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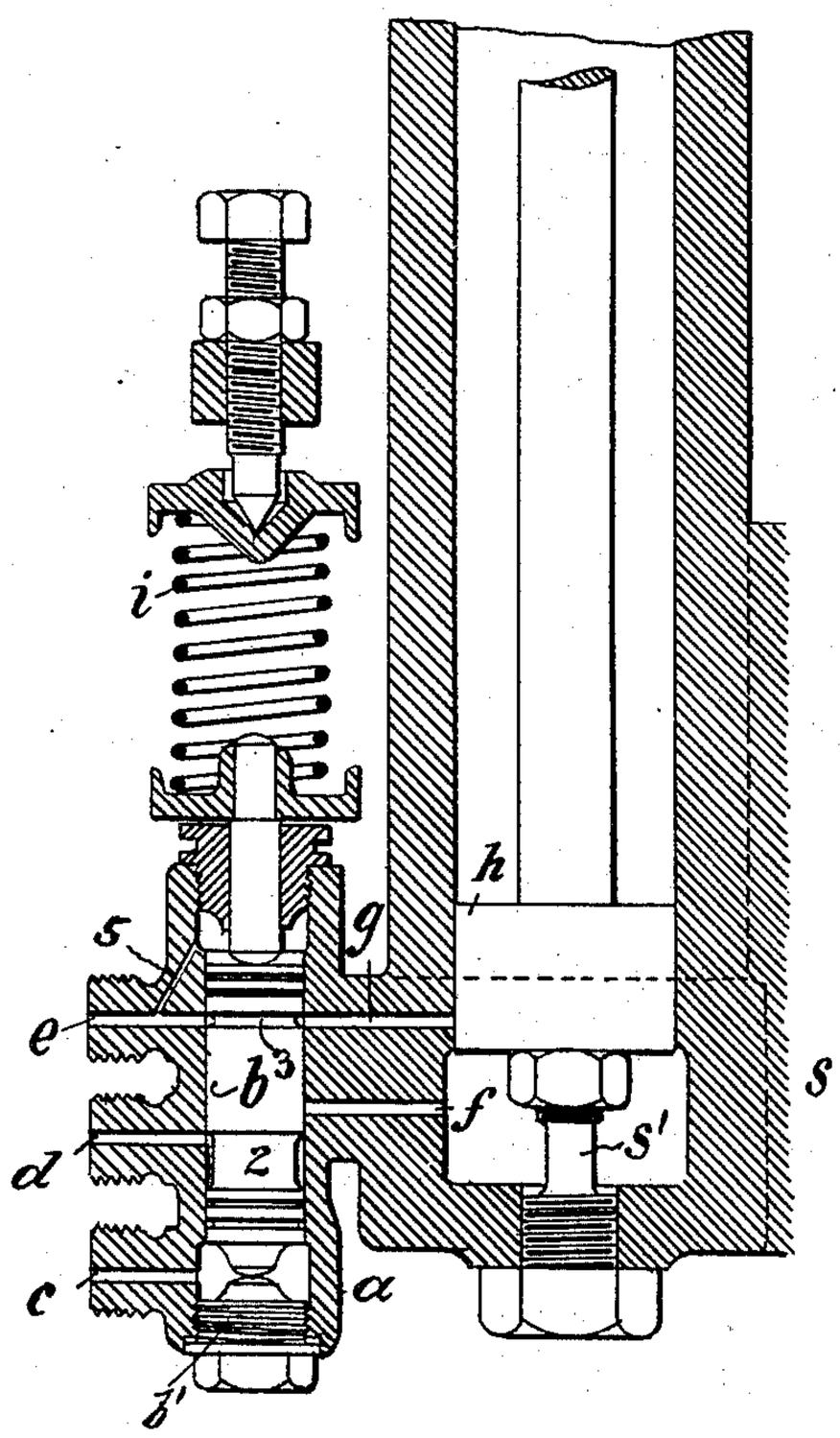
F. KRÜGER.

PRESSURE REGULATING, GOVERNING, SAFETY APPARATUS.

APPLICATION FILED JAN. 3, 1900.

NO MODEL.



Witnesses:
D. H. Shea.
B. K. Sommers

Inventor.
Ferdinand Krüger.
by Henry Orth
Atty.

UNITED STATES PATENT OFFICE.

FERDINAND KRÜGER, OF BERLIN, GERMANY, ASSIGNOR TO THE PHÖNIX MASCHINENBAU GESELLSCHAFT M. B. H., OF BERLIN, GERMANY, A FIRM.

PRESSURE-REGULATING, GOVERNING, SAFETY APPARATUS.

SPECIFICATION forming part of Letters Patent No. 722,026, dated March 3, 1903.

Application filed January 3, 1900. Serial No. 291. (No model.)

To all whom it may concern:

Be it known that I, FERDINAND KRÜGER, a subject of the King of Prussia, Emperor of Germany, residing at Berlin, Germany, have invented a new and useful Pressure-Regulating, Governing, Safety Apparatus, of which the following is a specification.

