

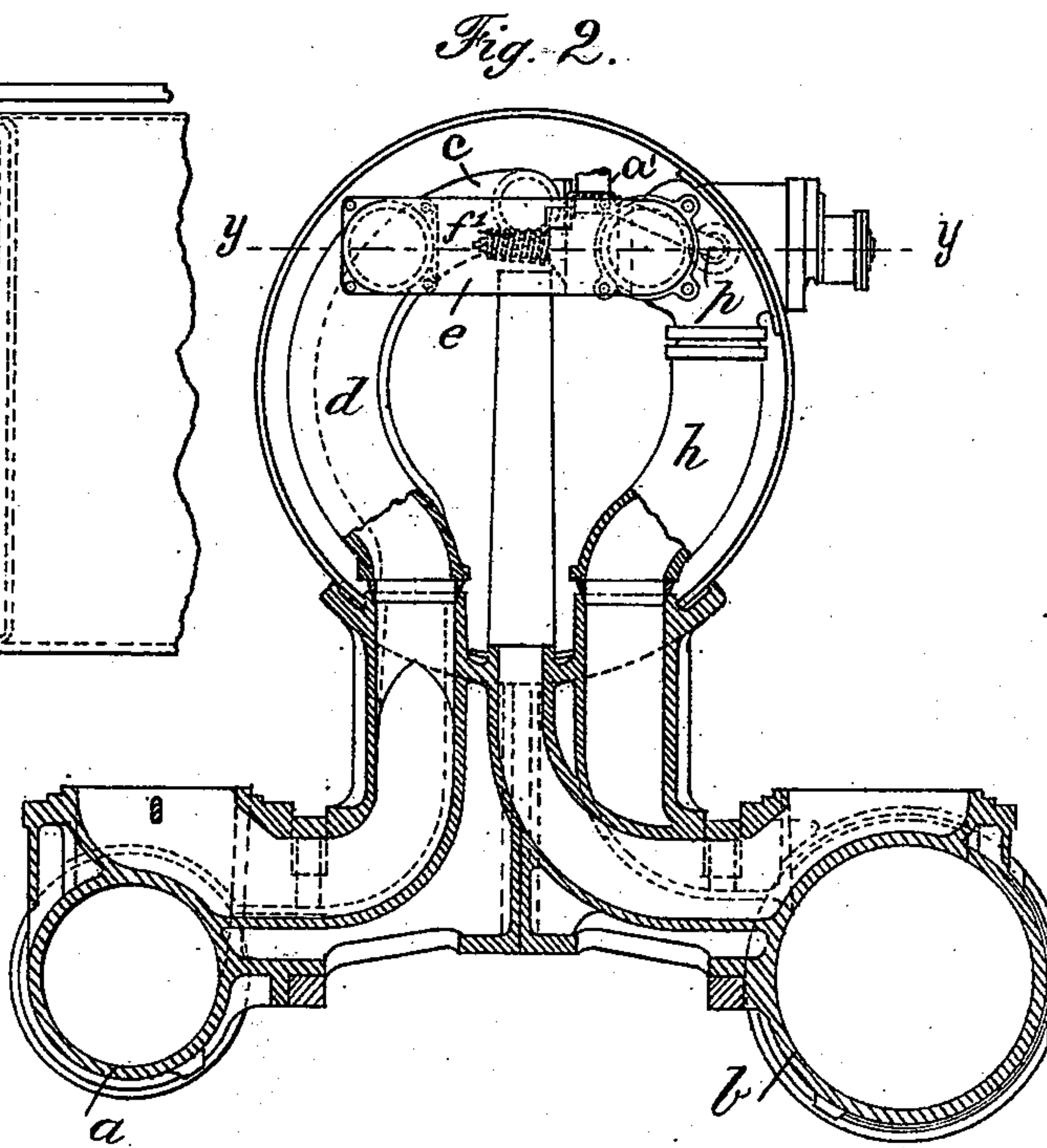
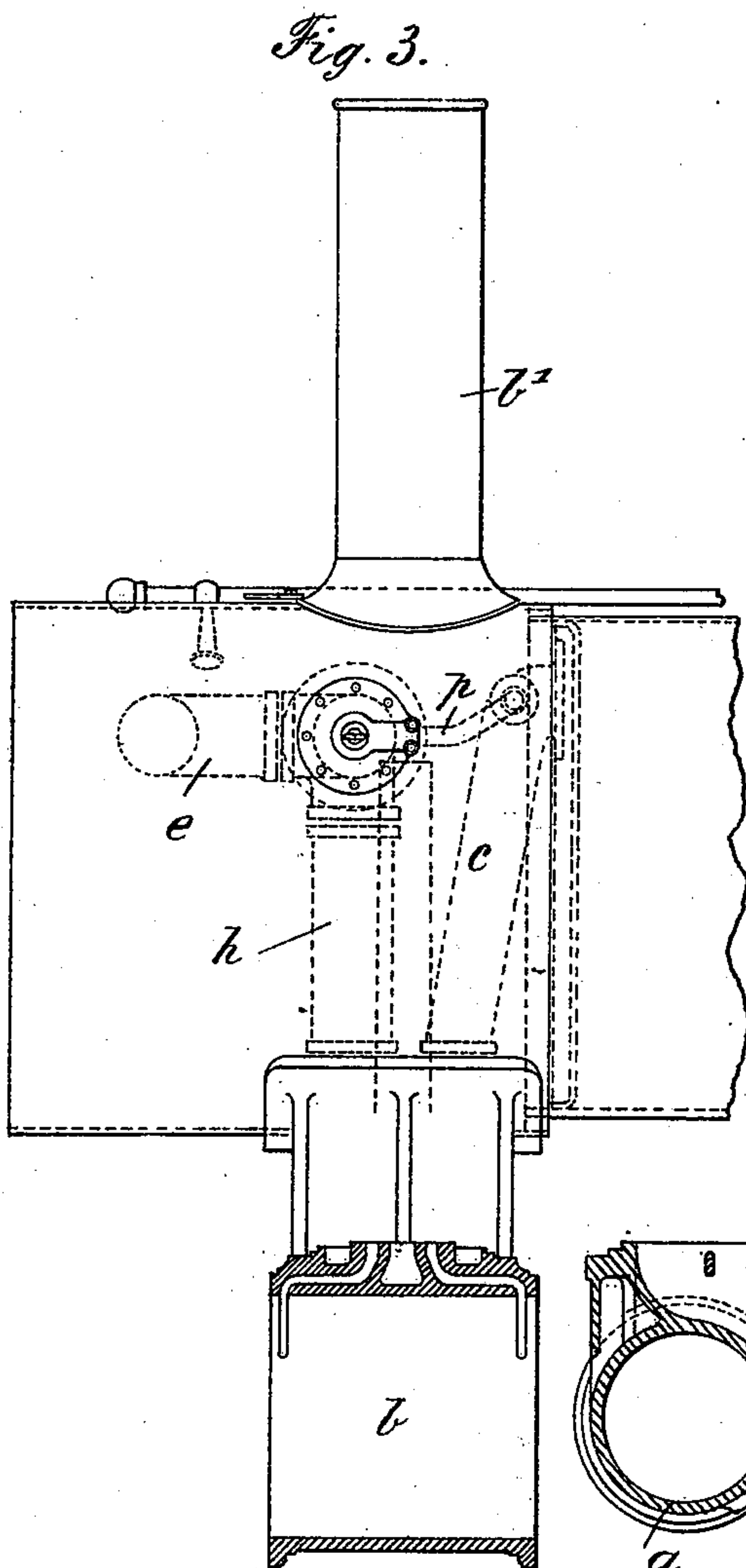
