

(No Model.)

4 Sheets—Sheet 1.

J. PLAYER.

COMBINED INTERCEPTING AND REDUCING VALVE.

No. 481,148.

Patented Aug. 16, 1892.

FIG. 1.

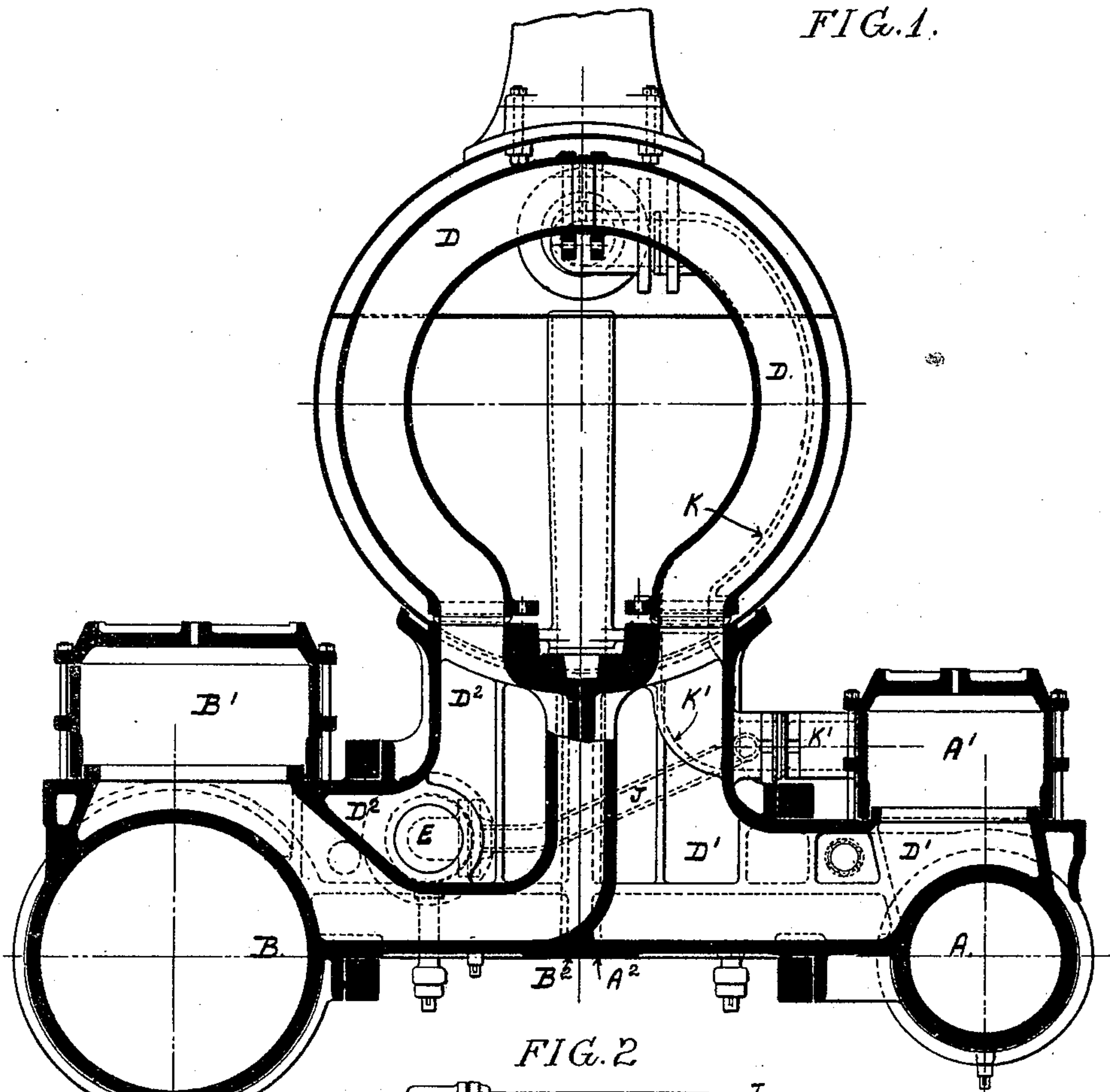
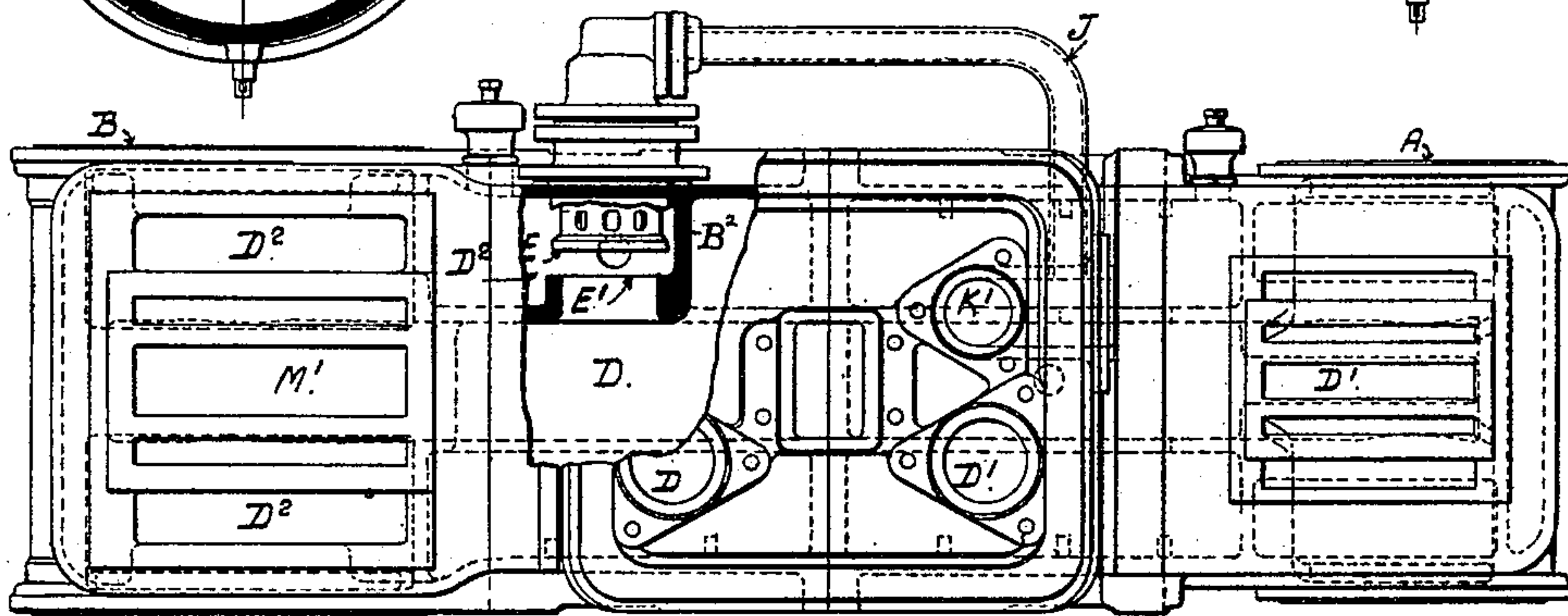


