June 20, 1961 F. A. ALCARO 2,989,000

PRESSURE GOVERNOR

Filed Dec. 1, 1959 3 Sheets-Sheet 1

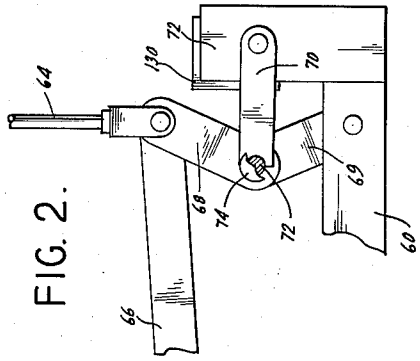


FIG. 2.

FIG. 1.

INVENTOR.
FRANCIS A. ALCARO
BY
Amster & Levy
ATTORNEYS

June 20, 1961 F. A. ALCARO 2,989,000

PRESSURE GOVERNOR

Filed Dec. 1, 1959 3 Sheets-Sheet 2

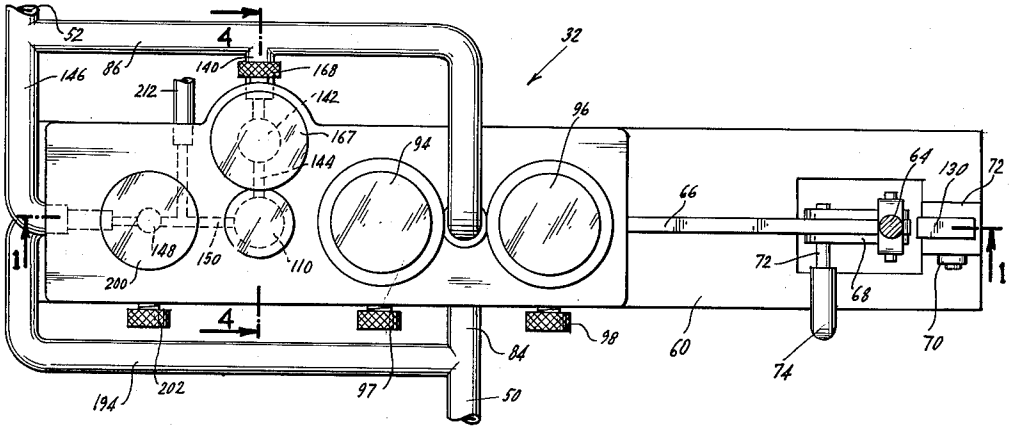


FIG. 3.

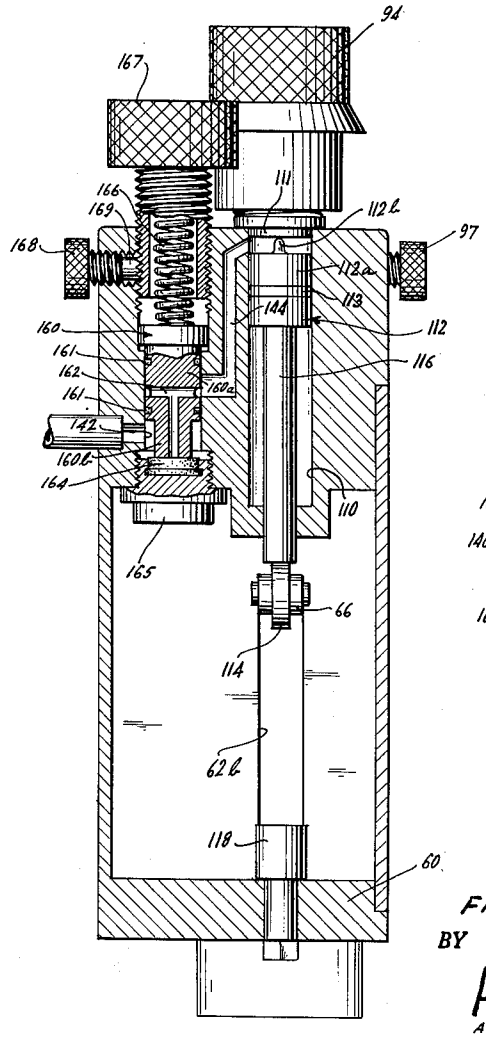
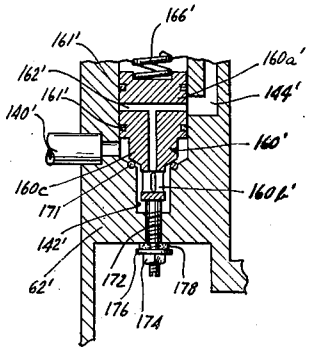


FIG. 4.

FIG. 4a.



INVENTOR.
FRANCIS A. ALCARO
BY
Amster & Levy
ATTORNEYS

June 20, 1961 F. A. ALCARO 2,989,000

PRESSURE GOVERNOR

Filed Dec. 1, 1959 3 Sheets-Sheet 3

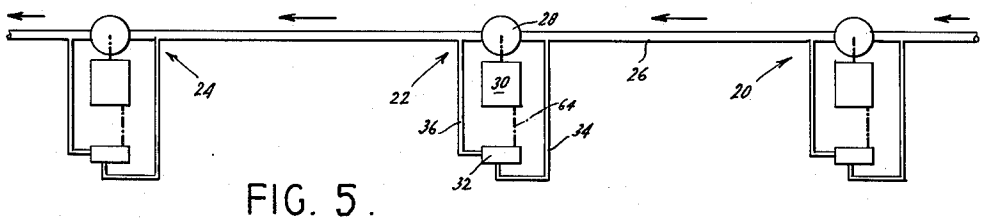


FIG. 5.

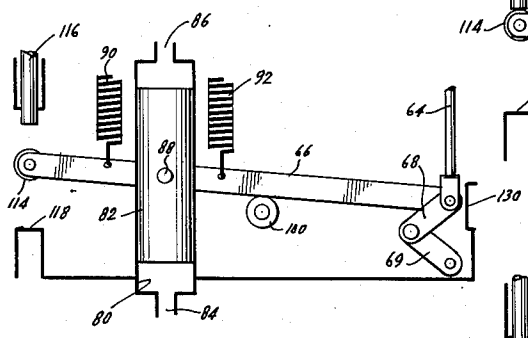


FIG. 7.

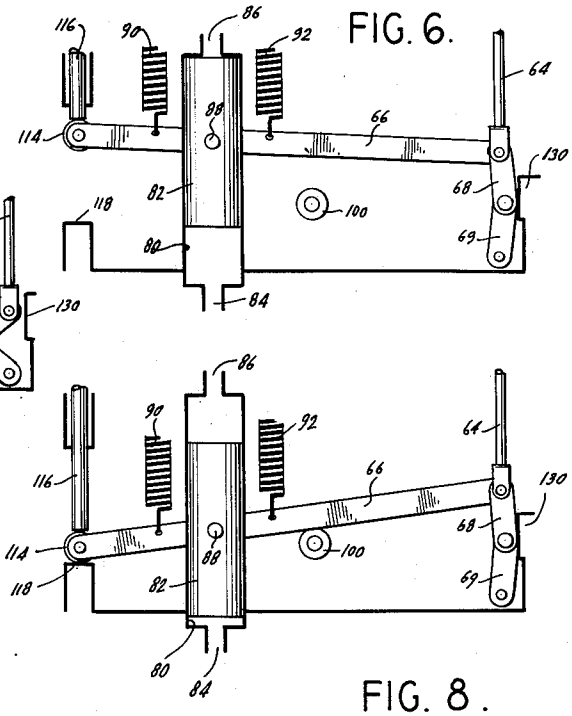


FIG. 6.

FIG. 8.

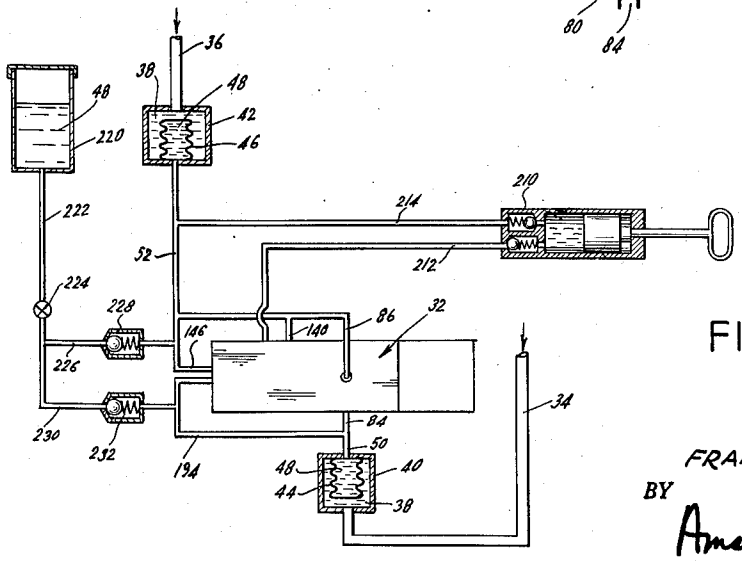


FIG. 9.

INVENTOR.
FRANCIS A. ALCARO
BY
Ameter & Levy
ATTORNEYS

United States Patent Office 2,989,000 Patented June 20, 1961

2,989,000

PRESSURE GOVERNOR

Francis A. Alcaro, Eastchester, N.Y., assignor to Santa Fe Manufacturing Corp.

Filed Dec. 1, 1959, Ser. No. 856,477
12 Claims. (Cl. 103—16)

The present invention relates generally to pumping-station equipment and in particular to a device for automatically governing pumping pressures.

A typical pumping station installation includes a pump, an intake line delivering a pumping fluid such as oil or water to the pump at an intake pressure, a motor driving the pump to boost the pumping fluid to a higher discharge pressure, and a discharge line through which the pumping fluid is discharged at the discharge pressure. Normally it is desired that the pump be operated at a speed calculated to provided a certain selected pressure differential or boost from the intake side to the discharge side thereof. Thus, if in the course of the pumping operation the pressure differential exceeds the selected value, because of either a drop in the intake pressure or a rise in the discharge pressure, the pump is pumping too fast for the prevailing conditions and should be slowed down. If, on the other hand, the pressure differential falls below the selected value, because of either a rise in the intake pressure or a drop in the discharge pressure, then the pump is not pumping fast enough for the prevailing conditions and should be speeded up. For adjusting the pumping speed the motor which drives the pump is generally provided with a speed control, such as a rheostat in the case of an electric motor, or a throttle if an internal combustion engine is employed. However, to avoid the necessity for constant attention, it is desirable to provide a device which continuously measures the differential between the intake and discharge pressures and automatically adjusts the speed control to keep the differential at the selected value.

In addition, it is desirable that such a device react to certain emergency conditions which may arise independently of the pressure differential. For example, if the intake pressure falls below a selected minimum because of a disruption of the intake supply, or if the discharge pressure should rise above a selected maximum owing to a blockage of the discharge line, it would then be desirable to terminate the pumping operation. Such termination should take place immediately upon the occurrence of the emergency condition and without the necessity for any human attention. Therefore it is desirable that the device be automatic and rapid in its response. Furthermore, the device should fail safe by terminating the pumping operation under certain abnormal conditions which make the device inoperable, such as failure of certain key operating parts, or the absence of sufficient hydraulic pressure to actuate the device properly.

