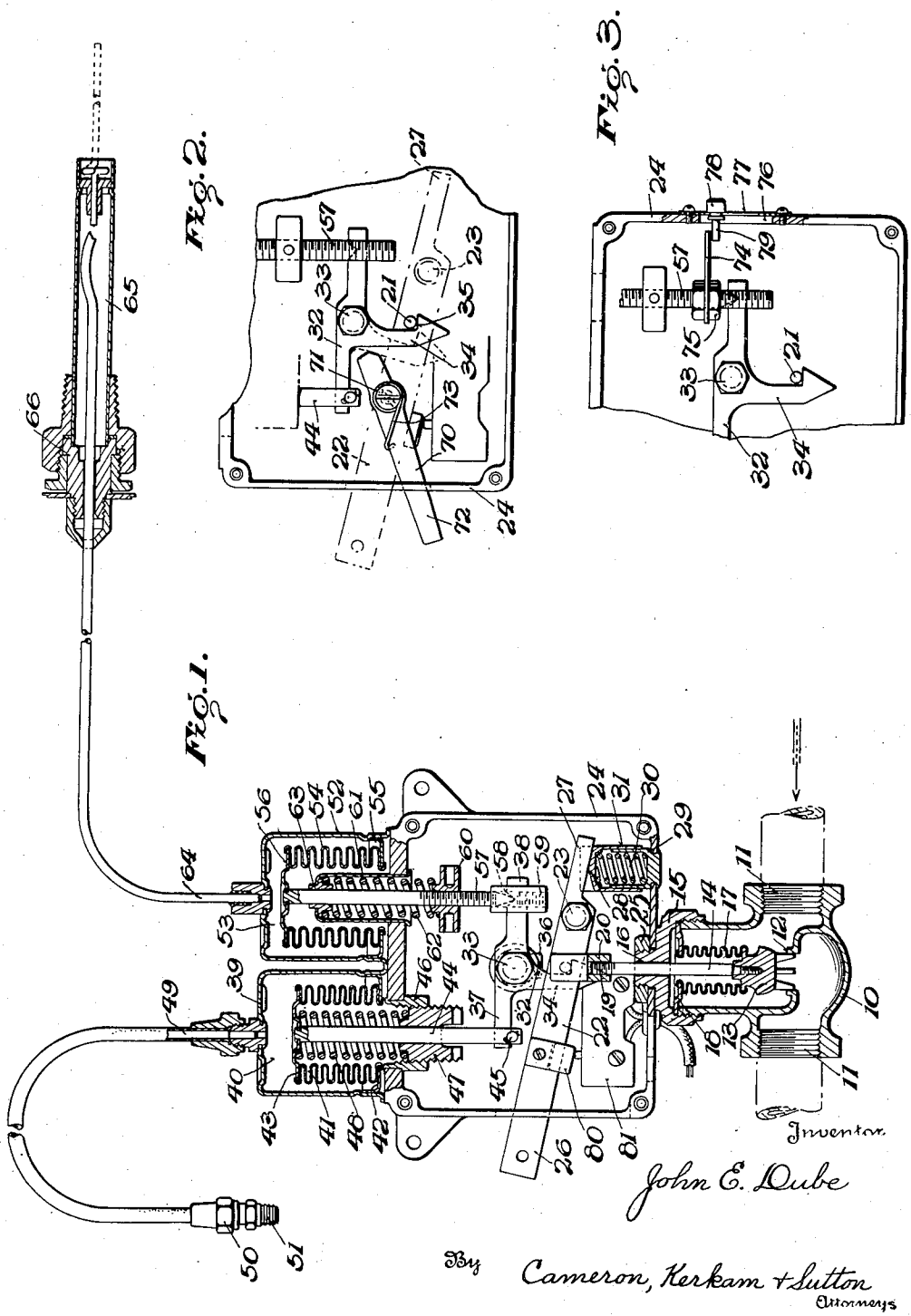
March 29, 1938. J. E. DUBE 2,112,664

CONTROL MECHANISM

Filed March 22, 1937



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Patented Mar. 29, 1938 2,112,664

UNITED STATES PATENT OFFICE

2,112,664

CONTROL MECHANISM

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Application March 22, 1937, Serial No. 132,401

17 Claims. (Cl. 123—178)

This invention relates to control mechanism, and more particularly to mechanism for controlling the operation of an engine, as a Diesel engine.