FIG. 2.



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FIG. 3.

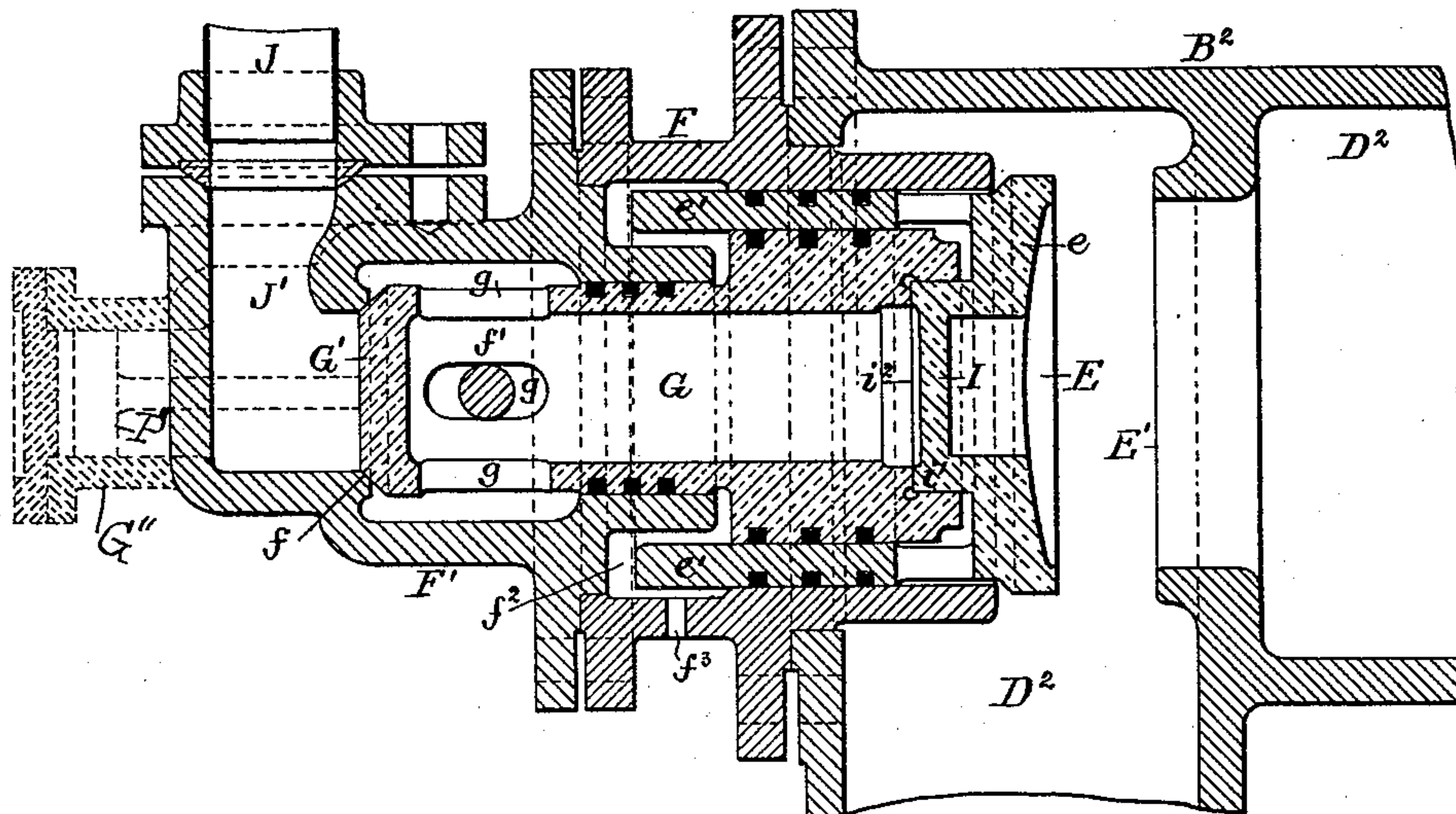
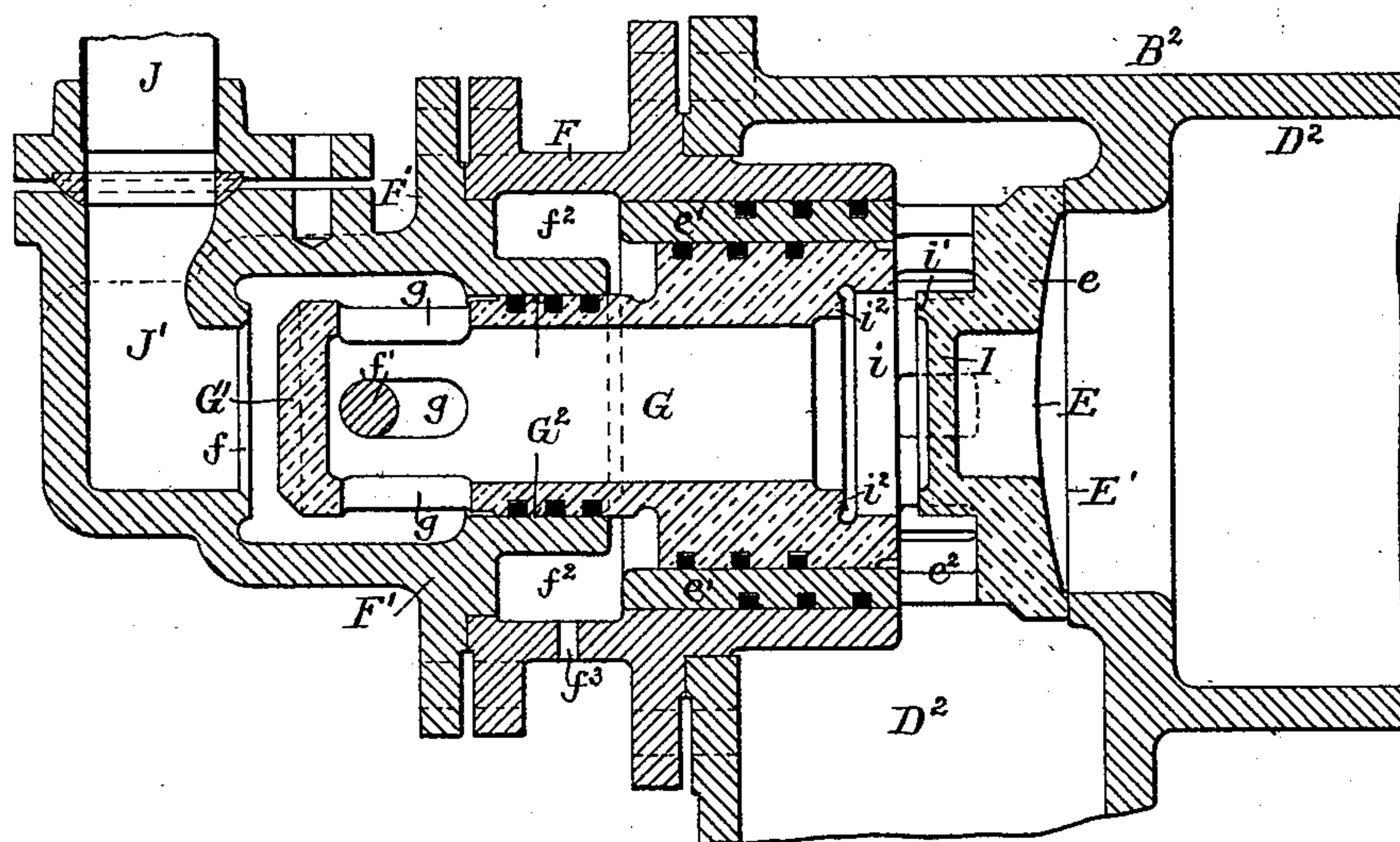


FIG. 4.