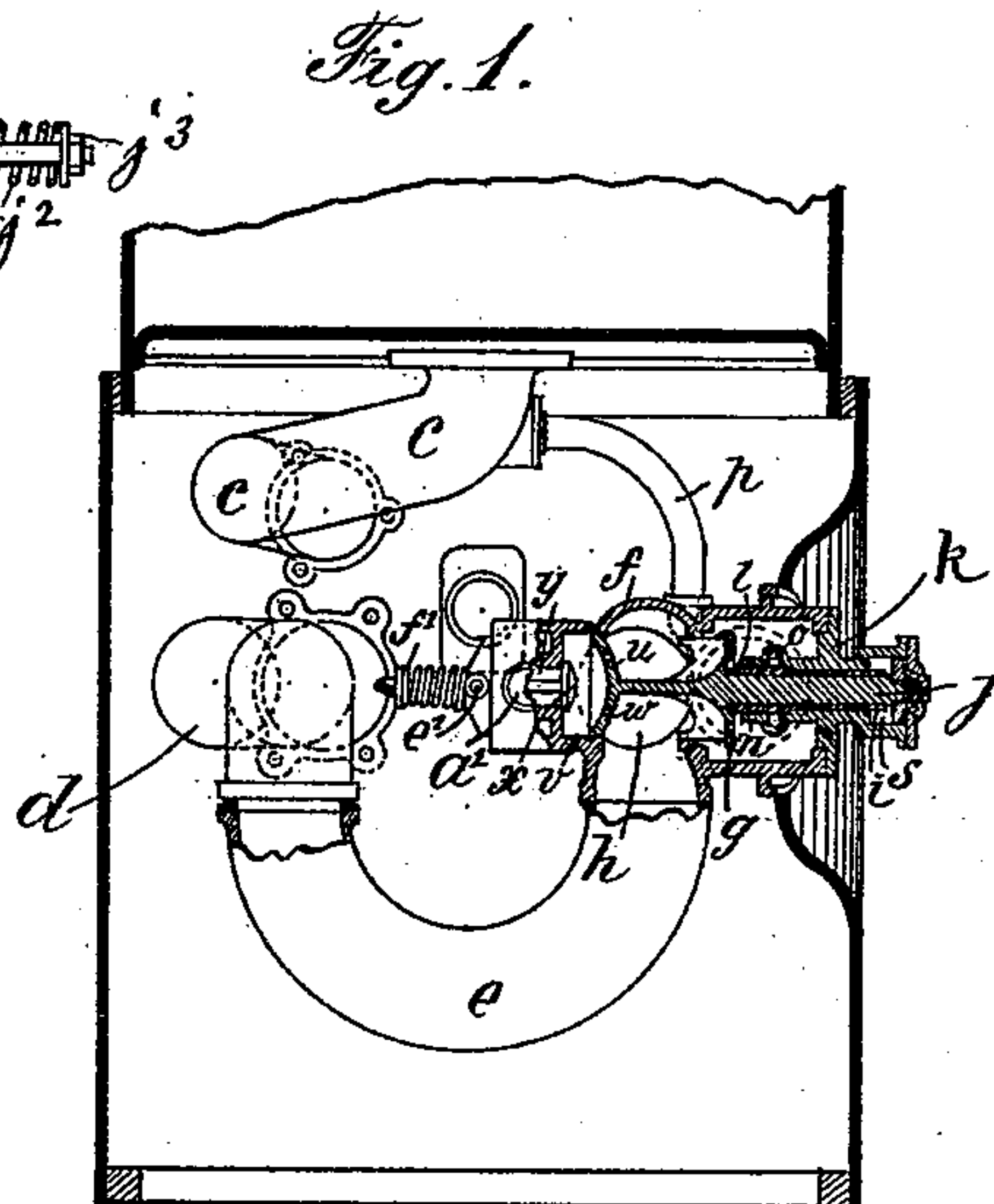
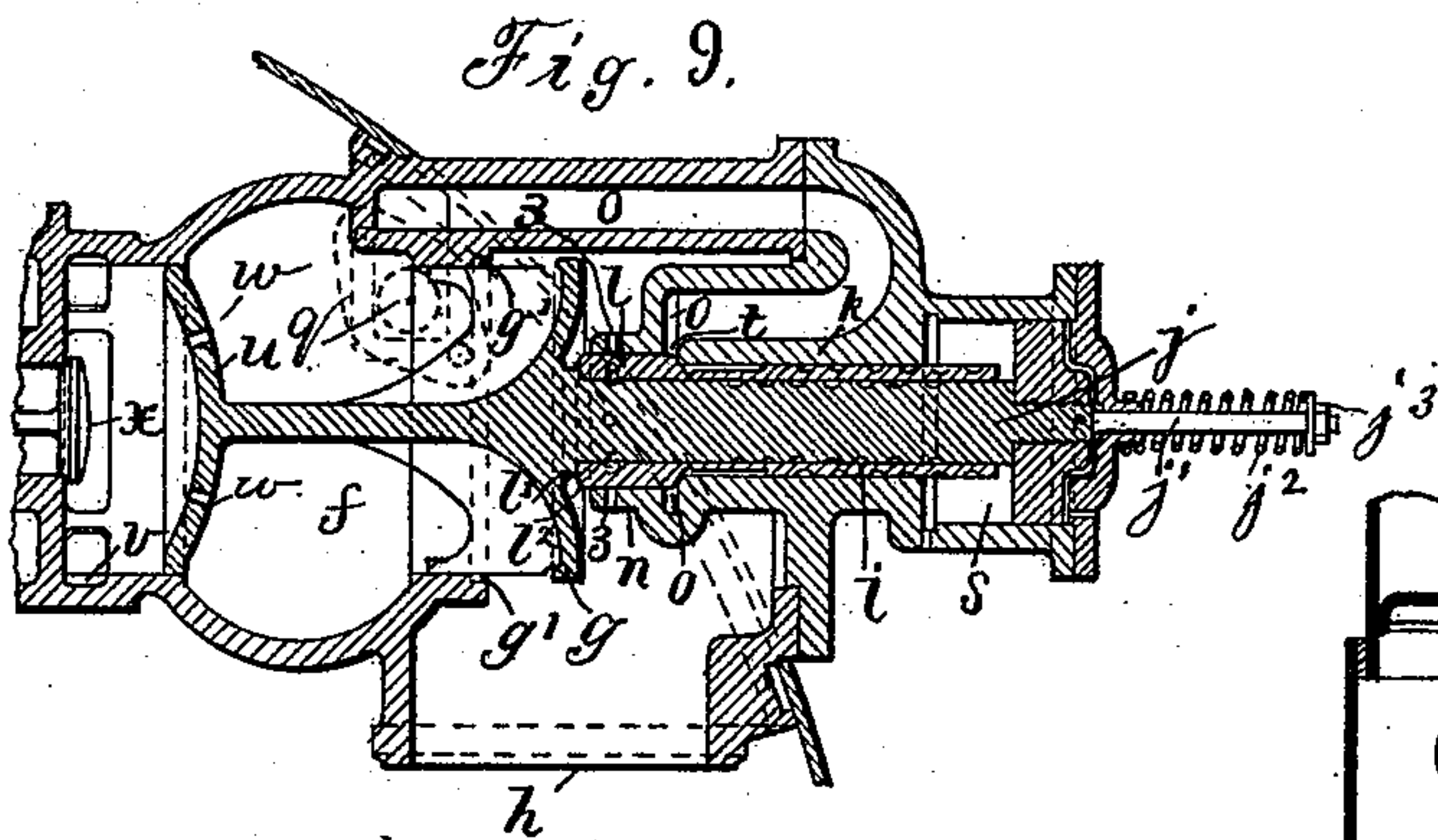
(No Model.)

