F. W. VAN NESS.
VACUUM GOVERNOR.
APPLICATION FILED JUNE 12, 1909.

1,090,893.

Patented Mar. 24, 1914.

2 SHEETS—SHEET 1.

Fig. 2.

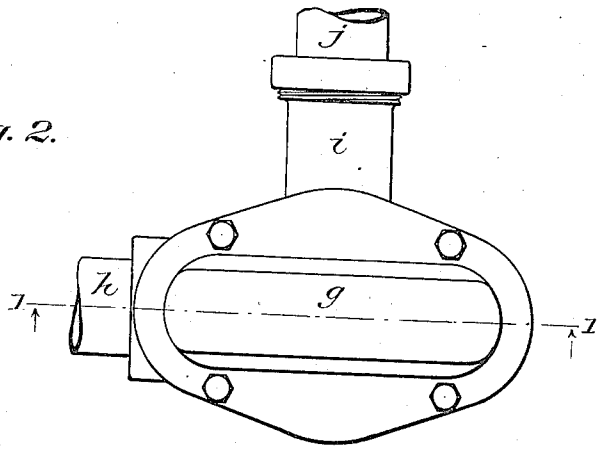
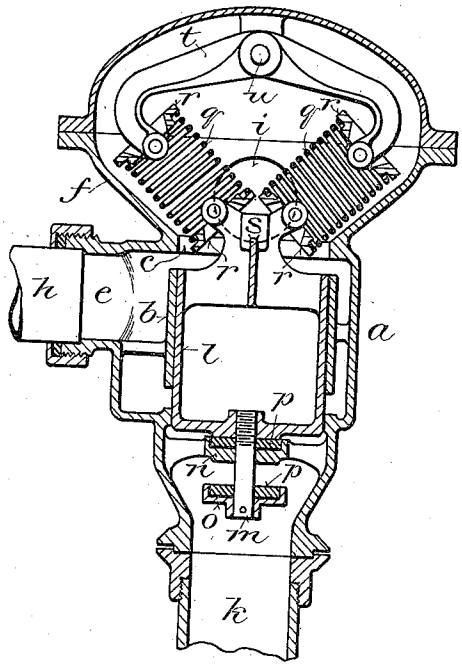


Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 3.

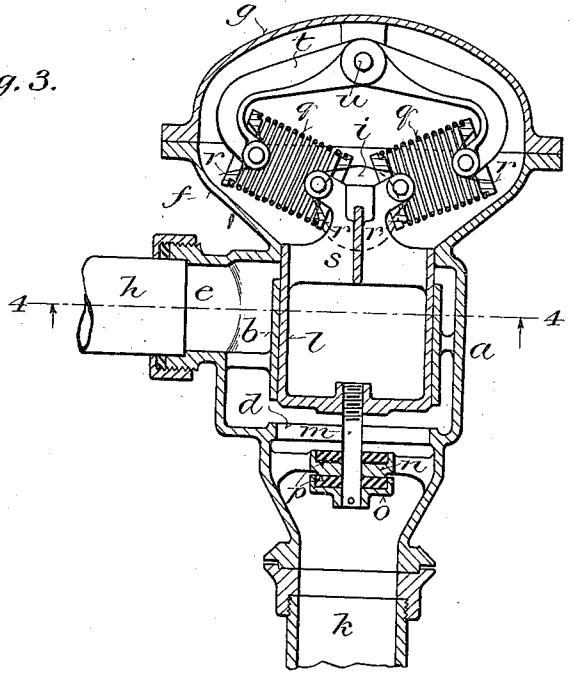
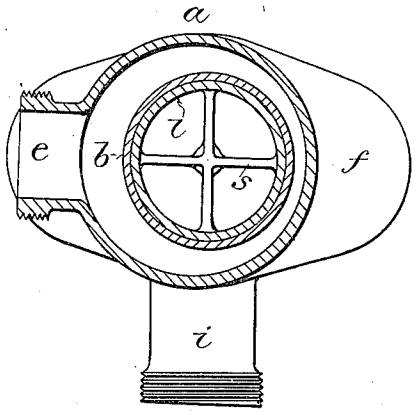


Fig. 4.



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VACUUM-GOVERNOR.

1,090,893. Specification of Letters Patent. Patented Mar. 24, 1914.

Application filed June 12, 1909. Serial No. 501,732.