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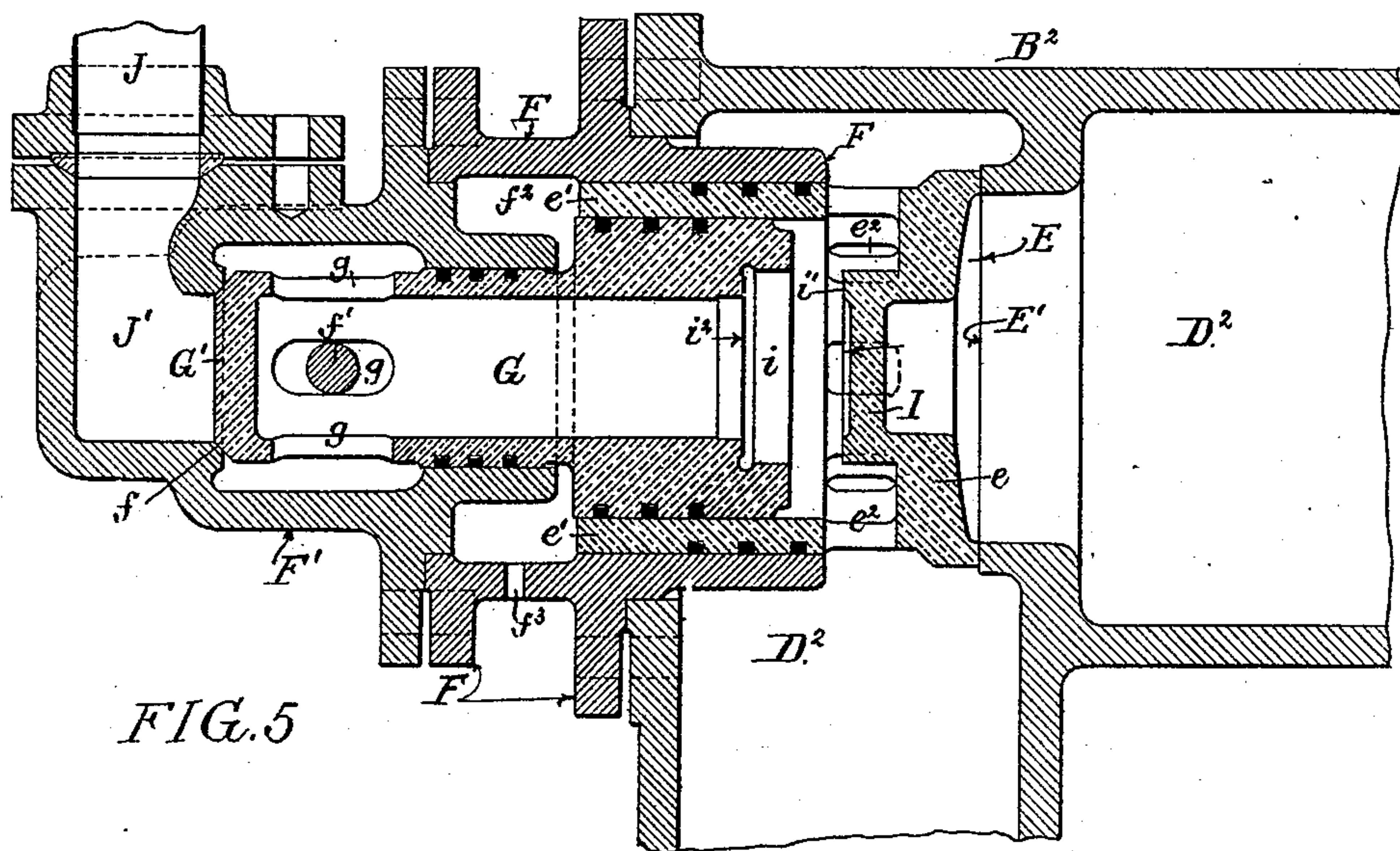