2 Sheets—Sheet 1.

C. J. MELLIN.
COMPOUND LOCOMOTIVE.

No. 519,407.

Patented May 8, 1894.



WITNESSES:

Ernst Lundgren

Chas. Morgan

INVENTOR:

Carl J. Mellin
By A. P. Thayer
att'y

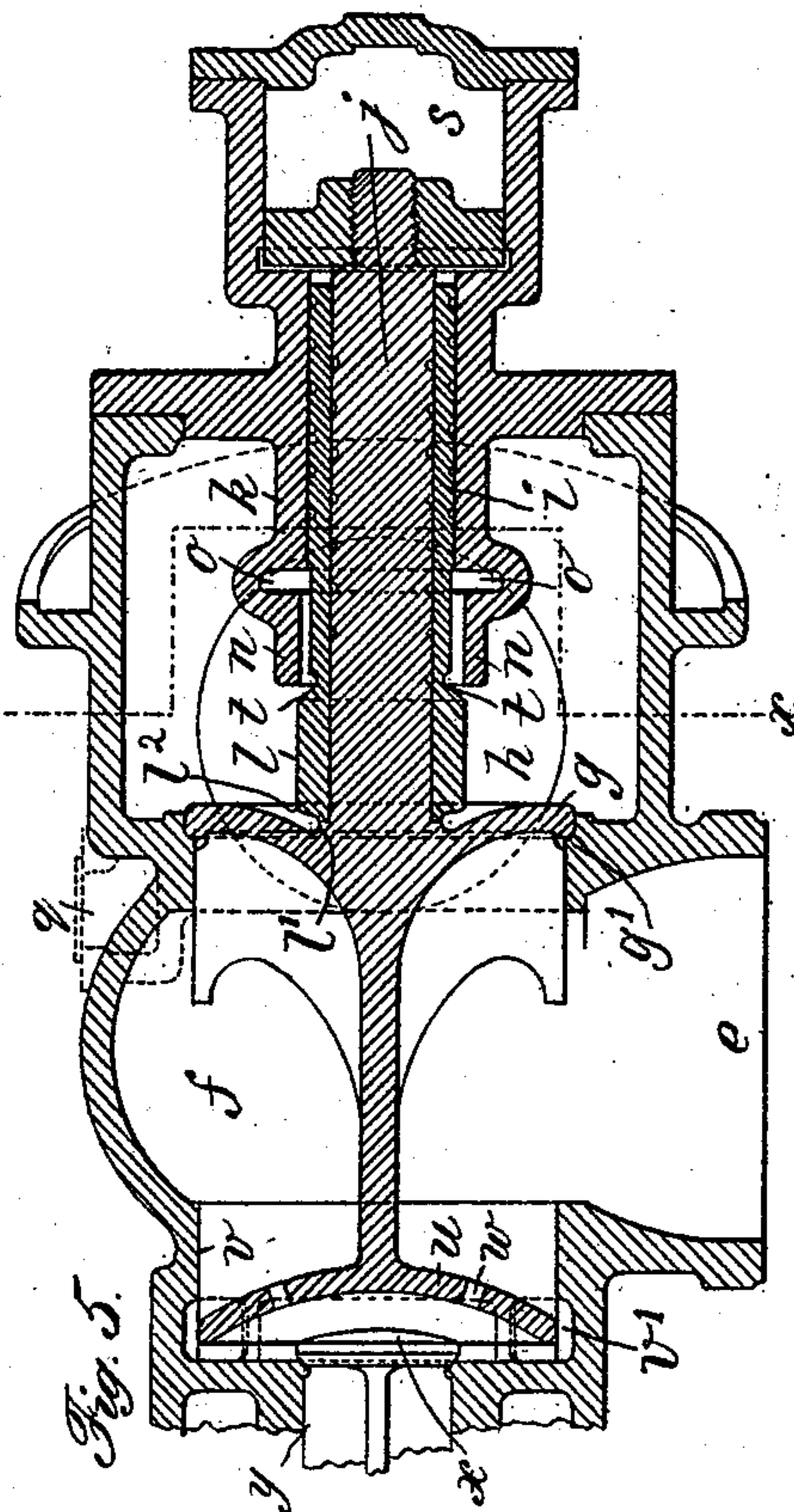
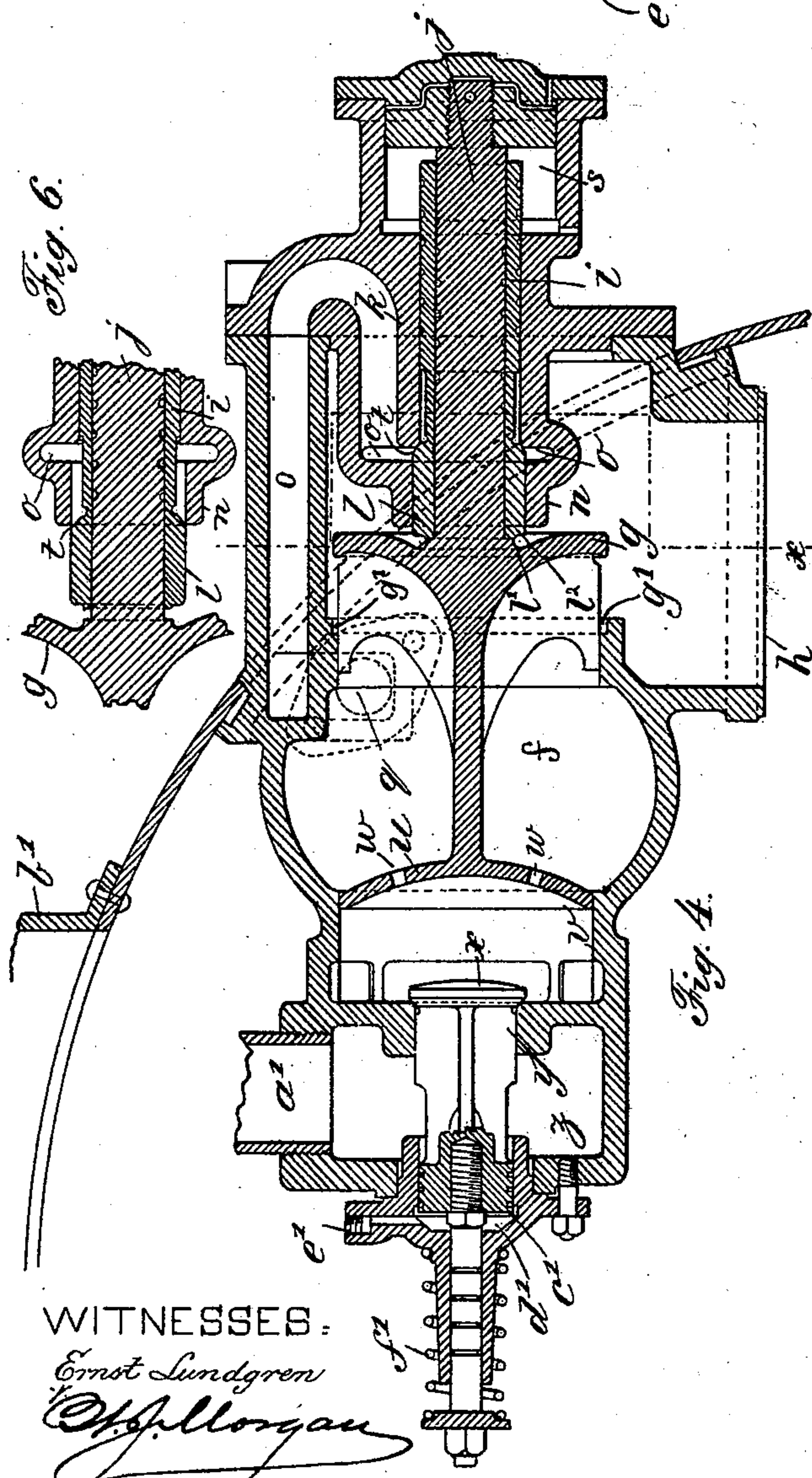
