(No Model.) 2 Sheets—Sheet 1.

J. S. CONNELLY.

SPEED GOVERNOR FOR GAS ENGINES.

No. 475,385. Patented May 24, 1892.

Fig. 2.

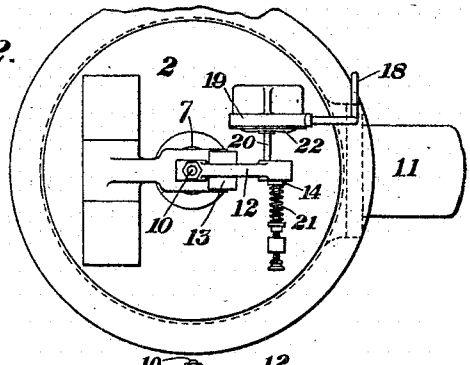
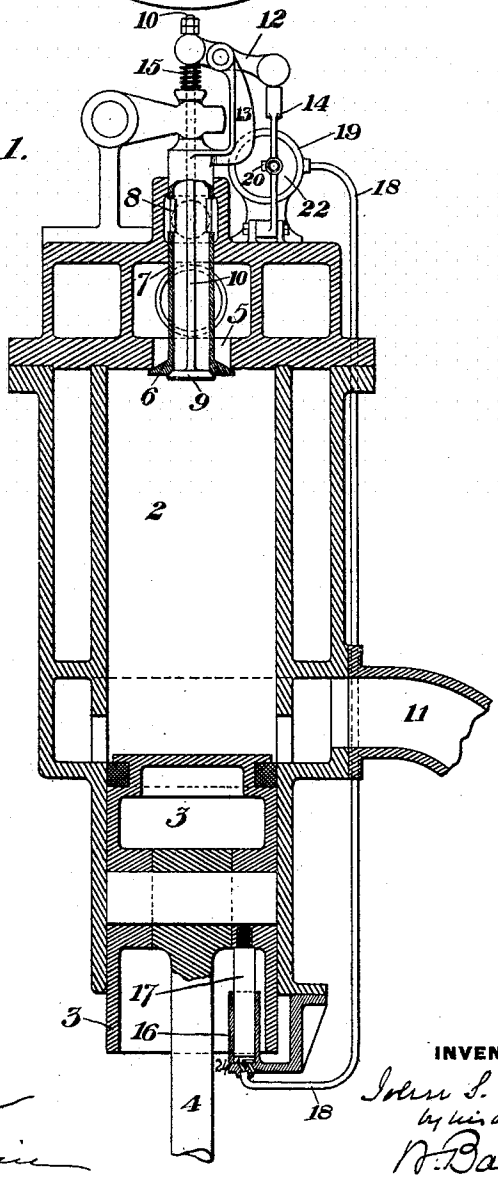


Fig. 1.



WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

J. S. CONNELLY.

SPEED GOVERNOR FOR GAS ENGINES.

No. 475,385. Patented May 24, 1892.

Fig. 3.

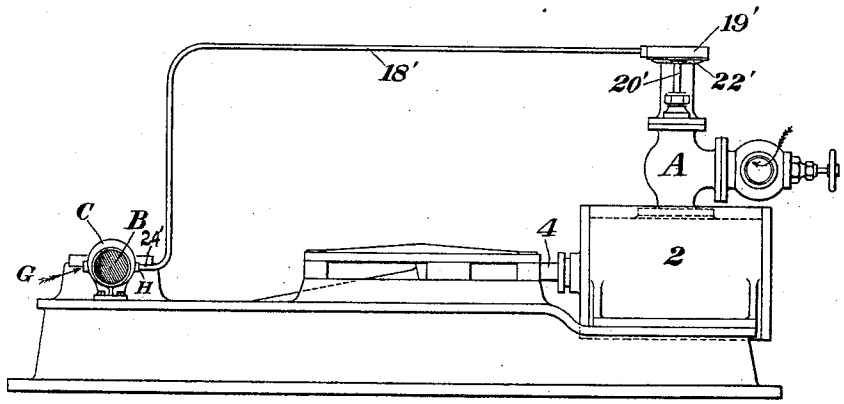


Fig. 4.