It is an object of this invention to provide an engine with a safety device which will effect the stoppage of the engine or release the same of its load if either or both the pressure of the lubricating oil falls below a predetermined minimum or the temperature of the cooling medium rises above a predetermined maximum.

Another object of this invention is to provide an improved device which by closure of a valve in the fuel line, or by operation upon the governor or other appropriate means, will stop an engine as soon as the pressure of the lubricating oil falls too low.

Another object of this invention is to provide an improved device which by closure of a valve in the fuel line, or by operation upon the governor or other appropriate means, will stop an engine as soon as the temperature of the cooling medium rises too high.

Another object of this invention is to provide a device of the type characterized which will also effect the stoppage of the engine upon failure of the pressure responsive element of the controlling mechanism.

Another object of this invention is to provide a device of the type characterized which may also include mechanism for giving a signal to attract the attention of the engineer in the event that the engine is stopped by the operation of the controlling mechanism.

Another object of this invention is to provide a device of the type characterized which may also operate indicating mechanism to show the cause of stoppage of the engine.

Another object of this invention is to provide a device of the type characterized which is relatively simple in construction, easy to set, and efficient in operation.

Other objects will appear as the description of the invention proceeds.

The invention is capable of receiving a variety of mechanical expressions one of which is shown on the accompanying drawing, but it is to be expressly understood that the drawing is for purposes of illustration only, and is not to be construed as a definition of the limits of the invention, reference being had to the appended claims for that purpose.

Referring in detail to the drawing, wherein the same reference characters are employed to designate corresponding parts in the several figures,—

Fig. 1 is an axial section through an embodiment of the present invention;

Fig. 2 is a fragmentary view showing means for locking the mechanism in operative position during the starting of the engine; and

Fig. 3 is a fragmentary section to illustrate indicating means operated by the controlling mechanism to show the cause of stoppage of the engine.

The control mechanism of the present invention may be associated with any suitable means for stopping the engine as a switch in the ignition system, a governor operating device, a valve in the fuel line, etc., but for illustrating an embodiment of the invention the control mechanism is shown as associated with a suitable valve in the fuel line as of a Diesel engine.

In the form shown, valve casing 10 has suitable inlet and outlet connections 11 whereby it may be interposed in a fuel line, and said casing is provided interiorly thereof with a suitable valve seat 12 with which cooperates a valve member 13 of any suitable construction and material. Connected to valve member 13 is a valve stem 14 which projects exteriorly of the bonnet 15 through an aperture 16 therein. As shown, said valve is of the packless type and has an expansible and collapsible tubular metallic wall or bellows 17 suitably attached at one end to the valve member, as by soldering or brazing, and suitably attached at its opposite end, as by soldering or brazing, to a disk 18, here shown as clamped between the body of the valve casing 10 and the bonnet 15. Bellows 17 thereby forms an extensible and collapsible fluid-tight seal around the stem 14.

Suitably attached to the outwardly extending end of the valve stem 14, as by screw threads 19, is a clevis 20 which carries a pivot pin 21. Pivotally mounted on said pin 21 is a lever 22, which lever is also pivotally mounted at 23 on the housing 24, said housing being mounted in any suitable way as by clamping the same between the bonnet 15 and a lock nut 25. Lever 22 at one end extends to the exterior of the housing, as through a slot in the wall thereof, as shown at 26, and the opposite end 27 of said lever is operatively associated with a spring pressed plunger 28 mounted in the housing in any suitable way. As here shown an open ended cylindrical casing 29 is mounted in an aperture in the wall of said housing and contains a coil spring 30 which reacts between the inner end wall of said casing 29 and the end of a second tubular casing 31

which is telescopically received and slidably mounted on the exterior of said casing 29 with its end wall constituting the plunger 28 heretofore referred to. Spring 30 thus normally urges lever 22 around its pivot 23 in a direction to move valve stem 14 and valve member 13 toward closing position.