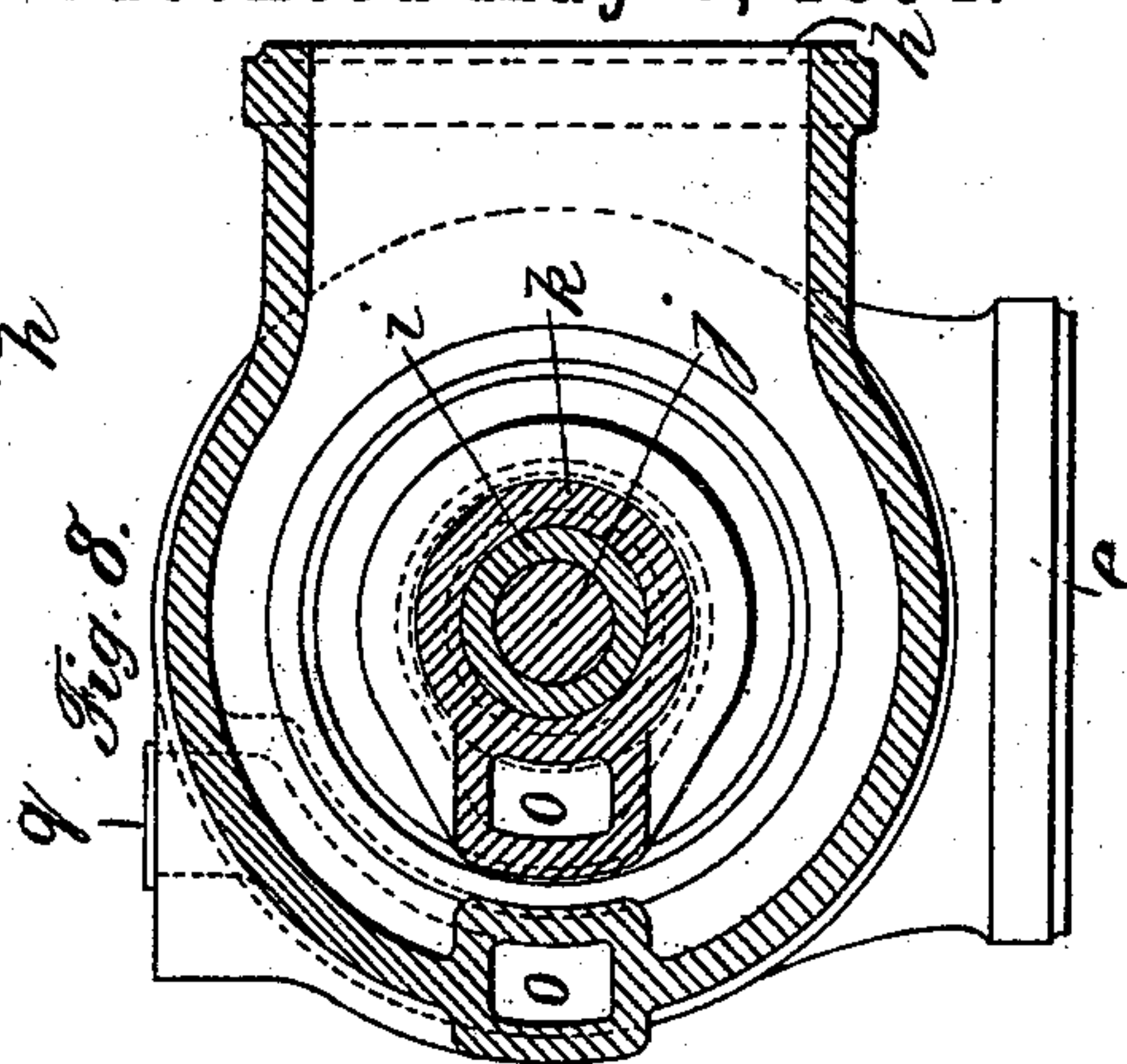
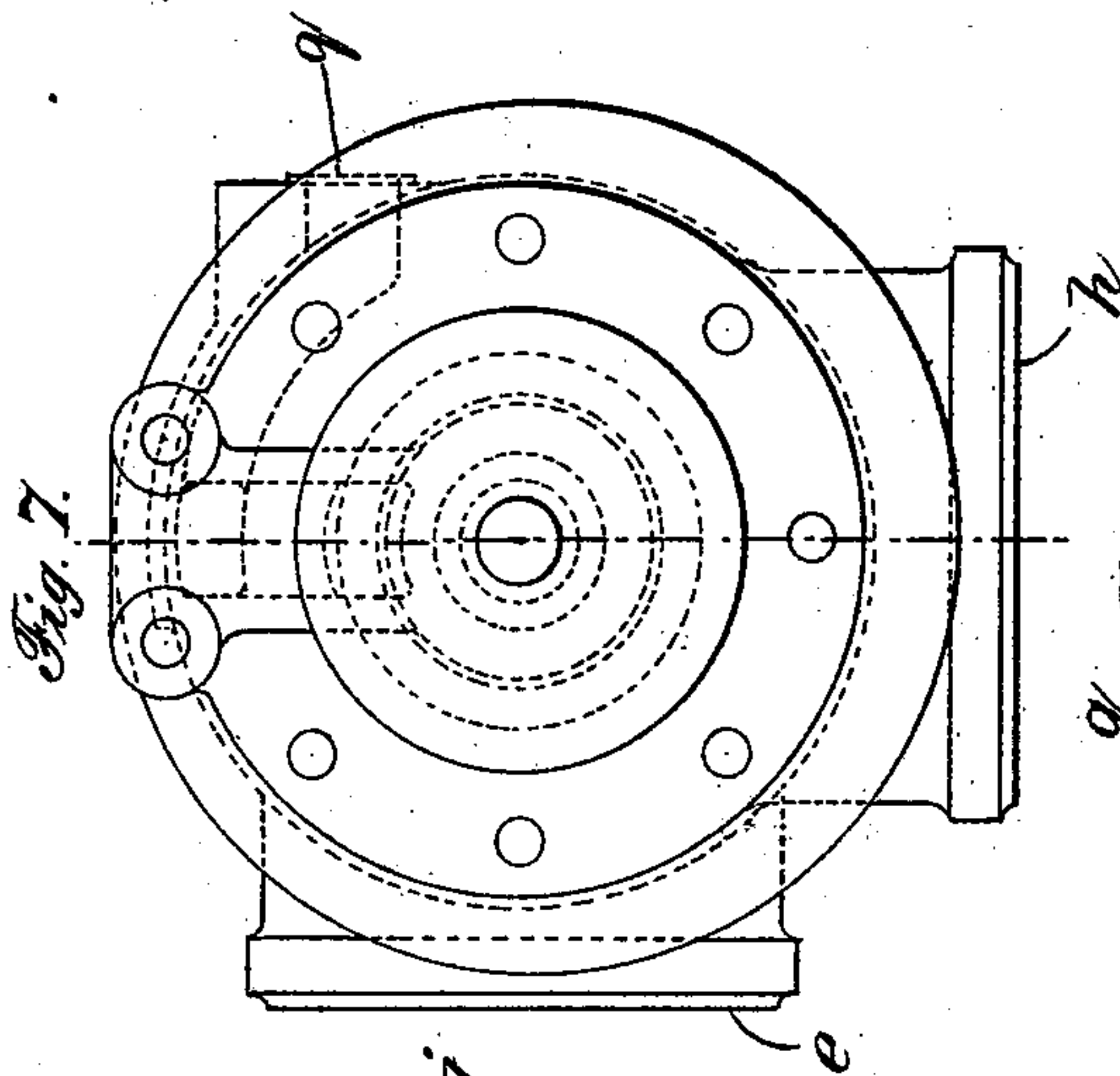
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2 Sheets—Sheet 2.

