductive bar 74 is connected by the wire 82 with one end of the heating coil 16a on the bimetallic arm 11a which is mounted at 12a on the insulated bracket 13a on the right hand end wall of the casing. The remaining end of the heating coil is soldered or otherwise suitably secured at 17a to the casing 5a. A stationary contact 83 mounted on an insulated bracket 84 on the back of the casing is opposed by a contact 83' on the bottom of the free end of the bi-metallic arm, and the contact 83 is connected by the wire 71a with the binding post 55a with which the wire 58a is connected, the latter leading to the ungrounded primary terminal 59a of the circuit breaker 60a. A wire 18a connects the mounted end of the bimetallic arm with the binding post 37a with which the wire 54a is connected, the latter having its remaining end connected to the primary winding 52a of the ignition coil 53a. The binding posts 37a and 55a are both insulated from the casing.

The bi-metallic arm has an upstanding spring 11b secured thereto adjacent the bracket 13a with which is engaged an adjustable screw 12b which is threaded through the end wall of the casing for the purpose of adjusting the tension of the bimetallic arm and the spacing of the contacts 83 and 83' in the warped condition of the bi-metallic arm.

A wire 72a connects the binding post 37a with the lower one of the spring contact fingers 7a and 8a, respectively, which occupy horizontal positions in vertically spaced relation, extending from the insulation block 6a which is mounted on the back of the casing. Another wire 57a

connects the binding post 55a with the upper one of the spring contact fingers, the latter being designated 8a. The spring contact fingers have opposed contacts 85 and 86, respectively, which are normally separated but which become engaged when the vertical projection 87 of the rockable insulated bar 6a rises and presses the lower spring finger 7a into engagement with the upper spring finger, whenever the bellows 31a expands with a normal oil pressure. With a less than normal oil pressure, the bellows 31a is in a collapsed condition as shown in Figure 2, wherein the bar 6a is in a depressed position and the contacts 85, 86 are open, thereby breaking the primary circuit of the ignition system. A stop pin 88 on the casing above the upper spring finger limits upward movement of the upper finger to an upward curving of the free end thereof under upward pressure of the lower spring finger and ensures thereby a better connection between the contacts 85 and 86.

As in the case of the first described embodiment, operation of the embodiment shown in Figure 2 depends on the generator turning up fast enough to generate sufficient current to close the cut-out or voltage regulator and establish an energizing circuit to the heating coil 16a, so that unwanted breaking of the ignition circuit does not take place during such periods of low oil pressure as are due to thin oil resulting from a hard run in hot weather or to abnormally slow engine idling speed while the car is halted and waiting for a traffic light to change.

However, with the engine running at normal road speed, any critical drop in the oil pressure allows the spring 81 to pull the arm 6a down and close the contacts 21a and 22a while opening the contacts 85 and 86. The closing of the contacts 21a and 22a energizes the heater coil 16a and causes the bi-metallic arm 11a to warp and separate the contacts 83 and 83', thereby breaking the primary ignition circuit and stalling the engine to prevent its operation without sufficient or suitably viscous oil.

Although I have shown and described herein preferred embodiments of my invention, it is to be understood that I do not wish to limit the application of the invention thereto, except as may be required by the scope of the subjoined claims.

Having described the invention, what is claimed is:

1. A circuit breaker for use with an internal combustion engine having an engine oil pressure responsive element and an ignition system including a source of current and an ignition coil, said circuit breaker comprising a conductive pivotally supported arm operatively connected to said oil pressure responsive element, a stationary insulated contact with which said conductive arm engages in a low pressure position of the said element, said conductive arm and said stationary contact being connected to the opposite sides of said source, an insulated bi-metallic arm, a pair of stationary contacts with which a portion of said metallic arm normally bridges, a pair of stationary contacts being connected between one side of said primary winding of the ignition coil and one side of said circuit breaker, an electrical heating coil on said bi-metallic arm, said heating coil being connected between said conductive pivoted arm and one side of said source whereby said coil is energized to heat said bi-metallic arm while said conductive arm and the first stationary contact are engaged, resulting in warping of said bi-metallic arm out of engagement with said pair of stationary contacts with consequent deenergization of said circuit breaker, and a third contactor connected to said primary winding of the ignition coil, said third contactor being engaged by said pivoted arm only in the expanded position of said pivoted arm while the oil pressure is normal.

