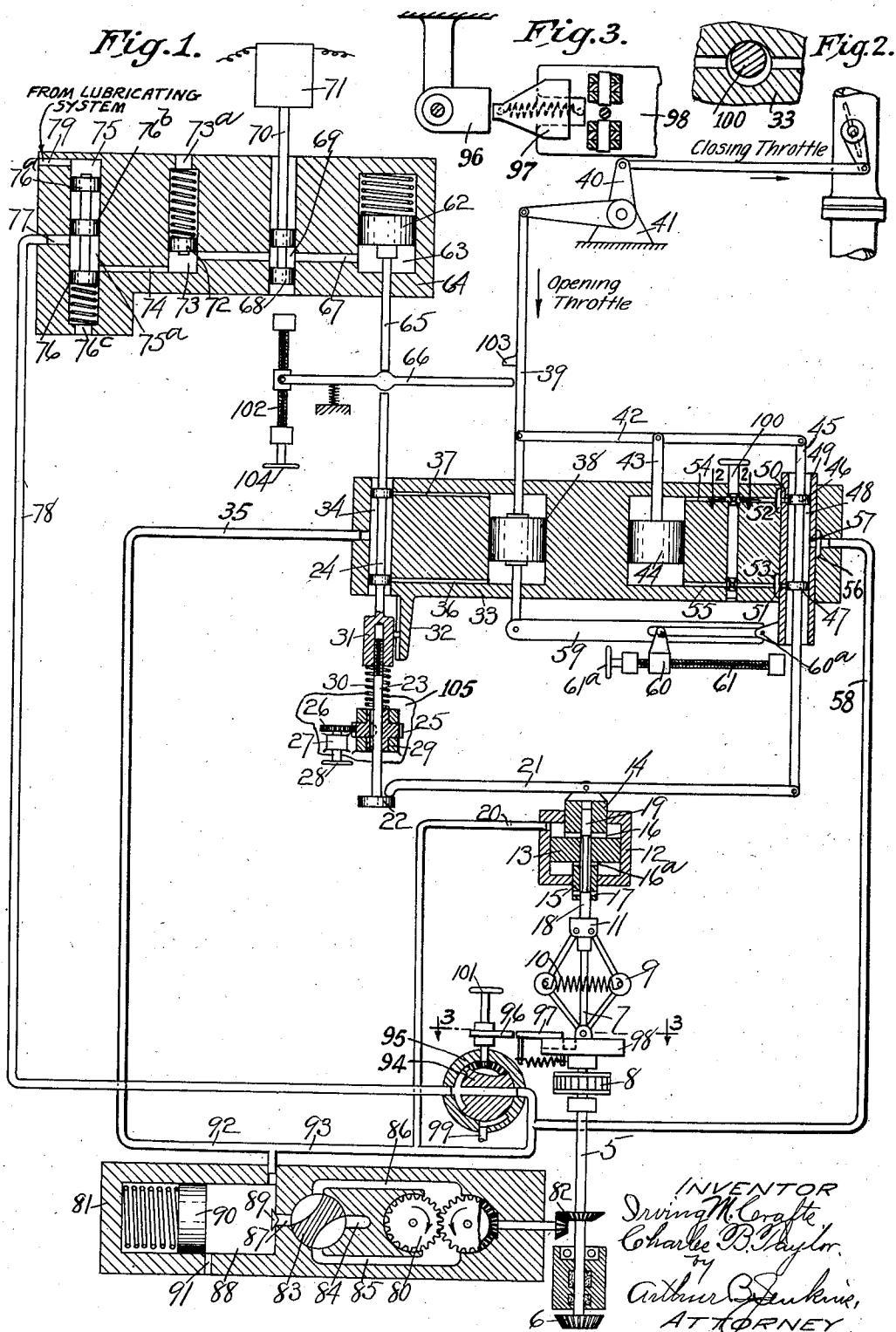


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GOVERNOR FOR PRIME MOVERS

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GOVERNOR FOR PRIME MOVERS

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Our invention relates to the class of devices which are employed for the purpose of regulating to a value approximating constant any measurable condition or quantity subject to variation, such condition being found in prime movers and our invention being particularly applicable to governors therefor, and an object of our invention, among others, is the creation of a device of the type mentioned that shall be particularly efficient in its operation.

