

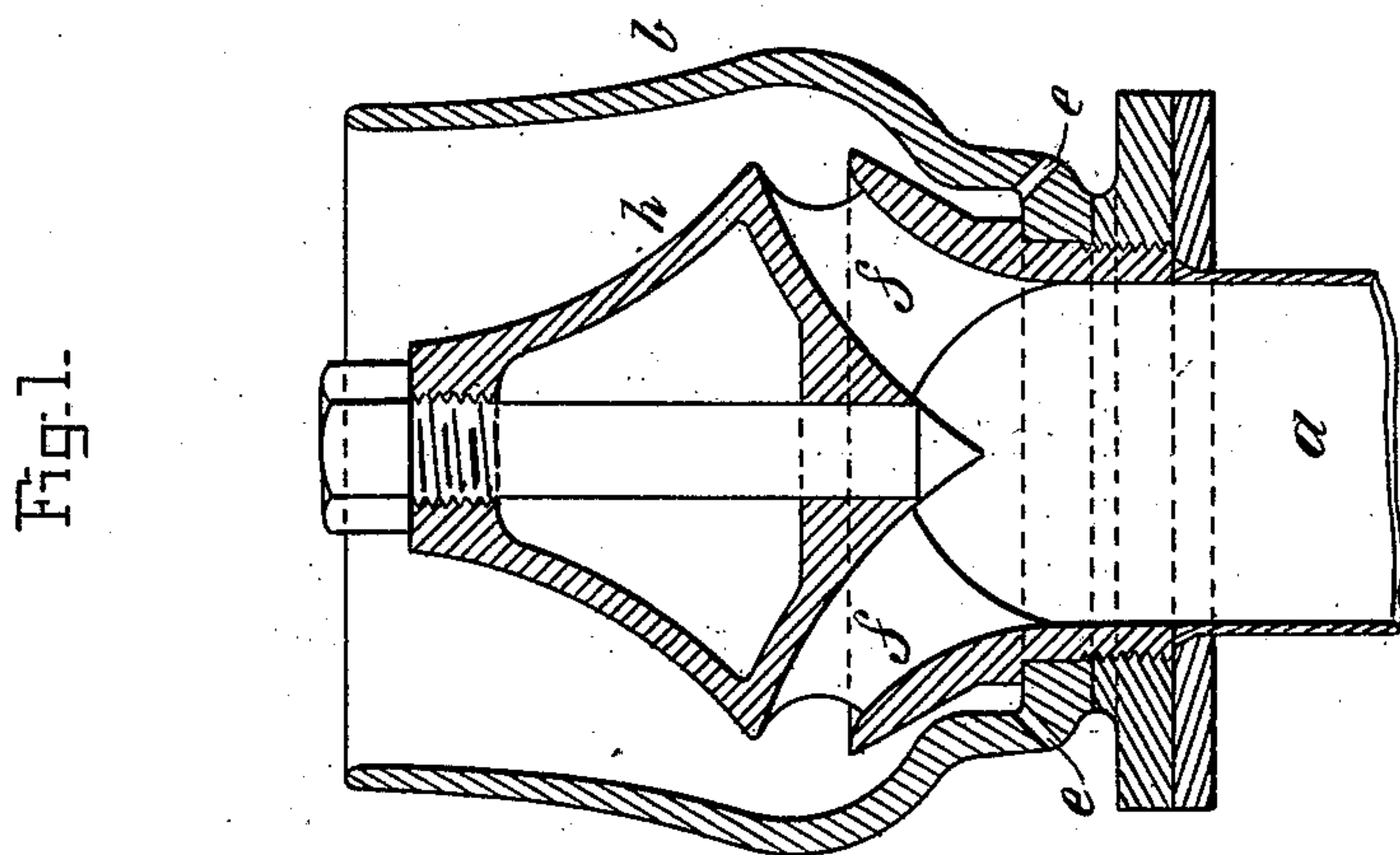
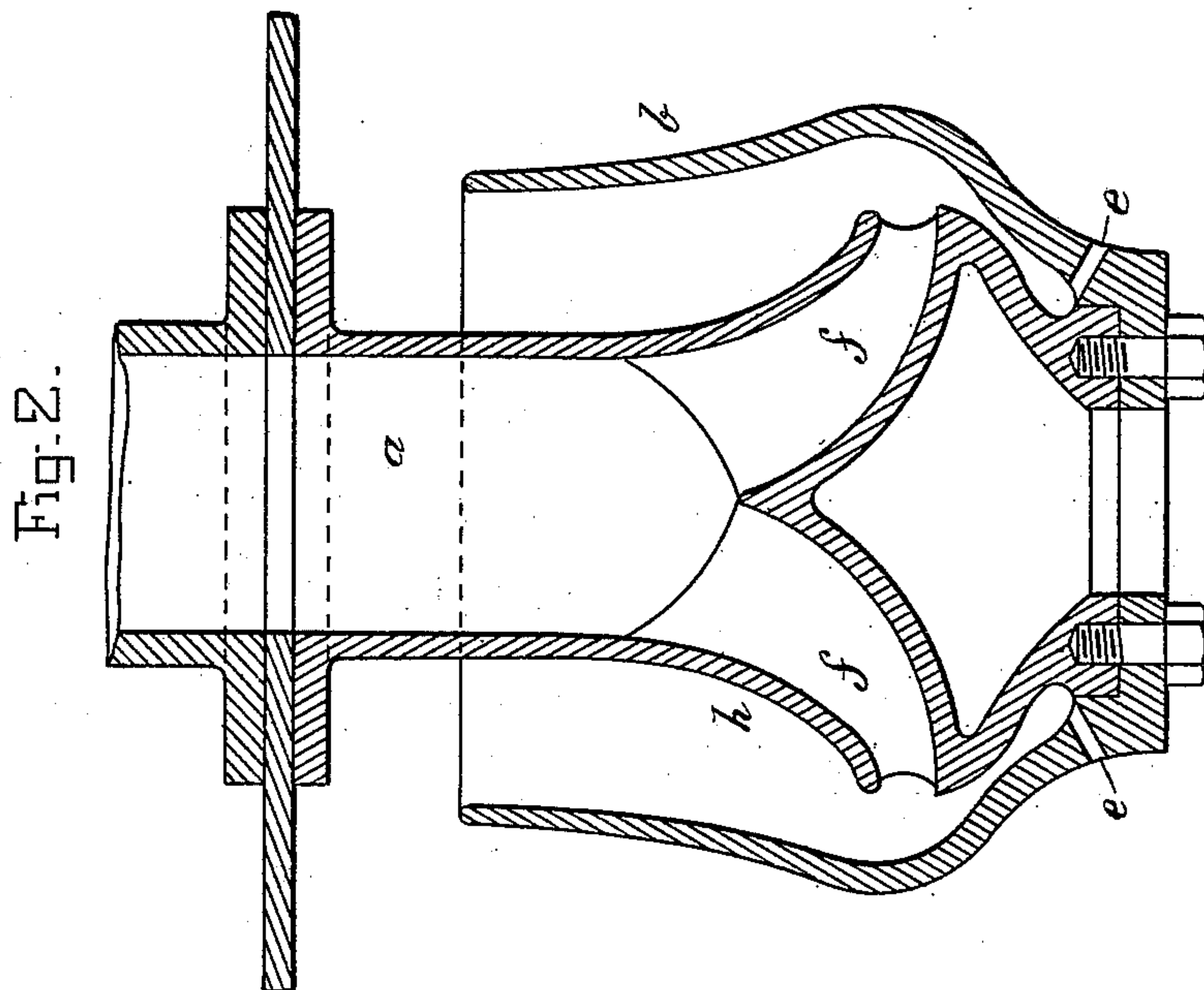
(No Model.)