My invention relates to an apparatus for actuating a working piston whereby operations of a widely-differing character can be performed. Such an apparatus can be employed as a governor, for which purpose a valve is operated by the working piston, or slides can be moved from the working piston, or the apparatus can be employed as a safety apparatus, in which case the working piston is adapted to open a safety-valve or other equivalent device.

My invention consists in a combination of a piston-valve which fits loosely in a cylinder and is on two sides exposed to a pressure with a working piston which can be adjusted through the movements of the piston-valve under pressure from the source of pressure. In the known constructions of this kind the full pressure as it comes from the source of pressure acts upon one surface of the piston-valve, while in the construction of this invention, although the full pressure is used for operating the working piston, the same need not be used for the piston-valve, as any pressure present in the connecting-pipe will suffice for the production of the requisite energy. The piston-valve is on both sides acted upon by any suitable pressure and by its movements brings the full pressure to act upon the working piston. In this way important advantages are gained—for example, the piston dimensions have not to be calculated for every difference of pressure which takes place on the one side or the other of the piston-valve, as the full pressure need not necessarily be used. The pressure which comes into use in the working cylinder remains the maximum pressure, while the pressure which serves for actuating the piston-valve can be reduced to any convenient pressure.

In the accompanying drawing the apparatus of the invention is shown in sectional view.

a is the cylinder in which the piston-valve *b* is adapted to move up and down.

c is a passage leading to underneath the piston-valve and where there may be a reduced pressure.

d is a passage which is in communication with the source of pressure, and consequently where there is full pressure; *e*, the exhaust-passage, in having a drainage-passage 5 leading into it from above the valve; *f*, a passage leading to the under side of the working piston *h*; *g*, a passage arranged to be placed in communication with the one, *e*, in alinement therewith by means of the reduced portion 3 in the valve *b*, thereby affording communication between the working piston and the atmosphere; *i*, a spring pressing upon the piston-valve *b*.

The apparatus works as follows: The passage *d* being connected with a source of high-pressure fluid-supply—as, for instance, a steam-generator—and the passage *c* with a source of low-pressure fluid-supply the normal pressure of which is insufficient to overcome the tension of spring *i* on piston-valve *b*, the said passage *d* will be normally cut off from the piston-cylinder *s*, the parts being in the position shown in the drawings, the piston *h* resting on the adjustable abutment *s'*, which determines its position relatively to the internally-enlarged lower part of the cylinder and relatively to the exhaust-passage *g*, so as to normally close the latter. If now the pressure in passage *c* is increased sufficiently to overcome the tension of spring *i*, the piston-valve will be moved up, and through its reduced portion 2 passage *f* will be placed in communication with passage *d* and exhaust-passages *e g* will be closed, the reduced portion 3 of the valve moving beyond said passages. High-pressure steam will be admitted to the piston-cylinder *s* below piston *h* to drive the same upward, thereby uncovering exhaust-passage *g* and causing said piston to perform the work it is intended to perform—as, for instance, the closing of a damper, throttle-valve, or the like—said piston *h* remaining in its operative position. When, however, the pressure in *c* is reduced to a normal, the spring *i* will force the piston-valve back to its normal position, cutting off

passages *d* and *f* and uncovering exhaust-passages *e* and *g*, allowing the steam below the piston to exhaust into the atmosphere, said piston moving back to its normal position on abutment *s'* by gravity or under the action or weight of the element or device operated by the piston and connected with its rod. As shown, the normal position of the valve *b* under the action of its weight or spring *i* relatively to the low-pressure passage *c* is determined by an adjustable abutment-screw *b'*. Therefore the piston-valve *b* is moved by the comparatively low pressure present in the pipe leading to underneath the piston-valve without the use of direct steam, and the working piston is moved by direct steam without influencing the piston-valve. With a comparatively small expenditure of pressure more work can be performed and also the apparatus is more sensitive than the hitherto-known governor or regulating apparatus and the scope of its use is increased.

What I claim as my invention, and desire to secure by Letters Patent, is—

The combination with a cylinder and a piston therein, said cylinder having inlet and outlet passages *f* and *g*, the former beyond the limit of travel of said piston; of a valve-casing parallel to the cylinder, a spring-held valve in said casing independent of the piston and provided with two reduced portions, an inlet *d* for high-pressure fluid out of alinement with the passage *f* and both beyond the limit of travel of said piston, and put into communication with each other by one of the reduced portions of said valve, an outlet-passage *e* in alinement with the passage *g* and put in communication therewith by the other reduced portion of said valve to form a continuous straight passage, and a passage *c* to admit low-pressure fluid to one end of the valve to operate the same, all of said passages being parallel to one another, substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

FERDINAND KRÜGER.

Witnesses:

HENRY HASPER,

WOLDEMAR HAUPT.