One form of an apparatus embodying the invention, and in the construction and use of which the objects herein set out, as well as others, may be attained is illustrated in the accompanying drawing in which:

The Figure 1 is a diagrammatic view illustrating our improved governor.

Figure 2 is a view in section on a plane denoted by the dotted line 2-2 of Figure 1.

Figure 3 is a view in section on a plane denoted by the dotted line 3-3 of Figure 1.

It will be readily understood by those skilled in the construction and operation of governors of the type herein contemplated that the apparatus may be arranged in different forms and embodied in various ways, and the illustration embodied in the drawing herein discloses in a general manner the construction of the various parts of the apparatus and their connections diagrammatically shown with no intent on our part to limit our invention to use in any particular apparatus or for accomplishing any purpose within the scope of the invention.

While our invention may be applied to various types of prime movers as engines, motors, turbines and the like, in order to simplify the disclosure we have illustrated our apparatus in connection with an engine which may be of the steam or internal combustion type, and in order to confine the effects of the action of the governor upon the prime mover within minimum limits we introduce relaying, compensating and stabilizing apparatus between the governor and the member, as a throttle, for controlling the operation of the prime mover. In the drawing herein the numeral 5 denotes a drive shaft having a beveled pinion 6 at its lower end which it will be understood is engaged by a driving gear secured to some rotating part of the prime mover which will be hereinafter referred to as an engine. The shaft 5 is mounted in bearings of any suitable construction and is preferably connected with the governor shaft 7 by means of a torsionally flexible drive 8.

The governor proper is of ordinary construc-

tion comprising fly weights 9 which spread outwardly by centrifugal action as the shaft 7 is rotated. A spring 10 acts upon the fly weights to draw them inwardly in opposition to centrifugal force, and a block 11 has a vertical movement effected by the action of the fly weights all in such a manner as to provide a jointless, frictionless, fly ball head construction somewhat as more fully described in Patent No. 1,674,950, dated June 26, 1928.

A differential actuator or relay is located in proximity to the governor proper and comprises a cylinder 12 in which a piston 13 is mounted for reciprocating movement. A valve actuating beam support, rigid with the piston, is mounted for reciprocating movement in the cylinder 12, said support comprising a head 14 projecting out of the cylinder at one end and a stem 15 reduced in size projecting out of the opposite end of the cylinder. A valve chamber is formed in said support, this chamber comprising a hole extending axially therein with a discharge port 17 extending out of the chamber through the stem 15 outside of the cylinder and with an inlet port 16 leading to said chamber on one side of the piston and another port 16^a leading from said chamber on the opposite side of the piston. A valve stem having valves at its opposite ends is located in said chamber, one of these valves 18 constituting an exhaust valve to control the port 17 and the valve 19 at the opposite end constituting an inlet valve which controls the port 16. The exhaust valve 18 is rigidly attached to the block 11 of the governor proper, said block therefore actuating the valves to control pressure on the under side of the piston 13, such pressure being introduced through an inlet tube 20 attached to the cylinder at one end thereof.

It is here remarked that the pressure surfaces on opposite sides of the piston 13 are different in area, that surface on the lower side of the piston being greater than that on the upper surface thereof.

A valve actuating beam 21 is pivotally mounted between ears extending from the exposed end of the supporting head 14. This beam is pivotally connected with one end of a compensating valve rod to be hereinafter described, the opposite end of said beam resting in contact with a disk 22 at one end of a rod 23 adjustably secured to the stem of a pilot valve 24. A gear 25 secured to the rod 23 is in mesh with a pinion 26 secured to one end of a shaft mounted in a bearing 27, the opposite end of said shaft having a hand wheel 28 secured thereto as a means for rotating

the pinion 26 and gear 25. The hand wheel 28 is located externally to a governor enclosing casing for the mechanism, a fragment 105 of which is shown, and a suitable dial (not shown) is provided to denote the setting of the adjustment. The rod 23 is thus rotated and adjusted relative to the pilot valve, said rod being splined to the gear 25 and said gear being mounted in a bearing 29 secured to or comprising a part of the governor casing 105. A spring 30 thrusts against the bearing 29 at one end and at its opposite end against a head 31 on the stem of the pilot valve, the latter being held from turning movement as by means of a pin traveling in a slot in a guide 32 projecting from a valve and piston block 33.