8 Sheets—Sheet 1.

C. J. MELLIN.
STEAM SEPARATOR.

No. 424,013.

Patented Mar. 25, 1890.



Witnesses

W. J. Morgan
Const. Mch. Engineer

Inventor

Carl J. Mellin

By his Attorney *A. O. Thayer*

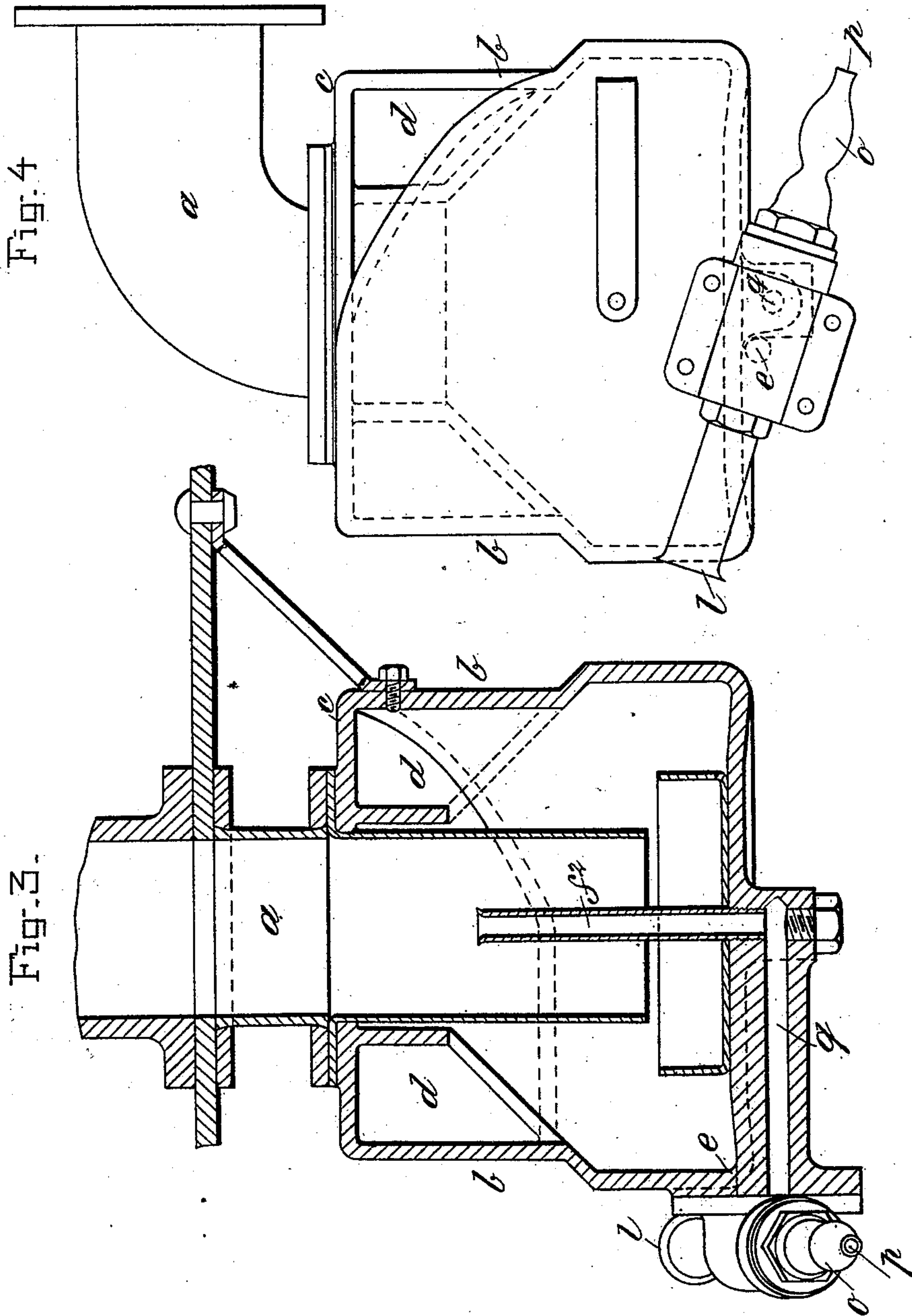
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C. J. MELLIN.
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No. 424,013.
Fig. 6.