To retain the valve member 13 in open position a latch 32 is pivotally mounted at 33 on the wall of the housing and has an arm 34 that is shouldered at 35 to engage a portion of the pivot pin 21 which projects into alignment therewith. Coiled around pivot pin 33 is a spring 36 which normally urges the latch in an anti-clockwise direction to hold its latch shoulder 35 in engagement with the pin 21. Latch member 32 is also provided with a pair of arms 37 and 38 projecting in opposite directions as shown. Cooperating with said arms 37 and 38 are suitable devices responsive to the pressure of the lubricating oil and the temperature of the cooling medium.

As here shown, the device responsive to the pressure of the lubricating oil takes the form of a cup-shaped casing 39, which may be mounted on the wall of the housing 24 in any suitable way and which constitutes the outer wall of an expansible and collapsible chamber 40. The inner wall of said chamber 40 is composed of an expansible and collapsible tubular corrugated metal wall 41 suitably attached at one end as by soldering or brazing to a mounting ring 42 which is sealed to the open end of the casing 39, and suitably attached at its opposite end as by soldering or brazing to a movable end member 43 which is attached in any suitable way to a stem 44 that is bifurcated at its outer end so as to straddle the arm 37 of the latch 32. A pin 45 is passed through the bifurcations at the end of said stem 44 so that it may engage and actuate the arm 37 as hereinafter described. Suitably mounted in an opening in the wall of the housing 24 is an interiorly threaded sleeve 46 which carries a threaded block 47 having an opening therethrough through which passes the stem 44. Interposed between the block 47 and the movable end member 43 is a coil spring 48 which normally urges the bellows 41 in a direction to extend said bellows and move the stem 44, upwardly as viewed in the drawing, to cause the pin 45 to engage the arm 37 and by rotation of the latter free the latch shoulder 35 from the pin 21. Threaded block 47 guides the stem 44 in its rectilinear movement and also constitutes an adjustable abutment for the spring 48 so as to predetermine the pressure that must exist in the chamber 40 to prevent stem 44 from removing latch shoulder 35 from engagement with pin 21. Suitably attached to casing 39 is a tube 49 which may be either rigid or flexible and which extends to any appropriate coupling 50 having a threaded nipple 51 for mounting in the wall of a chamber or passage which contains the lubricating oil under its operating pressure.

As here shown, the device responsive to the temperature of the cooling medium includes a cup-shaped casing 52 which is mounted on the wall of the housing 24 in any suitable way and which constitutes the exterior wall of an expansible and collapsible chamber 53 whose inner wall is constituted by an expansible and collapsible tubular corrugated metal wall or bellows 54 suitably attached at one end as by soldering or brazing to a retaining ring 55 that is sealed to the casing 52, and suitably attached at its opposite end as by soldering or brazing to a movable end member 56 which has attached thereto in any suitable way a stem 57. The outer end of stem 57 is pointed or made of knife-edge formation and engages in a notch 58 in the arm 38 of the latch device. Arm 38 may be retained in proper relationship to the end 58 of stem 57 by a member 59 which embraces the end of the arm 38. The stem 57 is also threaded for a portion of its length as shown, and rotatably mounted on said threaded portion is an abutment nut 60. Interposed between said abutment nut 60 and the end of a spring casing 61 retained in an aperture in the wall of the housing 24 in any suitable way is a coil spring 62 which by reaction between the bottom of said spring casing 61 and the abutment nut 60 normally urges stem 57 in a direction to rotate arm 38 in a clockwise direction around its pivot 33 and thereby withdraw the latch shoulder 35 from pin 21. By adjustment of the nut 60 the tension of the spring 62 may be varied as required. Spring casing 61 may also be formed to provide a guide for the stem 57 as shown at 63. Communicating with the casing 52 in any suitable way is a tube 64 which extends to a bulb 65 provided with any suitable means 66 for mounting the same in the wall of the chamber or passage containing the cooling medium at its operating temperature. Bulb 65, tube 64 and chamber 53 are charged with a volatile fluid at less than atmospheric pressure so that under normal conditions a sub-atmospheric pressure exists in chamber 53 whereby atmospheric pressure normally holds the movable end member 56, against the tension of spring 62, in such position as to permit the latch shoulder 35 to remain in engagement with pin 21.

