

No. 712,009.

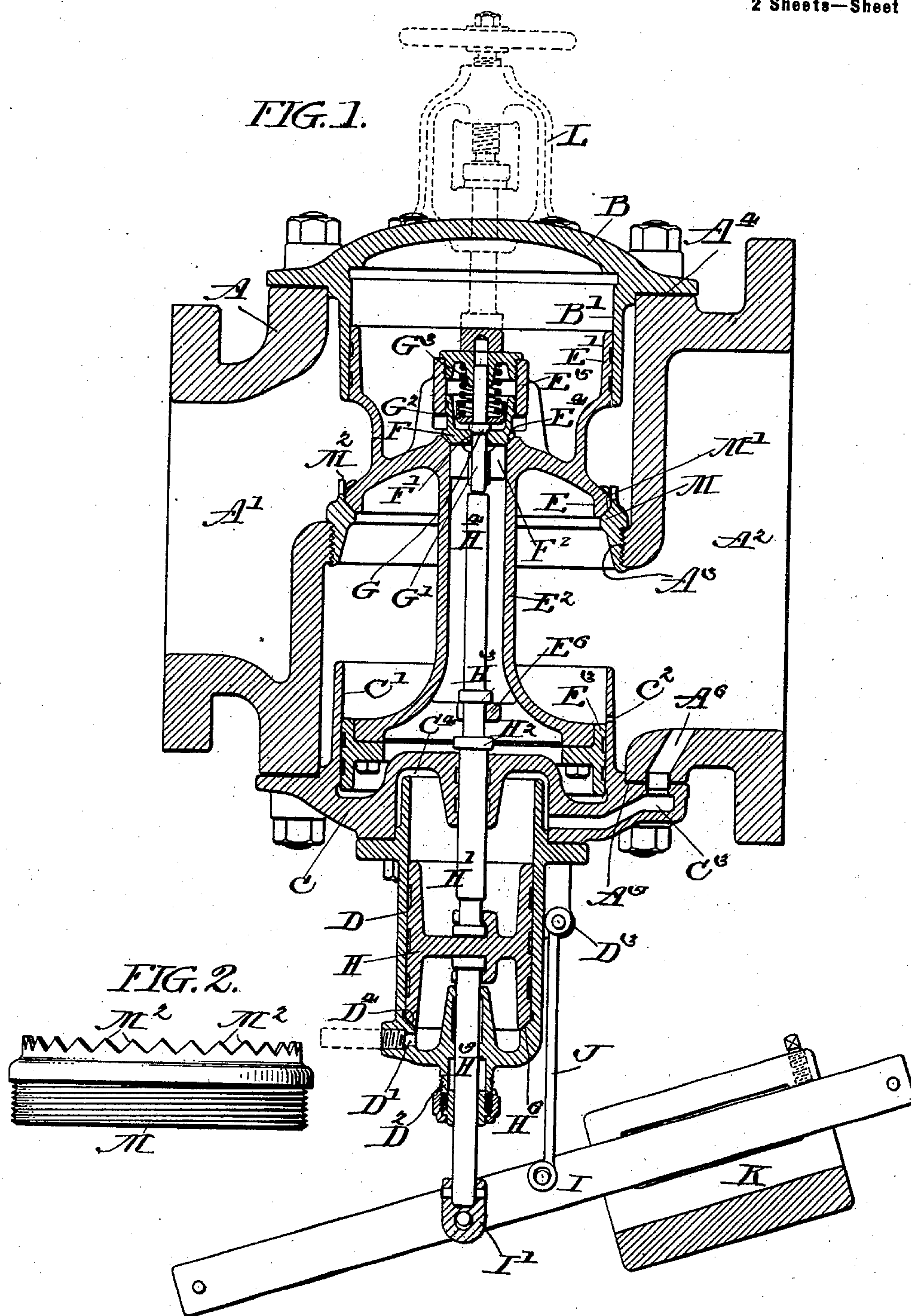
Patented Oct. 28, 1902.

L. SCHUTTE.
REDUCING VALVE.

(Application filed Dec. 28, 1901.)

(No Model.)