Accordingly it is broadly an object of this invention to provide a device which will fulfiill one or more of the aforesaid requirements. More specifically it is an object of this invention to provide an automatic pressure governor which continuously measures the differential between the intake and discharge pressure of a pump and automatically adjusts the speed of the driver motor to keep the pressure differential at a selected value, and which also cuts the speed of the driver and motor to a minimal level immediately upon the occurrence of various emergency conditions, such as rising of the discharge pressure above a selected maximum or falling of the intake pressure below a selected minimum. In addition it is a further object of this invention to provide a pressure governor device which fails safe under certain abnormal conditions such as failure of a key operating part or

absence of sufficient hydraulic pressure in the pumping system to actuate the pressure governor.

In accordance with an illustrative embodiment of this invention which will serve to demonstrate various features and advantages as well as further objects thereof, there is provided a pressure governor device which is designed for use with a motor which has a speed control and is connected to drive a pump which receives a pumping fluid at an intake pressure and discharges the pumping fluid at a discharge pressure higher than the intake pressure. The pressure governor includes an automatic pressure differential stabilizing means, and an automatic emergency speed reduction means. There are means which connect the pressure differential stabilizing means to sense the differential between the intake pressure and the discharge pressure and which also connect the emergency speed reduction means to sense the discharge pressure and the intake pressure respectively. There are further means connecting the pressure differential stabilizing means and the emergency speed reduction means to operate the speed control of the motor. The pressure differential stabilizing means is operable in response to variation of the pressure differential from a selected value thereof to adjust the speed of the motor in the direction to restore the selected value of the pressure differential. The emergency speed reduction means, on the other hand, is operable regardless of the pressure differential, responding to the occurrence of either one of two emergency conditions, rising of the discharge pressure above a selected maximum or falling of the intake pressure below a selected minimum, to reduce the speed of the motor to a minimal level. In addition the pressure governor includes means for adjusting the response of the pressure differential stabilizing means to select the selected pressure differential value and means for adjusting the response of the emergency speed reduction means to select the selected maximum and the selected minimum. Further means are provided which are operable in response to reduction of the speed of the motor to a minimal level to releasably maintain the speed of the motor substantially at that level. There may also be provided additional means for manually adjusting the speed of the motor so that the motor may be restored to a normal operating speed after the aforesaid emergency conditions have been corrected, and means for maintaining the speed of an internal combustion driver motor at a warm-up level when beginning the pumping operation after the motor has lain idle for a time.

The foregoing brief description of the invention, as well as additional features and advantages inherent in the invention, may be more fully appreciated by reference to the following detailed description, taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a vertical cross-section of a pressure governor in accordance with the present invention taken along the lines 1—1 of FIG. 3, the speed control linkage of the pressure governor being illustrated in position to hold the running speed of the driver motor at a maximum level;

FIG. 2 is a side elevational view of the warm-up holder and emergency holder means of the pressure governor of FIG. 1, illustrated in position to maintain the speed of the driver motor at a warm-up level;

FIG. 3 is a top plan view of the pressure governor of FIG. 1;

FIG. 4 is a vertical cross-section of the pressure governor of FIGS. 1 and 3 taken along the lines 4—4 of FIG. 3, and illustrating one embodiment of a portion of the emergency speed reduction means;

FIG. 4*a* is a vertical cross-section similar to FIG. 4 and illustrating an alternative embodiment of the portion of the emergency speed reduction means illustrated therein;

FIG. 5 is a schematic diagram illustrating three pump-

ing stations in series, each of which includes a pump driven by a motor which in turn is controlled by a pressure governor in accordance with this invention;

FIG. 6 is a schematic view of the speed control linkage of the pressure governor of FIGS. 1, 3 and 4 illustrated in position to releasably hold the speed of the driver motor at a minimal or idle level;

FIG. 7 is a similar schematic view of the speed control linkage of FIG. 6 illustrated in a position to maintain the speed of the driver motor at a normal running level;

FIG. 8 is a similar schematic view of the speed control linkage of FIGS. 6 and 7 illustrated in the position to reduce the speed of the driver motor to a minimal level in response to the occurrence of some emergency condition; and,

FIG. 9 is a schematic diagram illustrating the captive fluid systems which connect the pressure differential stabilizing means and the emergency speed reduction means of the pressure governor of FIGS. 1, 3 and 4 to sense the various operating pressures of the pumping system.

Referring now specifically to FIG. 5 of the drawings, there is seen a series of pumping stations, indicated generally by the numerals **20**, **22** and **24**, connected by a main line **26** through which a pumping fluid flows in the direction indicated by the arrows. Each of the pumping stations includes a pump **28**, an internal combustion engine **30**, and a pressure governor **32** in accordance with this invention. As indicated schematically by the dotted lines, each motor **30** is connected to drive a pump **28** for drawing in pumping fluid at the right at an intake pressure and ejecting the pumping fluid at the left at a discharge pressure higher than the intake pressure. The dotted lines connecting the pressure governors **32** to the driving motors **30** indicates schematically that the pressure governor **32** of each pumping station is connected to the throttle of the motor **30** of that pumping station for adjusting the speed thereof so as to govern the rate at which the pump **28** operates. In addition, there are branch lines **34** and **36** connecting the pressure governors **32** to the intake and discharge side of the pumps **28** respectively, schematically illustrating that the pressure governors **32** are connected to measure these operating pressures at each of the pumping stations.

The pumping fluid which passes through the main line **26** is not itself allowed to enter the pressure governor **32**, as this fluid, which might for example be crude oil or unfiltered water, might do some damage to the pressure governor. The lines **34** and **36**, as seen in FIG. 9, are connected to conduct the pumping fluid, designated **38**, into a pair of housings **40** and **42** respectively within which are mounted compressible bellows **44** and **46** respectively. The pumping fluid **38** within the housings **40** and **42** tends to compress the bellows **44** and **46** in proportion to the pressure under which such fluid is introduced into the housings. The branch lines **34** and **36** are connected to the intake and discharge sides respectively of the pump **28**, so that bellows **44** senses the intake pressure, while bellows **46** senses the discharge pressure. Inside bellows **44** and **46** is a captive operating fluid **48** sufficiently refined to pass through the pressure governor **32** without causing damage thereto. Fluid **48** serves to transmit the intake and discharge pressures sensed by bellows **44** and **46** respectively through conduits **50** and **52** connected respectively thereto. The conduits **50** and **52** are connected by means of various other conduits to enable the fluid **48** to operate the pressure differential stabilizing and emergency speed reduction means of the pressure governor **32** in a manner which will subsequently be described in detail.

Turning now to the details of the pressure governor **32**, and referring specifically to FIGS. 1–4 and 6–8 of the drawings, the pressure governor is mounted upon a base **60** and is partly contained within a casing **62**. A connecting rod **64** is provided for engaging the speed control (not shown) of the motor **30** to adjust the speed thereof. The connecting rod **64** moves vertically, and is connected to the speed control in such manner that downward motion of the rod **64** causes an increase, and upward motion thereof causes a decrease in the speed of motor **30**. For controlling the motion of connecting rod **64** an actuating lever **66** is connected for pivotal movement thereof to move the rod **64** vertically to vary the motor speed. For guiding the pivotal movement of the actuating lever **66** there is provided a toggle linkage **68**, **69** which is pivotally connected at one end to the base **60** and at the other end is pivoted to the actuating lever **66** and connecting rod **64** in such manner that the toggle linkage **68**, **69** closes upon acceleration of the motor **30** and opens upon deceleration thereof, as may be seen by comparing the position of the toggle linkage **68**, **69** in FIG. 1, which shows the members **64** and **66** in position to maintain the speed of motor **30** at a maximum running level, with the position of the same linkage in FIG. 2, which illustrates the members **64** and **66** in position to maintain the speed of the motor **30** at a warm-up level.

In order to maintain the speed of motor **30** at a warm-up level when first starting the pumping operation after an idle interval, there is provided a warm-up holder **70** loosely pivoted at one end on a bracket **72** and formed with a crescent-shaped cut-out **70***a* at the free end thereof which is sized to engage an elongated pivot pin **72** which pivotally connects links **68** and **69** to form the knee of the toggle. As seen in Fig. 2, the warm-up holder **70** may be swung outwardly toward the toggle linkage **68**, **69** and braced against the elongated pivot pin **72** to hold the toggle linkage **68**, **69** in a partly closed position so that the motor **30** will run at a warm-up speed. The cut-out **70***a* partially encircles the elongated pivot pin **72** to prevent disengagement of the warm-up holder **70** therefrom. While the warm-up holder is braced thereagainst the pin **72** at the knee of the toggle linkage cannot move to the right, and consequently the toggle linkage cannot return to the fully extended or open position, thus preventing the speed of motor **30** from falling below the warm-up level. For manually opening and closing toggle linkage **68**, **69** to set the speed of the motor **30** by hand just prior to engaging the warm-up holder **70**, or at other times, there is provided a handle **74**, best seen in FIG. 3, which is mounted at the end of elongated pivot pin **72**.

The automatic pressure differential stabilizing means includes a double-ended differential cylinder **80** which is mounted upon the base **60** and enclosed within the casing **62**. A double-ended differential piston **82**, both ends of which have the same area, is reciprocably mounted in the differential cylinder **80**. Conventional sealing rings **83** are provided to make a sealing fit between the piston **82** and cylinder **80** at both ends thereof. The discharge and intake pressure sensing systems described above are connected respectively to opposed ends of the double-ended differential cylinder **80** to bias the double-ended differential piston **82** in proportion to the differential between the intake and discharge pressure. Specifically, a conduit **84** is connected between the conduit **50** and the lower end of the double-ended differential cylinder **80** to carry the captive operating fluid **48** from the bellows **44** so as to impress the intake pressure sensed by the bellows **44** upon the lower end of the double-ended differential piston **82**. Similarly, a conduit **86** is connected between the conduit **52** and the upper end of double-ended differential cylinder **80** to carry the captive operating fluid **48** from the bellows **46** to impress the higher discharge pressure sensed thereby upon the upper end of the double-ended differential piston **82**. As a result of the differential between the intake and discharge pressures which are exerted in opposite directions against the opposed ends of double-ended differential piston **82**, a net downward biasing force is exerted on the piston **82** by the pressure sensing system. Because the opposed ends of the double-ended differential piston **82** are of equal

area, this net biasing force exerted thereon by the pressure sensing system is proportional to the pressure differential, and changes as the pressure differential changes. In order that motion of the piston 82 in response to such changes in the pressure differential may be transmitted to the actuating lever 66 so that the latter is moved to adjust the speed control, actuating lever 66 extends through a slot 62*a* in the wall of casing 62, opposed slots 80*a* and 80*b* in the mid-section of cylinder 80, and a slot 62*b* in an inner partition of the casing 62, and is pivotally connected to the mid-section of piston 82 by a pivot pin 88.