The pilot valve 24 is located in a pilot valve chamber 34 in the block 33, an inlet tube 35 for fluid (as oil) under pressure communicating with the chamber 34. Passages 36—37 communicate with the chamber 34 and extend through the block 33 into an actuating piston chamber in said block, said chamber containing an actuating piston 38. The piston 38 has a piston rod 39 extending to a bell crank 40 pivotally mounted as in a support 41 and adapted to be connected in any suitable manner with the valve or other device (as a throttle valve) for controlling the operation of an engine.

In the operation of the structure thus far described, assuming that the parts are in position with the engine and mechanism connected therewith operating at a uniform speed, and further assuming that the load on the engine is lessened, the engine of course will increase its speed. This will cause the fly weights 9 under the action of centrifugal force to move outwardly and the block 11 consequently to move downwardly. This will cause the exhaust and inlet valves 18—19 to move downwardly, the former uncovering the discharge port 17 and the latter closing the inlet port 16 in the valve actuating beam support. The pressure being thus released from underneath the piston 13 said piston will move downwardly until the ports in the piston return to the original position relatively to the valves and further movement of the piston therefore ceases. The described movement of the piston will move the valve actuating beam support comprising the head 14 downwardly by an amount equal to the movement of the valves and effecting downward movement of the left hand end of the beam 21, the opposite end of said beam being held stationary. This causes the beam to exert pressure on the disk 22, thereby moving the pilot valve 24 downwardly and opening the passage 36 to pressure from within the chamber 34. This also uncovers the passage 37 thereby releasing pressure from within the chamber of the actuating piston 38 on the upper side of said piston. The latter is thereby caused to move upwardly rocking the bell crank 40 and effecting closing movement of the throttle by an amount sufficient to reduce the speed of the engine to the original value under the reduced load condition.

A compensating valve lever 42 is pivotally attached at one end to the piston rod 39 and is supported intermediate its ends on the stem 43 of a compensating piston 44 mounted in a piston chamber in the block 33. The other end of said lever is pivotally connected with one end of a pilot valve rod 45 having pilot valves 46 and 47 constituting compensating valves secured thereto within a pilot valve chamber 48 in a pilot valve sleeve 49 adjustably mounted in an opening ex-

tending through the block 33. The sleeve 49 has ports 50—51 opening into recesses 52—53 which communicate by passages 54—55 with the chamber for the compensating piston 44 and on opposite sides of said piston. An inlet recess 56 in the block 33 communicates by an inlet port 57 with the pilot valve chamber 48 in the sleeve 49. An inlet tube 58 supplies fluid under pressure to the recess 56.

In the operation of this compensating mechanism, as the piston rod 39 moves upwardly to impart closing movement to the throttle valve, as hereinbefore described, the lever 42 rocking on its fulcrum on the end of the stem 43 of the piston 44 which is held against movement, pushes the pilot valve rod 45 downwardly, actuating the compensating valves 46—47 to uncover the ports 50 and 51, thereby admitting pressure to the under side of the piston 44 and relieving pressure from the upper side thereof.

As the rod 45 moves downwardly its lower end being pivotally connected with the beam 21 rocks said beam on its fulcrum on the head 14, thereby raising the left hand end of the beam and releasing the disk 22. This permits the spring 30 to raise the head 31 and consequently the pilot valves 24, this movement continuing until the valves 24 cover the ports 36—37, thus stopping further movement of piston 38.

Due to the resulting partially closed throttle the speed of the engine will be reduced from its overspeed as caused by the decrease in load. The ports 50—51 being uncovered due to the downward movement of the pilot valve rod 45 the piston 44 will be caused to move up. This upward movement will cause the valve rod 45 to be lifted until the ports 50—51 are again covered when further movement of the piston 44 will cease. This restoring movement of the rod 45 will lift the right hand end of the lever 21. Due to the new position of the throttle, the speed is now decreasing and the upward movement of the head 14 caused thereby together with the upward movement of the rod 45 above described will permit return of the lever 21 to the original or constant speed position without further displacement of the disk 22. In the event of increase of the load on the prime mover the operation above described will be reversed. Should, during the interval of the operation described, the load have been changed, the beam 21 will be caused to move by the fly weights to accord with the changed speed, but the action of the compensator will continue until the parts attain their equilibrium, as above described.