2 Sheets—Sheet 1.



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2 Sheets—Sheet 2.

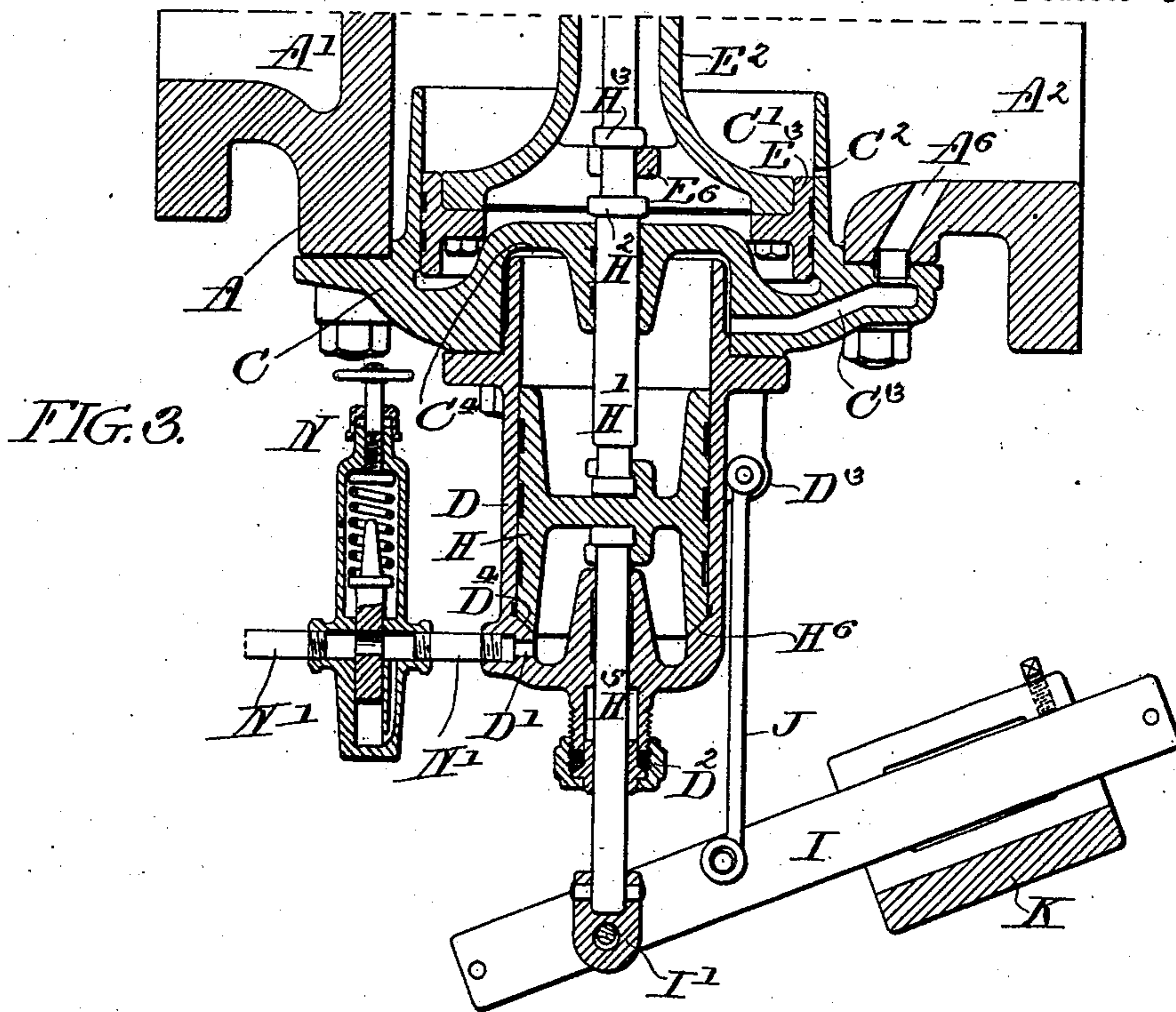
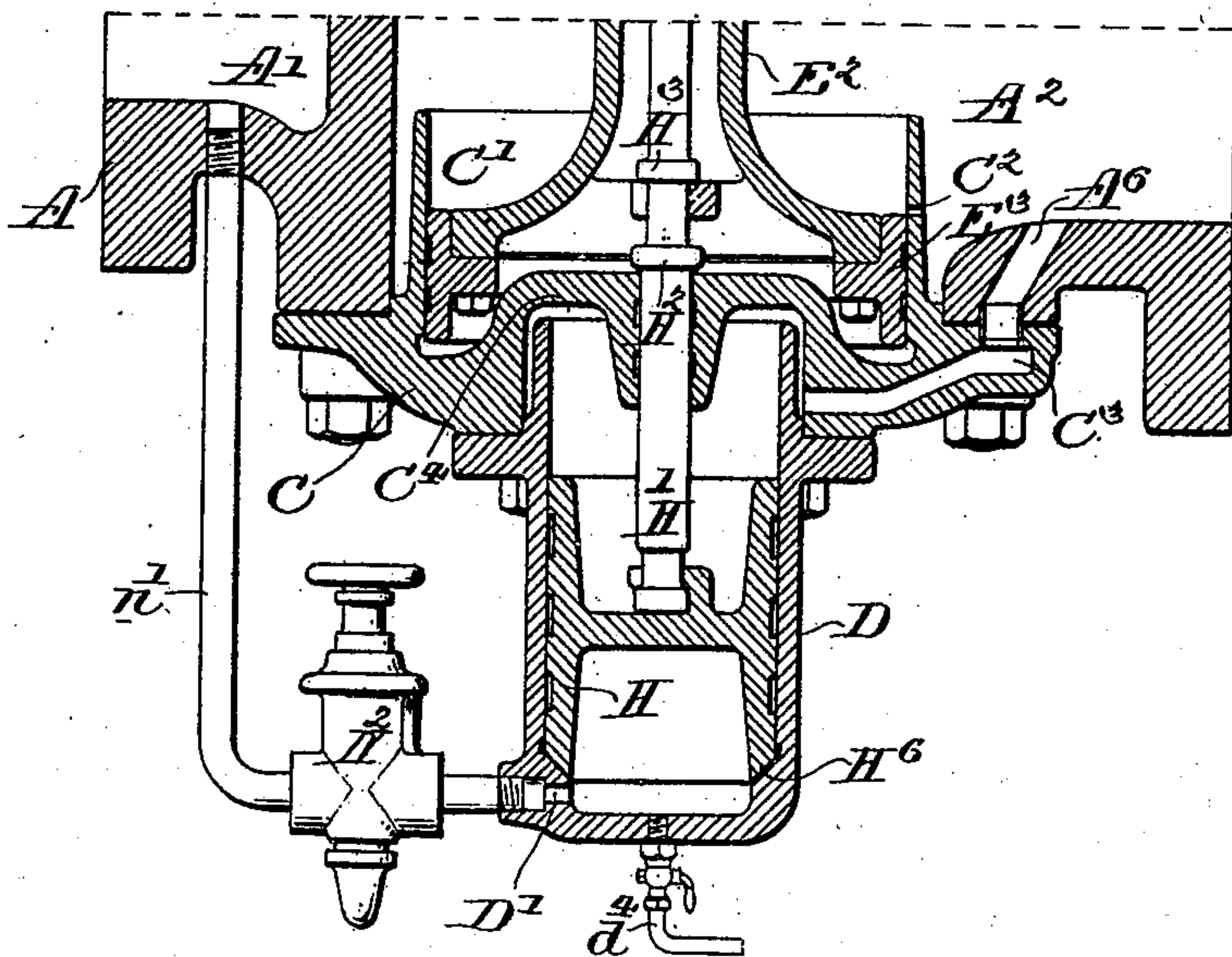


