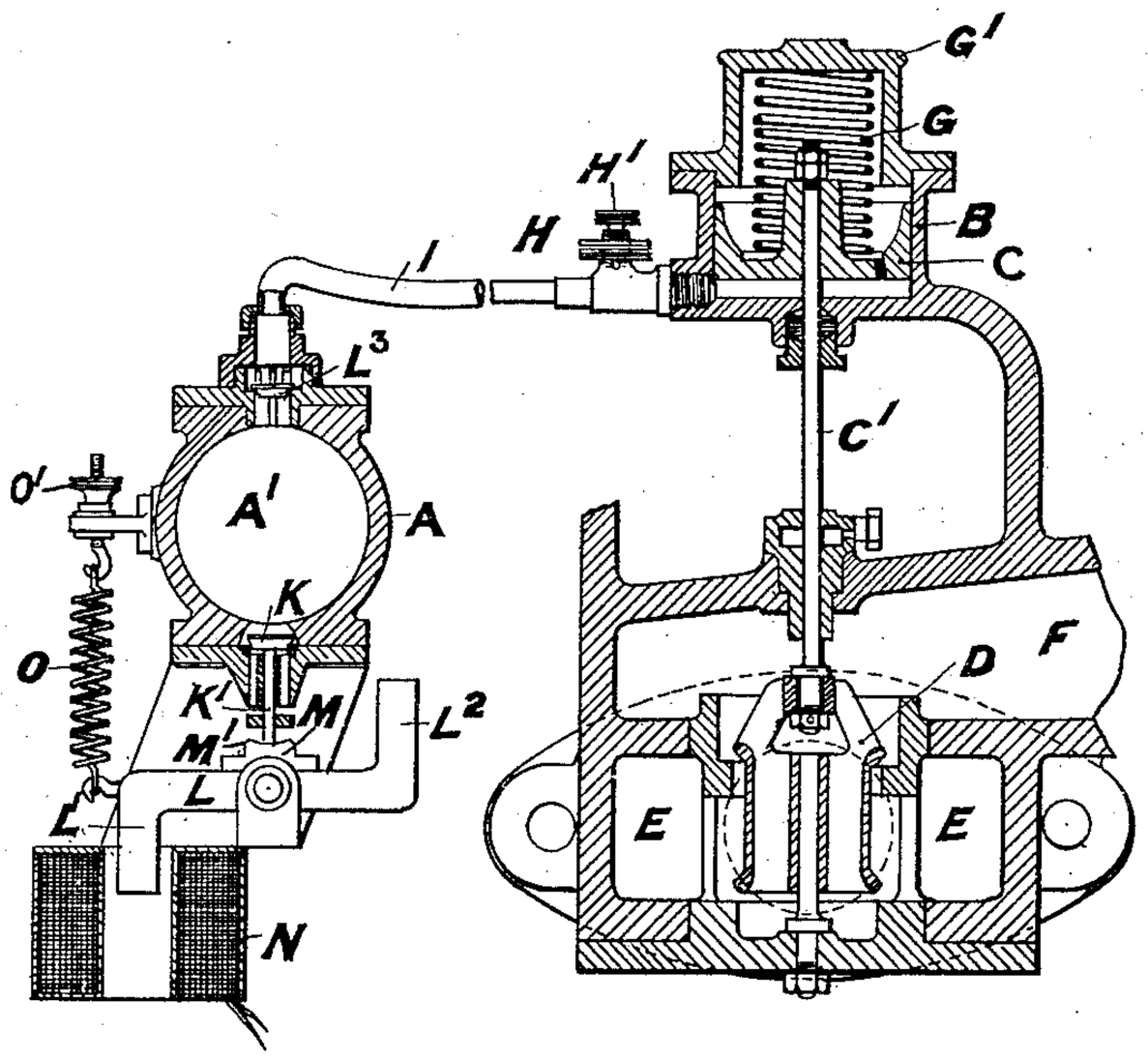
(No Model.)