FIG. 5

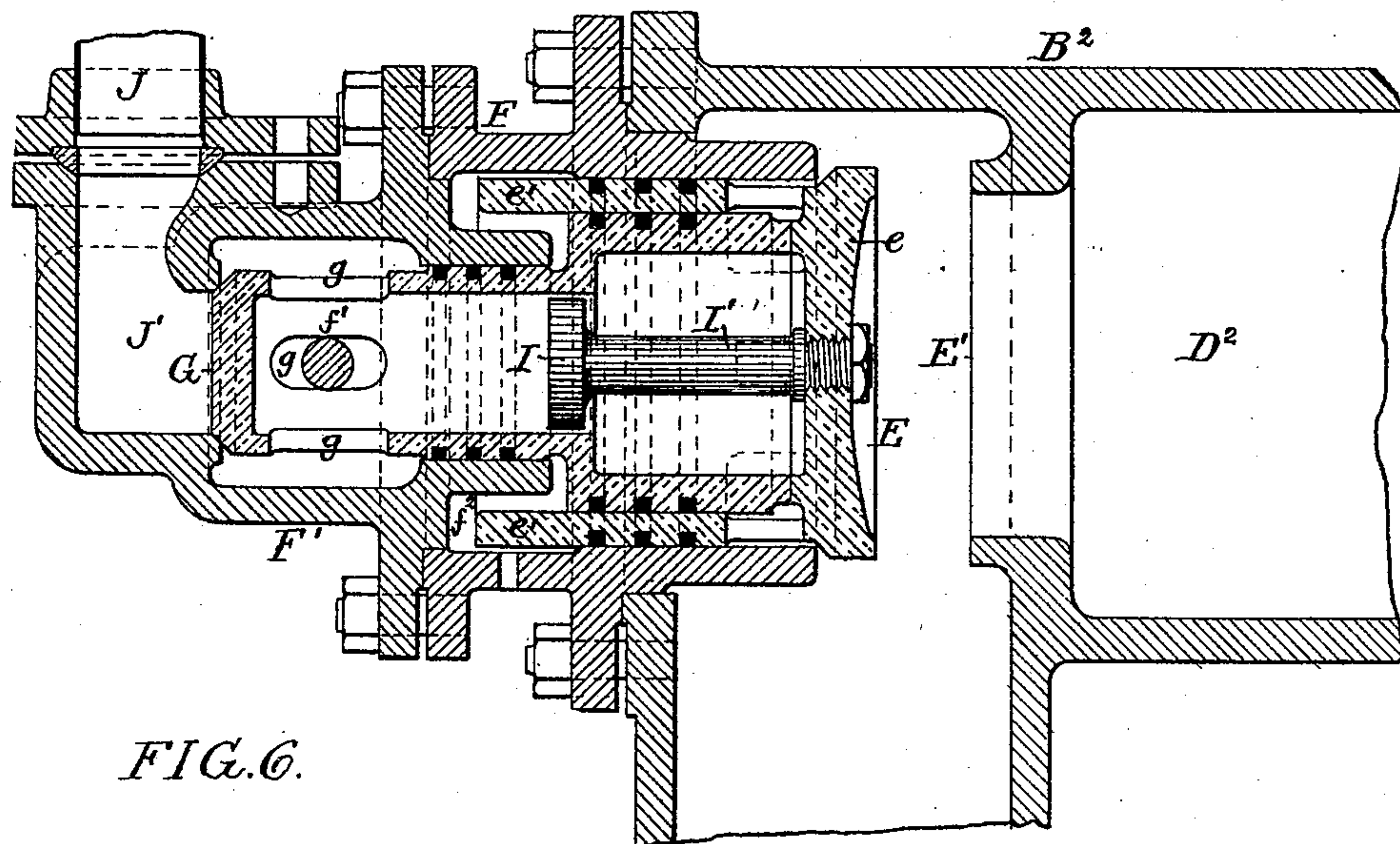


FIG. 6.

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### COMBINED INTERCEPTING AND REDUCING VALVE.

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FIG. 7.