To all whom it may concern:

Be it known that I, FRANK W. VAN NESS, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Vacuum-Governors, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

The main objects of this invention are to automatically regulate and control the operation of vacuum producing apparatus, such as suction pumps; to maintain a substantially constant vacuum or pressure, to economize power; and generally to simplify and improve the construction and operation of devices for such purposes.

It consists in the peculiar construction, arrangement and combination of parts as hereinafter particularly described and pointed out in the claims.

In the accompanying drawing like characters designate the same parts in the several figures.

Figure 1 is a vertical section on the line 1 1, Fig. 2, of a governor embodying the above invention, the valve being shown in position to close the relief port and open communication between the suction and service ports; Fig. 2 is a plan view of the governor; Fig. 3 is a section similar to that of Fig. 1 showing the valve in position to close the service port and open communication between the suction and relief ports; and Fig. 4 is a section on the line 4 4, Fig. 3.

The device comprises a valve case *a*, formed or provided with an internal cylindrical valve guide or sleeve *b*, and having in axial alinement with said guide or sleeve and adjacent to the ends thereof, a service port *c* and a relief port *d*, corresponding in diameter with the internal diameter of said guide or sleeve. On one side the valve case has a suction port *e*, which communicates with an annular space surrounding the guide or sleeve *b* and with the spaces between the ends of said guide or sleeve and the ports *c* and *d*. The valve case is extended above or beyond the port *c* and forms a spring housing or closure *f*, which is provided with a removable cap or cover *g*.

The port *e* is connected by a pipe *h* with the pump or other vacuum producing apparatus, and the port *c* is connected through a lateral port or passage *i* in the spring housing or closure *f* with the suction main *j* of vacuum cleaning or other apparatus in which it is desired to maintain a substantially constant vacuum or low pressure. The valve case is extended below or beyond the relief port *d* and may be connected as shown, by a pipe *k* with the exhaust pipe of the pump or with any other source from which air may be conveniently taken at or near atmospheric pressure for supplying the pump while it is running without load.

l is a piston valve fitted and movable axially in the guide or sleeve *b* and fitting at the ends into the ports *c* and *d*, either one of which is adapted to be closed thereby while the other is left open. At its lower end, which is preferably closed as shown, the valve is provided with a central stem *m* which passes loosely through a stop *n* formed with or attached to the case below the port *d* and is provided at its lower end with a head *o*. The stop *n* and the head *o* are recessed on the upper side to receive and hold disks or washers *p* of leather or other suitable material for arresting the movement of the valve at the proper limits without shock or noise, the lower end of the valve engaging with the disk or washer in the stop *n* when the valve is moved into position to close the port *d* and open the port *c*, as shown in Fig. 1, and the disk or washer in the head *o* engaging with the under side of the stop when the valve is moved upwardly into position to close the port *c* and open the port *d*, as shown in Fig. 3.

The valve is held normally in position to close the port *d* as shown in Fig. 1, by springs *q* which are arranged obliquely to its axis and the direction of its movement, and bear at their ends against opposing flanged seats or rings *r*. One of these seats or rings for each spring is pivoted to a spider or bridge piece *s* at the upper end of the valve, while the other is pivoted to one end of a yoke or evener *t*, which is centrally pivoted at *u* in the cap or cover *g* of the spring housing. The arrangement of the springs is such that their obliquity to the axis of the valve will be increased and the pressure which they exert to move the valve toward the port *d* will be diminished as the valve is moved in the opposite direction toward the port *c*. The springs being arranged sym-

metrically on opposite sides of the axis of the valve and being supported at their upper ends by the yoke or evener *t* equidistant from its pivot *u*, act with equal pressure upon the valve, which is thus prevented from binding in the guide or sleeve *b* and in the ports *c* and *d*, into one or the other of which it enters in its extreme positions.

In the operation of the governor, when the vacuum produced by the pump reaches a certain limit determined by the strength and adjustment of the springs *q*, it will move the valve upward against the tension of said springs toward the port *c*, the pressure of the springs upon the valve opposing its movement in this direction being thus diminished by their increased obliquity to the axis of the valve, and the valve will be instantly and positively shifted to its extreme upper position, closing the port *c* and opening the port *d*, as shown in Fig. 3. The service main *j* is thus cut off from communication with the pump, thereby preventing the waste of vacuum stored in the service main or the system which it supplies, and communication is established between the suction pipe *h* of the pump and the atmosphere through the relief port *d*, thereby unloading the pump and saving power. When the vacuum is reduced or the service pressure to which the valve *l* is subjected through the service port *c* is increased to a certain limit, the springs will move the valve back to its original and normal position, opening the port *c* and closing the port *d*. As the valve moves away from its upper toward its lower position, the springs act thereon with increasing force as their obliquity to its axis diminishes, so that the movement of the valve in this direction as in the other, will be prompt and positive.

