Feb. 18, 1936. W. A. ROBINSON 2,030,939

INTERNAL COMBUSTION ENGINE AND AUTOMATIC CONTROL THEREFOR

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FIG. 1

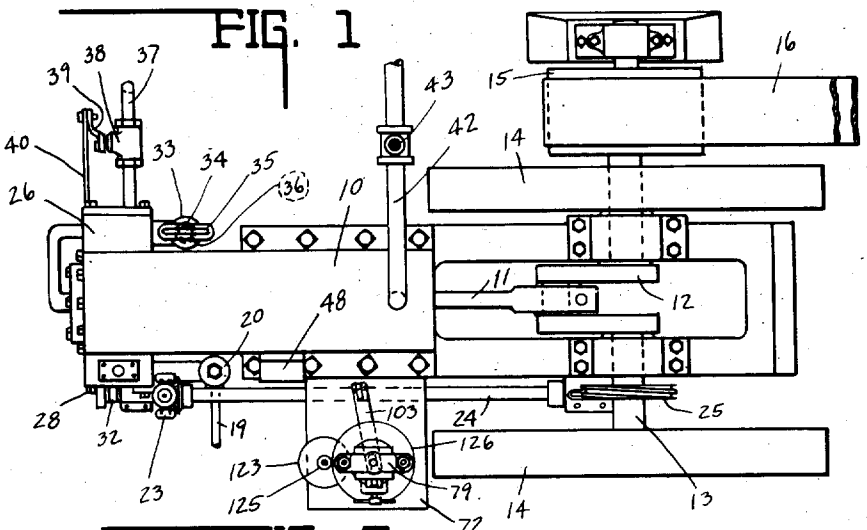


FIG. 2

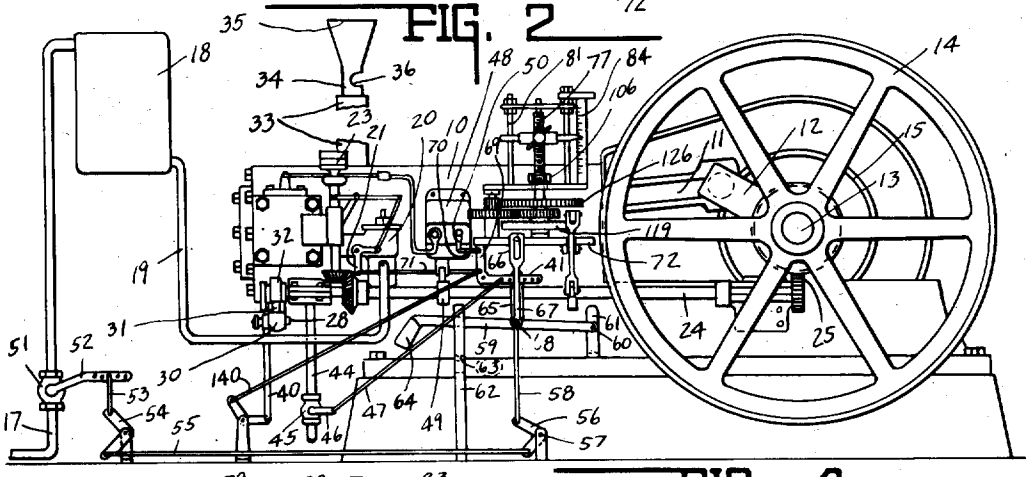


FIG. 3

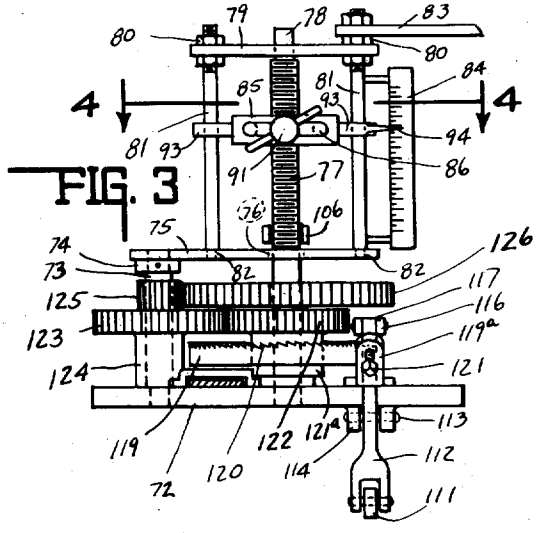
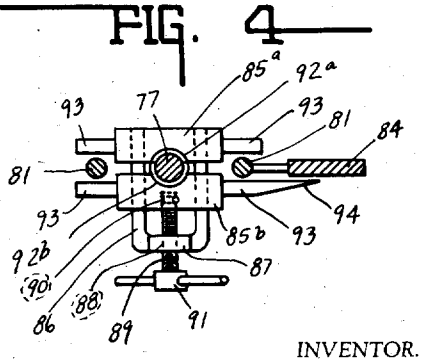