C. J. MELLIN.
COMPOUND LOCOMOTIVE.

No. 519,407.

Patented May 8, 1894.



WITNESSES:

Ernst Lundgren
O. J. Morgan

INVENTOR.

Carl J. Mellin.
By A. P. Thayer.
att'y.

UNITED STATES PATENT OFFICE.

CARL J. MELLIN, OF RICHMOND, VIRGINIA, ASSIGNOR TO THE RICHMOND LOCOMOTIVE AND MACHINE WORKS, OF SAME PLACE.

COMPOUND LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 519,407, dated May 8, 1894.

Application filed November 21, 1892. Serial No. 452,748. (No model.)

To all whom it may concern:

Be it known that I, CARL J. MELLIN, a citizen of the United States, residing at Richmond, Virginia, have invented a new and useful Improvement in Compound Engines, of which the following is a specification.

My invention consists in improvements in intercepting valves for temporarily working high steam direct in both cylinders of a compound engine at starting, whereby the valve will be automatically operated for changing from one to the other of either conditions and pressure will be limited in the low pressure cylinder for safety, and equal effect with the high pressure cylinder, and it also consists in an improved emergency valve attachment whereby the direct action of high steam in the low pressure cylinder may be continued longer at starting when desired, and the change from compound to direct action may be readily effected while working, as may often be required on steep grades all as hereinafter fully described reference being made to the accompanying drawings, in which—