As so far described, the devices operate as follows:—When the engine is to be started lever 22 is lifted by its outwardly projecting end 26 so as to permit the fuel to flow past valve member 13, and lever 26 is held in this position until the engine starts and the pressure of the lubricating oil has become such that the pressure on end member 43 holds stem 44 in its lowermost position as shown in the drawing, i. e., in such position that latch 35 may remain in engagement with pin 21. Thereafter the engine will continue to run as long as the pressure of the oil remains above the predetermined minimum determined by the tension of spring 48 and the temperature of the cooling medium remains below the predetermined maximum determined by the tension of spring 62, the sub-atmospheric pressure in chamber 53 causing the bellows 54 to be held in its extended position with no sufficient thrust exerted by the end of stem 57 on the arm 38 of latch 32 to remove said latch from pin 21.

If the pressure of the lubricating oil falls below the predetermined minimum, the pressure in chamber 40 is correspondingly reduced, the spring 48 will thereupon move member 43 in an upward direction, as viewed in the drawing, lifting stem 44 and engaging pin 45 with arm 37 to rotate latch 32 in a clockwise direction about its axis 33, withdrawing latch shoulder 35 from pin 21, whereupon spring 30 will move plunger 28 to rotate lever 22 about its pivot 23 in an anti-clockwise direction, engaging valve member 13 with its seat 12 and thereby discontinuing the flow of fuel to the engine. On the other hand, if the temperature of the cooling medium at the bulb 65 rises above the predetermined maximum the pressure of the volatile fluid in the chamber 53 will be increased so as to diminish the sub-at-

mospheric pressure in said chamber and permit the spring 62 to move stem 57 in a downward direction, as viewed in the drawing, exerting a thrust on arm 38 of lever 32 and rotating said latch in a clockwise direction to free the lever 22 and permit closure of the valve member as heretofore described.

In the event that bellows 41 should fail the pressure in chamber 40 will be released, and hence the latch 32 will be actuated in the same way as when the pressure lubricating oil falls below the predetermined minimum. Similarly, if bellows 54 should fail the sub-atmospheric pressure in chamber 53 is lost, and hence the latch 32 is operated by spring 62 in the same way as when the temperature rises above the predetermined maximum. Therefore, the control mechanism of the present invention provides a safety device which assures that the engine will be stopped if either or both the pressure responsive mechanism and the temperature responsive mechanism fail for any cause.

The structure as so far described requires that the lever 22 be held in open position until such time as the pressure of the lubricating oil in the chamber 40 moves the stem 44, downwardly as viewed in the drawing, to such position that latch 32 may remain in engagement with pin 21. Fig. 2 shows a second lever that may be mounted on lever 22 so as to obviate the necessity for holding said lever in open position. As here shown, lever 70 is pivotally mounted on lever 22 at 71 and projects exteriorly of the housing through a slot in the wall thereof as shown at 72. Coiled around the pivot pin 71 and reacting between levers 22 and 70 is a spring 73 which normally urges lever 73 in an anti-clockwise direction to the position shown in Fig. 2. The inner end of lever 70 is in alignment with and contiguous to the edge of latch arm 34. When lever 70 is rotated in a clockwise direction around its axis 71 it engages the lateral edge of latch arm 34 and moves latch 32 in an anti-clockwise direction around its pivot 33 into a position for its latch shoulder 35 to engage the pin 21. In this position the end of the lever 70 is in flatwise engagement with the edge of the latch arm 32, so that the tension of the spring 48 as applied to latch 32 through stem 44 holds latch arm 34 in frictional engagement with the end of lever 70 locking said lever in its upper position against the tension of spring 73. Thus latch arm 34 and lever 70 are interlocked, holding the latch shoulder 35 in engagement with pin 21 and restraining lever 70 from rotation back to the full line position shown in Fig. 2. As soon as the pressure has developed in the chamber 40 to the predetermined amount, said pressure acting through the movable end member 43 and stem 44 releases the pull on latch 32 and therefore the lever 70 is no longer restrained from return to the position shown in Fig. 2 under the action of its spring 73. Hence with this additional lever 70 the engine may be started by lifting lever 22 as heretofore described and simultaneously moving lever 70 around its pivot 71 into lateral alignment therewith, which movement locks the latch 32 in engagement with the pin 21 until such time as the pressure in the chamber 40 has built up to the predetermined minimum, after which the lever 70 returns to the position shown in Fig. 2 where it no longer interferes with the release of the latch 32 either by a drop in pressure in the chamber 40 or an increase of temperature at the temperature responsive mechanism, as heretofore described.