FIG. 4



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FIG. 5

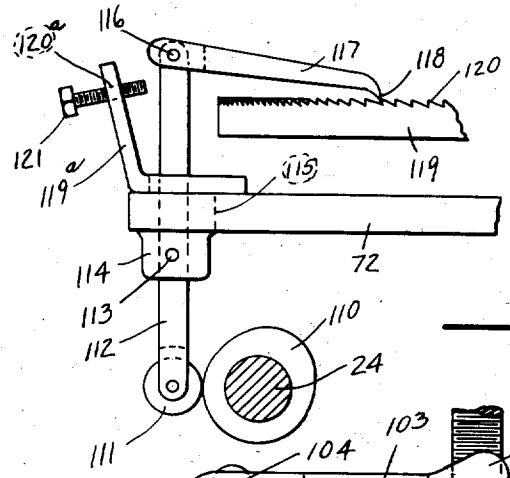
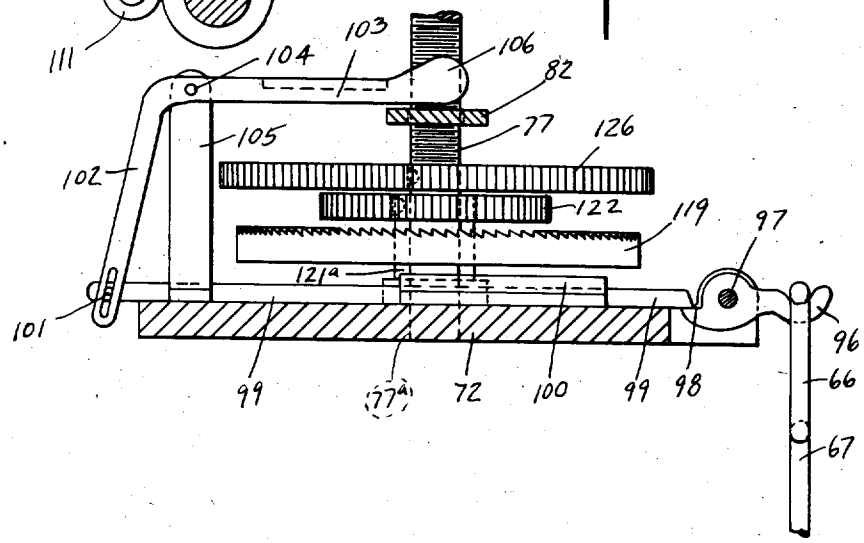


FIG. 6



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UNITED STATES PATENT OFFICE

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INTERNAL COMBUSTION ENGINE AND AUTOMATIC CONTROL THEREFOR

William A. Robinson, Oakland City, Ind., assignor of fifty-one per cent to Lewis C. Nicholson and John O. Rosebaum, both of Indianapolis, and William W. Rogers and Byron C. Van Hook, both of Princeton, and William H. Baugh, Terre Haute, Ind.

Application July 28, 1932, Serial No. 625,338

1 Claim. (Cl. 123—198)

This invention relates to apparatus for controlling a prime mover, which apparatus is manually adjustable so that it is automatically operable by the prime mover for stopping the prime mover after a predetermined amount of prime mover operation has occurred.

A prime mover of the character indicated may be a gas engine or an oil engine, and herein the invention is embodied in a control for a gas engine, although the same principle and the same mechanism may be, with slight alterations, associated with an oil engine. Gas and oil engines are utilized in the oil and gas fields for the pumping of oil from wells that do not flow with sufficient capacity to not require pumping. Usually wells gradually decrease in their volume output and at a certain production volume, the well is equipped with a pumping arrangement and this pumping arrangement is operable, for but a part of any predetermined period; for example, 18 hours per day, 12 hours per day or six or eight hours per day, depending upon the flow of the well or, as otherwise expressed, the accumulation of oil in the well.