The pilot valve sleeve 49 is pivotally attached at its lower end at point 60^a to a pilot valve sleeve adjusting lever 59 pivotally mounted on an adjustable support 60 and pivotally connected at its end opposite the sleeve with the piston rod 39. The support 60 is carried by an adjusting screw 61, having a hand wheel 61^a attached thereto, by means of which the support may be moved back and forth to change the fulcrum of the lever and thereby vary the extent of movement of the sleeve 49 in the operation of the lever 59 by the piston rod 39.

The hand wheel 61^a will be located externally to the governor enclosing casing hereinbefore referred to and a suitable dial (not shown) may be provided to show the setting of the adjustment.

Under ordinary conditions the speed of a governor controlled engine will be greater when the engine is operating without load than it will

when operating under a partial or full load. For example, if the governor is set to provide a speed of 1030 R. P. M. with no load, when a full load is placed upon the engine, the speed will lessen to approximately 1000 R. P. M., and this is known as "speed drop". The means for adjusting the degree of movement of the sleeve 49 provides for obtaining different speed settings from no load throttle position to full load throttle position.

10 That is, in many and perhaps the majority of instances, with our improved governor no movement of the sleeve 49 will be required, the support 60, being set at the inactive or zero point, that is, with the fulcrum for the lever 59 substantially coincident with the pivot 60^a. In such case the speed droop above described will be inappreciable. In some cases, however, owing to unavoidable conditions as to engine structure, load conditions, etc. the speed droop will be greater and to meet such situations the adjustment of the fulcrum for the lever 59 is provided so that the sleeve 49 may be automatically shifted to reduce the unobjectionable speed droop. From this it will be seen that movement of the sleeve 20 49 is required only in exceptional cases, and as the amount of movement will vary in different instances the adjustment to suit different amounts of movement is provided, and having been once made it will be maintained. The support 30 60 may be adjusted to produce any desired degree of movement of the sleeve 49 from zero to the maximum value obtainable with the linkage by the operation of the piston 38, and the speed droop is therefore adjustable within the same range and may be controlled by setting 35 the support 60 by means of the hand wheel 61^a so that substantially no speed droop will occur in passing from no load to partial or full load.

The description of the operation hereinbefore set out has considered the support 60 to be in a zero position, that is, adjacent the pivotal connection 60^a, in which position the operation of the piston 38 would have no effect upon the sleeve 49, thus maintaining the same speed for 45 any throttle position, regardless of load imposed on the engine.

In order to control the rate of movement of the compensating piston 44 a timing valve 100 is movably engaged in a hole extending across the passages 54 and 55 in the block 33, this valve having an eccentric portion such that by rotating the valve the passages may be constricted or enlarged to vary the rate of flow through the passages 54 and 55, thereby varying the rate of 55 movement of the piston 44.

The apparatus herein set forth includes an automatic safety shut down piston 62 located in a chamber 63 in a block 64, said piston being spring actuated downwardly and having a stem 60 65 projecting downwardly in line with the stem of the pilot valves 24, a lever 66, to be herein-after described, being located between the adjacent ends of said stems. A passage 67 leads from the chamber 63 to a shut down valve 68 located in a valve chamber 69 in the block 64. The stem 70 of the shut down valve is connected with or comprises the core of a solenoid 71.

A governor pressure valve 72 spring pressed downwardly is located in a governor pressure valve chamber 73 in the block 64 and controls a passage leading to the chamber 69 and is connected by a passage 74 with a valve chamber 75^a in said block. The chamber 75^a is connected with the source of governor operating

pressure, hereinafter described, by a passage 77 and a tube 78. The chamber 75^a is separated from another similar chamber 75 by beats 76^a and 76^b of the valve 76. The chamber 75 is connected by a lubricating pressure inlet 79 with a tube (not herein shown) leading to the pressure lubricating system of the prime mover. 5

In the operation of the valves hereinbefore just described, the parts being in the positions shown, a free passage exists from the governor 10 pressure system through the block 64 to the shut down piston 62. The solenoid 71 may be electrically connected by wires with any mechanism being operated by the prime mover controlled by the governor hereinbefore described. With 15 such parts in normal operation the valve 68 will be in the position shown. Should an abnormal condition arise in such mechanism the solenoid will be excited, the valve will be raised opening the passage 67 to the atmosphere, thereby relieving pressure in the chamber 63. The piston 62 will thereby be forced downwardly by its spring, thereby moving the lever 66 which will operate the stem of the valve 24, moving said valve downwardly and opening the passage 37 to the atmosphere 25 and the passage 36 to pressure, thereby operating the piston 38 to close the throttle and stop the prime mover.