Fig. 3 illustrates indicating mechanism that may be associated with the control mechanism so as to record the cause of the stoppage of the engine. As here shown, the stem 57 is threaded at its extremity and carries an arm 74 which may be retained thereon in any suitable way as by lock nuts 75. The wall of the housing 24 is provided with an aperture 76 which carries an index plate 77 in which is frictionally retained an indicating member 78 having an inwardly extending arm 79 that lies in the path of movement of arm 74. Indicating plate 77 may be provided, for example, with suitable temperature indicia, so that when the temperature responsive mechanism operates to cause the stoppage of the engine, arm 74 will move indicating member 78 to the same extent that stem 57 is moved by member 56, and hence to an extent that is proportional to the temperature developed at bulb 65. Plug 78 will be retained in the position to which it is moved though the temperature responsive mechanism is thereafter retracted by falling temperature, and hence the temperature which causes the engine to stop may be determined by the location of the member 78. Upon restarting the engine, member 78 must be moved manually until its arm 79 is engaged with arm 74.

If desired the control mechanism may also be provided with a visible or audible signal to attract the attention of the engineer. Referring to Fig. 1, lever 22 may be provided with a suitable contact 80 which upon closure of the valve member 13 into engagement with its seat 12 is moved by lever 22 to close a suitable switch 81 which may be in the circuit of any suitable visible or audible signal.

It will therefore be perceived that by the present invention improved controlling mechanism has been provided whereby the engine is stopped if the pressure of the lubricating oil falls below a predetermined minimum or if the temperature of the cooling medium rises above a predetermined maximum, and this is effected by mechanism which also assures stoppage of the engine in the event that either part of the controlling mechanism fails for any cause. Means may also be provided whereby a visible or audible signal of the stoppage of the engine may be given to attract the attention of the engineer so that he will be promptly advised thereof. Means may also be provided for indicating the cause of the stoppage of the engine, as in the illustration selected the temperature of the cooling medium which has caused the engine to stop. Means may also be provided whereby the controlling mechanism may be held in starting position without need of the operator retaining the same in such position until the oil pressure has been established. It will also be perceived that the device is relatively simple in construction, easy to manufacture and assemble, readily understood for setting, and efficient in operation.

While the embodiment of the invention illustrated on the drawing has been described with considerable particularity, it is to be expressly understood that the invention is not restricted thereto, as the same may take a variety of mechanical expressions, some of which will now readily suggest themselves to those skilled in the art, while changes may be made in the details of construction, arrangement and proportion of parts, and certain features used without other

features, or in its broader aspects one of the controlling devices may be used without the other, without departing from the spirit of this invention. Reference is therefore to be had to the appended claims for a definition of said invention.

What is claimed is:

1. In a controlling device for engines, in combination with means whose movement effects the stoppage of the engine, means for normally moving said stopping means toward stopping position, latching means cooperating with said stopping means for restraining the same against movement toward stopping position, and separate pressure responsive devices cooperating with said latching means and each adapted to separately actuate said latching means to release said stopping means without moving the other of said pressure responsive devices, one of said pressure responsive means being subjected to the pressure of the lubricating oil and the other of said pressure responsive means being subjected to the temperature of the cooling medium.