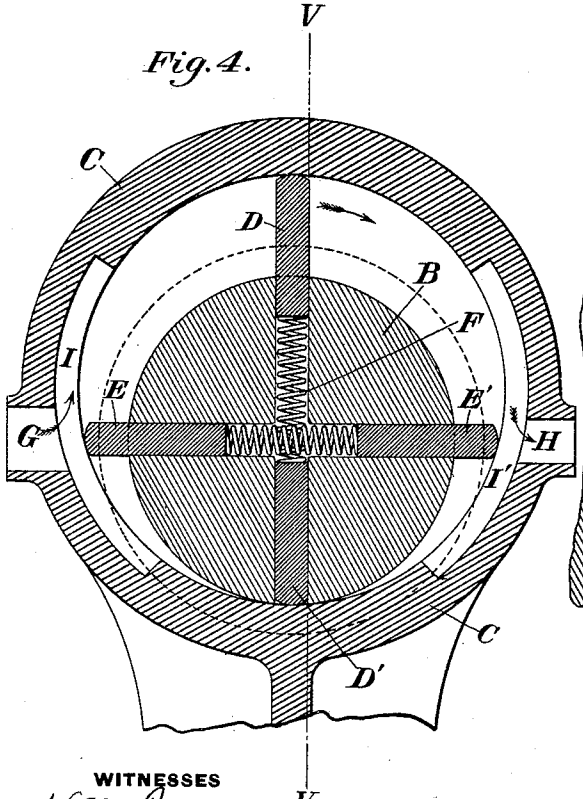
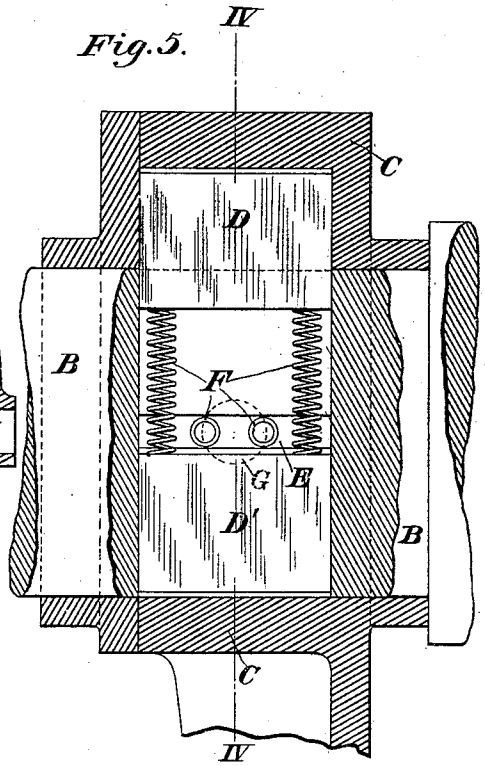


Fig. 5.



WITNESSES

A. M. Corwin

N. B. Corwin

INVENTOR

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UNITED STATES PATENT OFFICE.

JOHN STORER CONNELLY, OF PLAINFIELD, NEW JERSEY.

SPEED-GOVERNOR FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 475,385, dated May 24, 1892.

Application filed March 16, 1891. Serial No. 385,151. (No model.)

To all whom it may concern:

Be it known that I, JOHN STORER CONNELLY, of Plainfield, in the county of Union and State of New Jersey, have invented a new and useful Improvement in Speed-Governors for Gas-Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 shows in axial section the motive cylinder of a gas-engine provided with my improved governing mechanism. Fig. 2 is a plan view thereof. Fig. 3 shows in side elevation, partly in section, a stationary steam-engine to which a modified construction of the governor is applied. Fig. 4 shows in section the air-compressing device of Fig. 3, the section being on the line IV IV of Fig. 5. Fig. 5 is a vertical section on the line V V of Fig. 4.