The present invention, when applied to a prime mover for the purpose set forth, is adapted to automatically stop the prime mover and hence the pumping operations after a predetermined amount of prime mover operation has occurred. This permits a single operator to control a plurality of prime movers each of which, as is customary in the oil industry, mechanically operates a plurality of pumps at a plurality of wells. The operator after starting the prime mover, sets the stopping control mechanism embodying the invention for a predetermined amount of prime mover operation and then may proceed to another prime mover and similarly initiate the operation thereof and the adjustment of the cutoff mechanism thereof. This permits of the economical supervision and control of a plurality of prime movers scattered over a relatively large area and by a single operator.

When a water-cooled gas engine is employed as a prime mover, the mechanism is also arranged to automatically cut off the gas supply to the gasometer, the gas supply from the gasometer to the engine, the ignition to the engine, the water supply to the engine, whereby the latter is cooled, and to open the drain for draining the water jacket of the cylinder. This latter drain may be included as a part of but usually is separate from the water jacket discharge normally employed in the operation of the engine and which may be normally open, but which upon cutting off of the cooling water supply, would trap in the jacket a certain amount of water. The purpose of draining the water jacket is to insure that in cold weather there will be no water trapped in the water jacket so that in the event of freezing weather the cylinders will not be cracked by the possibility of freezing.

The chief feature of the invention, as before mentioned, consists in the accomplishment of the foregoing object, to wit, the automatic cut off of the prime mover after a predetermined amount of prime mover operation has occurred and by apparatus that is relatively simple in construction, positive in its action and readily adjustable to any predetermined desired period or interval of operation and which moreover is operable by the prime mover itself.

Another feature of the invention is the construction of the automatic cut off whereby it may be manually adjusted so that the prime mover may operate continuously when desired.

A further feature of the invention consists in constructing the automatic cut off whereby it may be manually actuated to stop instantly the prime mover in the event of an emergency.

The full nature of the invention will be understood from the accompanying drawings and the following description and claim:—

In the drawings, Fig. 1 is a top plan view of a gas engine embodying the invention and associated parts.

Fig. 2 is a side elevation of the engine with the invention applied thereto.

Fig. 3 is an enlarged side elevational view of a major portion of the invention, the parts being shown in the "engine running" position.

Fig. 4 is a transverse sectional view taken on line 4—4 of Fig. 3 and in the direction of the arrows.

Fig. 5 is a side elevation of the ratchet drive mechanism for control operation by the prime mover.

Fig. 6 is a side elevation of the release mechanism which when actuated secures stoppage of the prime mover.

In the drawings 10 indicates a cylinder structure of a horizontal gas engine having the piston rod 11 connected to the crank portion 12 of the crank shaft 13 mounting fly wheels 14 and supporting a power pulley 15 which through belt 16, or other suitable driving means, is adapted to drive mechanism in turn connected to a plurality of individual pump mechanisms for simultaneously operating said pump mechanisms which are remotely positioned with respect to a prime

mover, such as at each individual oil well, for the pumping of said oil well for a predetermined period.

The gas engine is connected to a supply of gas under pressure, indicated by the numeral 17, which discharges to a gasometer 18, in turn discharging by conduit 19 to an air mixing structure 20. Controlling the conduit 19 is a valve having the operating arm 21, the same constituting the gas intake control.

The engine is equipped with a governor structure 23, whereby predetermined speed of operation is maintained, said governor being driven by an auxiliary driving shaft 24 which is rotatable by the crank shaft through any suitable connection, indicated generally at 25.

The exhaust valve structure 26 includes a valve, the stem of which is operable by an exhaust valve lever 28 which pivotally supports at 30 a roller 31 that is engageable by a cam 32 carried by the auxiliary shaft 24.

The exhaust pipe from the engine is indicated by the numeral 36 and the upper outer end thereof terminates in a cougher structure 34 having a restricted discharge 35 at its outer end and a notched portion 36 adjacent said end so that as the engine exhausts, it amplifies the exhaust by a coughing or whistling action that may be readily heard at a considerable distance so that if the direction of the wind is right, the operator at a considerable distance, may hear the engine operate.

The cylinder jacket is supplied with cooling water through the conduit 37 controlled by a valve 38 having an arm 39, said arm being connected as by the members 40 and 140 to the main control lever 41 to which reference will be had later.

The normal discharge of the water from the water jacket is obtained through the conduit 42 which includes a check valve 43. This conduit may have a free discharge.

The water jacket to the cylinder also includes a drain conduit 44 controlled by a valve 45 having an arm 46 connected by a member 47 to the lever 41 and so connected thereto that when the valve 38 is opened, valve 45 is closed and when valve 38 is closed, valve 45 is opened.