In order to compensate for the net biasing force exerted on differential piston 82 by the pressure sensing systems so as to keep the differential piston 82 in equilibrium at a position between the opposed ends of double-ended differential cylinder 80, there is provided a pair of differential compensating tension springs 90 and 92 which are pivotally connected at their lower ends to the actuating lever 66 on opposite sides of pivotal pin 88 to bias the piston 82, to which the actuating lever 66 is connected by pivot pin 88, in a direction opposite to the biasing force exerted thereon by the pressure sensing system. The upper ends of the differential compensating springs 90 and 92 are connected to knurled adjustment knobs 94 and 96 respectively which are threadedly mounted on the casing 62 so that they can be adjusted vertically to vary the tension of the springs 90 and 92. Ball bearing tension spring mountings of any conventional type, such as mounting 93, are employed to prevent twisting of the springs incident to the rotary adjusting motion of knobs 94 and 96. Since adjustment of the tension of the springs 90 and 92 varies the compensatory biasing force exerted thereby on the piston 82, this has the effect of changing the value of the pressure differential for which the springs 90 and 92 will hold piston 82 in equilibrium. Thus a convenient means is provided for bringing the piston 82 into an equilibrium condition at some position between the ends of the double-ended differential cylinder 80 at a selected value of the pressure differential.

Once an equilibrium condition of the piston 82 is established, the latter will be reciprocated downwardly or upwardly from its equilibrium position in response to increases and decreases respectively in the pressure differential above or below the selected equilibrium-producing value thereof. Because of the pivotal connection 88 between the piston 82 and the actuating lever 66 such reciprocation of the piston 82 serves to impart a pivotal movement to the actuating lever 66 which in turn operates connecting rod 64 to adjust the speed of the motor. The differential compensating springs 90 and 92 exert their combined upward biasing force on the piston 82 via the actuating lever 66, and the spring 90 is made stronger than spring 92 so that they exert unequal forces on the actuating lever 66 on opposite sides of pivot pin 88. Consequently there is a tendency for the actuating lever 66 to be biased for clockwise rotation about the pivot pin 88 and to assume a slanted orientation as seen in FIGS. 1 and 7. A fulcrum roller 100 is rotatably mounted in the slot 62*a* and positioned to engage the downwardly slanting end of actuating lever 66 when the piston 82 is moved downwardly toward any one of a range of possible equilibrium positions between the opposed ends of double-ended differential cylinder 80, so that regardless of which equilibrium position within that range is assumed by the double-ended piston 82 at the particular selected value of the pressure differential, the fulcrum roller 100 will engage the actuating lever 66. FIGS. 1 and 8 illustrate the upper and lower limiting positions respectively of the range of positions which the piston 82 can assume and be able to hold actuating lever 66 in contact with the fulcrum roller 100 provided the position of the toggle linkage 68, 69 at the moment is not such as to prevent contact. FIG. 7 illustrates a typical intermediate position of the piston 82 between the aforesaid limiting positions. The pressure of fulcrum roller 100 against the actuating lever 66 causes pivotal movement of the actuating lever 66 about fulcrum roller 100 in response to reciprocation of the piston 82 from its equilibrium position by a variation of the pressure differential from the selected value thereof. An increase in the pressure differential above the selected value theerof causes piston 82 to be reciprocated downwardly, and this in turn causes actuating lever 66 to be pivoted counter-clockwise about fulcrum roller 100 so as to open toggle linkage 68, 69 and move connecting rod 64 upwardly to decrease the speed of motor 30 and thus to compensate for the increase of the pressure differential and restore the selected value thereof by reducing the pumping efforts of pump 28. In the event of a decrease of the pressure differential below the selected value thereof the differential compensating springs 90 and 92 meet less opposition and are effective to reciprocate piston 82 upwardly, and, because of the greater strength of spring 90, to pivot actuating lever 66 in a clockwise direction about the fulcrum roller 100 as the piston 82 rises as to close toggle linkage 68, 69 and move connecting rod 64 downwardly to increase the speed of motor 30, thereby augmenting the pumping efforts of pump 28 and thus compensating for the decrease in the pressure differential and restoring the selected value thereof. As the selected value is restored, after either a rise thereabove or a decrease therebelow, the differential piston 82 will return to the particular equilibrium position associated with that selected value and consequently the pressure differential will tend to stabilize itself at the selected value. If a different selected value of the pressure differential is desired, it is only necessary to adjust the tension of springs 90 and 92 by means of knobs 94 and 96 so as to establish an equilibrium condition of the differential piston 82 at some other value of the differential between the intake and discharge pressures. Set screws 97 and 99 are threadedly mounted in a side wall of casing 62 to lock adjustment knobs 94 and 96 respectively in place once the desired setting thereof has been attained.

For reducing the speed of motor 30 to a minimal level in response to the occurrence of specific emergency conditions there is provided an automatic emergency speed reduction means. This includes an emergency cylinder 110 bored into casing 62 and capped with a tightly fitting plug 111, and an emergency piston 112 reciprocably mounted in the emergency cylinder 110. The upwardly slanted end of actuating lever 66 extends to a position immediately beneath the emergency piston 112 and has a roller 114 rotatably mounted thereon. A push rod 116 depends from the emergency piston 112 and passes through an opening in the lower end of the emergency cylinder 110 toward the roller 114. The piston 112 includes an enlarged piston head 112*a* fitted with a sealing ring 113 which makes a sealing fit with cylinder 110, and a projecting nose 112*b* of reduced diameter which extends upwardly from piston head 112*a* to limit the upward travel thereof to provide a clearance space between the piston head 112*a* and the top of cylinder 110 into which an operating fluid can be injected to reciprocate the piston 112 downwardly within the emergency cylinder 110 so that the push rod 116 drives the roller 114 against an anvil 118 mounted on the base 60 therebelow, thus pivoting the actuating lever 66 as far as possible in a counter-clockwise direction to throttle motor 30 down to idling speed. The described arrangement permits the actuating lever 66 to be pivoted in a counter-clockwise direction about either the fulcrum roller 100 or the pivot pin 88 upon the occurrence of emergency conditions resulting in reciprocation of emergency piston 112. This is advantageous because if any difficulty is encountered in pivoting the actuating lever 66 counterclockwise about fulcrum roller 100 and moving piston 82 downwardly therewith owing to the resistance offered by the

captive operating fluid **48** located in the lower end of cylinder **80** below the piston **82**, the actuating lever can nevertheless be pivoted in a counter-clockwise direction about the pivot pin **88** without the necessity of moving piston **82** downwardly therewith so that more rapid reduction of the speed of motor **30** is accomplished under such emergency conditions without having to wait for piston **82** to be reciprocated all the way to the lower end of cylinder **80**.

For holding the speed of motor **30** at a minimal level after the emergency speed reduction means has been called into operation there is provided an emergency holder means. This includes a magnetic material mounted near the knee of toggle linkage **68**, **69**, such as the metal comprising the links **68** or **69** of the toggle itself or the elongated pivot pin **72**, and a magnet **130** mounted upon bracket **72** in position to cooperate with the magnetic material at the knee of the toggle linkage **68**, **69** for snapping the knee against the magnet **130** and pulling the toggle linkage into a slightly overcenter and substantially open position as is illustrated in the schematic view of FIG. 8. Once the toggle has been snapped against the magnet **130**, it will be releasably held in the substantially open overcenter position and will thus maintain the speed of the motor **30** at a minimal level, that is at a speed only slightly higher than the speed at which the motor **30** runs when the toggle linkage **68**, **69** is completely open or extended. Once it is desired to resume normal pumping operation, handle **74** is employed to manually release the magnetic material of the toggle linkage **68**, **69** from the magnet **130** and to reclose the toggle linkage for accelerating the motor **30**.

For actuating the emergency speed reduction mechanism there is provided a source of an operating fluid under pressure which is fed into the clearance space at the upper end of the emergency cylinder **110** to reciprocate the emergency piston **112** downwardly. There are further provided discharge and intake pressure valves which normally block the flow of the operating fluid into emergency cylinder **110** but which are operable in response to rising of the discharge pressure above a selected maximum and falling of the intake pressure below a selected minimum respectively to allow the operating fluid to flow into the emergency cylinder **110** for initiating emergency speed reduction. A conduit **140** is connected to conduit **52** to deliver captive fluid **48** supplied by the discharge pressure sensing bellows **46** to the lower end of a discharge pressure valve cylinder **142** and then upwardly through the cylinder **142** and through a further conduit **144** which is connected to cylinder **142** somewhat above conduit **140** and on into the emergency cylinder **110**. The conduit **144**, cylinder **142**, and terminal portion of conduit **140** are formed directly in the casing **62**. An additional conduit **146** is also connected to conduit **52** to conduct captive fluid **48** supplied by the discharge pressure sensing bellows **46** through an intake pressure valve guideway **148** and then through a further conduit **150** to the emergency cylinder **110**. The conduit **150**, guideway **148**, and terminal portion of conduit **146** are also formed directly in the casing **62**. Thus the operating fluid **48** is delivered under the discharge pressure to the emergency cylinder **110** along two alternative routes, one of the routes passing through the discharge pressure valve cylinder **142** and being governed by the discharge pressure valve, and the other route passing through the intake pressure valve guideway **148** and being governed by the intake pressure valve as will subsequently be explained.