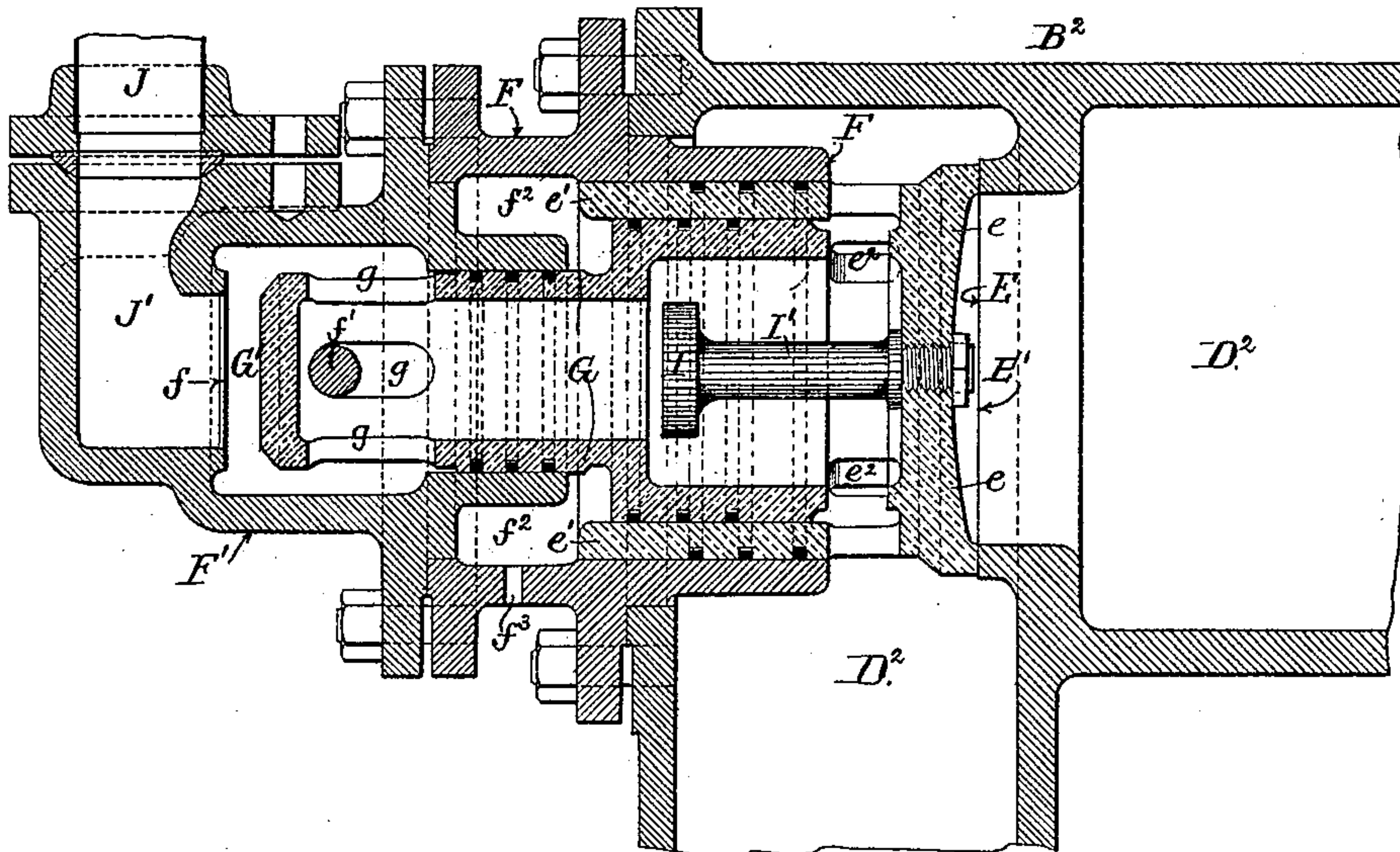
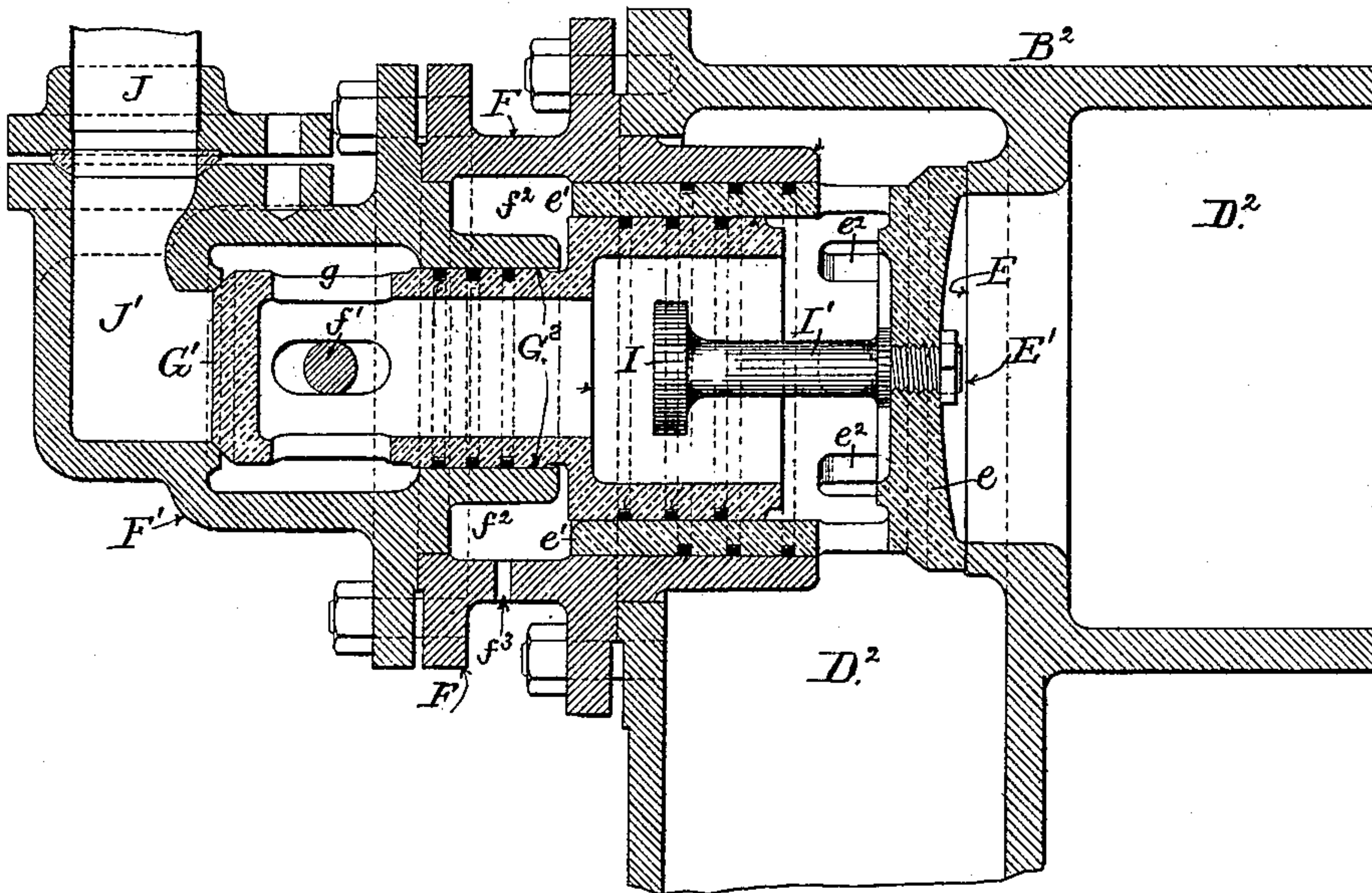


FIG. 8.



**WITNESSES :**

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# UNITED STATES PATENT OFFICE.

JOHN PLAYER, OF DUNKIRK, NEW YORK, ASSIGNOR TO THE BROOKS  
LOCOMOTIVE WORKS, OF SAME PLACE.

## COMBINED INTERCEPTING AND REDUCING VALVE.

SPECIFICATION forming part of Letters Patent No. 481,148, dated August 16, 1892.