2. In a controlling device for engines, in combination with means whose movement effects the stoppage of the engine, means for normally moving said stopping means toward stopping position, latching means cooperating with said stopping means for restraining the same against movement toward stopping position, and separate pressure responsive devices cooperating with said latching means and each adapted to separately actuate said latching means to release said stopping means without moving the other of said pressure responsive devices, one of said pressure responsive means being responsive to variations of pressure and the other of said pressure responsive means being responsive to variations of temperature.

3. In a controlling device for engines, in combination with means whose movement effects the stoppage of the engine, means for normally moving said stopping means toward stopping position, latching means cooperating with said stopping means for restraining the same against movement toward stopping position, and separate pressure responsive devices separately subjected to pressures which vary with the operating conditions of the engine and each cooperating with said latching means to actuate the same and release said stopping means without movement of the other of said pressure responsive devices upon predetermined pressures at either of said pressure responsive devices.

4. In a controlling device for engines, in combination with means whose movement effects the stoppage of the engine, means for normally moving said stopping means toward stopping position, latching means cooperating with said stopping means for restraining the same against movement toward stopping position, resilient means for urging said latching means into its position for restraining said stopping means, and a pressure responsive device operatively associated with said latching means, said pressure responsive device including a casing, an expansible and collapsible member in said casing, means operatively connected to said expansible and collapsible member and adapted upon a predetermined decrease in the pressure on said expansible and collapsible member to move said latching means against the tension of its resilient means to release said stopping means, and means for subjecting said expansible and collapsible member to pressure.

5. In a controlling device for engines, in combination with means whose movement effects the stoppage of the engine, means for normally moving said stopping means toward stopping position, latching means cooperating with said stopping means for restraining the same against movement toward stopping position, a pair of members cooperating with said latching means and each adapted to actuate said latching means in the same direction to release said stopping means without movement of the other of said members, flexible walls operatively connected to the respective members, casings associated with the respective flexible walls, and means communicating with the respective casings for subjecting the respective flexible walls therein to pressures which vary with varying conditions of operation of the engine.

6. In a controlling device for engines, in combination with means whose movement effects the stoppage of the engine, means for normally moving said stopping means toward stopping position, latching means cooperating with said stopping means for restraining the same against movement toward stopping position, a pair of members cooperating with said latching means and each adapted to actuate said latching means in the same direction to release said stopping means without movement of the other of said members, flexible walls operatively connected to the respective members, casings associated with the respective flexible walls, means for subjecting the interior of one of said casings to the pressure of the lubricating oil, and means for subjecting the interior of the other of said casings to pressures which vary with the temperature of the cooling medium.

7. In a controlling device for engines, in combination with a member whose movement effects the stoppage of the engine, means for normally urging said member toward stopping position, a latch for normally holding said member in non-stopping position, and a plurality of independently acting pressure responsive devices operatively associated with said latch and independently operable to actuate the same and release said stopping member without moving the other of said pressure responsive devices upon the occurrence of a predetermined change in pressure at either one of said pressure responsive devices.

8. In a controlling device for engines, in combination with a member whose movement effects the stoppage of the engine, means for normally urging said member toward stopping position, a latch for normally holding said member in non-stopping position, a plurality of pressure responsive devices operatively associated with said latch and independently operable to actuate the same and release said stopping member without moving the other of said pressure responsive devices, and means for subjecting one of said pressure responsive devices to the pressure of the lubricating oil.

9. In a controlling device for engines, in combination with a member whose movement effects the stoppage of the engine, means for normally urging said member toward stopping position, a latch for normally holding said member in non-stopping position, a plurality of pressure responsive devices operatively associated with said latch and independently operable to actuate the same and release said stopping member without moving the other of said pressure responsive devices, and means to subject one of said pressure responsive devices to pressures which vary with the temperature of the cooling medium.