The discharge pressure valve includes the discharge pressure valve cylinder **142** through which the operating fluid **48** must pass on one of the two alternate routes to the emergency cylinder **110**, and a discharge pressure valve piston **160** reciprocably mounted therein. The operating fluid **48** enters through conduit **140** at the lower end of the cylinder **142** and must pass upwardly therethrough and exit at a higher level through conduit **144**. The piston **160** includes an enlarged piston head **160***a* which is fitted with conventional sealing rings **161** sized to make a sealing fit with the cylinder **142**, the lower ring being positioned between conduit **140** and conduit **144** so as to prevent passage of operating fluid **48** therebetween through cylinder **142**. A stem **160***b* of reduced diameter depends from the piston head **160***a* to limit downward travel thereof and provide a clearance space between the piston head **160***a* and the lower end of cylinder **142** into which the operating fluid **48** can be injected from the conduit **140** to exert a pressure for biasing piston head **160** upwardly. A T-shaped discharge pressure valve passage **162** extends through the piston **160**, and includes a horizontal bore through piston head **160***a* and a vertical bore extending from the horizontal bore through the lower end of stem **160***b*. The operating fluid **48** is prevented by lower ring **161** from entering passage **162** except through the opening thereof at the lower end of stem **160***b*, but the latter opening is sealed by a sealing pad **164** formed of a compressible material and positioned on a plug **165** threaded into the lower end of cylinder **142** so that piston **160** may be pressed downwardly into sealing relationship with pad **164**. The force exerted on the discharge pressure valve piston **160** by the captive fluid **48** introduced under the discharge pressure into cylinder **142** by conduit **140** tends to force the piston **160** upwardly out of sealing relationship with the sealing pad **164** to admit the fluid **48** into emergency cylinder **110** to initiate emergency speed reduction. However, a discharge pressure valve compression spring **166** is arranged with its lower end bearing against piston **160** to bias the latter downwardly into sealing relationship with the sealing pad **164**, and the spring **166** is sufficiently strong to allow movement of the piston **160** upwardly against the biasing force thereof and out of sealing relationship with the sealing pad **164** only when the discharge pressure exerted on the piston **160** by the captive fluid **48** exceeds a selected maximum determined by the magnitude of the biasing force of spring **166**. The upper end of spring **166** bears against an adjustment knob **167** which is threaded into the upper end of cylinder **142** and is vertically adjustable to vary the compression of spring **166**. This in turn adjusts the magnitude of the biasing force exerted on piston **160** by spring **166** so as to select the maximum value of the discharge pressure which must be exceeded in order to reciprocate the piston **160** and thus initiate emergency speed reduction. In order to prevent twisting of the spring **166** during adjustment of knob **168**, the latter may be provided with a conventional ball bearing pressure plate similar to the ball bearing mounting **93** of FIG. 1 but designed for use with a compression spring instead of a tension spring. A set screw **169** is threaded in a side wall of casing **62** to lock the adjustment knob **167** in place when the desired setting thereof is attained. The view of FIG. 4 illustrates the manner in which a set screw dog **169** may be used to prevent the set screw **168** from squeezing the threads of adjustment knob **167** out of shape. The dog **169** consists of a cylindrical member small enough to slide freely in the threaded bore in which set screw **168** is mounted, and having at one end a plane surface against which the set screw **168** bears to exert its locking pressure, and at the other end a scalloped surface shaped to conform to the threads of adjustment knob **167** so as to transmit the locking pressure of set screw **168** to the adjustment knob **167** without distorting the threads of the latter. Similar set screw dogs (not shown) may be employed in conjunction with set screws **97** and **98** to protect the threads of adjustment knobs **94** and **96** respectively.

If it is found that the spring **166** puts too much thrust against the sealing pad **164**, resort may be had to the alternative embodiment of a discharge pressure valve illustrated in FIG. 4*a*, wherein parts corresponding to those of FIG. 4 are given corresponding reference numerals dis-

tinguished by prime marks. In this embodiment the lower end of the stem **160***b'* of piston **160'** is closed off at the end but is formed with ports **170** about the circumference thereof which communicate with the passage **162'** extending therethrough. The piston **160'** has a tapered mid-section **160***c'* located between the conduit **140'** and the ports **170** which rests against a compressible sealing ring **171** mounted in the cylinder **142'** with only enough force to prevent the operating fluid **48** delivered through the conduit **140'** from gaining access through the ports **170** to the passage **162'** which leads via conduit **144'** to the emergency cylinder. The remainder of the thrust of the discharge pressure valve spring **166'** which biases piston **160'** downwardly is taken by a bearing member **172** which is threadedly mounted on casing **162'** for adjustment upwardly or downwardly respectively to decrease or increase the pressure against ring **171**. When a satisfactory setting of the bearing member **172** is arrived at, it may be locked in place by means of a lock nut **174** which is threaded on the lower end of the member **172**. A washer **176** and a secondary sealing ring **178** cooperate to prevent leakage through the threaded bore in which the member **172** is mounted. When the discharge pressure exceeds the selected maximum the piston **160'** is raised against the biasing force of the spring **166'** and is thereby moved out of contact with the ring **170** to permit the operating fluid **48** to pass below sealing ring **171** and pass through ports **170** to the passage **162'** and then on into the emergency cylinder to initiate emergency speed reduction.

For governing the flow of operating fluid **48** through conduit **150** into emergency cylinder **110** according to the intake pressure there is provided an intake pressure valve which includes an intake pressure valve cylinder **190** which is located immediately below the intake pressure valve guideway **148** and communicates therewith, and an intake pressure valve piston **192** reciprocably mounted in the cylinder **190**. The piston **192** includes an enlarged piston head **192***a* fitted with a conventional sealing ring **193** which makes a sealing fit with the cylinder **190** and a depending stem **192***b* which extends into a blind hole **190***a* at the bottom of cylinder **190**. The stem **192***b* is sized for a close sliding fit with the hole **190***a* so as to help align the piston **192** within the cylinder **190**, and also has a length exceeding the depth of hole **190***a* so as to limit the downward travel of piston **192** and assure a clearance space between the piston head **192***a* and the lower end of cylinder **190**. A conduit **194** is connected to the lower end of cylinder **190** to deliver into the aforesaid clearance space the captive operating fluid **48** from the intake pressure sensing bellows **44** which is effective to bias the intake pressure valve piston **192** upwardly. An intake pressure valve plunger **196** sized for a close sliding fit with guideway **148** is movably mounted therein, and is positioned above the piston **192** and in contact therewith so as to be held by piston **190** in a raised blocking position to prevent passage of the operating fluid **48** under the discharge pressure from conduit **146** to the aligned conduit **150** through the guideway **148**. The plunger **196**, however, is formed with a relieved section **196***a* which is shaped to define an intake pressure valve passage located above the conduits **146** and **150** so as to conduct the captive fluid **48** under the discharge pressure from conduit **146** through the guideway **148** and on into the conduit **150** to the emergency cylinder **110** to initiate emergency speed reduction only when the intake pressure valve plunger **196** is lowered from its blocking position to a conducting position in which the passageway **196***a* is aligned with conduits **146** and **150**. The piston **192** urges the plunger **196** upwardly toward its blocking position in which the passageway **196***a* is above the position of alignment which enables the operating fluid **48** to pass into the emergency cylinder **110**, but there is provided an intake pressure valve compression spring **198** the lower end of which bears against plunger **196** to bias the latter downwardly toward the conducting position. The force of the spring **198**, however, is sufficiently weak to move the plunger **196** downwardly into its conducting position only when the opposing upward force of the intake pressure upon piston **192** falls below a selected minimum which depends upon the magnitude of the biasing force of spring **198**. There is provided an adjustment knob **200** upon which the upper end of spring **198** bears and which is threadedly mounted in casing **62** for vertical adjustment to vary the compression of the spring **198** so as to adjust the biasing force thereof to select the minimum value below which the intake pressure must fall in order to permit downward movement of plunger **196** under the urging of the spring **198** to initiate emergency speed reduction. The adjustment knob **200** may be provided with a set screw **202** and a set screw dog and ball bearing pressure plate of the type described above in connection with adjustment knob **167**. It will be appreciated that although the intake pressure valve responds to the intake pressure as sensed by the operating fluid **48** transmitted to cylinder **190** from the intake pressure sensing bellows **44** via conduit **194**, actual reciprocation of the emergency piston **112** is performed by the operating fluid **48** which is delivered under the higher discharge pressure from the discharge pressure sensing bellows through conduits **146** and **150** to the emergency cylinder **110**. In this way the greater operating force of the discharge pressure is employed to do the work, but the intake pressure is utilized as a control relay which triggers the operation.

Thus, upon the occurrence of either of the emergency conditions, the operating fluid **48** under the discharge pressure will be introduced into the emergency cylinder **110** to force the emergency piston **112** downwardly and cause the push rod **116** to rotate the actuating lever **66** counterclockwise for reducing the speed of the motor **30** to a minimal level. Subsequently, when it is desired to restore the speed of motor **30** to its normal operating level, difficulty may be encountered in bringing the emergency piston **112** back-up to its normal operating position to permit the actuating lever **66** be rotated clockwise for restoring the speed control to its normal position. The difficulty arises when the upper part of emergency cylinder **110** remains filled with the captive operating fluid **48**. For such contingencies there is provided a hand pump **210**, illustrated schematically in FIG. 9, which is connected to the emergency cylinder **110** by means of a conduit **212**, the terminal portion of which is formed directly in the casing **62**, and the conduit **150**. The hand pump **210** is used to draw the captive operating fluid **48** through the conduits **150** and **212** out of the emergency cylinder **110** so that the emergency piston **112** can be moved upwardly to its normal operating position when the actuating lever **66** is rotated in the clockwise direction to restore the speed of motor **30** to its normal operating level. A conduit **214** is connected to the discharge side of the hand pump **210** and serves to deliver the operating fluid **48** pumped from the emergency cylinder **110** to the conduit **52** so that it is reintroduced into the discharge pressure sensing system.

In the event of leakage of the captive operating fluid **48** from either the intake or discharge pressure sensing systems a reservoir **220** containing a supply of the captive operating fluid **48** feeds the latter by gravity through a conduit **22** controlled by a main shut-off valve **224** and then through either a further conduit **226** controlled by a check valve **228** to restore fluid to the discharge pressure sensing system or to an alternative further conduit **230** controlled by a check valve **232** to restore the captive operating fluid **48** to the intake pressure sensing system. Whenever in the course of operation of the pressure governor **32** it is thought that the level of the captive operating fluid **48** within the intake and discharge pressure sensing systems has fallen too low, the operator need only open the main shut-off valve **224**, at which time the intake and discharge pressure sensing systems will automatically draw as much of the gravity fed captive fluid **48**

from the reservoir 220 as is required to replenish their supply thereof. The check valves 228 and 232 serve to assure that fluid can only be drawn from the reservoir 220 into the pressure sensing systems and will not be forced by a back pressure back into the reservoir 220.