Application filed April 14, 1892. Serial No. 429,145. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN PLAYER, a resident of Dunkirk, Chautauqua county, New York, have invented a Combined Intercepting and Reducing Valve Structure for Compound En-

gines, of which the following is a specification. My invention relates to compound locomotive or other engines of that type in which for the purpose of obtaining full power at starting high-pressure steam is employed in both cylinders simultaneously, that portion which is admitted to the large or low pressure cylinder being automatically reduced in pressure and controlled at such pressure that the mean effective pressure on both sides of the engine is equalized or regulated in any desired ratio.

The object of my invention is to construct a combined intercepting and pressure-regulating valve, so as to dispense with all springs, and also to form a cut-off edge, which renders the pressure-regulating valve more sensitive, my present invention being a modification of the valve claimed in the application filed by me on February 24, 1892, Serial No. 422,630, and relates particularly to the combined intercepting and reducing valve.

In the accompanying drawings, Figure 1 is a transverse sectional view through the high and low pressure cylinders, steam-chest, smoke-box, receiver, the intercepting and pressure-regulating valve being shown as mounted in the cylinder-saddle. Fig. 2 is a plan view of the high and low pressure cylinders partly in section. Figs. 3, 4, and 5 are sectional views of my improved intercepting and pressure-regulating valve, showing the valves in different positions. Figs. 6, 7, and 8 are sectional views illustrating modifications of my improved valve.

Referring in the first instance to Figs. 1 and 2, A is the high-pressure cylinder, and B the low-pressure cylinder, arranged on opposite sides of the engine.

A' is the valve-chest for the high-pressure cylinder, and A<sup>2</sup> is the high-pressure-cylinder saddle, having the inlet and exhaust passages therein.

B' is the low-pressure valve-chest, and B<sup>2</sup> is the low-pressure-cylinder saddle, having the inlet and exhaust passages, as clearly shown

in Fig. 1. The exhaust-passage D' in the high-pressure-cylinder saddle is enlarged, as is also the inlet-passage D<sup>2</sup> of the low-pressure cylinder. A receiver-pipe D, situated in the smoke-box, forms a communication between these two passages, so that steam as it is exhausted from the high-pressure cylinder will pass through the receiver-pipe to the low-pressure cylinder.

E is the intercepting-valve, which is adapted to a seat E' in the cylinder-saddle B<sup>2</sup>, as shown in Figs. 2 and 4; but it will be understood that the valve may be arranged in the receiver-pipe D without departing from my invention. The intercepting-valve E is adapted to a casing F, which is secured to the cylinder-saddle in any suitable manner, and projects into the passage D<sup>2</sup>, so as to give sufficient bearing to the intercepting-valve. The intercepting-valve E has a head e, which, when the valve is in the position shown in Fig. 4, intercepts the passage of steam through the chamber D<sup>2</sup>, thus preventing the exhaust-steam from the high-pressure cylinder entering the admission-port of the low-pressure cylinder. The rearward extension e' of the intercepting-valve E is connected to the head e by a perforated section e<sup>2</sup>, the perforations in said section allowing live steam to enter the low-pressure steam-chest.

G is the pressure regulating or reducing valve regulating the pressure of steam that enters through the pipe J, which is connected in the present instance to the high-pressure-cylinder saddle and receives steam from the inlet-passage K'. The pressure-regulating valve slides within the extension e' of the reducing-valve and is also adapted to bearings in the casing F', which is secured to the casing F in any suitable manner.

In the casing F' is a seat f, to which is adapted the head G' of the regulating-valve G. This regulating-valve G is hollow and has passages g, which allow steam to enter the said valve from the pipe J and passage J' when the valve G is off its seat, as shown in Fig. 4. A cross-pin f', which is adapted to two of the slots g, limits the movement of the said valve G.

Formed in the casing F is a chamber f<sup>2</sup>, which communicates with the atmosphere through the leakage-port f<sup>3</sup>, whereby the differential areas of the intercepting-valve and



of the pressure-regulating valve may at all times be exposed to the atmosphere, in order to secure at all times their proper working. At the back of the intercepting-valve is a plunger I. This plunger operates at times in the cavity *i* in the reducing-valve or pressure-regulating valve G. This plunger is of such area that when steam is admitted to the small end of the pressure-regulating valve G it opens the valve until it reaches the limit of travel, striking the cross-piece *f'*, when live steam enters the valve G from the passage *J'*, past the head *G'* and through the slots *g*. The steam when it enters the valve G operates upon the plunger I of the intercepting-valve, causing the intercepting-valve to close against its seat *E'*, and a cut-off edge is formed by this construction, which renders the pressure-regulating valve more sensitive. The end of the plunger I is provided with a seat *i'*, which closes against a seat *i<sup>2</sup>* on the pressure-regulating valve G, the area of this seat, however, being less than the high-pressure area *G<sup>2</sup>* of the pressure-regulating valve. The area is reduced in order to compel the pressure-regulating valve to travel its full limit before the intercepting-valve closes.