In the drawings, 2 is the engine-cylinder. 3 is the plunger which reciprocates therein, being actuated by successive explosions of the gaseous charge, and 4 is the pitman which connects the plunger with the crank on the main shaft of the engine.

5 is an air-admission port situate at the end of the cylinder.

6 is a vertically-movable valve which controls the port and which has a hollow stem 7, connected by a lateral opening or openings 8 with a passage through which gas for the explosive charge may be admitted.

9 is a valve which controls the opening at the inner end of the hollow stem 7 and which has a stem 10, by which it is movable longitudinally. The valve-stem 7 is moved inwardly at or about the end of each outstroke of the piston 3 to open the port 5 and to admit air for the next explosive charge to the cylinder. This motion of the valve-stem may be effected by means of mechanical connection with the driven parts of the engine—for example, as shown in my patent application, Serial No. 370,892, filed November 10, 1890; or it may be effected otherwise—for example, by the sucking action of a charging-cylinder connected with the cylinder 2 by a passage 11—as shown in my patent application, Serial No. 381,039, filed February 11, 1891.

The gas-admission valve is so constructed and arranged that normally it shall open to admit gas at each opening of the air-valve, but is provided with mechanism by which when the speed of the engine exceeds a determined rate the gas-valve shall not open to admit gas and that the engine shall run without explosion until the speed falls to the required limit. To this end I may employ a lever 12, pivoted to a bracket 13, which is carried by the air-valve stem. One end of said lever is fitted to the part of the gas-valve stem 10 which projects above the air-valve stem, while the other end is situate opposite to the end of a post 14, which is pivoted to to the engine frame or cylinder.

15 is a spring which tends to lift the gas-valve stem and to seat the gas-valve. With this construction it will be seen that when the air-valve stem moves inwardly the bracket 13 will carry the lever 12 with it, and the outer end of said lever engaging the post 14 will cause the inner end to move downwardly relatively thereto and to unseat the gas-valve. There is, however, a speed-governing apparatus connected with the post 14 and adapted, when the speed of the engine exceeds the normal, to move the post away from the path of the lever. When this occurs, the downward motion of the lever with the air-valve stem will, of course, cause no tilting of the lever, and the gas-valve will not be unseated. Heretofore such governing apparatus has consisted of the ordinary centrifugal governor connected mechanically with the post.

My improvement consists in a governing mechanism of novel construction. It is illustrated in the drawings as applied to the specific valve mechanism above described, and while such application is desirable and is claimed specifically, I would have it understood that the invention is not limited thereto, but that the governor may be used with valves of many other constructions and arrangements.

I shall now proceed to describe the governor.

16 is a small cylinder, and 17 is a plunger actuated by motion of the engine and adapted at each stroke of the piston to enter the small cylinder. For this purpose said plunger is preferably fixed to the piston, and the

cylinder 16 is arranged in its path of motion. At the inner end of said cylinder is a hole or port connected with a pipe 18, so that each inward motion of the plunger will cause air to be forced or pumped through the pipe at some pressure. The cylinder is also provided with an inwardly-opening valve which admits air on the outward stroke of the plunger, so as to prevent formation of a vacuum therein.