2. A circuit breaker for use with an internal combustion engine having an engine oil pressure responsive element and an ignition system including a source of current and a primary circuit, said circuit breaker comprising first switch means connected in a selected part of said primary circuit of the ignition system, second switch means connected in another part of said primary circuit, a normally closed electrically heated thermostatic switch connected in another portion of said primary circuit, means operatively connecting said element with a portion of said first switch means to close said first switch means while said element is expanded and to open said first switch means while said element is in a collapsed condition, said second switch means comprising said portion of said first switch means, said second switch means being closed only while said first switch means is open, said electrically heated thermostatic switch being normally closed and arranged to be heated and thereby opened by operation of said first switch means from a closed to an open position and by closing of said second switch means.

3. A circuit breaker for use with an internal combustion engine having an engine oil pressure responsive element and an ignition system including a generator having a generator cut-out, a primary ignition circuit connected to the output side of said generator cut-out, a pair of contactors connected in said primary ignition circuit, thermostatic means normally bridging said pair of contacts to maintain said primary circuit closed, said thermostatic means comprising a bi-metallic arm having an electrical heating coil arranged to warp said bi-metallic arm and unbridge said pair of contactors when the heating coil is energized, a switch comprising a first stationary contact, a second stationary contact, and a movable conductive arm, said first contact and said conductive element being connected in said primary ignition circuit with said pair of contactors, said movable conductive arm having a first position due to normally high oil pressure in which said first contact and said arm are engaged and carry the primary ignition circuit current, said movable conductive arm having a second position due to below normal oil pressure in which said first contact and said arm are disengaged, said arm having an insulated contactor to engage said second contact in the disengaged position of said arm and said first contact, said second contact being connected in said primary circuit between said heating coil and a terminal of said generator and said generator cut-out, whereby effective energization of said heating coil is dependent on sufficient output of the generator to close said generator cut-out.

4. In an oil pressure operated ignition cut-off for an internal combustion engine as recited by claim 3, said switch comprising a pivotally supported insulated bellcrank having one arm connected with and insulated from said element, a first insulated support carrying said first contact, a second insulated support bearing said second contact and insulated means carrying the said pair of contactors.

5. In an oil pressure operated ignition cut-off for an internal combustion engine as recited by claim 3, said switch comprising a conductive lever pivotally supported between its ends, said lever having one arm thereof operatively connected with and insulated from said element, a first insulated support carrying said first contact for engagement by a portion of said lever, a second insulated support bearing said second contact, said lever having an insulated contactor for engagement with said second contact, said insulated contactor being arranged to engage the last-mentioned contact in a position corresponding to low oil pressure and to disengage the same in a position of normally high oil pressure, said insulated contactor comprising a plate fixed to said lever.

6. A circuit breaker for use with an internal combustion engine having an engine oil pressure responsive element and an ignition system having a primary circuit including an ignition coil and a source of current, said circuit breaker comprising a pair of contacts connected in the primary circuit between said source and said coil, a bi-metallic arm having a conductive portion normally bridging said contacts, said bi-metallic arm being arranged to warp away from said contacts when heated, electrical heating means for said bi-metallic arm, and switch means arranged for operation by said pressure responsive element, said switch means being connected between said heating means and said source and normally disconnecting said heating means from said source while normally high oil pressure subsists, said switch means being operative while abnormally low pressure subsists to connect said heating means with said source to unbridge said pair of contacts and deenergize the ignition system, said switch means comprising a member pivotally supported intermediate its ends and having one end arranged to be operatively engaged by said element, a conductive portion at the opposite end of said member, a short conductive element on and insulated from said end, a first stationary contact, spring means normally urging said member in a direction toward engaging said conductive portion with said first stationary contact, a second stationary contact with which said short conductive element engages while below normal oil pressure subsists and said conductive portion is out of engagement with said first stationary contact.