In Figs. 6, 7, and 8 I have shown a modification of the above-described construction, the plunger I in this instance being mounted upon a rod *I'*, which is attached to the head *e* of the intercepting-valve E, the plunger working within the intercepting-valve, the passage in the intercepting-valve being of two diameters, so that when the valves are in the position shown in Fig. 6 the plunger will block the passage of steam through the valve G, said steam will force the plunger forward, and as this plunger is carried by the intercepting-valve it will force the said valve against its seat. In some instances a dash-pot *G''* may be attached to the valve-casing *F'*, as shown in Fig. 3, and a piston *P''* may be attached to the valve G, said piston working within the dash-pot. This dash-pot prevents the too rapid closing of the said valve. When the dash-pot is used, it is necessary to increase the travel of the valve G an amount equivalent to the length of the additional travel in the dash-pot.

The operation of the valve is as follows: When the engine comes to a rest after running with the throttle shut, the intercepting-valve, unless provided with springs, will be found open and seated against the pressure-regulating valve, the pressure-regulating valve also being closed; but if the intercepting-valve is provided with springs it will be found closed against its seat and the pressure-regulating valve will be open. In practice, however, it has been found that these springs are unnecessary, and in order to secure a more sensitive action of the pressure-regulating valve the cut-off plunger I is provided, working within the chamber of the valve G. This keeps the pressure-regulating valve in a more accurate state of equilibrium during the admission of

steam. When the throttle-valve is opened, live steam is admitted to the high-pressure steam-chest through the steam-pipe K and passages *K'* and operates upon the high-pressure piston in the ordinary manner. At the same time steam is admitted to the high-pressure end of the pressure-regulating valve through the connecting-pipe J, causing the valve to open and, passing through the slots, thence through the hollow portion of the valve, causes the intercepting-valve to close against its seat, as shown. This steam flows through the passages in the intercepting valve into the low-pressure steam-chest and, acting upon the large end of the pressure-regulating valve, causes it to partially close as soon as the requisite pressure is obtained and thereafter regulates the amount of steam admitted by the pressure-regulating valve, maintaining an even pressure. The reduced-pressure steam thus admitted acts upon the low-pressure piston in the ordinary manner. As soon, however, as the high-pressure cylinder has exhausted sufficient steam into the high-pressure end of the receiver to overbalance the intercepting-valve this valve opens automatically, at the same time locking the pressure-regulating valve against its seat. The exhaust-steam from the high-pressure cylinder flows through the receiver and acts directly upon the low-pressure piston, the pressure of this exhaust-steam, even when considerably reduced, being sufficient to keep the pressure-regulating valve closed through the action of the duplex valve at all times. It will thus be readily seen that with my improved combination live steam at a suitable working pressure is permitted to act upon the low-pressure piston at all times in starting, and that steam at this pressure is maintained in the low-pressure side of the receiver and prevented from working against the high-pressure piston until such time as the high-pressure end of the receiver becomes charged with exhaust-steam from the high-pressure cylinder at approximately the same pressure, whereupon the intercepting-valve, acting in combination with the pressure-regulating valve, permanently cuts off any further supply of live steam to the low-pressure cylinder and permits the direct passage of the exhaust-steam from the high-pressure into the low-pressure cylinder. This combination also prevents the passage of live steam admitted through the pressure-regulating valve from passing into the high-pressure end of the receiver, and thus acting upon the back of the high-pressure piston.

In the above description of my improvements I have only referred to a locomotive or other engine of the two-cylinder type. My improvements, however, are equally applicable to a locomotive or other engine having a greater number of high and low pressure cylinders, whether arranged parallel to one another or on the tandem principle. In case of a four-cylinder engine there can be employed two sets of intercepting and pressure-regu-



lating valves, one set for each pair of cylinders, or the engine may be arranged so that only one set is required.

The above - described improvements are mainly intended to be applied to a compound engine of the receiver type, and are equally applicable to triple or quadruple as well as double expansion engines.

I claim as my invention—

10 1. A combined intercepting and reducing valve structure having a passage from the high to the low pressure cylinder, and a live-steam inlet to the low-pressure cylinder, in combination with a reducing-valve having a passage therethrough, and an intercepting-valve  
15 in line with the reducing-valve and having on its back a plunger adapted to the passage in the intercepting-valve, substantially as set forth.

20 2. The combination, with the receiver pipe or passages of a compound locomotive or other engine, of the live-steam pipe connecting with the pressure-regulating-valve casing, the regulating-valve casing, the regulating-valve, its  
25 seat, its stop, its hollow steam-passages, the intercepting-valve casing having its balancing-chamber connected to the atmosphere, the intercepting-valve with its annular balanc-

ing device, and steam-passages working outside the pressure-regulating valve and within  
30 its own casing and having one seat close to the opening in the receiver-pipe, with another seat closing against the regulating-valve and working within a cut-off chamber in said valve, as and for the purpose set forth. 35

3. The combination, with the receiver pipe or passages of a compound locomotive or other engine, of the intercepting-valve having an annular balancing device, steam-passages, and  
40 interior seat, with a pressure-regulating valve working within and seating itself against said valve at its larger extremity and having its smaller extremity seating itself in its casing against the high-pressure steam and its travel  
45 regulated by a stop, said high-pressure end of this stop being connected to a piston working in a suitable dash-pot attached to the exterior of its casing, substantially as and for the purpose set forth.

In testimony whereof I have signed my  
50 name to this specification in the presence of two subscribing witnesses.

JOHN PLAYER.

Witnesses:

WILLIAM D. CONNER,  
HENRY HOWSON.