The engine also is provided with an ignition system 48 which is operable by a member 49 carried by the auxiliary shaft 24. The ignition system at 48 includes a control lever arm 50.

The supply line 17 to the gasometer includes a valve 51 having an arm 52 adjustably connected by a link 53 to a bell crank lever 54, in turn connected by a rod 55 to a bell crank 56 pivoted at 57 upon or adjacent the engine, the other arm of the bell crank 56 being connected to a rod 58, in turn connected to a lever 59 pivotally supported at 60 upon any suitable support 61, a slotted or bifurcated guard 62 having the stop portion 63 straddles the lever 59 which terminates in a combination handle and counterweight 64. The lever 59 is connected by the link 65 to the bell crank lever 41 which is the main control lever.

Likewise connected to the lever 59 is a loop member or catch 66, the end portion 67 of which is pivotally connected as at 68 to said lever 59 which connection also constitutes the same connection for the link 65 and the rod 58.

It will be apparent, therefore, that when the loop member 66 is permitted to escape from the catch, see Fig. 6, that, through the counterweight 64 and lever 59, the lever 41 is tilted, the bell crank lever 56 is tilted, which cuts off the gas supply to the gasometer, the valve 51 being rotated clockwise and the lever 54 being rotated counterclockwise. Likewise, the lever 41 is rotated clockwise and since said lever has an arm portion 69 and the latter is connected by rod 70 to the control arm 50 of the ignition control mechanism and by the rod or cable 71 to the arm 21 of the gas supply control and by the rod 47 connected to the water jacket drain control valve and by the rod 40 to the water jacket supply control valve, the following operations occur simultaneously, to wit, the engine is stopped because the ignition is cut off, the gas supply is cut off directly at the engine, the gas supply to the gasometer is cut off and the water supply to the water jacket is cut off and the water jacket drain valve is opened.

The specific mechanism per se for releasing the loop member 66 is as follows:—Suitably supported on the engine is a base plate 72 and extending upwardly therefrom is a rod 73. Supported by said rod as at 74 is a plate 75 apertured as at 76. Extending through the aperture 76 is a vertical, threaded member 77. The vertical threaded member 77 has an upper bearing 78 in a parallel plate 79. Plate 79 is adjustably but rigidly secured as at 80 to a pair of rigid standards 81, the lower ends of which are supported as at 82 by the plate 75. The upper ends of the standards or the plate 79 is suitably supported as at 83 from the engine.

Suitably secured to one of the rods 81 and at a plurality of points and extending oppositely from the other rod, is a scale 84. Adjustably mounted on said threaded member 77 is a split nut structure 85, the same being shown clearly in Fig. 4 and including a half-nut 85*a* and another half-nut 85*b*. Half-nut 85*b* is movable towards and away from the half-nut 85*a* and is slidably supported on the U-shaped member 86 and carried by the half-nut 85*a*. The central portion of the U-shaped member 86 is enlarged as at 87 and an aperture therein is threaded as at 88. A threaded bolt 89 has a threaded connection therewith and with the half-nut 85*a* as at 90.

The threaded bolt 89 includes a hand wheel or similarly manually adjustable member 91, whereby the two half-nuts are drawn towards each other or are caused to move away from each other through the instrumentality of the threaded member 89. When drawn towards each other, they ultimately engage the vertically threaded member 77 and since each half-nut has a complementary threaded portion 92*a* and 92*b* respectively, it will be apparent that the nut structure 85*a* and 85*b* will be caused to move axially of the threaded member 77 in the rotation of the latter, since each of the members 85*a* and 85*b* include extensions 93 that are so arranged that the extensions from two of the half-nuts embrace the adjacent vertical standard.

One of the members 93 is further extended as at 94 and serves as an indicator. The half-nuts are caused to be spaced from each other sufficiently for disengagement from the threaded member 77 and are then positioned at a sufficient elevation so that the pointer or finger or indicator 94 is indicating the desired position of time interval on the scale 84. The manually engageable member 91 is then rotated clockwise to cause the half-nut 85*b* to approach half-nut 85*a* and to nest the half-nut threaded portions 92*a* and 92*b*, respectively, on the threads of the member 77. Rotation of member 77, therefore, since the half-nuts are prevented from rotation, causes

vertical movement of the half-nuts and this is so arranged that the nut structure moves toward the bottom of the threaded member 77 and at a predetermined position engages an actuating member that is adapted to release the loop member before mentioned.