FIG. 4.



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UNITED STATES PATENT OFFICE.

LOUIS SCHUTTE, OF PHILADELPHIA, PENNSYLVANIA.

REDUCING-VALVE.

SPECIFICATION forming part of Letters Patent No. 712,009, dated October 28, 1902.

Application filed December 26, 1901. Serial No. 87,184. (No model.)

To all whom it may concern:

Be it known that I, LOUIS SCHUTTE, a citizen of the United States of America, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Reducing-Valves, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to the construction of reducing-valves, and has for its object to provide a valve of this character at once simple and highly efficient.

The nature of my improvements will be best understood as described in connection with the drawings, in which I have illustrated my improved valve in what I believe to be its best form, and in which—

Figure 1 is a vertical sectional view of the valve; Fig. 2, a side elevation showing the construction of the rim rising from the valve-seat; and Figs. 3 and 4 are sectional views showing modifications.

A is the valve-casing, divided by suitable partitions into a receiving side A^1 and delivery side A^2 , connected through a passage A^3 , having formed in or secured to it a valve-seat, which, as shown, is an annular ring M, screwing into the threaded passage A^3 and having a valve-seat M^1 formed in it, and rising from the outer edge of the seat a serrated wall, (indicated at M^2 .) As shown at A^4 , the upper end of the casing A is open for the insertion of the valve and cap, and the lower end A^5 is also open for the insertion of the cap carrying the lower cylinder, a port A^6 being formed through the bottom of the casing for purposes to be described.

B is the cap closing the opening A^4 and having formed on it the depending cylinder B^1 , the lower end of which opens into the receiving-chamber A^1 and which cylinder has a diameter equal to that of the outer circumference of the seat M^1 .

C is the head closing the lower opening A^5 and having formed on it the cylinder C^1 , which extends up in the chamber A^2 and in diameter is equal to the cylinder B^1 , with which it alines.

C^2 is a drainage-passage extending through the wall of the cylinder C^1 .

C^4 is a cylinder-head formed on the under

side of the head C, and C^3 a port formed in the head connecting the port A^6 with the said cylinder-head C^4 .

D is a cylinder secured on the bottom of the cap C, having an opening D^1 at its lower end leading to the atmosphere, a stuffing-box D^2 formed through its lower end, and in Figs. 1 and 3 a flange D^3 extending out from its side. An annular valve-seat D^4 is formed in the cylinder near its lower end.

E is a regulating-valve of outer effective diameter to that of the cylinders B^1 and C^1 , said valve having attached to its upper face a piston E^1 , fitting and working in the cylinder B^1 , and having also through the preferably hollow spindle or rod E^2 another piston E^3 , attached to its lower face and working in the cylinder C^1 . It is necessary for the operation of my valve that the interior of the cylinder B^1 should be in communication with the chamber A^1 and the interior of the cylinder C^1 in communication with the chamber A^2 , in both cases through restricted passages, and in practice I secure this communication by making the fit of the pistons E^1 and E^3 such as will permit a restricted flow of fluid between the said pistons and walls of the cylinders. The upper end of the hollow rod E^2 is provided with a valve-seat, (indicated at E^4 ,) around which arise supports for a cylindrical guide, (indicated at E^5 E^6 ,) indicating an abutment in the lower part of the hollow rod E^2 , the purpose of which will be hereinafter described.

F is a valve normally seated on the valve-seat E^4 and guided in the cylindrical guide-way E^5 . As shown, it is formed with a central port F^1 and with depending fingers F^2 , extending down from the under edge of said port, which is in turn closed by a valve G, which is held to its seat, and pressing down upon the valve F by means of the spring G^3 , acting against a cup-shaped washer G^2 , as shown.

G^1 indicates the spindle of the valve G, which extends down through the valve F to a point a little below the ends of fingers F^2 when the valve G is seated.

H is a piston working in the cylinder D and having attached to its upper face the piston-rod H^1 , which extends up through the valve-rod E^2 , as shown, and has formed upon it col-

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lars H^2 H^3 , which lie, respectively, below and above the abutment E^6 , while the upper end H^4 of the rod rests in contact, or substantially so, with the spindle G' . The end H^4 is of sufficient diameter to abut against the fingers F^2 when raised. H^5 , Figs. 1 and 3, indicates another piston-rod connected with the lower face of the piston H and extending through the stuffing-box D^2 , the lower end of this rod connecting, through a pivoted block I' , with a lever I , supported on a rod J , extending from the lug D^3 and having adjustably secured upon it the counterweight K , which tends to raise the piston H and through it the valves.