Should the governor pressure become low, thereby reducing pressure in the tube 78, the 30 pressure will be reduced in the chamber 73 permitting the valve 72 to move downwardly under the influence of its spring, thereby discharging the chamber 63 through the opening 73^a to the atmosphere. This will permit the piston 62 to be operated as hereinbefore described to stop the engine, the valve 68 remaining in the position shown during this operation.

Should the pressure in the lubricating system of the prime mover become low such pressure will be reduced in the lubricating pressure inlet 79 opening from the lubricating system and on the upper side of the valve beat 76^a, thereby permitting the spring to move said valve beat 76^a and valve 76 upwardly, and opening the passage 74 and the other passages, as related, to the atmosphere through the passage 76^c and causing the piston 62 to operate to shut down the engine. 45

Pressure may come from any suitable source, 50 although a pump is shown in the present instance, such pump being a gear pump 80 located in a block 81 and operated as by means of interconnecting gears, as shown in the lower part of the drawing, driven from a pump actuating 55 gear 82 secured to the drive shaft 5. A governor pressure reversing valve 83 is employed for reversing the direction of flow of the pressure fluid, as oil, to and from the pump. In the position of the valve shown with the pump gears 60 rotating in the direction indicated by the arrows, the oil will be drawn in, as from the tail of the governor pressure system, through an inlet port 84 and passing through the valve will be delivered through an inlet passage 85 to the 65 pump and will be delivered through an outlet passage 86 to the valve and through a port 87 to a pressure chamber 88. A check valve 89 controls flow through the port 87. A relief valve 90 spring pressed in one direction controls a relief port 91 leading from the chamber 88, said valve controlling flow through said port 91. A liquid pressure tube extending to different parts of the governor pressure system leads from the chamber 88, branches 92 and 93 of said tube 70

extending to the inlets 20, 35, and 58, and to such other parts of the structure as may be desired. The branch 93 also extends to the passage 78 by way of an overspeed shut down valve 94 rotatably mounted in a valve chamber 95 and having an operative geared connection with a finger 96 located in position to be struck by an overspeed trip 97 carried by a disk 98 secured to and rotating with the governor shaft 7. The trip is movably mounted on the disk to be actuated by centrifugal force and when an excessive speed exists the trip will be thrown outward far enough to strike the finger 96 and thereby operate the valve 94 rotating it to close the branch 93 and to open the tube 78 to the atmosphere as through a drain 99 leading from the chamber 95, and as shown in the drawing. The pressure being thus relieved in the tube 78, the valve 72 will function to close the throttle as hereinbefore described.

Ports in the valve 94 and valve chamber 95 are so located that the passage 78 may be opened to discharge through the port 99 by rotating the valve 94 in either direction thus making the latter operative for either direction of rotation of the flyball assembly.

A knob 101 operably connected to the valve 94 is provided for the purpose of manually resetting the valve 94 to the proper position for normal governor operation. This knob may be located externally to the governor enclosing casing hereinbefore referred to and a suitable dial (not shown) may be provided to show the position of the valve 94.

An adjustment is provided to limit the degree to which the governor may cause the throttle to open, this means comprising a threaded member 102 to which the left hand end of the lever 66, hereinbefore referred to, is attached. The right hand end of said lever is positioned to be engaged by a lug 103 on the piston rod 39 when said rod is moving in a direction to open the throttle. By means of the threaded member 102 this point of engagement may be varied so that for any given throttle position the lever 66 will contact the pilot valve 24 when the latter is in position to just cover the ports 36 and 37. By this means the valve 24 is blocked from upward movement which would uncover the ports to cause further opening of the throttle than that for which the adjustment 102 is set.

A hand wheel 104 for operating the screw 102 may be located external to the governor enclosing casing hereinbefore referred to and a suitable dial (not shown) may also be provided to show the setting of the adjustment.

