V. GELPKE & P. KUGEL.

HYDRAULIC REGULATOR VALVE.

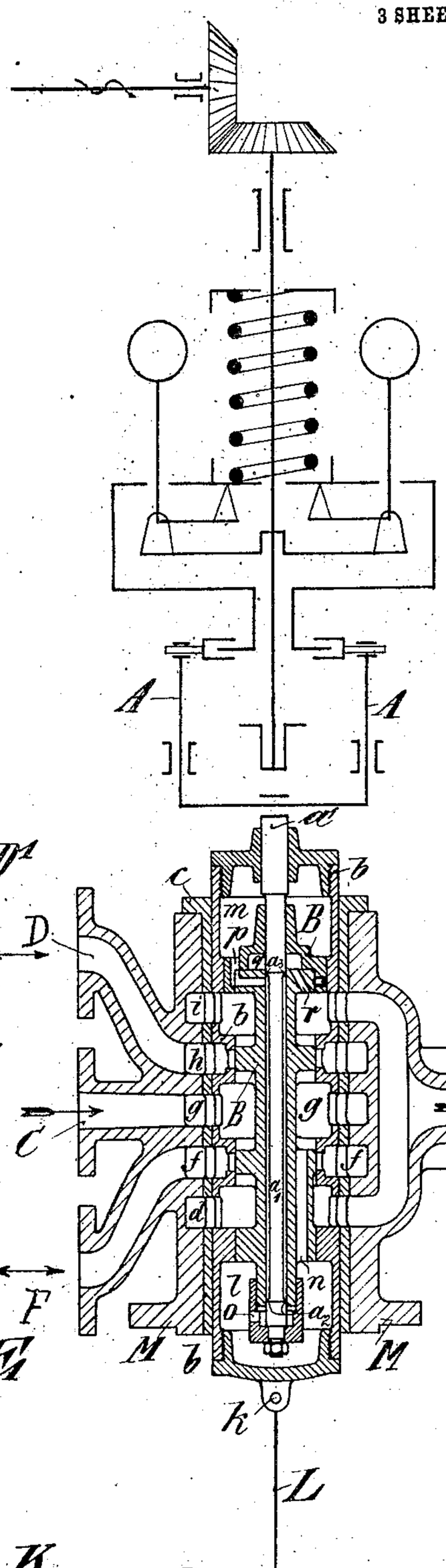
APPLICATION FILED OCT. 13, 1905.

929,206.

Patented July 27, 1909.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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3 SHEETS—SHEET 2.

Fig. 2.

