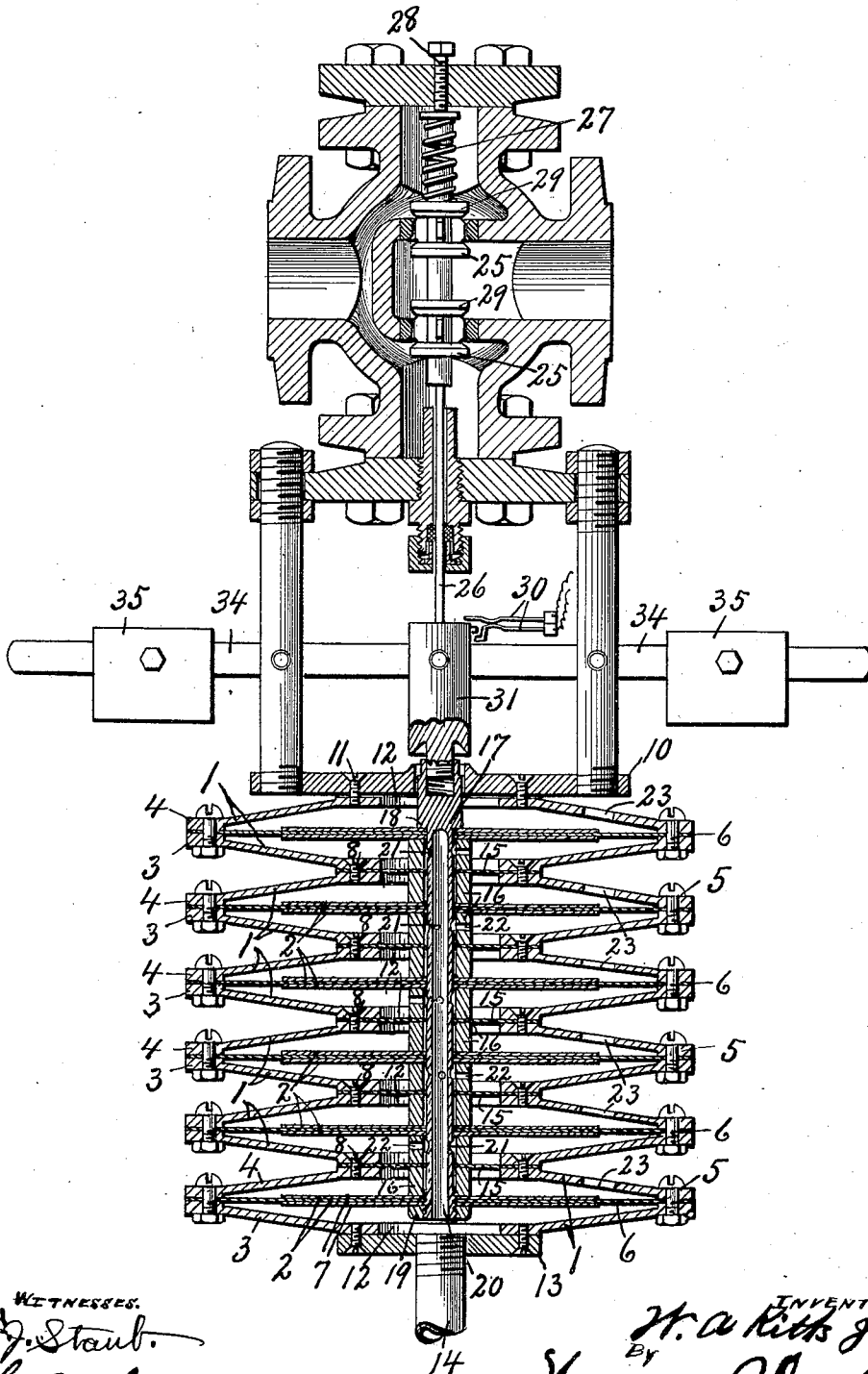


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 FLUID PRESSURE REGULATOR.  
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1,007,451.

Patented Oct. 31, 1911.



WITNESSES.  
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# UNITED STATES PATENT OFFICE.

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## FLUID-PRESSURE REGULATOR.

1,007,451.

Specification of Letters Patent.