C. A. PARSONS.

GOVERNOR FOR STEAM TURBINE VALVES.

No. 549,815. Patented Nov. 12, 1895.



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GOVERNOR FOR STEAM-TURBINE VALVES.

SPECIFICATION forming part of Letters Patent No. 549,815, dated November 12, 1895.

Application filed September 26, 1891. Serial No. 406,944. (No model.) Patented in England July 16, 1890, No. 11,083.

To all whom it may concern:

Be it known that I, CHARLES ALGERNON PARSONS, a citizen of Great Britain, residing at Ryton, in the county of Durham, England, have invented new and useful Improvements in Governors for Steam-Turbine Valves, (for which I have obtained Letters Patent in Great Britain, No. 11,083, dated July 16, 1890,) of which the following is a specification.

My invention relates to a special type of engine-governor in which motive fluid is used to operate the steam-admission valve or valves of steam-turbines in a particular way, and also to the mode of regulating the action of the fluid by electrical or other means.

The main object of the invention is to efficiently work and control an admission valve or valves admitting steam periodically to the engine for periods of longer or shorter duration, the periods being varied automatically to suit the varying demands of work from the motor, together with varying steam-pressure. I thereby secure to the motor greater economy in the consumption of working fluid than is obtainable when the regulation is effected by throttling the working fluid or by other means detrimental to economical working. To supply motive fluid for working the admission-valve in accordance with one feature of my invention, I prefer to use a reciprocating pump or any pump producing a pulsating flow. It may be either a pressure or a suction pump, and it may have no valves or any number of valves. I prefer, however, a single-acting pump for pressure, with two valves utilizing air as the working fluid. The pump may be worked from the engine-shaft or a counter-shaft driven from the engine or an electric or other motor of any description, the required condition being that the speed of the reciprocations shall be such as to secure the most suitable periodicity of the admissions of motive fluid to the motor to obtain good economy with steadiness of motion. I prefer in most cases to pump from a counter-shaft driven by gearing from the main engine. From the pump the fluid is led under a piston, which lifts the main admission-valve against a strong spring or weight tending to close it.

According to one arrangement of my invention a leak-off or waste valve allows the fluid to escape from the pump or supply-pipe, thus allowing the admission-valve to close more or less or for longer or shorter periods at each stroke of the pump. If the leak-off valve be closed, the admission-valve remains full open. If the leak-off valve be opened, the admission-valve remains closed. A relief-valve or hole is provided under the piston which lifts the admission-valve.

According to another arrangement of my invention a catch or stop is arranged to prevent the working or closing of one or more valves of the pump, with the object of either allowing the air to escape back, or to prevent its passage more or less through the pump. When the air escapes back, or little or none is pumped, the main throttle-valve soon closes by the action of the spring or weight, and its rapidity of closing may be increased or diminished to any degree by providing a leak in the system to the required amount. To regulate the leak-off valve in the first or the pump-valves in the second arrangement, I may use any mechanical governo actuated from the engine or any other source, such as an electric motor, if a dynamo is being driven by the engine; but I prefer to use the attractive force of magnets or a solenoid and core or two solenoids or any convenient force derived from an electric source. Any of these methods may be used to work a small leak-off valve, which may be of any ordinary construction—such as a small slide-valve, plain or cylindrical, or a miter-valve—but so proportioned as to give the necessary accuracy and quickness of governing and to be free of movement.

In the accompanying drawing I illustrate an effective arrangement of governor constructed in the manner hereinbefore described and designed to control the steam-admission to a steam-turbine.

The pump-cylinder A (shown in transverse section) carries the piston A′, which piston is actuated by crank or eccentric on a counter-shaft driven from the turbine-spindle by suitable means, such as is illustrated and described in the specification forming part of my application for Letters Patent of the United States, filed July 27, 1893, Serial No. 481,653;

but since such features form no part of this application and are not claimed herein they are not illustrated.