We claim:

1. A governor mechanism including a motor driven centrifugally operated member, a member for controlling supply of an energizing medium to said motor, and a connection between said members, said connection including a pressure operated actuating member, a pilot valve for controlling admission of pressure to said actuating member, a pressure actuated relay connected with said centrifugally operated member for actuation thereby and a connection between said relay and pilot valve, said connection including a member connected with said pilot valve for operating it and also connected with said pilot valve for operation thereby.

2. A governor mechanism including a motor driven centrifugally operated member, a member for controlling supply of an energizing medium to said motor, and a connection between said mem-

bers, said connection including a relay comprising a cylinder, a piston located in said cylinder and having a greater pressure area on one side than on the other and also containing a chamber, ports leading laterally from said chamber to opposite sides of said piston, a double acting valve located in said chamber to control flow through said ports, and an operative connection between said valve and said centrifugally operated member.

3. A governor mechanism including a motor driven centrifugally operated member, a member for controlling supply of an energizing medium to said motor, and a connection between said members, said connection including a pressure operated actuator, a pilot valve for controlling admission of pressure to opposite sides of said actuator, a disk rigidly supported by said pilot valve, a relay including a pressure actuated piston operatively connected with said centrifugally operated member, and a beam pivotally carried by said relay and having one end loosely engaged with one side of said disk for movement of the beam independently of the disk, and a connection between said actuator and said beam to effect said independent action.

4. A governor mechanism including a motor driven centrifugally operated member, a member for controlling supply of an energizing medium to said motor, and a connection between said members, said connection including a pressure operated actuator, a pilot valve for controlling admission of pressure to opposite sides of said actuator, a disk carried by said pilot valve, a relay comprising a cylinder, a piston located in said cylinder and comprising an enlarged head projecting out of one end thereof and a reduced stem projecting out of the other end, said piston having a chamber with ports opening therefrom to opposite sides thereof, a valve located in said chamber and operatively connected with said centrifugally operated member, and a beam pivotally supported by said head and having one end adapted to rest loosely engaged with one side of said disk for movement of the beam independently of the disk, and a connection between said actuator and beam to effect said independent action.

5. A governor mechanism including a motor driven centrifugally operated member, a member for controlling supply of an energizing medium to said motor, and a connection between said members, said connection including loosely disengageable members operating independently of each other and a pressure operated actuating piston, a pressure actuated compensating piston, means connected with said actuating piston for operation thereby of said compensating piston, and means including a compensating valve lever pivotally supported intermediate its ends by said compensating piston that acts to restore said lever to a preexisting position, said lever being connected at one end with said actuating piston, a compensating valve connected with said compensating valve lever to control operation of said compensating piston, a pilot valve for controlling pressure to opposite sides of said actuating piston, a connection between the opposite end of said lever and said pilot valve and including said loosely disengageable members to permit movement of said compensating mechanism independently of said pilot valve, and an operative connection between said last mentioned connection and said centrifugally operated member.

6. A governor mechanism including a motor driven centrifugally operated member, a member for controlling supply of an energizing medium

to said motor, and a connection between said members, said connection including loosely disengageable members operating independently of each other and a pressure operated actuating piston operatively connected with said member for controlling supply of an energizing medium to said motor, a pressure actuated compensating piston, means connected with said actuating piston for operation thereby of said compensating piston, and means including a compensating valve lever pivotally supported intermediate its ends by said compensating piston that acts to restore said lever to a preexisting position, said lever being connected at one end with said actuating piston, a compensating valve connected with said compensating valve lever to control operation of said compensating piston, a pilot valve for controlling pressure to opposite sides of said actuating piston, a connection between the opposite end of said lever and said pilot valve including said loosely disengageable members to permit movement of said compensating mechanism independently of said pilot valve, and an operative connection between said last mentioned connection and said centrifugally operated member and including a pivotally mounted beam connected with said centrifugally operated member.