Patented Oct. 31, 1911.

Application filed October 11, 1910. Serial No. 586,538.

*To all whom it may concern:*

Be it known that I, WILLARD A. KITTS, JR., of Oswego, in the county of Oswego, in the State of New York, have invented new and useful Improvements in Fluid-Pressure Regulators, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to certain improvements in fluid pressure regulators for the purpose of automatically maintaining a substantially uniform pressure or partial vacuum as produced by a fluid pressure or vacuum producing apparatus.

The main object is to obtain a sufficiently large pressure area for the purpose within a comparatively small radius by employing a multiplicity of diaphragm chambers connected for serial operation whereby the slightest variation in pressure or partial vacuum on the diaphragms above or below a determined degree, will instantly operate a controller for the motive power to regulate the speed of the motor and thereby re-establish such predetermined pressure or partial vacuum.

Another object is to enable the same system of diaphragms to be used to control the speed of any motor or motor driven device.

Other objects and uses relating to specific parts of the regulator will be brought out in the following description:

The drawing is a longitudinal sectional view of my improved regulator as applied more particularly to the throttle valve of engine driven pressure and vacuum producing apparatus showing also contact terminals of an electric circuit operated by the same system of diaphragms to control an electric motor or any suitable valve operating translating device or devices.

The main feature of the invention consists in providing a series of similar lenticular chambers —1— secured together end to end in coaxial relation and containing separate diaphragms —2—.

Each diaphragm chamber preferably comprises opposite concavo convex metal sections or disks —3 and 4— preferably of circular form secured together end to end by clamping bolts —5— with their concave sides facing each other.

The diaphragm —2— of each chamber

preferably consists of one or more circular disks —6— of flexible material such as rubber, dividing the chambers into opposite compartments and having its marginal edges clamp between the meeting edges of the sections —3 and 4— by means of the bolts —5—, said diaphragm being reinforced by thin metal disks —7— applied to opposite sides of central portion thereof.

The meeting ends of diaphragm chambers —1— are secured together by clamping bolts —8— which hold them in fixed relation to each other. The entire system of chambers are also held in fixed position by securing one of its end chambers as the upper section —4— to the fixed support —10— by means of clamping screws —11— placed in substantially the same position as these screws —8— so that one or more chambers may be readily added to or taken from the ends of the system without disconnecting any of the others.

The sections —3 and 4— of the diaphragm chambers are provided with central openings —12—, that in the uppermost section being closed by the head —10— while the opening in the lowermost section is covered by a cap or plate —13— having a pipe —14— communicating with the lowermost compartment for a purpose herein after described.

Direct communication between adjacent compartments of contiguous sides of the diaphragm chambers is cut off by a comparatively small, but flexible diaphragms —15— having their marginal edges secured between said contiguous sides by the screws —8— and their central portions extending across the corresponding openings —12—. These diaphragms —2 and 15— are centrally connected for simultaneous action in the manner previously described, the diaphragms —15— being of considerably less area than the diaphragms —2— and serve mainly to cut off communication between adjacent compartments and at the same time to allow for the joint action of the larger diaphragms. The central portions of these diaphragms are spaced a fixed distance apart by intervening spacing sleeves or rings —16— having vertically alined openings through which is passed a hollow connecting rod or tube —17—. The upper end of this rod or tube is enlarged forming an annular shoulder —18— engaging the

upper face of the upper diaphragm —2—, the lower end of said rod or tube being threaded and engaged by a nut —19— which also engages the under side of the lowermost diaphragm so that, when the nut —19— is tightened, the central portions of the diaphragm —2 and 15— are effectively clamped between the spacing rings or sleeves —16— to cause all the diaphragms to move in unison.

The connecting rod —17— is provided with the central lengthwise opening —20— open at the bottom and communicating with the lowermost compartment and therefore with the pipe —14—. This tubular rod is also provided with branch passages —21— communicating with the lower compartments of corresponding diaphragm chambers through suitable passages —22— in adjacent spacing rings —16—. It is now apparent that any fluid pressure or partial vacuum, which may be maintained or produced in the pipe —14— will be also maintained or produced to the same extent or degree in the lower compartments of all of the diaphragm chambers thereby exerting a corresponding lifting or depressing power as the case may be, upon all of the diaphragms —2—, it being understood, that the upper compartments of all the diaphragm chambers are provided with openings as —23— leading to the atmosphere for permitting the free exit and entrance of air from and to said compartments to remove as far as practicable air resistance to the free action of the larger diaphragm.