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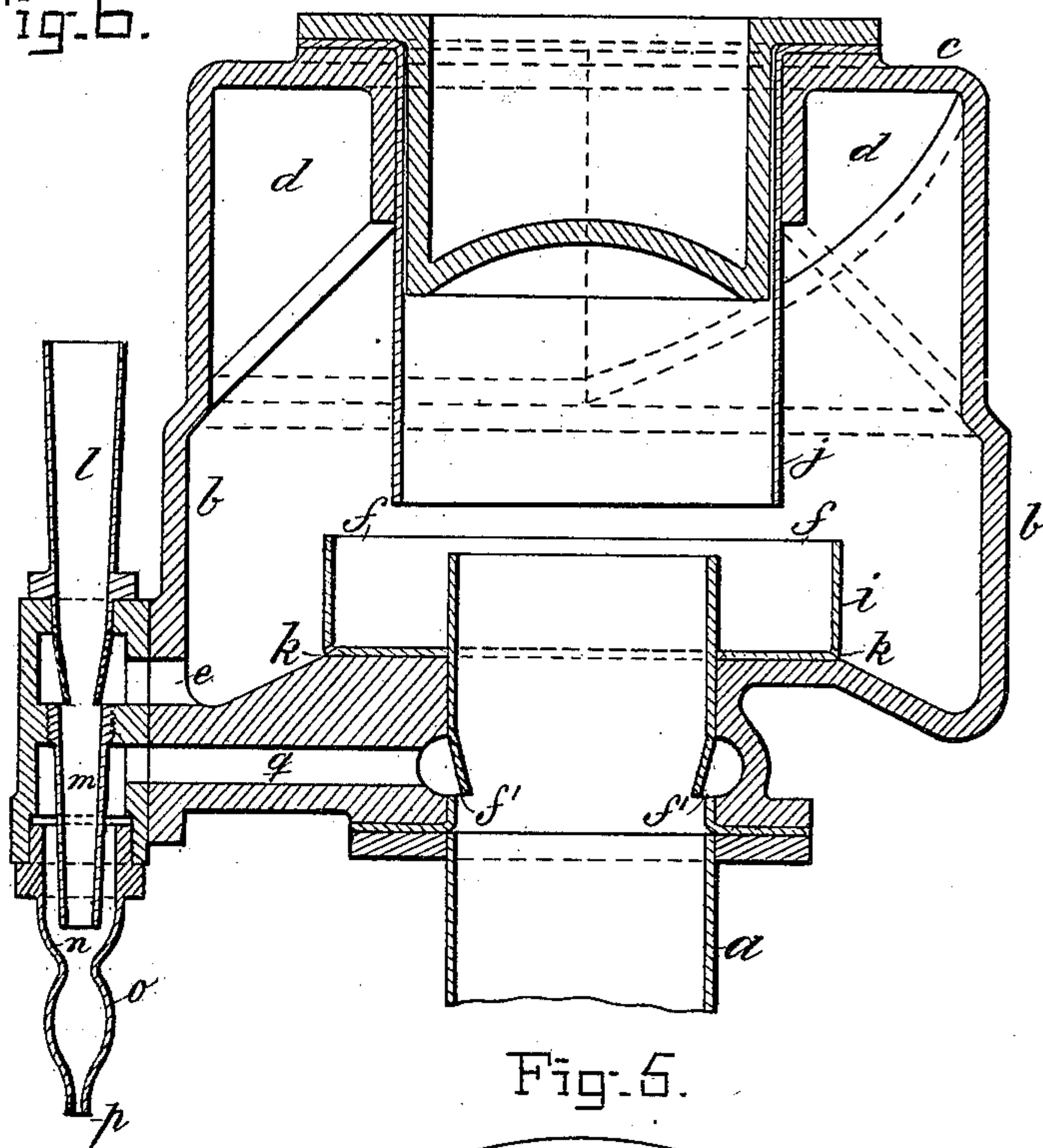
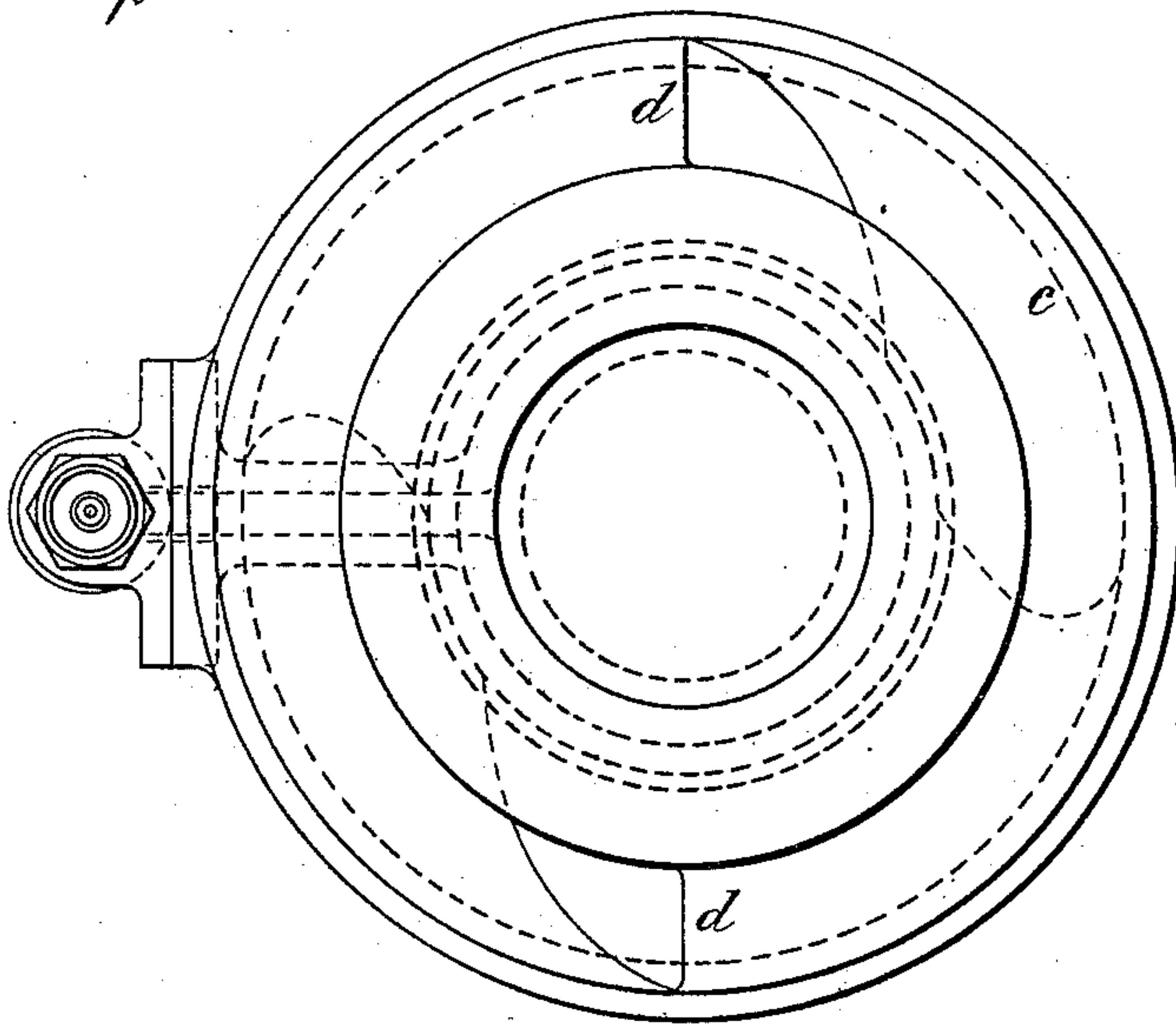


Fig. 6.



Witnesses

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Fig. 8.