Figure 1, is a horizontal section of a front end portion of a locomotive boiler and the smoke box, with my improved intercepting and emergency valves arranged as I propose to apply them, said valves being also in horizontal section or partly so, on line *yy*, Fig. 2. Fig. 2, is a front end elevation of the smoke box, cylinders, and steam pipes, said cylinders and pipes being partly in section. Fig. 3, is a side elevation of the smoke box and part of the boiler, and longitudinal section of one of the steam cylinders, the steam pipes being indicated in dotted lines. Fig. 4, is a vertical longitudinal sectional elevation of the intercepting and emergency valves in the position when working compound, on a larger scale. Fig. 5, is a partial horizontal longitudinal section of the same in the position when working steam direct in both cylinders, also enlarged. Fig. 6, is a detail of the intercepting valve showing the position when cutting off the live steam from the low pressure cylinder also enlarged. Fig. 7, is an end elevation of Fig. 4, and Fig. 8, is a transverse section of the intercepting valve on line *xx* Figs. 4 and 5. Fig. 9, is a vertical longitudinal sectional elevation of the intercepting and emergency

valves similar to Fig. 4, but with modifications of some of the parts.

a, represents the high pressure cylinder and *b*, the low pressure cylinder. Steam enters cylinder *a*, through the steam pipe *c*, in the usual way; it exhausts therefrom into pipe *d* and receiver *e*. Receiver *e* discharges into valve case *f* containing the intercepting valve *g* from which, when said intercepting valve is open, the steam passes through pipe *h* into the low pressure cylinder *b*, this being the usual condition in which the compound action goes on. The intercepting valve *g* has a sleeve *i*, on its stem *j*, that works steam tight in the cylinder *k*, and has a larger piston head *l* also working steam tight in the larger cylinder *n*, the other end being open to the atmosphere. Live steam is admitted to cylinder *n* on shoulder *t* behind head *l*, through port *o*, and the small steam pipe *p*, connecting with port *o* at *q*, said pipe being a branch of the main steam pipe *c*, and always open to the steam when the throttle valve is open. The intercepting valve remains in the normal position for compound action when the engine stops (see Fig. 4), then when the throttle is opened for starting again steam entering through port *o*, and acting on shoulder *t*, closes valve *g* by forcing piston head *l*, against shoulder *l'* on the stem *j* of said valve *g*, said valve *g* entering its recessed seat *g'* and closing communication between pipe *h* and chamber *f* before shoulder *t* issues from cylinder *n*, and admits the live steam, so as to prevent the live steam from escaping past valve *g* and to cause it to take effect on the low pressure cylinder, both cylinders then work together with live steam for starting, the sleeve *i* acting as a reducing valve to prevent excessive pressure in the low pressure cylinder but admitting sufficient for developing about the same power in cylinder *b* as in *a*, during the first turn or turn and a half of the driving wheels.

In Fig. 9 I represent the cylinder *n* provided with ports 3, to be opened by shoulder *t* to admit the live steam into the low pressure cylinder so that said shoulder does not move out at the end of cylinder as in Figs. 4, 5 and 6, said cylinder *n* being made a little longer, which is an arrangement that may be preferred in some cases.

The end l^2 of piston head l , opposed to shoulder t has greater area for steam pressure than shoulder t , so that in case pressure might rise too high in the low pressure cylinder through unusual delay of starting, piston head l of sleeve i , being movable relatively to stem j , will be forced back into the cylinder n , independently of the movement of valve g , by overbalancing pressure on said head and the live steam will be shut off.

When the receiver fills with exhaust steam from the high pressure cylinder, and pressure of live steam fails in the low pressure cylinder on account of the reducing effect of the sleeve, and as the speed of the piston increases the power of the accumulated exhaust steam in the receiver overcomes the power of the live steam and opens the intercepting valve, and at the same time shuts off the live steam by piston head l closing cylinder n , this action taking place very soon after the starting of the engine—from a half to one and a half revolutions—high pressure in the low pressure cylinder then being no longer needed for starting.

The intercepting valve is provided with a pneumatic dash pot s , to prevent shocks; the sleeve i extends through its cylinder k , into this dash pot and is therein open to the atmosphere as before stated.

In Fig. 9 I represent the stem j of the intercepting valve as having an extension j' through the cap of the dash pot with a coiled spring j^2 on it, the tension of which can be adjusted by a nut j^3 , to regulate the opening of said valve by any given pressure in the receiver of the exhaust steam from the high pressure cylinder.

The emergency valve is represented at x , it is applied to an escape passage y through one side of the intercepting valve case f which passage communicates with chamber z , from which a nozzle a' discharges upward into the smoke pipe b' . Although a lever connected directly to the stem of the valve may be used to operate it, in this example I represent the valve with a steam piston c behind which in the cylinder d' steam is to be admitted through a pipe e' at the will of the engineer to open valve x and allow the steam from the high pressure cylinder to exhaust through said valve, and thus to prolong the action of live steam in the low pressure cylinder at starting, when desired, and also to enable high steam to be substituted in the low pressure cylinder at any time when under way, and to be used as long as desired, valve g , being closed by the live steam when valve x is opened, and the action of the live steam being continued as long as the emergency valve is kept open by the engineer keeping the valve open that admits steam to cylinder d' behind piston c' .

The valve g has a piston u working in a cylinder v at the opposite side of chamber f and intermediate to said chamber and the emergency valve, the purpose of which is to

insure quick closing of said valve g , when the emergency valve is opened, at which time said piston standing in the position represented in Fig. 6, with the pressure of exhaust steam equalized on it through the small holes w , will, when relieved of pressure on the side next to and by the opening of the valve x be instantly shifted back by the pressure of the exhaust steam on the other side, the volume of which is such that the pressure is not materially affected by the holes w . At the end of this movement said piston comes to rest over the annular enlargement v' of the cylinder v , through which the exhausting steam escapes past the piston. It will be seen that with this piston u attached to valve g its closing action will be prompt and positive, and the pressure on it being equalized through holes w , when the emergency valve is closed, it does not oppose the automatic opening of valve g , for resumption of compound action when the pressure of exhaust steam accumulates in chamber f . When the engineer shuts the steam off and it exhausts from behind said piston c' the emergency valve closes automatically by the pressure of the steam in case f on it, and by a spring f' and compound action is at once resumed. It will be seen that in this arrangement the intercepting valve works automatically, and there can be no communication between the low pressure side of the receiver and the emergency valve exhaust, or between the low pressure side when there is live steam, and that of the high pressure side of the receiver, consequently there is no drop of pressure in changing the engine under way as the intercepting valve acts independently of the emergency valve, when this is not operated, but obeys it promptly and automatically when operated and changes the engine at will, from either condition to the other as may be required at any time during the run.