In order to facilitate the fullest understanding of this invention there will now be described a cycle of operation of the pressure governor 32 under various operating conditions, both typical and atypical, which might occur. Before the start of the pumping operation there will be no pressure on the discharge side of the pump 28, and so no fluid will be introduced to the upper end of the differential cylinder 80 to force the differential piston 82 downwardly. Consequently the upward biasing force of the differential compensating springs 90 and 92 will be unopposed, and the actuating linkage of the pressure governor 32 will be in the position indicated schematically in FIG. 6. That is, the operating lever 66 will be raised upwardly, with the roller 114 contacting the push rod 116 at the left and the toggle linkage 68, 69 opened to a slightly overcenter position. The toggle linkage 68, 69 will be held in that position by the magnet 130. The first step in initiating the pumping operation is the starting of the internal combustion engine 30. Once this is accomplished it will normally be desired to warm up the motor 30 for a short time before bringing it up to normal operating speed. This may be done by grasping the manual operating handle 74 and moving it to the left to release the toggle linkage 68, 69 from the magnet 130 and to partially close the toggle linkage 68, 69 for bringing the speed of motor 30 up to a somewhat higher warm-up level. Then the warm-up holder 70 is pivoted toward the toggle linkage 68, 69 and the cut-out 70*a* is braced against the elongated pivot pin 72 at the knee of the toggle to hold the knee to the left and keep the toggle in a flexed or closed position as indicated in FIG. 2 so that the motor 30 will continue to run at the aforesaid warm-up speed. As the running of the motor 30 causes the pump 28 to build-up the pressure on the discharge side thereof, the operating fluid 48 introduced at the upper end of the cylinder 80 will drive the piston 82 and actuating lever 66 downwardly against the biasing force of the springs 90 and 92, until a point is reached at which the toggle linkage 68, 69 is flexed or closed sufficiently to move the knee thereof to the left and disengage the elongated pivot pin 72 from the cut-out 70*a*. The warm-up holder 70 will then fall from its operating position and be automatically returned to the position indicated in FIG. 1 so that it no longer restrains the toggle linkage 68, 69. As the piston 82 continues to move downwardly a point is reached at which the actuating lever 66 first makes contact with the fulcrum roller 100, as illustrated in FIG. 1. At this point the toggle linkage 68, 69 is flexed to a considerably greater extent than in the warm-up position indicated in FIG. 2, and the motor 30 is accordingly running at a high speed. Further build-up of the discharge pressure causes the piston 82 to be reciprocated further downwardly from the position illustrated in FIG. 1, which causes the actuating lever 66 to be pivoted counterclockwise about the fulcrum roller 100 so as to decrease the speed of motor 30 by opening the toggle linkage 68, 69 from the position of maximum closure illustrated in FIG. 1. Eventually an equilibrium position of the piston 82 will be reached when the discharge pressure biasing it downwardly is balanced by the intake pressure biasing it upwardly plus the upward biasing force of the springs 90 and 92. In a typical equilibrium condition such as is illustrated schematically in FIG. 7 the motor 30 runs at a normal speed, with the toggle linkage 68, 69 flexed somewhat less than in FIG. 1 but more than in FIG. 2, and the actuating lever 66 continues to contact the fulcrum roller 100 which thus serves to cause counter-clockwise rotation of the actuating lever 66 thereabout in response to downward movement of the piston 82 from its equilibrium position caused by an increase in the pressure differential to slow the motor and thus compensate for the increase. On the other hand, if the piston 82 is moved upwardly from its equilibrium position then the greater strength of spring 90 will serve to pivot the actuating lever 66 clockwise about the pivot pin 88 against the weaker tension of spring 92 to keep the actuating lever pressed against the fulcrum roller 100 and to cause a closure of the toggle linkage 68, which increases the speed of motor 30 and compensates for the decrease. In the equilibrium position illustrated in FIG. 7 the left-hand end of the actuating lever 66 floats freely between the push-rod 116 and the anvil 118 so that neither of these elements restricts its motion within the normal operating range. Similarly, the piston 82 in its equilibrium position floats freely under the influence of the fluid pressure biasing it at either end of the cylinder 80 so that its freedom of movement is not restricted. Thus the actuating linkage of the differential control linkage moves freely through its operating range under the influence of variations in the pressure differential, always moving in the proper direction to compensate for such variations so that the pressure differential has a tendency to stabilize itself at a selected value dependent upon the tension of springs 90 and 92.

If, regardless of what the differential between the discharge and intake pressures may be at the moment, the absolute value of the discharge pressure should rise above the selected maximum, the piston 160 would be biased upwardly by the force of the operating fluid 48 exerted on piston head 160*a* strongly enough to overcome the downward urging of the spring 166 and thus raise the lower end of stem 160*b* to allow the operating fluid 48 to pass through the passageway 162 and on through the conduit 144 into the clearance space at the upper end of emergency cylinder 110. In the alternative embodiment of FIG. 4*a*, the operation of the device would be similar, the modified discharge pressure valve piston 160′ being raised upwardly from the seat 170 to allow the operating fluid 48 to pass the sealing ring 171 and enter the ports 170 leading to the passage 162′ and then through the conduit 144′ into the emergency cylinder.

Upon the falling of the intake pressure below the selected minimum, regardless of what the differential relative to the discharge pressure may be, the upward biasing force of the operating fluid 48 under the intake pressure upon the head 192*a* of the piston 192 would become too weak to hold the plunger 196 upwardly in its blocking position against the downward biasing force of the spring 198, and the plunger 196 would then be moved downwardly until the passageway 196*a* became aligned with the conduits 146 and 150 to allow the operating fluid 48 under the discharge pressure to enter the emergency cylinder 110.

Entrance of the operating fluid 48 under the discharge pressure into the emergency cylinder 110 under either of the emergency conditions will cause the emergency piston 112 to be reciprocated downwardly, whereupon the push-rod 116 exerts a downward force upon the roller 114, rotating the actuating lever 66 in a counter-clockwise direction to open the toggle linkage 68, 69 completely and thus reduce the speed of motor 30 to a minimal or idling level. The force of the push-rod 116 against the roller 114 serves to pivot the actuating lever 66 about the fulcrum roller 100, which causes the differential piston 82 to be reciprocated downwardly as the actuating lever 66 is rotated, and, if the differential piston 82 does not move downwardly promptly, the actuating lever 66 is also pivoted about pivot pin 88 to achieve the same result. Thus, the actuating lever 66 is pivoted counter-clockwise very rapidly to cut the speed of the motor 30 upon the occurrence of either of the emergency conditions, and the viscous resistance of the operating fluid 48 in the lower end of cylinder 80 would not materially slow the reaction of the pressure governor 32 thereto. FIG. 8 illustrates schematically the condition of the pressure governor 32 upon the occurrence of an emergency condition which causes

a downward motion of the push-rod **116**. It is seen that the roller **114** is forced down until it contacts the anvil **118**, the piston **82** is forced to the lower end of cylinder **80**, and the actuating lever **66** is rotated in the counter-clockwise direction about fulcrum roller **100**.

It will also be appreciated from an inspection of FIG. 8 that upon the occurrence of this sort of emergency condition the toggle linkage **68**, **69** is first opened completely and is subsequently snapped by the magnet **130** to a slightly overcenter but substantially open position so that subsequent efforts to rotate the actuating lever **66** in a clockwise direction will not be effective to close the toggle linkage or restore the speed of the motor **30** to an operating level. Any attempt to produce clockwise rotation of the actuating lever **66** would only serve to jam the knee of the toggle linkage **68**, **69** against the magnet **130** because of the overcenter condition of the toggle linkage **68**, **69**. It will be necessary in order to enable subsequent resumption of the pumping operation for an operator to deliberately reclose the toggle linkage **68**, **69** by means of the handle **74**. It will be appreciated that this is a significant safety feature which allows resumption of the pumping operation after the occurrence of emergency condition only at the discretion of an operator who has decided that subsequent conditions warrant such resumption.

It will also be appreciated from the schematic diagram of FIG. 8 that in the event that one or both of the differential compensating springs **90** and **92** should break during operation of the pressure governor **32** under non-emergency conditions the device would fail safe because the margin by which the discharge pressure exerted downwardly upon the upper end of the differential piston **82** exceeds the intake pressure exerted upwardly upon the lower end thereof would no longer be fully compensated for by the differential compensating springs **90** and **92**. The equilibrium condition of piston **82** would therefore be destroyed and the piston **82** would then be reciprocated downwardly within the cylinder **80** to rotate the actuating lever **66** counter-clockwise about the fulcrum roller **100** and thus reduce the speed of the motor **30** to a minimal level and engage the emergency holder mechanism to maintain that level. Thus, it is apparent that upon the breakage of one or both of the differential compensating springs **90** and **92** the pressure governor **32** will go through an operation very similar to the emergency speed reduction operation which is initiated by the emergency piston **112** in response to pressure conditions as described above. However, in the event of such breakage the response is initiated by the failure without regard to the particular levels of the various critical fluid operating pressures which normally govern such operation.

On the other hand, should the differential compensating springs **90** and **92** be in good working order but a serious leak should develop in the captive operating fluid system, then there would be insufficient downward pressure at the upper end of the cylinder **80** to hold the piston **82** in its equilibrium position against the upward biasing force of the differential compensating springs **90** and **92**. Thus in the event of failure of sufficient hydraulic pressure in the captive operating fluid system to operate the pressure governor **32** properly, the differential compensating springs **90** and **92** would pull the actuating lever **66** and differential piston **82** upwardly into the original starting position indicated schematically in FIG. 6. This operation would also serve to open the toggle linkage **68**, **69** completely and thus to snap it into the overcenter position in which it is releasably held by the magnet **130**.

Thus failure of either the differential compensating springs or of the captive operating fluid system is sufficient to cause the pressure governor **32** to terminate the pumping operation until the operator can correct the condition which produced the termination and deliberately causes a resumption thereof.

It will now be appreciated that this invention provides a highly effective and simple pressure governor device which may be installed in one or more pumping stations to provide precise and continuous automatic control of the differential between the pressure at the intake and discharge sides of the pump. The device is also effective to automatically and immediately discontinue the pumping operation upon the occurrence of certain emergency conditions along the pumping line, such as the falling of the intake pressure below a selected minimum or the rising of the discharge pressure above the selected maximum, regardless of whether the differential between the intake and discharge pressure is or is not maintained. The device further disrupts the pumping operation if there should occur a failure within its own operating mechanism which renders it incapable of responding properly to perform the operations for which it is primarily designed. Once the pumping operation has been terminated, the pressure governor of this invention will not allow resumption thereof until an operator deliberately resets the device with the express intention of allowing the pumping operations to be resumed after determining that such action is warranted.

The particulars of the foregoing description are provided merely for purposes of illustration and are subject to a considerable latitude of modification without departing from the novel teachings disclosed herein. Accordingly, the scope of this invention is intended to be limited only as defined in the appended claims, which should be accorded a breadth of interpretation consistent with this specification.

What I claim is:

1. For use with a motor having a speed control and connected to drive a pump receiving a pumping fluid at an intake pressure and discharging said pumping fluid at a discharge pressure higher than said intake pressure, a pressure governor comprising actuating means connected to said speed control to adjust the speed of said motor, automatic pressure differential stabilizing means including differential cylinder means, differential piston means reciprocably mounted in said differential cylinder means, discharge and intake pressure sensing systems, means connecting said discharge and intake pressure sensing systems to bias said differential piston means in proportion to the differential between said intake and discharge pressures, differential compensating means biasing said differential piston means in a direction opposite to the biasing force exerted by said pressure differential for maintaining said differential piston means in equilibrium at a selected value of said pressure differential, said differential piston means being reciprocated in response to variations in said pressure differential from said selected value, means for operating said actuating means in response to reciprocation of said differential piston means by variations in said pressure differential from said selected value to adjust the speed of said motor in the direction to restore said selected value, means for adjusting the biasing force of said differential compensating means to select said selected value, automatic emergency speed reduction means including an emergency cylinder, means providing a source of an operating fluid and connected to deliver said operating fluid to said emergency cylinder along a pair of alternative routes, discharge pressure valve means connected to control the flow of operating fluid to said emergency cylinder along one of said alternative routes and operatively connected to said discharge pressure sensing system and operable in response to rising of said discharge pressure above a selected maximum to admit said operating fluid into said emergency cylinder, intake pressure valve means connected to control the flow of said operating fluid to said emergency cylinder along the other of said alternative routes and operatively connected to said intake pressure sensing system and operable in response to falling of said intake pressure below a selected minimum to admit said operat-

ing fluid into said emergency cylinder, an emergency piston mounted in said emergency cylinder for reciprocation in response to entrance of said operating fluid thereinto, means for operating said actuating means to reduce the speed of said motor to a minimal level in response to reciprocation of said emergency piston, and means for individually adjusting the response of said discharge pressure and intake pressure valve means to select said selected maximum and said selected minimum.