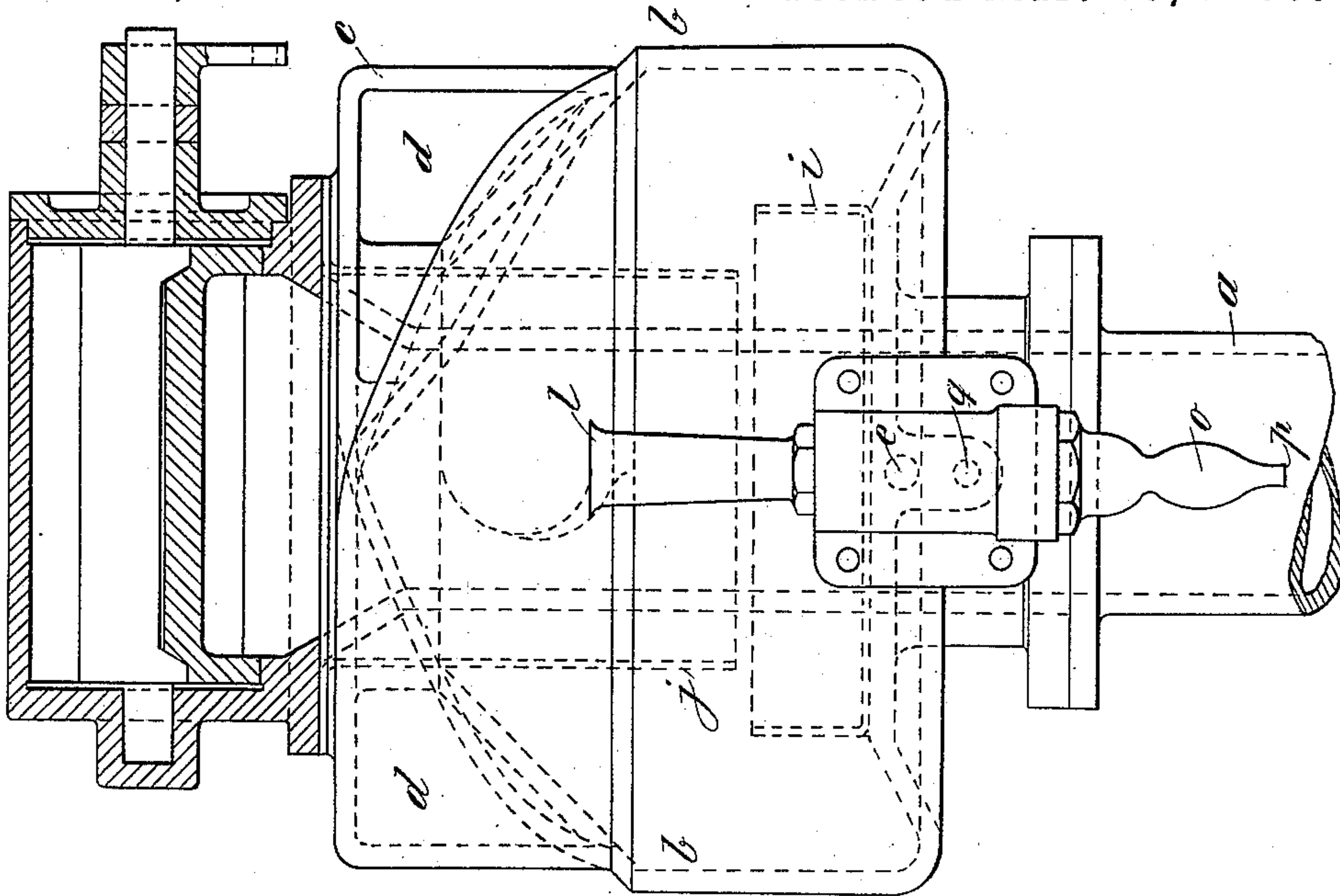
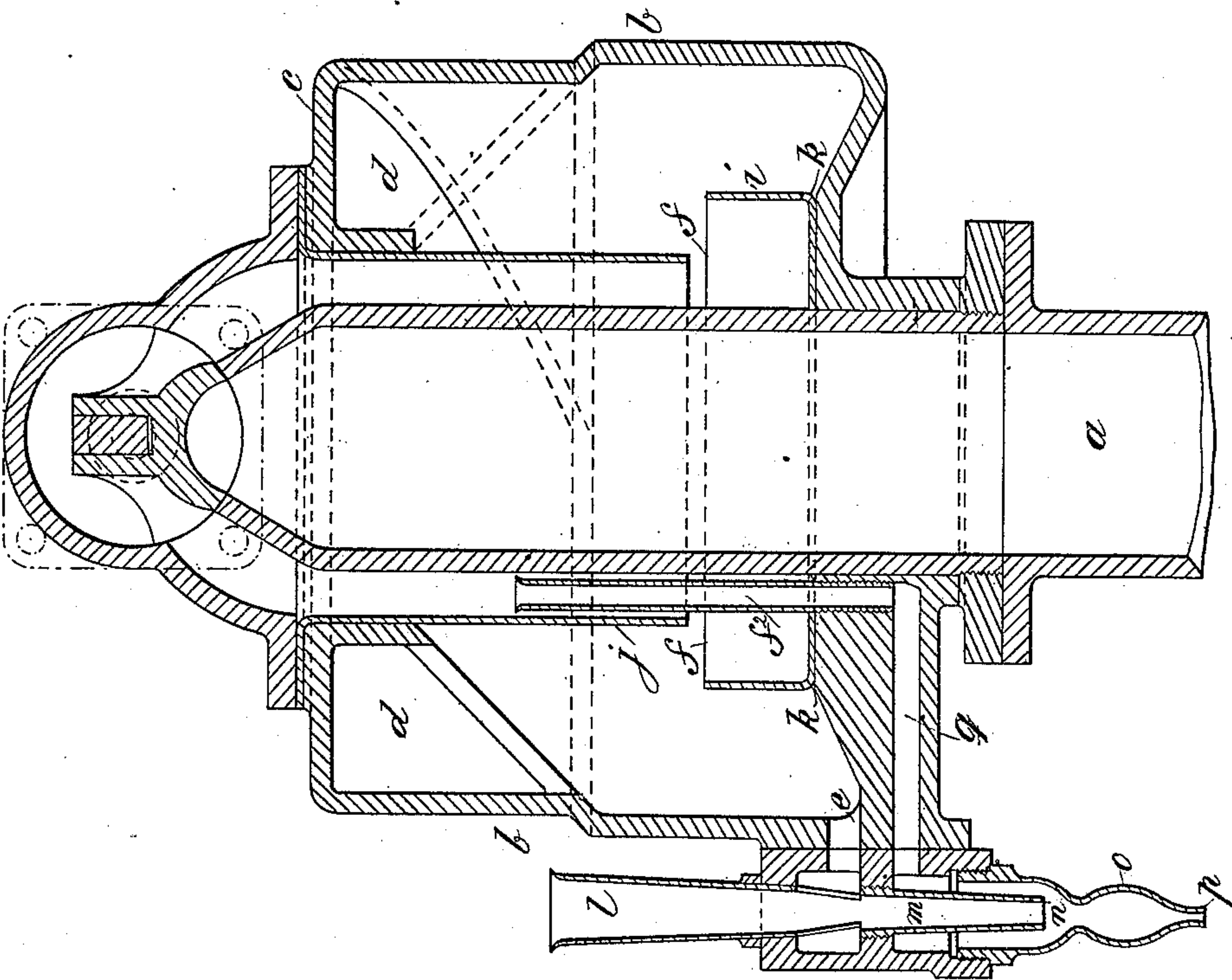


Fig. 7.