The minimum and maximum limits of vacuum or service pressure at which the valve will be operated to open and close the relief port *d* depends upon the strength and adjustment of the springs *q* and may be varied by providing the governor with springs of greater or less tension or by the adjustment of the springs to different angles. The angle of the springs to the axis of the valve and hence the pressure which they exert upon the valve, may be varied slightly by the adjustment of the stops which determine the limits of movement of the valve. This may be accomplished by replacing the disks or washers *p* with others of different thickness or by adjusting the head *o* toward or from the valve.

Various changes in details of construction and arrangement of parts may be made without departing from the principle and scope of the invention.

I claim:

1. In a vacuum governor the combination of a three-way valve case, a valve subjected to service pressure and adapted to close either of two ports and afford communication between the other and the third port, and a spring arranged obliquely to the movement of the valve and tending to hold it against service pressure in position to close one of said two ports.

2. In a vacuum governor the combination of a valve case having suction and service connections and a relief port, a piston valve subjected to service pressure and adapted to close either the relief or the service port leaving the other in open communication within the suction port, and a spring arranged obliquely to the movement of the valve and tending to hold it in position to close the relief port, the arrangement of the spring being such that its obliquity to the movement of the valve increases and its pressure upon the valve diminishes as the valve moves away from the relief port.

3. In a vacuum governor the combination of a valve case having suction and service connections and a relief port, a valve subjected to service pressure and adapted to close either the relief or the service port leaving the other in open communication with the suction port, opposing spring seats pivotally connected with the valve and valve case respectively and a spring interposed between said seats obliquely to the axis of the valve and tending with diminishing pressure as the valve moves away from the relief port to return it to its normal position in which it closes said port.

4. In a vacuum governor the combination of a valve case having suction and service connections and a relief port, a valve subjected to service pressure and adapted to close either the relief or the service port while the other is left in open communication with the suction port, an evener pivoted to the case, opposing spring seats pivoted to the evener and to the valve respectively, and springs interposed between said seats obliquely to the axis of the valve and tending to hold the valve in its normal position closing the relief port, the arrangement of the springs being such that their obliquity to the axis of the valve increase and their pressure tending to move the valve toward the relief port diminishes as the valve is moved in the opposite direction.

5. In a vacuum governor the combination of a valve case having an internal valve-guiding sleeve, relief and service ports in axial alinement with said sleeve and a suction connection in open communication with the ends of said sleeve, a piston valve fitted in said sleeve and movable axially therein to close either the relief or the service port and open communication between the other and the suction connection, said valve being subjected to the vacuum or service pressure, and means acting in opposition to the vacuum

service pressure and tending with increasing force to move said valve toward the relief port into position to close the same.

6. In a vacuum governor the combination of a three-way valve case, a valve subjected to service pressure and adapted to close either of two ports and afford communication between the other and the third port, a spring arranged obliquely to the movement of the valve and tending to hold it against service pressure in position to close one of said two ports, and a stop for limiting the movement of the valve within the effective range of the spring.

7. In a vacuum governor the combination of a valve case having suction and service connections and a relief port, a valve subjected to service pressure and adapted to close either the relief or the service port while the other is left in open communication with the suction port, and springs arranged obliquely to the axis of the valve on opposite sides thereof and acting with increasing pressure upon the valve as it moves from the service toward the relief port.

8. In a vacuum governor the combination of a valve case having suction, service and relief ports, a valve adapted in one position to close the relief port and establish communication between the suction and service ports and in another position to close the service port and establish communication between the suction and relief ports, said valve being subjected to the vacuum or service pressure which tends to move it away from the relief port, and means acting in opposition to said vacuum or service pressure upon said valve with diminishing force as the valve moves away from said relief port.

In witness whereof I hereto affix my signature in presence of two witnesses.

FRANK W. VAN NESS.

Witnesses:
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CHAS. L. GOSS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents. Washington, D. C."