2. For use with a motor having a speed control and connected to drive a pump receiving a pumping fluid at an intake pressure and discharging said pumping fluid at a discharge pressure higher than said intake pressure, a pressure governor comprising actuating means connected to said speed control to adjust the speed of said motor, automatic pressure differential stabilizing means including differential cylinder means, differential piston means reciprocably mounted in said differential cylinder means, discharge and intake pressure sensing systems, means connecting said discharge and intake pressure sensing systems to bias said differential piston means in proportion to the differential between said intake and discharge pressures, differential compensating means biasing said differential piston means in a direction opposite to the biasing force exerted by said pressure differential for maintaining said differential piston means in equilibrium at a selected value of said pressure differential, said differential piston means being reciprocated in response to variations in said pressure differential from said selected value, means for operating said actuating means in response to reciprocation of said differential piston means by variations in said pressure differential from said selected value to adjust the speed of said motor in the direction to restore said selected value, means for adjusting the biasing force of said differential compensating means to select said selected value, automatic emergency speed reduction means including an emergency cylinder, means providing a source of an operating fluid and connected to deliver said operating fluid to said emergency cylinder along a pair of alternative routes, discharge pressure valve means connected to control the flow of operating fluid to said emergency cylinder along one of said alternative routes and operatively connected to said discharge pressure sensing system and operable in response to rising of said discharge pressure above a selected maximum to admit said operating fluid into said emergency cylinder, intake pressure valve means connected to control the flow of said operating fluid to said emergency cylinder along the other of said alternative routes and operatively connected to said intake pressure sensing system and operable in response to falling of said intake pressure below a selected minimum to admit said operating fluid into said emergency cylinder, an emergency piston reciprocably mounted in said emergency cylinder for reciprocation in response to entrance of said operating fluid thereinto, means for operating said actuating means to reduce the speed of said motor to a minimal level in response to reciprocation of said emergency piston, means for individually adjusting the response of said discharge pressure and intake pressure valve means to select said selected maximum and said selected minimum, and emergency holder means operable in response to movement of said actuating means into a position to reduce the speed of said motor to said minimal level for releasably holding said actuating means substantially in said position.

3. For use with a motor having a speed control and connected to drive a pump receiving a pumping fluid at an intake pressure and discharging said pumping fluid at a discharge pressure higher than said intake pressure, a pressure governor comprising actuating means connected to said speed control to adjust the speed of said motor, automatic pressure differential stabilizing means including differential cylinder means, differential piston means reciprocably mounted in said differential cylinder means, discharge and intake pressure sensing systems, means connecting said discharge and intake pressure sensing systems to bias said differential piston means in proportion to the differential between said intake and discharge pressures, differential compensating means biasing said differential piston means in a direction opposite to the biasing force exerted by said pressure differential for maintaining said differential piston means in equilibrium at a selected value of said pressure differential, said differential piston means being reciprocated in response to variations in said pressure differential from said selected value, means for operating said actuating means in response to reciprocation of said differential piston means by variations in said pressure differential from said selected value to adjust the speed of said motor in the direction to restore said selected value, means for adjusting the biasing force of said differential compensating means to select said selected value, automatic emergency speed reduction means including an emergency cylinder, means providing a source of an operating fluid and connected to deliver said operating fluid to said emergency cylinder along a pair of alternative routes, discharge pressure valve means connected to control the flow of operating fluid to said emergency cylinder along one of said alternative routes and operatively connected to said discharge pressure sensing system and operable in response to rising of said discharge pressure above a selected maximum to admit said operating fluid into said emergency cylinder, intake pressure valve means connected to control the flow of said operating fluid to said emergency cylinder along the other of said alternative routes and operatively connected to said intake pressure sensing system and operable in response to falling of said intake pressure below a selected minimum to admit said operating fluid into said emergency cylinder, an emergency piston reciprocably mounted in said emergency cylinder for reciprocation in response to entrance of said operating fluid thereinto, means for operating said actuating means to reduce the speed of said motor to a minimal level in response to reciprocation of said emergency piston, means for individually adjusting the response of said discharge pressure and intake pressure valve means to select said selected maximum and said selected minimum, emergency holder means operable in response to movement of said actuating means into a position to reduce the speed of said motor to said minimal level for releasably holding said actuating means substantially in said position, and means for manually altering the position of said actuating means to adjust the speed of said motor.

4. For use with a motor having a speed control and connected to drive a pump receiving a pumping fluid at an intake pressure and discharging said pumping fluid at a discharge pressure higher than said intake pressure, a pressure governor comprising actuating means connected to said speed control to adjust the speed of said motor, automatic pressure differential stabilizing means including differential cylinder means, differential piston means reciprocably mounted in said differential cylinder means, discharge and intake pressure sensing systems, means connecting said discharge and intake pressure sensing systems to bias said differential piston means in proportion to the differential between said intake and discharge pressures, differential compensating means biasing said differential piston means in a direction opposite to the biasing force exerted by said pressure differential for maintaining said differential piston means in equilibrium at a selected value of said pressure differential, said differential piston means being reciprocated in response to variations in said pressure differential from said selected value, means for operating said actuating means in response to reciprocation of said differential piston means by variations in said pressure differential from said selected value to adjust the speed of said motor in the direction to restore said selected value, means for adjusting the biasing force of said differential compensating means to select said selected value, automatic emer-

gency speed reduction means including an emergency cylinder, means providing a source of an operating fluid and connected to deliver said operating fluid to said emergency cylinder along a pair of alternative routes, discharge pressure valve means connected to control the flow of operating fluid to said emergency cylinder along one of said alternative routes and operatively connected to said discharge pressure sensing system and operable in response to rising of said discharge pressure above a selected maximum to admit said operating fluid into said emergency cylinder, intake pressure valve means connected to control the flow of said operating fluid to said emergency cylinder along the other of said alternative routes and operatively connected to said intake pressure sensing system and operable in response to falling of said intake pressure below a selected minimum to admit said operating fluid into said emergency cylinder, an emergency piston mounted in said emergency cylinder for reciprocation in response to entrance of said operating fluid thereinto, means for operating said actuating means to reduce the speed of said motor to a minimal level in response to reciprocation of said emergency piston, means for individually adjusting the response of said discharge pressure and intake pressure valve means to select said selected maximum and said selected minimum, emergency holder means operable in response to movement of said actuating means into a position to reduce the speed of said motor to said minimal level for releasably holding said actuating means substantially in said position, means for manually altering the position of said actuating means to adjust the speed of said motor, and warm-up holder means for holding said actuating means in a position to maintain the speed of said motor at a warm-up level.

5. For use with a motor having a speed control and connected to drive a pump receiving a pumping fluid at an intake pressure and discharging said pumping fluid at a discharge pressure higher than said intake pressure, a pressure governor comprising an actuating lever, connecting means engaging said speed control and arranged to adjust the speed of said motor in response to pivotal movement of said actuating lever, automatic pressure differential stabilizing means including a double-ended cylinder, a double-ended piston reciprocably mounted in said double-ended cylinder, discharge and intake pressure sensing systems adatped to contain a captive fluid and including a pair of bellows positioned to sense said intake and discharge pressures respectively and conduit means connected to said bellows to transmit said captive fluid under the pressures sensed by said bellows, said conduit means being connected to transmit said captive fluid under said intake and discharge pressures respectively to opposed ends of said double-ended cylinder to bias said double-ended piston in proportion to the differential between said intake and discharge pressures, differential compensating spring means connected to bias said double-ended piston in a direction opposite to the biasing force exerted by said pressure differential for maintaining said double-ended piston in equilibrium at a position between the opposed ends of said double-ended cylinder at a selected value of said pressure differential, said differential piston being reciprocated from said equilibrium position toward either end of said double-ended cylinder in response to increases and decreases respectively in said pressure differential from said selected value, pivot means pivotally connecting said double-ended piston to said actuating lever, a fulcrum positioned to engage said actuating lever when said double-ended piston is in any one of a range of equilibrium positions for causing pivotal movement of said actuating lever about said fulcrum in the direction to decelerate said motor when said double-ended piston is reciprocated from an equilibrium position in said range in response to an increase in said pressure differential, said differential compensating spring means being connected to pivot said actuating lever about said pivot means and about said fulcrum in the direction to accelerate said motor when said double-ended piston is reciprocated from an equilibrium position in said range by a decrease in said pressure differential, automatic emergency speed reduction means including an emergency cylinder, an emergency piston reciprocably mounted in said emergency cylinder, means arranged to pivot said actuating lever about said pivot means and about said fulcrum in the direction to decelerate said motor sufficiently far to reduce the speed of said motor to a minimal level in response to reciprocation of said emergency piston, a discharge pressure valve cylinder, an intake pressure valve guideway, said conduit means being connected to deliver said captive fluid from said discharge pressure sensing system along alternative routes through said discharge pressure valve cylinder to said emergency cylinder and through said intake pressure valve guideway to said emergency cylinder to reciprocate said emergency piston, a discharge pressure valve piston reciprocably mounted in said discharge pressure valve cylinder arranged to block passage of said captive fluid through said discharge pressure valve cylinder and formed with a discharge pressure valve passage for conducting said captive fluid through said discharge pressure valve cylinder, sealing means positioned to seal off said discharge pressure valve when said discharge pressure valve piston is in sealing relationship therewith, said discharge pressure valve piston being arranged to be urged out of sealing relationship with said sealing means in response to the discharge pressure exerted thereon by said captive fluid, discharge pressure valve spring means arranged to bias said discharge pressure valve piston into sealing relationship with said sealing means with sufficient force to allow movement of said discharge pressure valve piston out of sealing relationship with said sealing means only when said discharge pressure exceeds a selected maximum, an intake pressure valve cylinder, an intake pressure valve piston reciprocably mounted in said intake pressure valve cylinder, an intake pressure valve plunger movably mounted in said intake pressure valve guideway normally arranged in a blocking position to prevent passage of said captive fluid therethrough and shaped to define an intake pressure valve passage located to conduct said captive fluid through said intake pressure valve guideway when said intake pressure valve plunger is moved from said blocking position to a conducting position, said intake pressure valve piston being connected to urge said intake pressure valve plunger toward said blocking position, said conduit means being connected to deliver said captive fluid from said intake pressure sensing system to said intake pressure valve cylinder for urging said intake pressure valve piston in a direction to maintain said intake pressure valve plunger in said blocking position, and intake pressure valve spring means arranged to bias said intake pressure valve plunger toward said conducting position with a force sufficiently weak to move said intake pressure valve plunger into said conducting position only when said intake pressure falls below a selected minimum.