7. An oil pressure operated ignition cut-off for an internal combustion engine, said internal combustion engine having a battery generator ignition system including a generator cut-out arranged to stay open while the engine is idling and to close when the engine is at running speed, said ignition system further comprising an ignition coil having primary and secondary windings and an engine operated circuit breaker connected between the battery of the circuit and the primary winding of the ignition coil, said cut-off comprising a switch, comprising first circuit closing means connected between said circuit breaker and the primary winding of said ignition coil, said switch further comprising second circuit closing means, said first circuit closing means being closed only while the oil pressure in the engine is normally high, said second circuit closing means being closed only while the oil pressure in the engine is below normal, a normally closed thermostatic switch including a heating coil, said thermostatic switch being effectively connected between the primary winding of the ignition coil and one side of said first circuit closing means, said heating coil being connected between one side of said second circuit closing means and the battery, whereby when the oil pressure falls below normal with the engine at running speed said first circuit closing means is opened and said second circuit closing means is closed so as to cause energization of said heating coil and opening of said thermostatic switch, thereby deenergizing the primary winding of said ignition coil and disconnecting said circuit breaker from the primary winding of said ignition coil.

8. An oil pressure operated ignition cut-off according to claim 7 wherein the output side of said generator cut-out is connected to conduct the output of the generator to the primary winding of the ignition coil and to the battery only at running speed of the engine and to fail to conduct any output from the generator to the primary winding of the ignition coil at idling speed of the engine, thereby precluding unwanted energization of said heating coil and operation of said thermostatic switch while the engine is idling and the oil pressure is naturally reduced below normal during such idling.

9. An oil pressure operated ignition cut-off for an internal combustion engine of the type having a generator-battery ignition circuit including an ignition coil, circuit breaker and generator cut-out, said cut-off comprising switch means responsive to the oil pressure in the engine and normally closed thermostatic switch means, electrical heating means therefor, said pressure responsive switch means being connected in said ignition circuit to maintain said ignition circuit closed only while the engine is at running speed and the oil pressure is up to normal and the generator is turning over fast enough to close said generator cut-out and energize said ignition coil and circuit breaker, said electrical heating means of the thermostatic switch means being connected in said circuit to be effectively energized only during a period of below normal oil pressure with the engine at running speed, said generator cut-out being connected in said circuit to close at idling speed of the engine and maintain energization of said ignition coil by the battery while the engine is idling despite opening of said pressure responsive switch means in response to the below normal oil pressure incident to idling speed of the engine, said generator cut-out opening at running speed of the engine to energize said ignition circuit from the output of the generator.

10. An oil pressure operated ignition circuit cut-off for an internal combustion engine having a battery generator ignition circuit containing a generator cut-out, an ignition coil having a primary winding, and a circuit breaker, said cut-off comprising oil pressure responsive two-position switch means connected in said ignition circuit, said switch means being closed in one position while normally high oil pressure subsists in the engine thereby maintaining energization of said circuit by the generator and being open in its other position while below normal oil pressure subsists, so as to deenergize a portion of said circuit, thermostatic switch means connected in said ignition circuit between the battery and generator and the remainder of said circuit and normally closed to maintain energization of said circuit, said thermostatic switch means including an electrical heating coil energization of which opens said thermostatic switch to deenergize the ignition as a whole, said pressure re-

sponsive switch means being arranged to connect said heating coil with said circuit to energize said heating coil in the said other position of said pressure responsive switch means.

11. An ignition circuit cut-off according to claim 10 wherein said generator cut-out is connected in said circuit to close and energize said circuit from the generator at running speed of said engine and to open and energize said circuit from the battery while the engine is at idling speed and the oil pressure is naturally lower than normal, so as to prevent unwanted cutting off of the ignition circuit by the operation of said pressure responsive switch means while the engine is idled.

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