Witnesses

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(No Model.)

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Fig. 10.

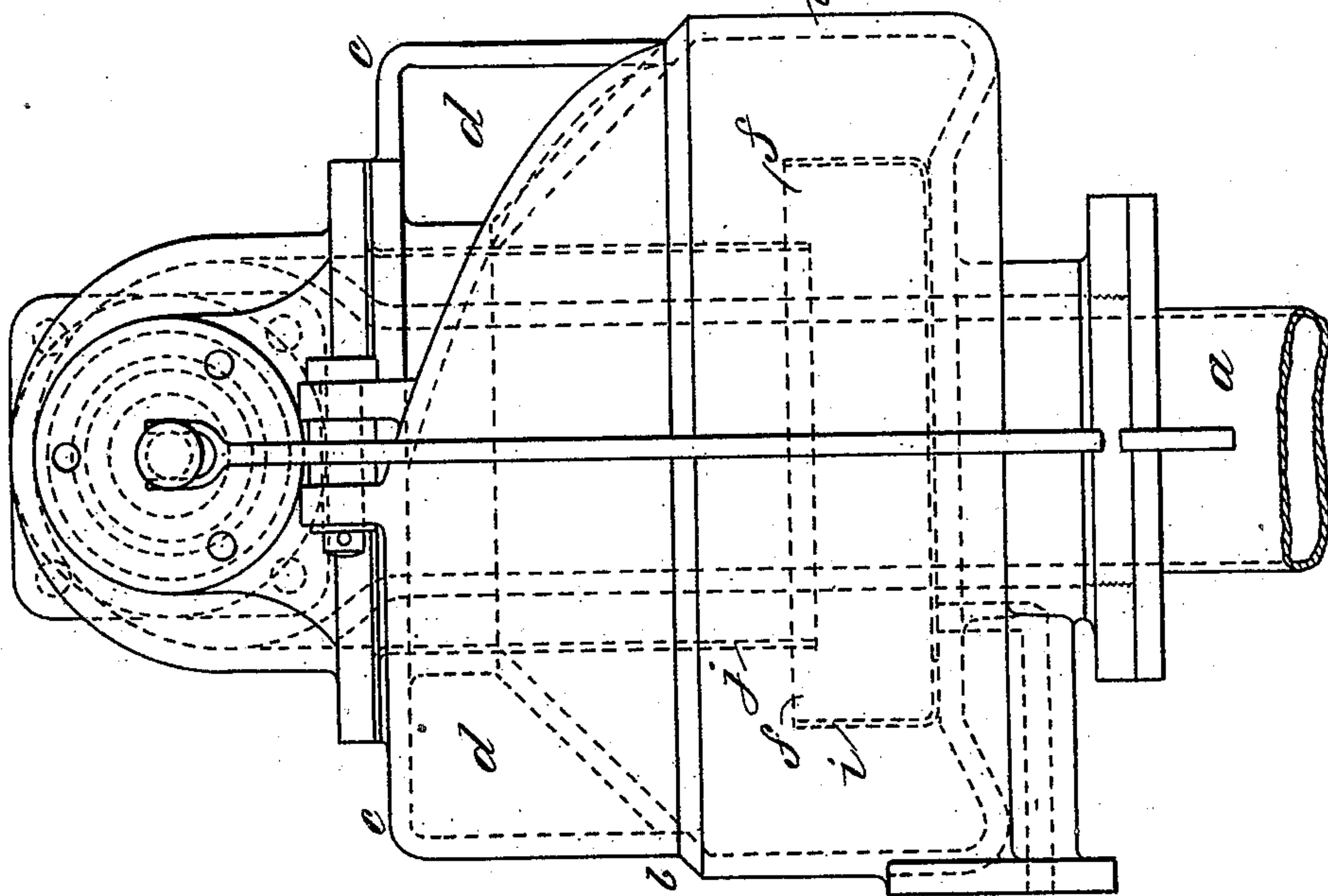
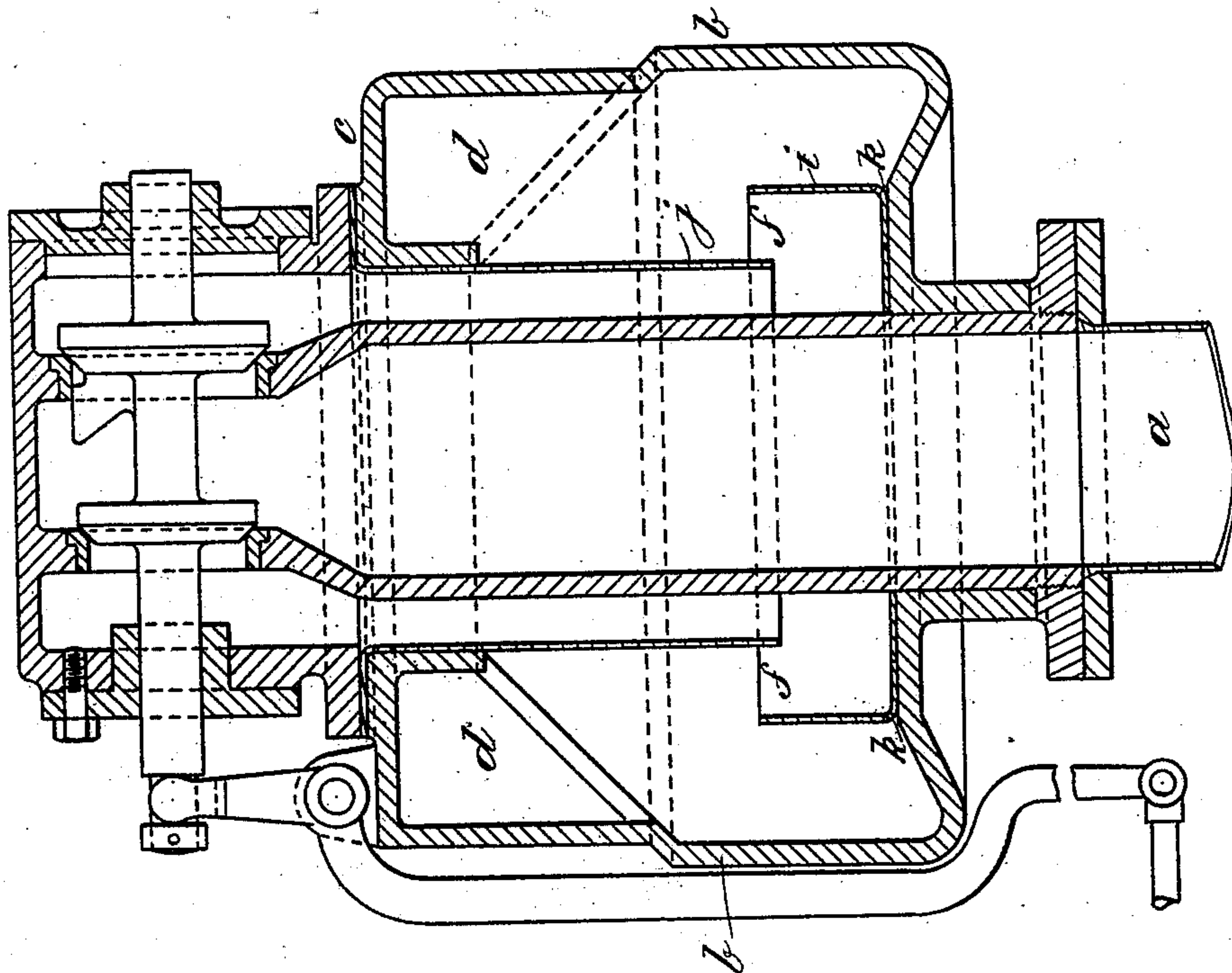


Fig. 9.