7. A governor mechanism including a motor driven centrifugally operated member, a member for controlling supply of an energizing medium to said motor, and a connection between said members, said connection including a pressure actuated relay connected with said centrifugally operated member, a pressure operated actuating piston connected for operation by said relay for controlling supply of said energizing medium to said motor, said relay including an actuating piston, means for admitting pressure to opposite sides of said piston, and a double acting pilot valve shiftably mounted in and carried by said piston and operated thereby to control said admission of said pressure to either side of said piston or to be released therefrom, a pressure actuating compensating piston, means for actuating the latter, a compensating valve lever pivotally supported by said compensating piston and connected at one end with said actuating piston, a compensating valve connected with said compensating valve lever to control operation of said compensating piston, a pilot valve for controlling pressure to opposite sides of said actuating piston, and a connection between the opposite end of said lever and said pilot valve and including a valve actuating beam pivotally supported on said relay.

8. A governor mechanism including a motor driven centrifugally operated member, a member for controlling supply of an energizing medium to said motor, and a connection between said members, said connection including a pressure actuated relay comprising a piston having a chamber therein with ports opening laterally therefrom, a double acting valve shiftably mounted in said chamber and carried by said piston to control pressure on opposite sides of said piston and to release the pressure therefrom and a pressure operated actuating piston operatively connected with said member for controlling supply of said medium to said motor, said connection including a rod extending from said piston and pivotally connected with said member for controlling supply of said medium to said motor, a pressure actuated compensating piston, compensating valve means for actuating the latter, a compensating valve lever pivotally supported by said compen-

sating piston and connected at one end with said rod and also connected with said compensating valve means, a pilot valve for controlling pressure to opposite sides of said actuating piston, a connection between the opposite end of said lever and said pilot valve, and an operative connection between said last mentioned connection and said centrifugally operated member.

9. A governor mechanism including a motor driven centrifugally operated member, a member for controlling supply of an energizing medium to said motor, a pressure actuated relay operatively connected with said centrifugally operated member, said relay including a piston having a chamber therein with ports opening laterally therefrom, a double acting valve shiftably mounted in said chamber and carried by said piston to control pressure on opposite sides of said piston to release the pressure therefrom and a connection between said relay and said member for controlling supply of said medium to said motor, said connection including a pressure operated actuating piston, a stem projecting from said piston to said member for controlling supply of said medium to said motor, a pressure actuated compensating piston, compensating valve means for actuating the latter, a compensating valve lever pivotally supported by said compensating piston and connected at one end with said stem and also connected with said compensating valve means for operation thereof, a pilot valve for controlling pressure on opposite sides of said actuating piston, a valve actuating beam pivotally supported by said relay and operatively connected at one end with said pilot valve, and an operative connection between the other end of said beam and said compensating valve lever.

10. A governor mechanism including a motor driven centrifugally operated member, a member for controlling supply of an energizing medium to said motor, and a connection between said members, said connection including a pressure actuated relay comprising a piston having a chamber therein with ports opening laterally therefrom, a double acting valve shiftably mounted in said chamber and carried by said piston to control pressure on opposite sides of said piston and to release the pressure therefrom and a pressure operated actuating piston operatively connected with said member for controlling supply of said medium to said motor, a pressure actuated compensating piston, means for actuating the latter, a compensating valve lever pivotally supported by said compensating piston and connected at one end with said actuating piston, a pilot valve for controlling pressure to opposite sides of said actuating piston, a pilot valve for controlling admission of pressure to opposite sides of said compensating piston, a connection between the opposite end of said compensating valve lever and said last mentioned pilot valve, and an operative connection between said last mentioned pilot valve and the first mentioned pilot valve.

11. A governor mechanism including a motor driven centrifugally operated member, a member for controlling supply of an energizing medium to said motor, and a connection between said members, said connection including a pressure actuated relay comprising a piston having a chamber therein with ports opening laterally therefrom, a double acting valve shiftably mounted in said chamber and carried by said piston to control pressure on opposite sides of said piston and to release the pressure therefrom and a pressure operated actuating piston operatively con-

5 nected with said member for controlling supply
of said medium to said motor, a pressure actu-
ated compensating piston, a compensating valve
10 lever pivotally supported by said compensating
piston and connected at one end with said actu-
ating piston, a pilot valve for controlling pressure
to opposite sides of said actuating piston, a pilot
valve for controlling pressure to opposite sides
15 of said compensating piston and pivotally con-
nected to said compensating valve lever, a ported
sleeve within which said last mentioned pilot valve
is located, means for adjusting the position of
said sleeve, a connection between the opposite end
of said last mentioned pilot valve and the first
20 mentioned pilot valve, and an operative connec-
tion between said last mentioned connection and
said centrifugally operated member.