6. For use with a motor having a speed control and connected to drive a pump receiving a pumping fluid at an intake pressure and discharging said pumping fluid at a discharge pressure higher than said intake pressure, a pressure governor comprising an actuating level, connecting means engaging said speed control and arranged to adjust the speed of said motor in response to pivotal movement of said actuating lever, automatic pressure differential stabilizing means including a double-ended cylinder, a double-ended piston reciprocably mounted in said double-ended cylinder, discharge and intake pressure sensing systems adapted to contain a captive fluid and including a pair of bellows positioned to sense said intake and discharge pressures respectively and conduit means connected to said bellows to transmit said captive fluid under the pressures sensed by said bellows, said conduit means being connected to transmit said cap-

tive fluid under said intake and discharge pressures respectively to opposed ends of said double-ended cylinder to bias said double-ended piston in proportion to the differential between said intake and discharge pressures, differential compensating spring means connected to bias said double-ended piston in a direction opposite to the biasing force exerted by said pressure differential for maintaining said double-ended piston in equilibrium at a position between the opposed ends of said double-ended cylinder at a selected value of said pressure differential, said differential piston being reciprocated from said equilibrium position toward either end of said double-ended cylinder in response to increases and decreases respectively in said pressure differential from said selected value, pivot means pivotally connecting said double-ended piston to said actuating lever, a fulcrum positioned to engage said actuating lever when said double-ended piston is in any one of a range of equilibrium positions for causing pivotal movement of said actuating lever about said fulcrum in the direction to decelerate said motor when said double-ended piston is reciprocated from an equilibrium position in said range in response to an increase in said pressure differential, said differential compensating spring means being connected to pivot said actuating lever about said pivot means and about said fulcrum in the direction to accelerate said motor when said double-ended piston is reciprocated from an equilibrium position in said range by a decrease in said pressure differential, screw means for adjusting the biasing force exerted on said double-ended piston by said differential compensating spring means to select said selected pressure differential value, automatic emergency speed reduction means including an emergency cylinder, an emergency piston reciprocably mounted in said emergency cylinder, means arranged to pivot said actuating lever about said pivot means and about said fulcrum in the direction to decelerate said motor sufficiently far to reduce the speed of said motor to a minimal level in response to reciprocation of said emergency piston, a discharge pressure valve cylinder, an intake pressure valve guideway, said conduit means being connected to deliver said captive fluid from said discharge pressure sensing system along alternative routes through said discharge pressure valve cylinder to said emergency cylinder and through said intake pressure valve guideway to said emergency cylinder to reciprocate said emergency piston, a discharge pressure valve piston reciprocably mounted in said discharge pressure valve cylinder arranged to block passage of said captive fluid through said discharge pressure valve cylinder and formed with a discharge pressure valve passage for conducting said captive fluid through said discharge pressure valve cylinder, sealing means positioned to seal off said discharge pressure valve passage when said discharge pressure valve piston is in sealing relationship therewith, said discharge pressure valve piston being arranged to be urged out of sealing relationship with said sealing means in response to the discharge pressure exerted thereon by said captive fluid, discharge pressure valve spring means arranged to bias said discharge pressure valve piston into sealing relationship with said sealing means with sufficient force to allow movement of said discharge pressure valve piston out of sealing relationship with said sealing means only when said discharge pressure exceeds a selected maximum, screw means for adjusting the biasing force of said discharge pressure valve spring means to select said selected maximum, an intake pressure valve cylinder, an intake pressure valve piston reciprocably mounted in said intake pressure valve cylinder, an intake pressure valve plunger movably mounted in said intake pressure valve guideway normally arranged in a blocking position to prevent passage of said captive fluid therethrough and shaped to define an intake pressure valve passage located to conduct said captive fluid through said intake pressure valve guideway when said intake pressure valve plunger is moved from said blocking position to a conducting position, said intake pressure valve piston being connected to urge said intake pressure valve plunger toward said blocking position, said conduit means being connected to deliver said captive fluid from said intake pressure sensing system to said intake pressure valve cylinder for urging said intake pressure valve piston in a direction to maintain said intake pressure valve plunger in said blocking position, intake pressure valve spring means arranged to bias said intake pressure valve plunger toward said conducting position with a force sufficiently weak to move said intake pressure valve plunger into said conducting position only when said intake pressure falls below a selected minimum, and screw means for adjusting the biasing force of said intake pressure valve spring means to select said selected minimum.

7. For use with a motor having a speed control and connected to drive a pump receiving a pumping fluid at an intake pressure and discharging said pumping fluid at a discharge pressure higher than said intake pressure, a pressure governor comprising an actuating lever, connecting means engaging said speed control and arranged to adjust the speed of said motor in response to pivotal movement of said actuating lever, a toggle linkage connected to said actuating lever to close upon acceleration and open upon deceleration of said motor, automatic pressure differential stabilizing means including a double-ended cylinder, a double-ended piston reciprocably mounted in said double-ended cylinder, discharge and intake pressure sensing systems adapted to contain a captive fluid and including a pair of bellows positioned to sense said intake and discharge pressures respectively and conduit means connected to said bellows to transmit said captive fluid under the pressures sensed by said bellows, said conduit means being connected to transmit said captive fluid under said intake and discharge pressures respectively to opposed ends of said double-ended cylinder to bias said double-ended piston in proportion to the differential between said intake and discharge pressures, differential compensating spring means connected to bias said double-ended piston in a direction opposite to the biasing force exerted by said pressure differential for maintaining said double-ended piston in equilibrium at a position between the opposed ends of said double-ended cylinder at a selected value of said pressure differential, said differential piston being reciprocated from said equilibrium position toward either end of said double-ended cylinder in response to increases and decreases respectively in said pressure differential from said selected value, pivot means pivotally connecting said double-ended piston to said actuating lever, a fulcrum positioned to engage said actuating lever when said double-ended piston is in any one of a range of equilibrium positions for causing pivotal movement of said actuating lever about said fulcrum in the direction to decelerate said motor when said double-ended piston is reciprocated from an equilibrium position in said range in response to an increase in said pressure differential, said differential compensating spring means being connected to pivot said actuating lever about said pivot means and about said fulcrum in the direction to accelerate said motor when said double-ended piston is reciprocated from an equilibrium position in said range by a decrease in said pressure differential, screw means for adjusting the biasing force exerted on said double-ended piston by said differential compensating spring means to select said selected pressure differential value, automatic emergency speed reduction means including an emergency cylinder, an emergency piston reciprocably mounted in said emergency cylinder, means arranged to pivot said actuating lever about said pivot means and about said fulcrum in the direction to decelerate said motor sufficiently far to open said toggle linkage completely for reducing the speed of said motor to a minimal level in response to reciprocation of said emergency piston, emergency holder means including a magnetic material mounted on said toggle and

a magnet positioned to cooperate therewith for snapping said toggle linkage into a substantially open overcenter position and for releasably holding said toggle linkage in said overcenter position for maintaining the speed of said motor substantially at said minimal level in response to complete opening of said toggle linkage, a discharge pressure valve cylinder, an intake pressure valve guideway, said conduit means being connected to deliver said captive fluid from said discharge pressure sensing system along alternative routes through said discharge pressure valve cylinder to said emergency cylinder and through said intake pressure valve guideway to said emergency cylinder to reciprocate said emergency piston, a discharge pressure valve piston reciprocably mounted in said discharge pressure valve cylinder arranged to block passage of said captive fluid through said discharge pressure valve cylinder and formed with a discharge pressure valve passage for conducting said captive fluid through said discharge pressure valve cylinder, sealing means positioned to seal off said discharge pressure valve passage when said discharge pressure valve piston is in sealing relationship therewith, said discharge pressure valve piston being arranged to be urged out of sealing relationship with said sealing means in response to the discharge pressure exerted thereon by said captive fluid, discharge pressure valve spring means arranged to bias said discharge pressure valve piston into sealing relationship with said sealing means with sufficient force to allow movement of said discharge pressure valve piston out of sealing relationship with said sealing means only when said discharge pressure exceeds a selected maximum, screw means for adjusting the biasing force of said discharge pressure valve spring means to select said selected maximum, an intake pressure valve cylinder, an intake pressure valve piston reciprocably mounted in said intake pressure valve cylinder, an intake pressure valve plunger movably mounted in said intake pressure valve guideway normally arranged in a blocking position to prevent passage of said captive fluid therethrough and shaped to define an intake pressure valve passage located to conduct said captive fluid through said intake pressure valve guideway when said intake pressure valve plunger is moved from said blocking position to a conducting position, said intake pressure valve piston being connected to urge said intake pressure valve plunger toward said blocking position, said conduit means being connected to deliver said captive fluid from said intake pressure sensing system to said intake pressure valve cylinder for urging said intake pressure valve piston in a direction to maintain said intake pressure valve plunger in said blocking position, intake pressure valve spring means arranged to bias said intake pressure valve plunger toward said conducting position with a force sufficiently weak to move said intake pressure valve plunger into said conducting position only when said intake pressure falls below a selected minimum, and screw means for adjusting the biasing force of said intake pressure valve spring means to select said selected minimum.

8. For use with a motor having a speed control and connected to drive a pump receiving a pumping fluid at an intake pressure and discharging said pumping fluid at a discharge pressure higher than said intake pressure, a pressure governor comprising an actuating lever, connecting means engaging said speed control and arranged to adjust the speed of said motor in response to pivotal movement of said actuating lever, a toggle linkage connected to said actuating lever to close upon acceleration and open upon deceleration of said motor, a handle on said toggle linkake for manually opening and closing said toggle linkage to adjust the speed of said motor, automatic pressure differential stabilizing means including a double-ended cylinder, a double-ended piston reciprocably mounted in said double-ended cylinder, discharge and intake pressure sensing systems adapted to contain a captive fluid and including a pair of bellows positioned to sense said intake and discharge pressures respectively and conduit means connected to said bellows to transmit said captive fluid under the pressures sensed by said bellows, said conduit means being connected to transmit said captive fluid under said intake and discharge pressures respectively to opposed ends of said double-ended cylinder to bias said double-ended piston in proportion to the differential between said intake and discharge pressures, differential compensating spring means connected to bias said double-ended piston in a direction opposite to the biasing force exerted by said pressure differential for maintaining said double-ended piston in equilibrium at a position between the opposed ends of said double-ended cylinder at a selected value of said pressure differential, said differential piston being reciprocated from said equilibrium position toward either end of said double-ended cylinder in response to increases and decreases respectively in said pressure differential from said selected value, pivot means pivotally connecting said double-ended piston to said actuating lever, a fulcrum positioned to engage said actuating lever when said double-ended piston is in any one of a range of equilibrium positions for causing pivotal movement of said actuating lever about said fulcrum in the direction to decelerate said motor when said double-ended piston is reciprocated from an equilibrium position in said range in response to an increase in said pressure differential, said differential compensating spring means being connected to pivot said actuating lever about said pivot means and about said fulcrum in the direction to accelerate said motor when said double-ended piston is reciprocated from an equilibrium position in said range by a decrease in said pressure differential, screw means for adjusting the biasing force exerted on said double-ended piston by said differential compensating spring means to select said selected pressure differential value, automatic emergency speed reduction means including an emergency cylinder, an emergency piston reciprocably mounted in said emergency cylinder, means arranged to pivot said actuating lever about said pivot means and about said fulcrum in the direction to decelerate said motor sufficiently far to open said toggle linkage completely for reducing the speed of said motor to a minimal level in response to reciprocation of said emergency piston, emergency holder means including a magnetic material mounted on said toggle and a magnet positioned to cooperate therewith for snapping said toggle linkage into a substantially open overcenter position and for releasably holding said toggle linkage in said overcenter position for maintaining the speed of said motor substantially at said minimal level in response to complete opening of said toggle linkage, a discharge pressure valve cylinder, an intake pressure valve guideway, said conduit means being connected to deliver said captive fluid from said discharge pressure sensing system along alternative routes through said discharge pressure valve cylinder to said emergency cylinder and through said intake pressure valve guideway to said emergency cylinder to reciprocate said emergency piston, a discharge pressure valve piston reciprocably mounted in said discharge pressure valve cylinder arranged to block passage of said captive fluid through said discharge pressure valve cylinder and formed with a discharge pressure valve passage for conducting said captive fluid through said discharge pressure valve cylinder, sealing means positioned to seal off said discharge pressure valve passage when said discharge pressure valve piston is in sealing relationship therewith, said discharge pressure valve piston being arranged to be urged out of sealing relationship with said sealing means in response to the discharge pressure exerted thereon by said captive fluid, discharge pressure valve spring means arranged to bias said discharge pressure valve piston into sealing relationship with said sealing means with sufficient force to allow movement of said discharge pressure valve piston out of sealing relationship with said sealing means only when