Witnesses

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(No Model.)

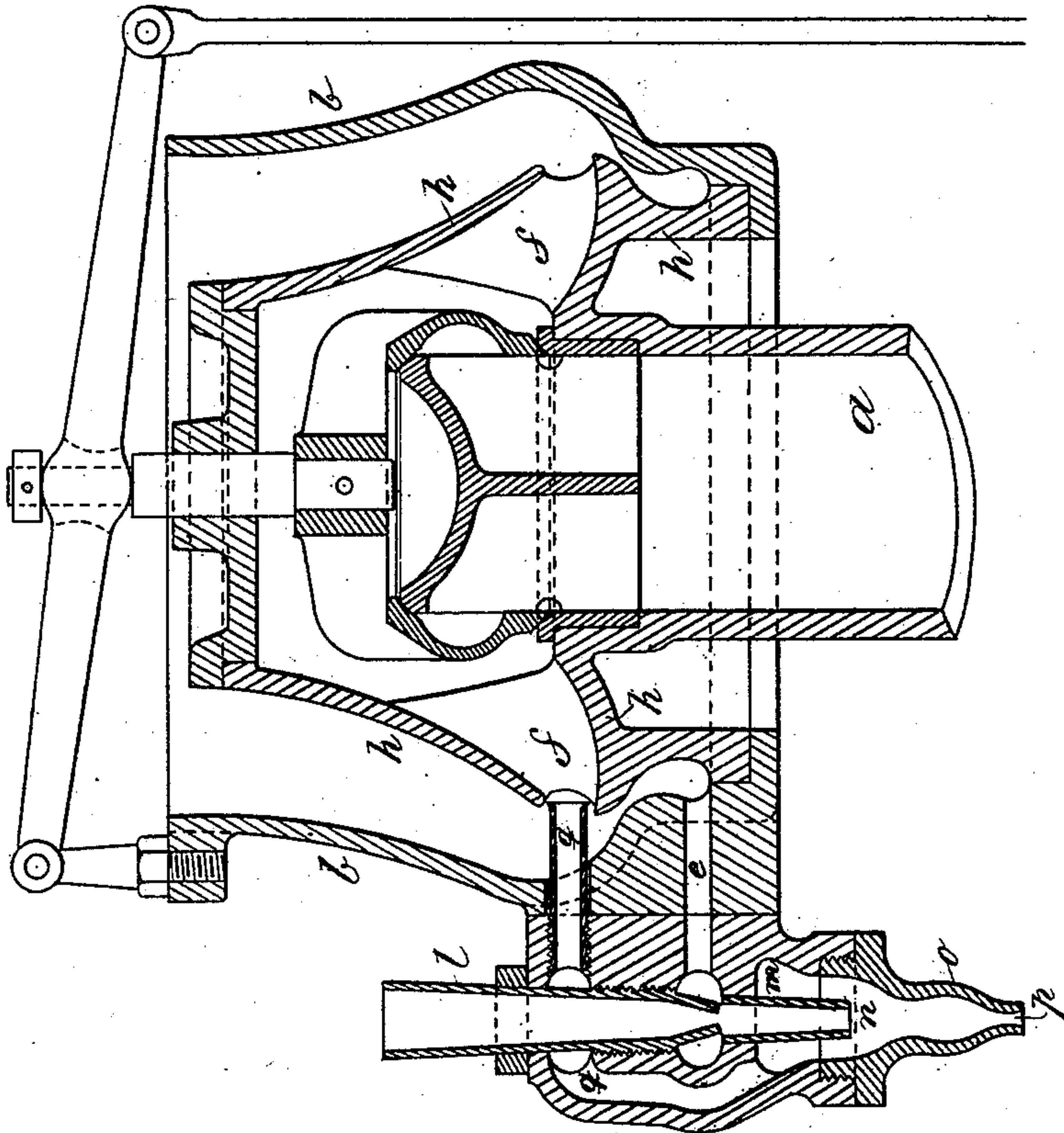
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C. J. MELLIN.
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Fig. 11.