19 is a closed chamber containing a small expansible diaphragm 22, connected by a rod 20 to the post 14, and 21 is a spring arranged to resist the action of the diaphragm. An opening for the escape of air is provided at the delivery side of the air-pump, as at 24 in Fig. 1 and at 24′ in Fig. 3, hereinafter to be described. This opening is of proper size to permit air compressed by the pump to escape in such current that the residual pressure in the diaphragm-chamber shall balance the spring 21 when the engine is running at normal speed. When the engine exceeds such speed even slightly, the increased pressure will be sufficient to overcome the resistance of the spring and to move the diaphragm. At each outstroke of the engine-piston the motion of the plunger in the cylinder 16 will expel air through said opening 24, and if the force of the pump is too great for the air displaced to flow at once through the opening it will create an air-pressure in the chamber 19, the pressure of which will tend to expand the diaphragm 22 and through the rod 20 to force the post 14 against the spring 21 and out of the path of the lever 12. The size of the outlet-opening at 24 remaining constant, the degree of the pressure exerted by the air will vary with the speed of the engine and the consequent rapidity of motion of the plunger in the small cylinder, and it is evident that by adjusting the tension of the spring 21 to such point that it shall not permit motion of the post by the diaphragm until the pressure of air thereon has reached a degree occasioned by running of the engine above the desired speed, the required result will be attained. Then at each excess of speed of the engine, the air-pressure in the chamber 19, occasioned by the plunger 17, will move the diaphragm, and overcoming the resistance of the spring will move the post 14 from the path of the lever 12 at the time when said lever is moved with the air-valve, and, as before explained, will prevent opening of the gas-valve. Suitable adjusting mechanism—such as a screw or nut—may be used for giving the spring the proper tension.

The mechanism above described affords a most efficient and simple means of governing the speed of the engine. It may be modified by the skilled mechanic in many ways within the scope of my invention, which relates, broadly, to governing apparatus comprising an air-compressor actuated variably by the motion of the engine and operatively connected with the valve. It will be understood that a piston may be substituted as an equivalent for the diaphragm.

In Figs. 3, 4, and 5 I show a modified construction of the air-compressing apparatus and show it applied, also, to an ordinary stationary steam-engine. In this case the rod 20′, extending from the diaphragm in the chamber 19′, is connected with the steam-admission valve A. The construction of the air-pump, which is connected with the diaphragm-chamber 19′ by the pipe 18′, is shown in Figs. 4 and 5. It is a rotary pump having a rotatory shaft B, which may be fixed to the main engine-shaft and extends through a cylindrical case C. D D′ E E′ are vanes or plates fitted radially in slots in the shaft B, and between the opposite vanes are interposed springs F, which tend to project them. G is the air-inlet port, and H is the air-outlet port, which communicates with the pipe 18′. I I′ are relief-passages at said ports. When thus constructed, it is clear that as the shaft B rotates in the direction of the arrow, Fig. 4, it will draw air in through the port G and force it through the port H and pipe 18′ into the diaphragm-chamber in the manner common to rotary pumps and that this pressure of the air thus forced will vary with the speed of the engine, so that by applying spring-resistance to the diaphragm the valve A will be moved to vary the steam-admission conformably to the rate of such speed, the pressure of the air being too great to allow the escape of the same through the opening 24′ in the pipe 18′.

Other modifications in construction and application will be suggested to those skilled in the art.

It will be understood that although I describe the governing apparatus as adapted to be operated by compressed air other fluids, whether gaseous or liquid, may be employed as the means for transmitting the required variable pressure.

I claim—

1. In a gas-motor, the combination of the air-valve, a gas-valve carried thereby, a lever connected with said gas-valve, a post with which said lever engages to cause the opening of the valve, a diaphragm-chamber the diaphragm of which is connected with said post and is adapted to move the same, substantially as described, and a fluid-compressor driven by the moving parts of the engine and adapted to compress fluid with pressure varying with the rate of speed, said compressor being connected with said chamber, substantially as and for the purposes described.

2. In a gas-motor, the combination of a hollow cylindrical air-valve, a gas-valve located within the hollow air-valve, a lever connected with said gas-valve, a post with which said lever engages to cause the opening of the valve, a diaphragm-chamber the diaphragm of which is connected with said post and is

adapted to move the same, substantially as described, and an air-compressor driven by the moving parts of the engine and adapted to compress air with pressure varying with the rate of speed, said compressor being connected with said chamber, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 14th day of March, A. D. 1891.

JOHN STORER CONNELLY. [L. S.]

Witnesses:
T. E. CONNELLY,
M. I. MAWHINNEY.