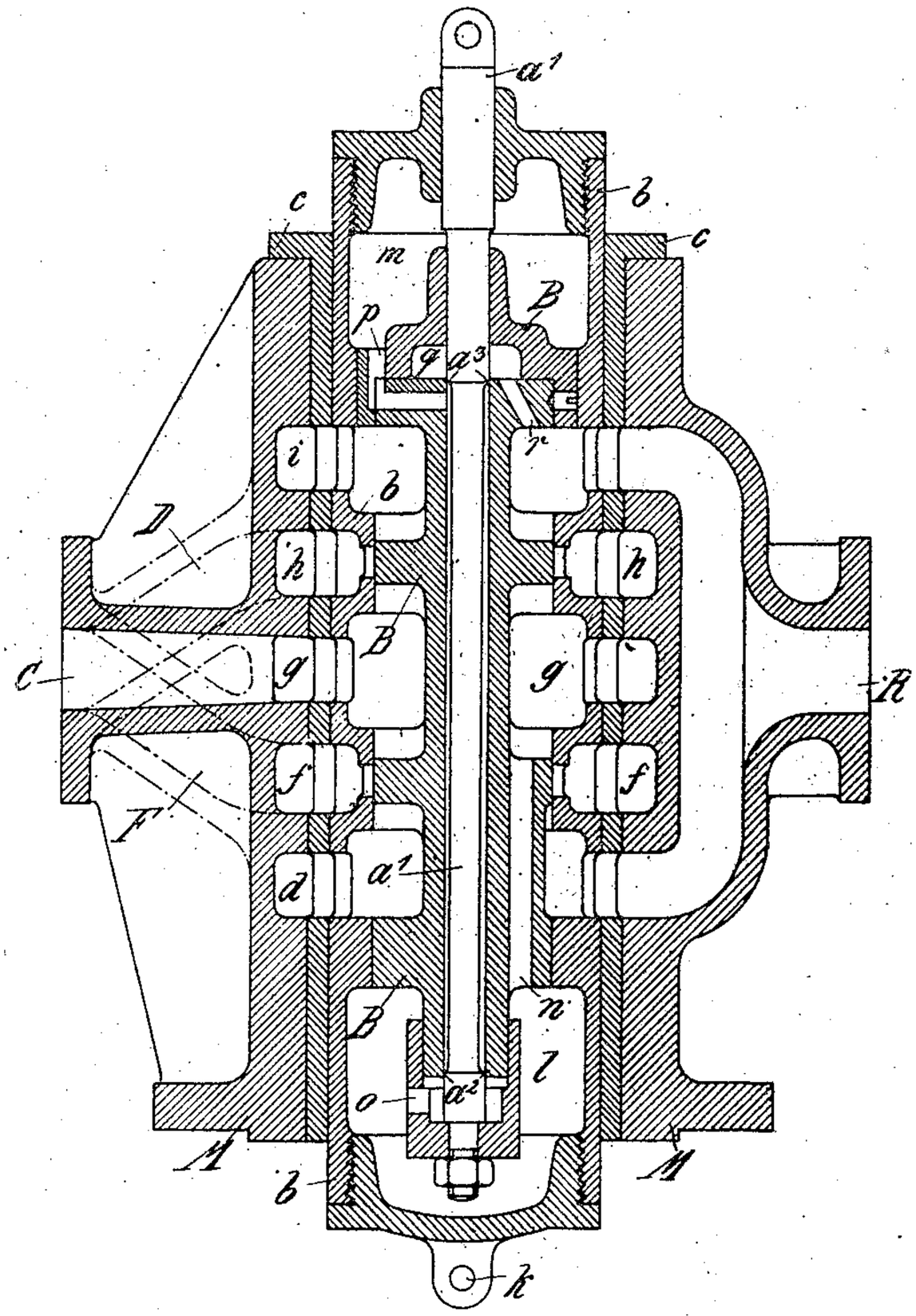

Fig. 3.

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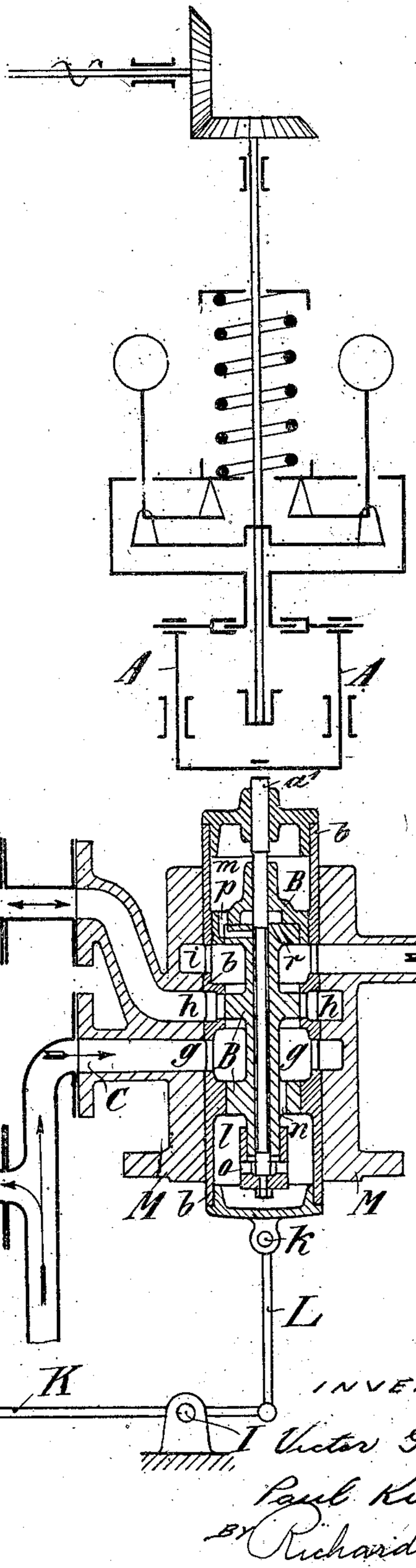
3 SHEETS—SHEET 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

VICTOR GELPKE, OF LUCERNE, SWITZERLAND, AND PAUL KUGEL, OF DUSSELDORF, GERMANY.

HYDRAULIC REGULATOR-VALVE.

No. 929,206. Specification of Letters Patent. Patented July 27, 1909.

Application filed October 13, 1905. Serial No. 282,663.

To all whom it may concern:

Be it known that we, VICTOR GELPKE, a citizen of the Republic of Switzerland, and resident of Lucerne, Switzerland, and PAUL KUGEL, a subject of the Emperor of Germany, and resident of Dusseldorf, Germany, have invented certain new and useful Improvements in Hydraulic Regulator-Valves, of which the following is a full, clear, and exact specification.

Our invention relates to improvements in the regulating of hydraulic motors as water wheels, hydraulic or gas-turbines and the like.

The object of our improvement is to provide a most simple regulating device insuring a correct and delicate regulating.

The invention is illustrated in the accompanying drawing, in which:—

Figure 1 is a view, partly diagrammatic, illustrating the new valve in a complete regulating device, Fig. 2 is a central longitudinal section through our hydraulic regulator valve on a larger scale, Fig. 3 is a transverse section through a detail of Fig. 2, Fig. 4 is a view, similar to Fig. 1, illustrating a modification of our hydraulic regulator valve.