In Fig. 3 I show connected with the opening D' a pressure-regulating valve N , situated in an outlet-conduit N' , leading from opening D' , the construction of the valve being such that it will permit only a determined pressure to accumulate in the cylinder D below piston H . The valve is of a very ordinary type and is not therefore described in detail. In Fig. 4 I show the piston H without connections other than through rod H' and the opening D' connected through a conduit n' with the side A' of the valve-casing, a pressure-regulating valve N^2 being situated in said conduit to maintain the pressure below piston H at a determined amount.

The operation of the device is as follows: The counterweight K or equivalent device is adjusted so that the lifting forces exerted by it on the piston H will be substantially equal to the pressure desired in the chamber A^2 as said pressure is exerted through the ports A^6 and C^3 upon the upper face of the piston H . In Fig. 3 the force exerted by the counterweight is supplemented by the pressure of steam passing between the piston H and the walls of cylinder D and accumulating in the lower end of the cylinder until the pressure equals that for which the regulating-valve N is set, the said valve supplementing the counterweight, which of course is adjusted to exert correspondingly less pressure than in the construction of Fig. 1. In the modification of Fig. 4 the counterweight is entirely omitted, the upward pressure on the piston H being from steam drawn from the high-pressure side of the casing and reduced to the desired pressure by valve N^2 . A special drainage pipe and cock d^4 is provided in this modification. It will be obvious that the devices of all modifications are full equivalents and all work alike. The high-pressure fluid in the chamber A' communicates, through the restricted passage between the piston E' and cylinder B' , with the said cylinder B' , and as the valve E and piston E' are of equal diameter the pressure exerted by the fluid in the chamber A' upon the outside of the valve and piston is balanced, and the valve is held to its seat by the pressure in the cylinder B' , which of course exceeds that on the lower face of the valve. On the other hand, the pressure in the chamber A^2 , communicating with the cylinder C' ,

is practically balanced on both sides of the piston E^3 and exerted upon the lower face of the valve E' . If now the pressure in the chamber A^2 falls below the determined amount, the counterweight K , acting through its connections upon the piston H or its equivalent, as described, will push it upward, the piston-rod H' H^4 pushing against the valve-rod G' and lifting the valve G from its seat, which relieves the pressure upon the upper face of the valve F , so that when the valve-rod H^4 comes in contact with said last-mentioned valve it will more readily recede from its seat E^4 , lifting the said valve and permitting the high-pressure fluid in the cylinder B' to flow through the hollow rod E^2 into the cylinder C' , thus balancing the pressure acting upon the upper and lower pistons of the valve E , so that when the lower collar H^2 of the rod H' comes in contact with the projection E^6 the valve E will be readily raised from its seat, and after it is raised held above its seat practically balanced, so far as pressure is concerned. My reason for forming the wall M^2 of the valve-seat M' with serrations, as shown, is to prevent undue pressure between the valve-seat and valve when the valve is slightly raised from its seat. The construction illustrated permits the high-pressure fluid to escape through orifices at the base of the serrations, so that its expansion to the pressure of the chamber A^2 can take place largely in the annular space between the seat and the valve and without exerting undue pressure to lift the valve. When the pressure in the chamber A^2 reaches the determined point, the piston H moves downward, and the downward movement of its rod H' permits the closing of valves F and G , whereupon the high pressure in the cylinder C' escapes between the piston and cylinder and the pressure in said cylinder falls to that in the chamber A^2 , so that as the valve-rod H' moves farther downward the valve E follows it until it reaches its seat M . The port D' in the cylinder D permits any water or fluid which passes the piston H to escape, while the valve-seat D^4 , in connection with the annular valve H^6 , prevents any escape of fluid from the cylinder D when the valve is closed.

Obviously many of the advantages of my valve can be secured without the utilization of the valve F or G , in which case the pressure in the cylinders B' and C' will always balance and the movements of valve E will be governed directly by piston H , and of course a single valve F can be used without valve G .