said discharge pressure exceeds a selected maximum, screw means for adjusting the biasing force of said discharge pressure valve spring means to select said selected maximum, an intake pressure valve cylinder, an intake pressure valve piston reciprocably mounted in said intake pressure valve cylinder, an intake pressure valve plunger movably mounted in said intake pressure valve guideway normally arranged in a blocking position to prevent passage of said captive fluid therethrough and shaped to define an intake pressure valve passage located to conduct said captive fluid through said intake pressure valve guideway when said intake pressure valve plunger is moved from said blocking position to a conducting position, said intake pressure valve piston being connected to urge said intake pressure valve plunger toward said blocking position, said conduit means being connected to deliver said captive fluid from said intake pressure sensing system to said intake pressure valve cylinder for urging said intake pressure valve piston in a direction to maintain said intake pressure valve plunger in said blocking position, intake pressure valve spring means arranged to bias said intake pressure valve plunger toward said conducting position with a force sufficiently weak to move said intake pressure valve plunger into said conducting position only when said intake pressure falls below a selected minimum, and screw means for adjusting the biasing force of said intake pressure valve spring means to select said selected minimum.

9. For use with a motor having a speed control and connected to drive a pump receiving a pumping fluid at an intake pressure and discharging said pumping fluid at a discharge pressure higher than said intake pressure, a pressure governor comprising an actuating lever, connecting means engaging said speed control and arranged to adjust the speed of said motor in response to pivotal movement of said actuating lever, a toggle linkage connected to said actuating lever to close upon acceleration and open upon deceleration of said motor, a warm-up holder for releasably holding said toggle linkage closed for maintaining the speed of said motor at a warm-up level, a handle on said toggle linkage for manually opening and closing said toggle linkage to adjust the speed of said motor, automatic pressure differential stabilizing means including a double-ended cylinder, a double-ended piston reciprocably mounted in said double-ended cylinder, discharge and intake pressure sensing systems adapted to contain a captive fluid and including a pair of bellows positioned to sense said intake and discharge pressures respectively and conduit means connected to said bellows to transmit said captive fluid under the pressures sensed by said bellows, said conduit means being connected to transmit said captive fluid under said intake and discharge pressures respectively to opposed ends of said double-ended cylinder to bias said double-ended piston in proportion to the differential between said intake and discharge pressures, differential compensating spring means connected to bias said double-ended piston in a direction opposite to the biasing force exerted by said pressure differential for maintaining said double-ended piston in equilibrium at a position between the opposed ends of said double-ended cylinder at a selected value of said pressure differential, said differential piston being reciprocated from said equilibrium position toward either end of said double-ended cylinder in response to increases and decreases respectively in said pressure differential from said selected value, pivot means pivotally connecting said double-ended piston to said actuating lever, a fulcrum positioned to engage said actuating lever when said double-ended piston is in any one of a range of equilibrium positions for causing pivotal movement of said actuating lever about said fulcrum in the direction to decelerate said motor when said double-ended piston is reciprocated from an equilibrium position in said range in response to an increase in said pressure differential, said differential compensating spring means being connected to pivot said actuating lever about said pivot means and about said fulcrum in the direction to accelerate said motor when said double-ended piston is reciprocated from an equilibrium position in said range by a decrease in said pressure differential, screw means for adjusting the biasing force exerted on said double-ended piston by said differential compensating spring means to select said selected pressure differential value, automatic emergency speed reduction means including an emergency cylinder, an emergency piston reciprocably mounted in said emergency cylinder, means arranged to pivot said actuating lever about said pivot means and about said fulcrum in the direction to decelerate said motor sufficiently far to open said toggle linkage completely for reducing the speed of said motor to a minimal level in response to reciprocation of said emergency piston, emergency holder means including a magnetic material mounted on said toggle and a magnet positioned to cooperate therewith for snapping said toggle linkage into a substantially open over-center position and for releasably holding said toggle linkage in said overcenter position for maintaining the speed of said motor substantially at said minimal level in response to complete opening of said toggle linkage, a discharge pressure valve cylinder, an intake pressure valve guideway, said conduit means being connected to deliver said captive fluid from said discharge pressure sensing system along alternative routes through said discharge pressure valve cylinder to said emergency cylinder and through said intake pressure valve guideway to said emergency cylinder to reciprocate said emergency piston, a discharge pressure valve piston reciprocably mounted in said discharge pressure valve cylinder arranged to block passage of said captive fluid through said discharge pressure valve cylinder and formed with a discharge pressure valve passage for conducting said captive fluid through said discharge pressure valve cylinder, sealing means positioned to seal off said discharge pressure valve passage when said discharge pressure valve piston is in sealing relationship therewith, said discharge pressure valve piston being arranged to be urged out of sealing relationship with said sealing means in response to the discharge pressure exerted thereon by said captive fluid, discharge pressure valve spring means arranged to bias said discharge pressure valve piston into sealing relationship with said sealing means with sufficient force to allow movement of said discharge pressure valve piston out of sealing relationship with said sealing means only when said discharge pressure exceeds a selected maximum, screw means for adjusting the biasing force of said discharge pressure valve spring means to select said selected maximum, an intake pressure valve cylinder, an intake pressure valve piston reciprocably mounted in said intake pressure valve cylinder, an intake pressure valve plunger movably mounted in said intake pressure valve guideway normally arranged in a blocking position to prevent passage of said captive fluid therethrough and shaped to define an intake pressure valve passage located to conduct said captive fluid through said intake pressure valve guideway when said intake pressure valve plunger is moved from said blocking position to a conducting position, said intake pressure valve piston being connected to urge said intake pressure valve plunger toward said blocking position, said conduit means being connected to deliver said captive fluid from said intake pressure sensing system to said intake pressure valve cylinder for urging said intake pressure valve piston in a direction to maintain said intake pressure valve plunger in said blocking position, intake pressure valve spring means arranged to bias said intake pressure valve plunger toward said conducting position with a force sufficiently weak to move said intake pressure valve plunger into said conducting position only when said intake pressure falls below a selected minimum, and screw means for adjusting the biasing force of said in-

take pressure valve spring means to select said selected minimum.

10. For use with a motor having a speed control and connected to drive a pump receiving a fluid at an intake pressure and discharging said fluid at a discharge pressure higher than said intake pressure, a pressure governor comprising automatic pressure differential stabilizing means, automatic emergency speed reduction means, means connecting said pressure differential stabilizing means to sense the differential between said intake pressure and said discharge pressure and connecting said emergency speed reduction means to sense said discharge pressure and said intake pressure, and means connecting said pressure differential stabilizing means and said emergency speed reduction means for operating said speed control, said pressure differential stabilizing means being operable in response to variation of said pressure differential from a selected value thereof to adjust the speed of said motor in the direction to restore said selected value, said emergency speed reduction means being operable in response to rising of said discharge pressure above a selected maximum and in response to falling of said intake pressure below a selected minimum to reduce the speed of said motor to a minimal level, and magnetic means associated with said means for operating said speed control to magnetically maintain said speed control at a position whereby the speed of said motor is at a minimum level.

11. A pressure governor for use with a motor having a speed control and connected to drive a pump receiving a fluid at an intake pressure and discharging said fluid at a discharge pressure higher than said intake pressure, said pressure governor comprising automatic pressure differential stabilizing means including a piston, automatic emergency speed reduction means, means connecting said pressure differential stabilizing means to sense the differential between said intake pressure and said discharge pressure and connecting said emergency speed reduction means to sense said discharge pressure and said intake pressure, lever means connecting said pressure differential stabilizing means and said emergency speed reduction means to operate said speed control, said lever means including a lever pivoted to said piston and a toggle linkage pivoted to said lever and said speed control, said pressure differential stabilizing means being operable in response to variation of said pressure differential from a selected value thereof to adjust the speed of said motor in the direction to restore said selected value, said emergency speed reduction means being operable in response to rising of said discharge pressure above a selected maximum and in response to falling of said intake pressure below a selected minimum to reduce the speed of said motor to a minimal level, means for adjusting the response of said pressure differential stabilizing means to select said selected pressure differential value, and means for adjusting the response of said emergency speed reduction means to select said selected maximum and said selected minimum.

12. A pressure governor for use with a motor having a speed control and connected to drive a pump receiving a fluid at an intake pressure and discharging said fluid at a discharge pressure higher than said intake pressure, said pressure governor comprising automatic pressure differential stabilizing means including a piston, automatic emergency speed reduction means, means connecting said pressure differential stabilizing means to sense the differential between said intake pressure and said dicharge pressure and connecting said emergency speed reduction means to sense said discharge pressure and said intake pressure, lever means connecting said pressure differential stabilizing means, said emergency speed reduction means to operate said speed control, said lever means including a lever pivoted to said piston and a toggle linkage pivoted to said lever and said speed control, said pressure differential stabilizing means being operable in response to variation of said pressure differential from a selected value thereof to adjust the speed of said motor in the direction to restore said selected value, said emergency speed reduction means being operable in response to rising of said discharge pressure above a selected maximum and in response to falling of said intake pressure below a selected minimum to reduce the speed of said motor to a minimal level, means for adjusting the response of said pressure differential stabilizing means to select said selected pressure differential value, and means for adjusting the response of said emergency speed reduction means to select said selected maximum and said selected minimum, and magnetic means adjacent said lever means and engageable with said toggle linkage to magnetically hold said toggle linkage to maintain said speed control at a position whereby the speed of said motor is at a minimum level.

References Cited in the file of this patent

UNITED STATES PATENTS

1,415,647	Huff	May 9, 1922
2,373,143	Samiran	Apr. 10, 1945
2,667,150	Coar	Jan. 26, 1954
2,764,868	Watson et al.	Oct. 2, 1956
2,771,843	Brown	Nov. 27, 1956
2,852,031	Schellers	Sept. 16, 1958