Owing to the independence of the intercepting valve it does not call for any additional attention of the engineer than that of an ordinary engine except in emergency.

It will be seen that the safety or pressure regulating device consisting of the reducing valve contrivance of sleeve i is very simple in construction and is well adapted for efficient and durable service, and with the emergency valve it affords simple and practicable means of converting the machine into a single acting engine in case of one side breaking down as the arrangement is such that either cylinder can be worked alone by simply disconnecting the slide valve on the disabled side and placing it in its central position, and then opening the emergency valve, the high pressure cylinder will then exhaust through the emergency valve independently of the low pressure cylinder, and the latter will receive steam directly through pipe p independently of the high pressure cylinder.

I claim—

1. In a compound locomotive the combina-

tion with the intercepting valve in the steam receiver between the high and low pressure cylinders, of the device for closing said valve by the live steam pressure, consisting of the piston and reducing sleeve fitted on the stem of said valve and within the surrounding cylinder therefor said sleeve being movable on the stem independently of the intercepting valve substantially as described.

2. In a compound locomotive, the combination with the intercepting valve in the steam receiver between the high and low pressure cylinders, of the device for closing said valve by the live steam pressure, consisting of the piston and reducing sleeve fitted on the stem of said valve and within the surrounding cylinder therefor having the larger and the smaller bores, said piston and sleeve made with the shoulder for receiving the live steam, and the sleeve extended in the smaller bore past the steam port and being movable independently of the intercepting valve substantially as described.

3. In a compound locomotive the combination with the intercepting valve in the steam receiver between the high and low pressure cylinders, of the piston, steam reducing sleeve, and the live steam branch pipe communicating therewith, and adapted to close said intercepting valve when the receiver is exhausted, and admit live steam from said branch to the low pressure cylinder in limited amount, said piston being movable independently of the intercepting valve and thereby adapted to be closed independently of the intercepting valve by overbalancing pressure of live steam, when above the predetermined limit in said low pressure cylinder substantially as described.

4. In a compound locomotive the combination with the intercepting valve in the steam receiver between the high and low pressure cylinders, of the device for closing said valve by the live steam pressure consisting of the piston and reducing sleeve fitted on the stem of said valve and within the surrounding cylinder therefor having the larger and the smaller bores, said piston and sleeve made with the shoulder for receiving the live steam and the sleeve extended in the smaller bore past the steam port, and the stem of the intercepting valve extended through the case and provided with the adjusting nut and spring to regulate the opening of said valve according to pressure in the receiver substantially as described.

5. In a compound locomotive, the combination with the intercepting valve in the steam receiver between the high and low pressure cylinders, of the device for closing said valve by the live steam pressure consisting of the piston and reducing sleeve fitted on the stem of said valve and within the surrounding cylinder therefor, said piston being movable independently of the intercepting valve and thereby adapted to be closed independently of the intercepting valve by overbalancing

pressure of live steam when above the predetermined limit in said low pressure cylinder steam chest, substantially as described.

6. In a compound locomotive the combination with the intercepting valve in the steam receiver between the high and low pressure cylinders, of the device for closing said intercepting valve by the live steam, consisting of the piston, steam reducing sleeve, and the live steam branch pipe communicating therewith, and adapted to close said intercepting valve when the receiver is exhausted, and admit live steam from said branch to the low pressure cylinder, steam chest, said piston and reducing sleeve arranged axially with, and movable on the stem of the intercepting valve independently of said valve substantially as described.

7. In a compound locomotive the combination with the intercepting valve in the steam receiver between the high and low pressure cylinders, of the piston and live steam branch pipe communicating therewith and adapted to close said intercepting valve when the receiver is exhausted, and admit live steam from said branch to said low pressure cylinder, and be closed in turn by said intercepting valve, said intercepting valve and piston relatively adjusted to close communication through either one prior to the opening of communication through the other substantially as described.

8. In a compound engine the combination with the intercepting valve in the steam receiver between the high and low pressure cylinders, of the emergency valve, the exhaust passage of said valve and the piston connected with the intercepting valve intermediately of said valve and the emergency valve and subject to steam exhaust through the said emergency valve for positive effect in closing said intercepting valve, said emergency valve arranged independently of the intercepting valve, and adapted to open the high pressure side of the receiver to said exhaust at the will of the engineer substantially as described.

9. In a compound locomotive, the combination of the intercepting valve in the steam receiver between the high and low pressure cylinders, and adapted to be normally held open by the steam exhausting from the high pressure cylinder into the low pressure cylinder, the live steam piston and reducing sleeve normally open to the live steam and opposing but overbalanced by the pressure of exhaust steam on the intercepting valve, and the emergency valve subject to the control of the engineer substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 2d day of August, 1892.

CARL J. MELLIN.

Witnesses:

W. J. MORGAN,

GEORGE M. JAUVRIN.