Witnesses

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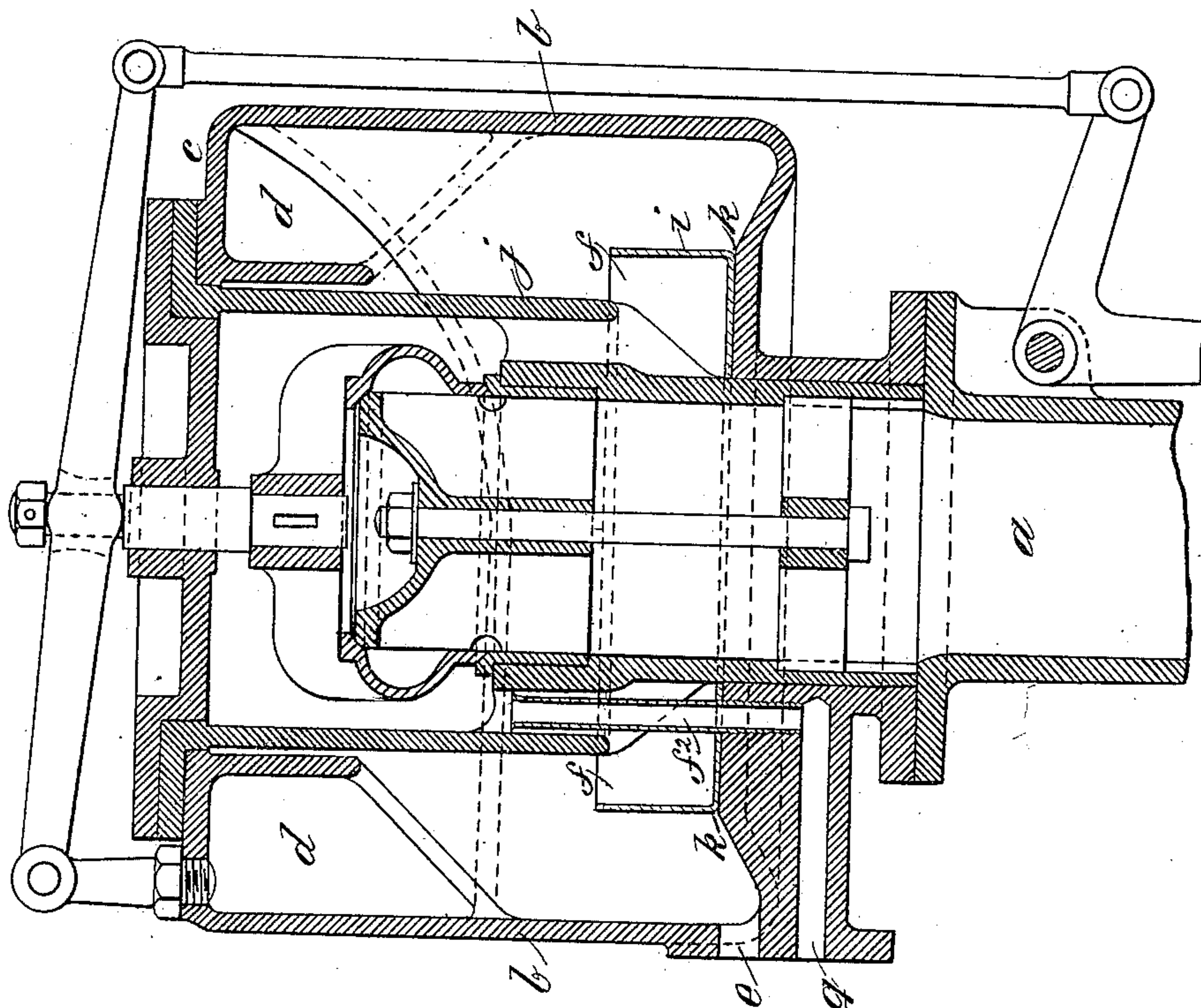
C. J. MELLIN.
STEAM SEPARATOR.

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No. 424,013.

Patented Mar. 25, 1890.

Fig. 12.