The movement of the connecting rod —17— as actuated by the diaphragm —2— is utilized to control the motive power for the fluid pressure or vacuum producing device, not shown, but by which the diaphragms are actuated.

In the present instance, I have shown the throttle of an ordinary steam engine as provided with normally open valves —25— co-acting with their respective valve seats and adapted to be closed by upward pressure on the diaphragms through the medium of the connecting rod —17— and a valve stem —26— which connects said valves to the upper end of the rod —17.

The valves —25— are normally held in their open position by a coil spring —27— the tension of which may be regulated by an adjusting screw —28—, so that the predetermined pressure on the under side of the diaphragm —2— is required to close the valves, although in some instances, the valves —25— may open by their own gravity, in which case, they will be of course closed by a corresponding light pressure on the diaphragm —2—.

The fluid pressure or vacuum producing device together with the motor for actuating the same, are purposely omitted because the

system of diaphragm chambers forming the subject of this invention is clearly applicable to either of such devices or their actuating motors, but it is understood that the pipe —14— is to be connected to the fluid pressure or vacuum producing apparatus according to which is used and that the movement of the diaphragms caused by such pressure or partial vacuum is employed to regulate the supply of motive fluid to the motor or to the operation of any auxiliary controlling means whereby the speed of the motor may be automatically regulated.

When the regulator is used in connection with a vacuum producing device operated by a steam engine, the valve stem —26— may be provided with a set of additional normally open valves —29— which co-act with suitable seats to close on downward movement of diaphragm —2— and valve stem —26—.

In some instances the fluid pressure device may be operated by an electric motor not shown, but controlled by a normally closed electric switch —30—, adapted to be opened by the upward movement of the diaphragms as for example—through the medium of a coupling —31— between the connecting rod —17— and valve stem —26— or if the vacuum producing device is used, the same switch may be opened by a suitable shoulder on the coupling —31— as the diaphragms are depressed. The diaphragms —2— are also held in or returned to their normal positions by weighted levers —34—, which are connected to the coupling —31— and provided with adjustable weights —35—. In the present instance, the weighted levers are used to exert an upward lift of the diaphragms. But it is evident, that these weights may be used at the inner ends of the levers for depressing the diaphragms when the device is used in connection with a vacuum producing apparatus but I do not limit myself to the use of weights nor to springs for the balancing of the diaphragm nor returning them to a certain position under a predetermined pressure or partial vacuum.

In operation, assuming that the pipe —14— is connected to a fluid pressure producing device driven by a steam engine having the throttle valves —25—, which are normally open, then the fluid under pressure will enter the lower compartment of each diaphragm chamber thereby exerting an uplift on each diaphragm and connecting rod —17— until the tension of the spring tending to hold said valves open is overcome whereupon the increased pressure upon the under side of the diaphragm will close the valves —25— thereby cutting off the motive power to the engine which will reduce the speed of the engine and resultant pressure of the pressure device and allow the dia-

phragms and valves to resume their initial position.

What I claim is—

5 A fluid pressure regulator comprising a valvular element, a vertically movable member connected with said element for shifting it and provided with a longitudinally-extending passage and further having radially disposed ports opening into said passage, a  
10 series of superposed casings axially mounted upon said member and each provided with a diaphragm dividing each respective casing into two compartments, said casing provided with means whereby the compartments at  
15 one side of the diaphragms will communicate with the atmosphere, said ports and passages establishing communication be-

tween the compartments at the other side of the diaphragms, means for supplying fluid pressure to that compartment of the lower casing out of communication of the atmosphere, said passage opening into the last mentioned compartment, and spacing means for the diaphragms, said spacing means carried by said member and provided with  
25 openings alining with the parts of said member.

In witness whereof I have hereunto set my hand this 26th day of Sept. 1910.

WILLARD A. KITTS, JR.

Witnesses:

H. E. CHASE,

E. T. SPEARING.

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