12. A governor mechanism including a motor
driven centrifugally operated member, a member
20 for controlling supply of an energizing medium
to said motor, and a connection between said
members, said connection including a pressure
actuated relay comprising a piston having a
chamber therein with ports opening laterally
25 therefrom, a double acting valve shiftably mount-
ed in said chamber and carried by said piston to
control pressure on opposite sides of said piston
and to release the pressure therefrom and a pres-
sure operated actuating piston operatively con-
30 nected with said member for controlling supply of
said medium to said motor, a pressure actuated
compensating piston, a compensating valve lever
pivotally supported by said compensating piston
and connected at one end with said actuating
35 piston, a pilot valve for controlling pressure to
opposite sides of said actuating piston, a pilot
valve for controlling pressure to opposite sides of
said compensating piston, a ported sleeve within
which said last mentioned pilot valve is located,
40 a sleeve operating lever connected at one end with
said sleeve and operatively connected at its op-
posite end with said actuating piston, and a valve
actuating beam connected at one end with the
valve located in said sleeve and at its opposite
45 end with the pilot valve for operating the actu-
ating piston, said beam being operatively con-
nected with said centrifugally operated member.

13. A governor mechanism including a motor
driven centrifugally operated member, a member
50 for controlling supply of an energizing medium to
said motor, and a connection between said mem-
bers, said connection including a pressure actu-
ated relay comprising a piston having a chamber
therein with ports opening laterally therefrom, a
55 double acting valve shiftably mounted in said
chamber and carried by said piston to control
pressure to opposite sides of said piston and to
release the pressure therefrom and a pressure
operated actuating piston, means connected with
60 said centrifugally operated member for regulat-
ing pressure applied to said actuating piston, a
compensating piston connected with said actu-
ating piston for operation thereby, a pilot valve for
supplying fluid pressure to opposite sides of said

compensating piston, and means in the passage
between said pilot valve and compensating piston
for regulating the supply of pressure to said com-
pensating piston to control its rate of movement.

14. A governor mechanism including a motor
driven centrifugally operated member, a device
for controlling supply of an energizing medium
to said motor, an operative connection between
said members, said connection including loosely
disengageable members operating independently
10 of each other and an actuating piston, means
connected with said centrifugally operated mem-
ber for controlling operation of said actuating
piston, a compensating mechanism operatively
connected with said actuating piston for opera-
15 tion thereby, said mechanism including a com-
pensating piston, a compensating valve to control
operation of said compensating piston, a com-
pensating valve lever pivotally supported inter-
mediate its ends by said compensating piston that
20 said lever being connected at one end with the
actuating piston for operation thereby and being
also connected with said compensating valve for
operation thereof and an adjustable connection
25 between said actuating piston and compensating
mechanism for varying the effects of the latter
on the former to provide for different speed set-
tings at no load and at full load throttle positions.

15. A governor mechanism including a motor
driven centrifugal actuating device, a member for
controlling the supply of an energizing medium
to said motor, a piston operatively connected with
said member, a valve to control supply of pressure
30 to opposite sides of said piston, an operating lever
operatively and disengageably connected with
said valve to operate it and also operatively con-
nected with said actuating device for operation
thereby, and an operative connection between
one end of said lever and said piston for opera-
40 tion of said lever by said piston independently
of said valve in a resetting operation.

16. A governor mechanism including a motor
driven centrifugal actuating device, a member for
controlling the supply of an energizing medium
45 to said motor, a piston operatively connected with
said member, a valve to control supply of pres-
sure to opposite sides of said piston, an operating
lever operatively and disengageably connected
with said valve to operate it and also operatively
50 connected with said actuating device for opera-
tion thereby, a second piston mounted in a pres-
sure chamber, a lever pivotally mounted on said
second piston and operatively connected at one
end with the first mentioned piston and at its
55 opposite end with a valve bearing rod, valves
on said rod to control supply of pressure to said
second piston, and an operative connection be-
tween said rod and the opposite end of the first
mentioned lever for operation of the latter inde-
60 pendently of said valve by said rod and first men-
tioned piston in a resetting operation.

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