The loop member before mentioned, is retained in the engine operating position by a hook or catch 96 pivotally supported at 97. Said member 96 includes a tooth 98 which is normally engaged, as shown in Fig. 6, by a slide bolt or plate 99, the latter being guided by member 100 secured to the base 72. The slide at its opposite end is pivotally connected as at 101 to bell crank arms 102 of lever 103 which is pivotally supported as at 104 upon a standard 105 rigid with the plate 72. When the nut structure, before mentioned, engages the bifurcated ends 106 of the lever 103, which straddles the threaded member 77, the slide will be retracted and due to the counterweight 64 the catch 96 will be tilted clockwise to release the loop member 66. The catch member 96 is so constructed that it normally is constrained toward the loop releasing position and is retained in the loop retaining position by the slide or bolt member 99.

The means for operating the mechanism from the prime mover consists of a cam 110 rigid with the auxiliary shaft 24 and the same is adapted to engage a roller 111 carried in the bifurcated end of the lever 112 pivoted at 113 in the spaced arms 114 extending from the base 72, the lever 112 extending through the slot 115 adjacent said portions 114. The upper end of the lever 112 pivotally supports as at 116, a pawl 117 having a toothed portion 118. A bracket 119*a* has a threaded connection 120*a* with a bolt 121. This constitutes an adjustable stop for limiting the inward movement of the roller 111 toward the cam. The tilting movement of the lever in a clockwise direction is determinable by the size and shape of the cam 110. The pawl or dog 117 rides upon the ratchet wheel 119 having the teeth 120 on a side face thereof. The ratchet 119 is rotatably mounted about the member 77 which, as before stated, has its lower end mounted in a bearing 77*a* in the plate 72. The ratchet 119 is rigid with the sleeve 121*a* that surrounds the member 77 and in superposed relation to the ratchet 119 is the gear 122 which rotates with the ratchet.

Gear 122 meshes with the gear 123 which is rotatably supported upon the member 73 through a sleeve 124, to which is secured a pinion 125. Pinion 125 meshes with the gear 126 in turn rigid with the rotatable member 77. A predetermined gear reduction is obtained and for each revolution of the auxiliary shaft 24 actuated by the engine and controlled by the governor structure before mentioned, there will be a predetermined return movement of the nut structure toward the base plate 72.

The scale is calibrated in minutes and hours and when the nut structure is positioned at a predetermined interval above the level that it engages the loop releasing member through retraction of the slide or locking bolt, then said interval must lapse before said slide or locking bolt is retracted to release the loop member 66 to stop the engine.

Merely for convenience, the reduction gear has been incorporated so that the amount of linear travel per unit of time for the nut structure is relatively small. The nut structure, however, may be caused to travel at a more rapid rate by the direct connection of the ratchet wheel to the shaft 77 in which event the pitch of the thread of the member 77 might possibly be very much smaller than that illustrated or might be the same in which latter event, the time interval per unit of linear travel of the nut structure will be relatively rapid.

When it is desired to obtain continuous operation the nut structure is disassociated from the rotatable member 77 and the slide is positioned in the catch retaining position and the loop member is associated therewith through the elevation of the handle member in opposition to the counter weight embodied as a part thereof. When thus arranged, the mechanism has no control over the engine and it will continuously operate. It is only when the nut structure is associated therewith and said nut structure engages the bifurcated portion 106 of lever 103 that the engine is automatically stopped. When the nut structure is not employed or when it is employed and it does not engage the bifurcated portions and it is desired to immediately stop the engine, the operator may depress the bifurcated portion 106 of the lever 103 and cause immediate stoppage of the engine. Thus, the mechanism is capable of manual operation for instantaneous stopping of the engine.

While the invention has been described in great detail in the foregoing description, it is to be considered as illustrative and not restrictive in character, and the various modifications which have been described as well as those which will readily suggest themselves to those skilled in the art to which this invention applies, are all considered to be within the broad scope of this invention, reference being had to the appended claim.

The invention claimed is:

In combination with an engine having a shaft operable thereby, a fuel intake, a valve therefor, a speed control operable by said shaft, and an ignition system operable by said shaft, of a control mechanism operable by said shaft, means connecting said mechanism to the speed control, ignition system and valve, and means released by said mechanism after predetermined amount of prime mover operation to cut off the fuel supply and the ignition supply to the engine upon the elapse of a predetermined period following initiation of the mechanism for automatic control of the engine.

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