I have shown at L a device of ordinary construction by which the valve E can be locked to its seat.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a pressure-regulating valve mechanism, a valve, as E , having secured to it on its receiving side a piston of diameter equal to the outside diameter of the valve and secured

to it on its delivery side another piston of similar diameter, in combination with a valve-casing having cylinders with ends opening into the delivery and receiving chambers respectively of the casing and in which cylinders the pistons attached to the valve move, a connection between the cylinders, means whereby each cylinder is in communication with the chamber in which it is situated through a restricted passage, a third cylinder in free communication with the chamber on the delivery side of the valve, a third piston connected to the valve and working in said third cylinder the pressure in which tends to seat the valve and means acting with regulated force to lift the valve from its seat.

2. In a pressure-regulating valve mechanism, a valve, as E, having secured to it on its receiving side a piston of diameter equal to the outside diameter of the valve and secured to it on its delivery side another piston of similar diameter, in combination with a valve-casing having cylinders with ends opening into the delivery and receiving chambers respectively of the casing and in which cylinders the pistons attached to the valve move, a connection between the cylinders, a valve normally closing said connection, means whereby each cylinder is in communication with the chamber in which it is situated through a restricted passage, a third cylinder in free communication with the chamber on the delivery side of the valve E, a third piston connected to the valve E and working in said third cylinder the pressure in which tends to seat the valve, means whereby the motion of the third piston in a direction to raise the regulating-valve E acts first to open the other valve in the passage connecting the two cylinders, and means acting with regulated force to lift the third piston and through it the valve.

3. In a pressure-regulating valve mechanism, a valve, as E, having secured to it on its receiving side a piston of diameter equal to the outside diameter of the valve and secured to it on its delivery side another piston of similar diameter, in combination with a valve-casing having cylinders with ends opening into the delivery and receiving chambers respectively of the casing and in which cylinders the pistons attached to the valve move, a connection between the cylinders, a valve normally closing said connection, means whereby each cylinder is in communication with the chamber in which it is situated through a restricted passage, a third cylinder in free communication with the chamber on the delivery side of the valve E, said cylinder having a drain-passage leading from its lower end and a valve-seat D^4 formed in it also at its lower end, a third piston connected to the valve E and working in said third cylinder the pressure in which tends to seat the valve

E, said cylinder having a valve, as H^6 , formed on its lower end adapted to seat itself on the seat D^4 in the cylinder when the piston is in its lowermost position, means whereby the motion of the third piston in a direction to raise the regulating-valve E acts first to open the valve in the passage connecting the two cylinders, and means acting with regulated force to lift the third piston and through it the valve E.

4. In a pressure-regulating valve mechanism, a valve, as E, having secured to it on its receiving side a piston of diameter equal to the outside diameter of the valve and secured to it on its delivery side another piston of similar diameter, in combination with a valve-casing having cylinders with ends opening into the delivery and receiving chambers respectively of the casing and in which cylinders the pistons attached to the valve move, a connection between the cylinders formed through the valve E and valve-rod, a valve normally closing said connection, means whereby each cylinder is in communication with the chamber in which it is situated through a restricted passage, a third cylinder in free communication with the chamber on the delivery side of the valve, a third piston connected to the valve E and working in said third cylinder the pressure in which tends to seat the valve E, means whereby the motion of the third piston in a direction to raise the regulating-valve E acts first to open the valve in the passage connecting the two cylinders, and means acting with regulated force to lift the third piston and through it the valve E.

5. In a pressure-regulating valve mechanism, the valve-casing having open-ended cylinders B' and C' of similar diameters and a valve-seated port A^3 , of outer diameter similar to the cylinders, situated between said cylinders, in combination with a regulating-valve E having a hollow rod E^2 and pistons E' and E^3 attached to it and working in cylinders B' and C' , a passage connecting cylinders B' and C' through the valve and hollow rod E^2 , a valve normally closing said passage, a cylinder D situated beneath cylinder C' and having its upper end in communication with the chamber on the delivery side of the valve-casing and its lower end open to the atmosphere, a piston H working in said cylinder and having a rod working through the hollow rod E^2 of the regulating-valve and arranged to successively engage and open the valve closing the passage through the regulating-valve and the regulating-valve itself and means tending to raise the piston H with regulated force.

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Witnesses:

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