The piston on its outstroke takes air into the cylinder through the inlet-valve K and compresses it and discharges it through the valve L^3 by the pipe I to the cylinder B under the piston C. The piston C is thrust downward by the spring G, acting between it and the cap G′, and the piston, by the piston-rod C′, passing through suitable packing-glands, moves the balanced or double-beat valve D, which valve controls the admission of steam to the turbine by opening or closing the passage F leading to the turbine, and so allowing steam to enter from the live-steam space E or cutting it off.

In ordinary action each stroke of the pump-piston, by forcing air under the piston C, causes it to rise against the spring G, and so open the valve D. When the pump ceases forcing air, the leak-off aperture H, which is controlled by the screw H′, permits the air to escape from the cylinder B, and so allows the spring G to thrust down the piston C and close the steam-admission valve. The leak-off aperture H may be regulated to cause the valve D to close with the desired rapidity, so that it opens and closes at every stroke of the pump or remains open till the governor determines that it shall close. One arrangement of electrical governing contrivance is shown. The solenoid N has pivoted above it the lever L, which carries at one end the immersed core L′, forming part of the lever, and is balanced by a similarly-shaped end L^2. The spring O, which is adjusted by the screw O′, resists the action of the solenoid and pulls the lever L to one extreme position when no current is passing. The spindle K′ of the inlet or suction air-valve K projects below the cylinder, and when the lever L is in the position shown upon the drawing the end of the spindle is just clear of the shaped or cam piece M, carried upon the lever L. The valve K then acts at every stroke of the pump, and so a charge of air in a compressed state is delivered to the cylinder B at every stroke. If, however, the speed of the turbine, and therefore of the dynamo, should increase, the solenoid N will pull the core L′ farther in against the action of the spring O, and the cam or raised portion M′ of the piece M will raise the spindle K′ and hold open the valve K, so that the air taken into the pump on the outstroke is discharged on the return-stroke without passing through the valve L^3, and therefore the piston C remains down and does not open the steam-valve D. So long as the speed remains too high the valve D is kept shut. When the solenoid N ceases to pull the core L′ to such an extent as to hold open the valve K, then the pump resumes its action, and by forcing the air causes the valve D to open and close at every stroke or remain more or less open, as determined by the adjustment of the leak-off aperture H. The valve K may be controlled, as I have hereinbefore explained, by a centrifugal or other mechanical governor, but I prefer the arrangement illustrated. If by any accident the electric current should cease and the load be thereby removed from the turbine by the cessation of dynamo resistance, then the solenoid no longer attracts the core L′, and the spring O pulls the lever L to such position that the projection M′ of the piece M raises the valve K by the stem K′. The pump is thus put out of action and the steam-valve D is closed in either case—that is, when current increases unduly, or when it ceases altogether or is unduly reduced by an accident to the dynamo, or other cause.

Instead of the solenoid N and core-lever L an electromagnet and pivoted armature may be adopted with similar effect.

The motion of the main steam-admission valve in the arrangement illustrated is essentially intermittent and periodical.

Having thus described my invention, what I claim is—

1. The combination with a cut-off valve for a steam turbine, of a spring pressed piston or diaphragm connected to said valve, a fluid compressing pump communicating with said piston or diaphragm, a valve admitting fluid to said pump, and means for controlling or governing said admission valve, substantially as described.

2. The combination with a cut-off valve for a steam turbine, of a spring pressed piston or diaphragm connected to said valve, a fluid compressing pump communicating with said piston or diaphragm, a valve admitting fluid to said pump, a solenoid, a core and a cam carried by said core and adapted to engage said admission valve, substantially as described.

In testimony whereof I have hereunto set my hand and affixed my seal in presence of two subscribing witnesses.

CHARLES ALGERNON PARSONS. [L. S.]

Witnesses:
EDWARD BELL,
THOMAS ARMSTRONG.