10. In a controlling device for engines, in combination with a member whose movement effects the stoppage of the engine, means for normally urging said member toward stopping position, a latch for normally holding said member in non-stopping position, independently operating pressure responsive devices operatively associated with said latch and separately operable to actuate the same and release said stopping member, and means actuated by the movement of said member to stopping position for closing a signal circuit.

11. In a controlling device for engines, in combination with a member whose movement effects the stoppage of the engine, means for normally urging said member toward stopping position, a latch for normally holding said member in non-stopping position, independently operating pressure responsive devices operatively associated with said latch and separately operable to actuate the same and release said stopping member, and means operated by the movement of a pressure responsive device for registering the extent of its movement.

12. In a controlling device for engines, in combination with a member whose movement effects the stopping of the engine, a lever pivoted to said member, resilient means cooperating with said lever and normally urging said lever in a direction to move said member into stopping position, a latch cooperating with said lever and normally restraining the same against moving said member into stopping position, and a pair of pressure responsive devices operatively associated with said latch and separately and independently operable to release the same upon the occurrence of a predetermined change of pressure at the respective pressure responsive device.

13. In a controlling device for engines, in combination with a member whose movement effects the stopping of the engine, a lever pivoted to said member, resilient means cooperating with said lever and normally urging said lever in a direction to move said member into stopping position, a latch cooperating with said lever and normally restraining the same against moving said member into stopping position, a pair of pressure responsive devices operatively connected to said latch for operation of said latch, said pressure responsive devices being operable separately and independently of each other, means for subjecting one of said pressure responsive devices to the pressure of lubricating oil, and means for subjecting the other of said pressure responsive devices to pressures which vary with changes of temperature in the cooling medium.

14. In a controlling device for engines, in combination with a member whose movement effects the stopping of the engine, a lever pivoted to said member, resilient means cooperating with said lever and normally urging said lever in a direction to move said member into stopping position, a latch cooperating with said lever and normally restraining the same against moving said member into stopping position, a pressure responsive device operatively associated with said latch and adapted to actuate the same upon a predetermined drop in pressure, and means for temporarily locking said latch in latched position prior to the development of said pressure.

15. In a controlling device for engines, in combination with a member whose movement effects the stopping of the engine, a lever pivoted to said member, resilient means cooperating with said lever and normally urging said lever in a direction to move said member into stopping position, a latch cooperating with said lever and normally restraining the same against moving said member into stopping position, a pressure responsive device operatively associated with said latch and adapted to actuate the same on a predetermined drop in pressure, a second lever pivotally mounted on said first named lever and adapted to interlock with said latch to hold the same in latched position until said predetermined pressure has been built up, and means cooperating with said second named lever for withdrawing the same from its interlocking position whereby it does not interfere with the release of said latch upon a subsequent drop in pressure below said predetermined pressure.

16. In a controlling device for engines, in combination with a member whose movement effects the stopping of the engine, a lever pivoted to said member, resilient means cooperating with said lever and normally urging said lever in a direction to move said member into stopping position, a latch cooperating with said lever and normally restraining the same against moving said member into stopping position, said latch including a pair of projecting arms, flexible walls operatively connected to said arms and having their axes disposed at angles to said arms, casings associated with said flexible walls to provide therewith expansible and collapsible chambers, and means for subjecting said chambers to variations of pressure incident to the operation of the engine whereby said latch is actuated upon a predetermined change in pressure at either of said chambers.

17. In a controlling device for engines, in combination with a member whose movement effects the stopping of the engine, a lever pivoted to said member, resilient means cooperating with said lever and normally urging said lever in a direction to move said member into stopping position, a latch cooperating with said lever and normally restraining the same against moving said member into stopping position, said latch being provided with a pair of oppositely projecting arms, a flexible wall associated with each arm and disposed at an angle thereto, a casing cooperating with each wall to provide therewith an expansible and collapsible chamber, operating connections between each wall and one of said arms including resilient means cooperating therewith whereby one of said arms is actuated by a thrust transmitted from one flexible wall and the other of said arms is actuated by a pull transmitted from the other flexible wall, and means for subjecting the respective chambers to variations of pressure incident to the operation of the engine.

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