Similar letters refer to similar parts throughout the several views.

It is to be understood that there is available a motive fluid which is led by the governor to the one or the other side of a piston, moving with its rod the device which allows the working fluid to enter the turbine or the like.

E in Fig. 1 is a cylinder which contains the aforesaid piston designated by the letter G and connected to the piston rod H, which projects through suitable stuffing boxes in opposite ends of the cylinder, being connected at the upper end to the above mentioned device, determining the admission of the water, gas, steam and the like to the turbine, water wheel and the like. This device is not shown in the present drawing as it forms no part of our invention.

M represents a stationary valve casing which has an inlet port C for the motive fluid, an outlet port R and branch ports D and F which are designed to be connected to the ports D^1 and F^1 at opposite ends of the cylinder E by rigid pipes not shown. The flow of the motive fluid for operating the regulating piston is controlled by the valve B, which is arranged in the valve casing M. Between the valve B and the stationary casing M we provide a movable part *b* which is in the shape of a cylinder having ports corresponding respectively to the ports of the casing of which ports *g* designates the inlet port of the motive fluid, *h* and *f* the ports by which the fluid passes respectively through D or F into the one or the other end of the regulating cylinder E according to the position of the valve B, *i* and *d* the ports by which the water escapes from the regulating cylinder. The movement of the part *b* is effected by having its lower end connected by a link L with one end of a rocking lever K pivoted upon a fixed pivot I having its other end connected with the lower end of the piston rod H.

The valve B has a central passage through which passes a spindle a^1 which has a certain amount of longitudinal movement in the passage. The upper end of the spindle is connected with the governor A. The space within the movable part of the valve casing and surrounding the lower end of the valve, which is designated by the letter *l*, is in constant communication through a port *n* with the space *g*, which as before stated is in communication with the motive fluid. This space *l* is in communication through a port *o* with a passage through the body of the valve B which is formed by reducing the rod a^1 so as to provide an annular space as shown and lower and upper shoulders a^2 and a^3. The space *l* is only in communication however with this annular space when the rod a^1 has been moved downwardly by the governor, but when it has been thus moved downwardly the motive fluid will pass from the space *g* through the port *n* into the chamber *l* and thence through port *o* and along the rod a^1 and out through the port *p* into the space *m* above the valve. As the head of the valve is of greater diameter than the lower end, the result will be that the greater pressure on the valve head in the chamber *m* will move the valve downwardly and this relative movement will cause the shoulders a^2 and a^3 to close the passage through the valve. After this is done the governor has ceased to influence the valve. If the valve has gone down enough, the shoulder a^3 becomes free and the motive fluid in the space *m* escapes through the ports *p*, *q* and *r* in the outlet R. If in this

manner the fluid in m has lost its pressure the pressure of the fluid in l lifts the valve B, closes the shoulder a^2 against the bore in the valve B so that the neutral position of the latter against the rod a^1, shown in Fig. 4, is taken again. Thus arrived the valve B has changed its position against the movable casing part b accordingly to the downward movement of the rod a^1, consequently it has opened the ports f and h thereby connecting them respectively with the spaces g and i. The motive fluid now flows from space g through the ports f, F and F^1 into the space O below the regulating piston G lifting the latter, while the fluid above the piston escapes through the ports D^1, D, h and i in the outlet R. As soon as the piston G moves upwardly the movable part b of the valve casing is moved downwardly by the lever K and link L causing the part b to follow the valve B and to cut off the supply of the regulating fluid to the cylinder E.

Fig. 4 illustrates a modified arrangement in which a differential piston is used instead of the piston G, shown in Fig. 1, and having working surfaces of the same size. To the smaller face of the differential piston the motive fluid is led directly therefore operating with constant pressure, whereas on the upper side of the piston the pressure of the fluid is working, which is controlled through the governor by means of the valve B. In this arrangement the port f is needless.

Having thus described our invention, what we claim is:—

1. In hydraulic regulating apparatus, a hydraulic distributing valve, comprising a fixed ported casing, a hollow outer cylindrical valve member slidable in said casing and moved by an auxiliary reciprocating motor regulating a hydraulic motor, an inner cylindrical valve member slidable in said outer valve member, a central spindle extending axially of said inner valve member, and moved by a governor, substantially as described.

2. In hydraulic regulating apparatus, a hydraulic distributing valve comprising a fixed ported casing, a hollow outer cylindrical ported valve member slidable in said casing, an inner cylindrical valve member slidable in said outer valve member having ends of unequal cross sectional area, a central spindle extending axially of said inner valve member, chamber in one end of said outer valve member permanently connected to the inlet of the casing, a chamber in the opposite end of said outer valve member, ports in said inner valve member for connecting the chambers in said outer valve member together, this connection being allowed or interrupted by shoulders of the said central spindle, means connecting said outer valve to the piston of a reciprocating auxiliary motor, and means connecting said valve spindle to a governor, whereby said valve spindle is operated by said governor to control said ports connecting said chamber together, substantially as described.

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