Witnesses

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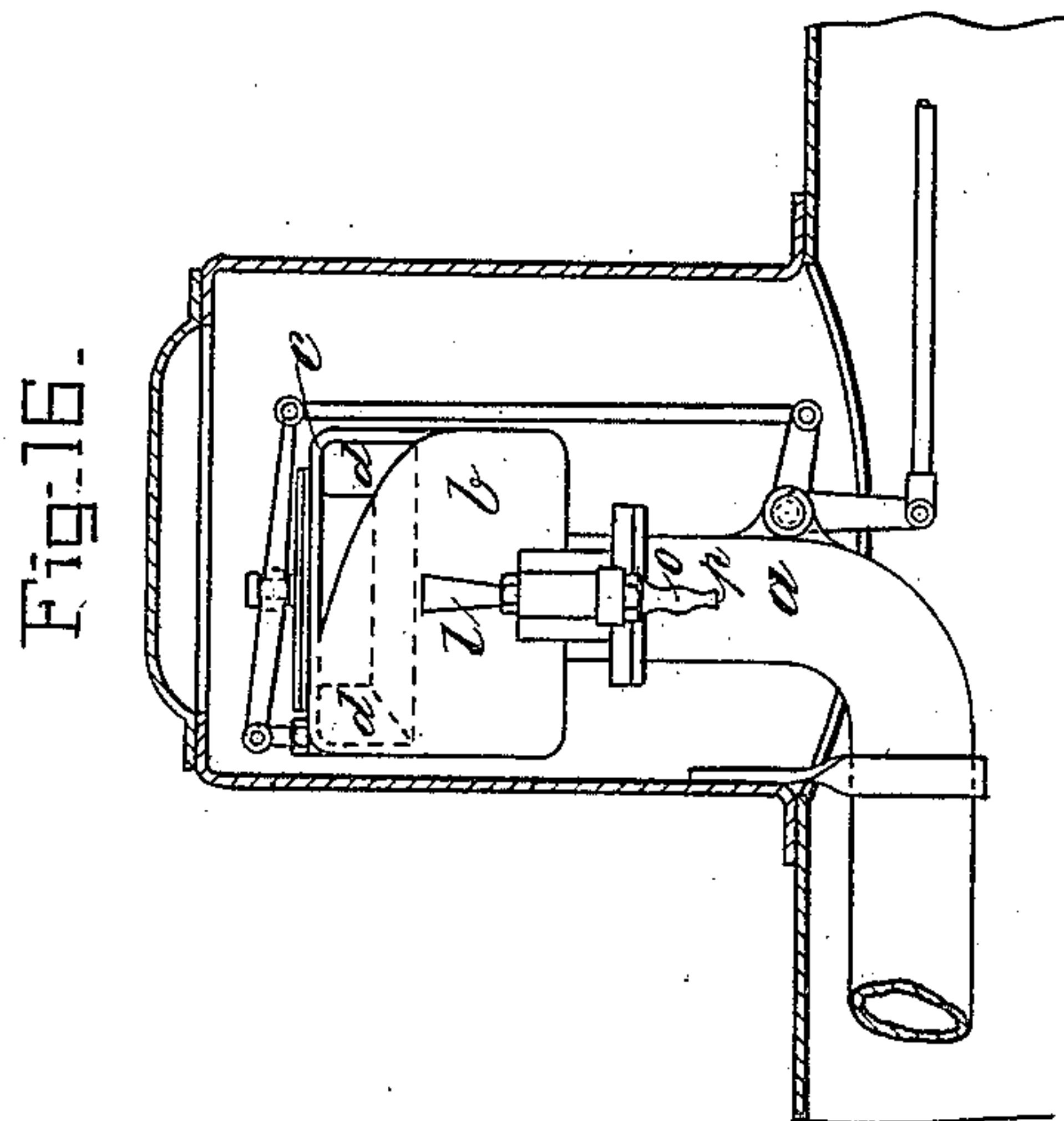
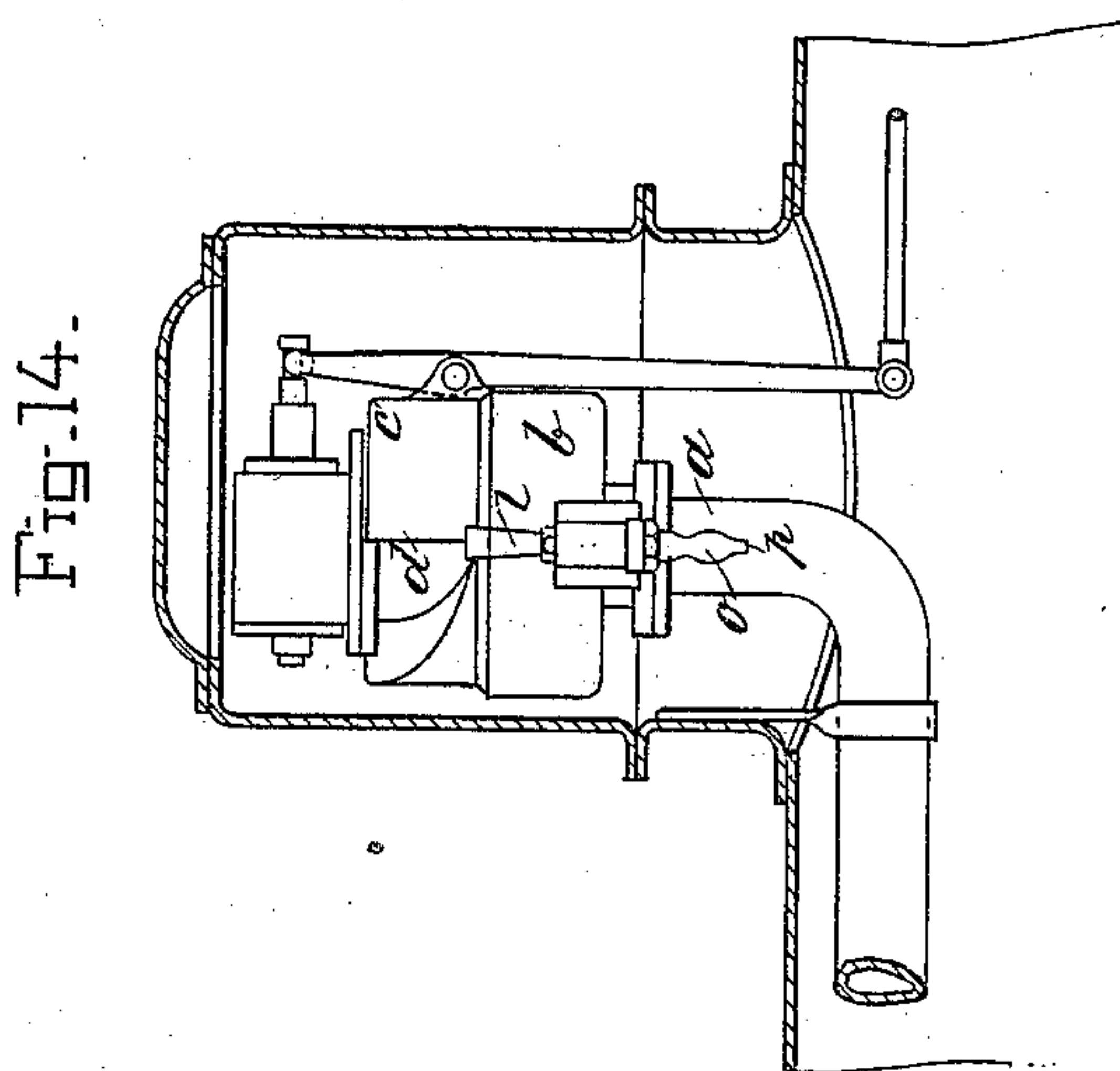
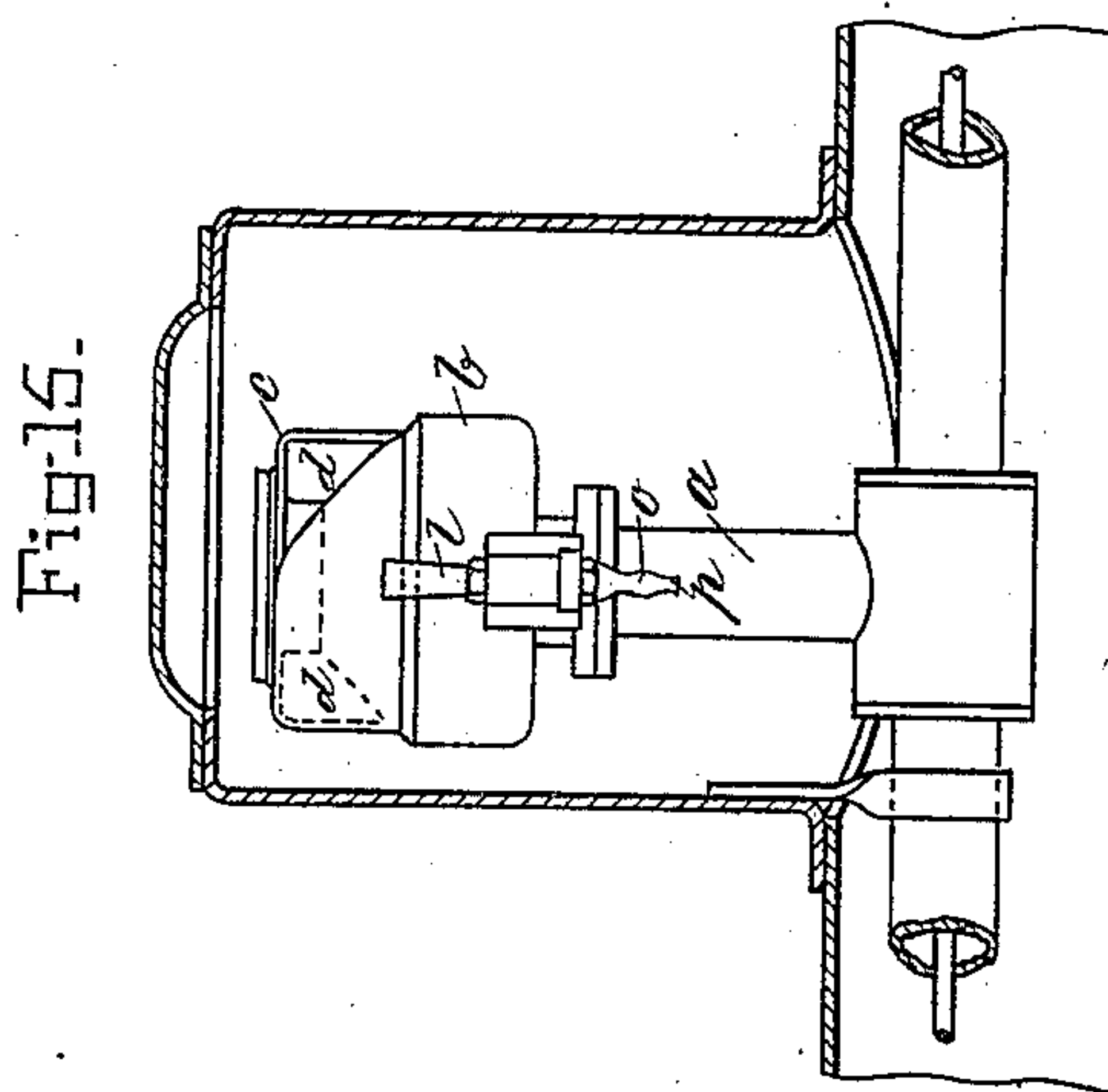
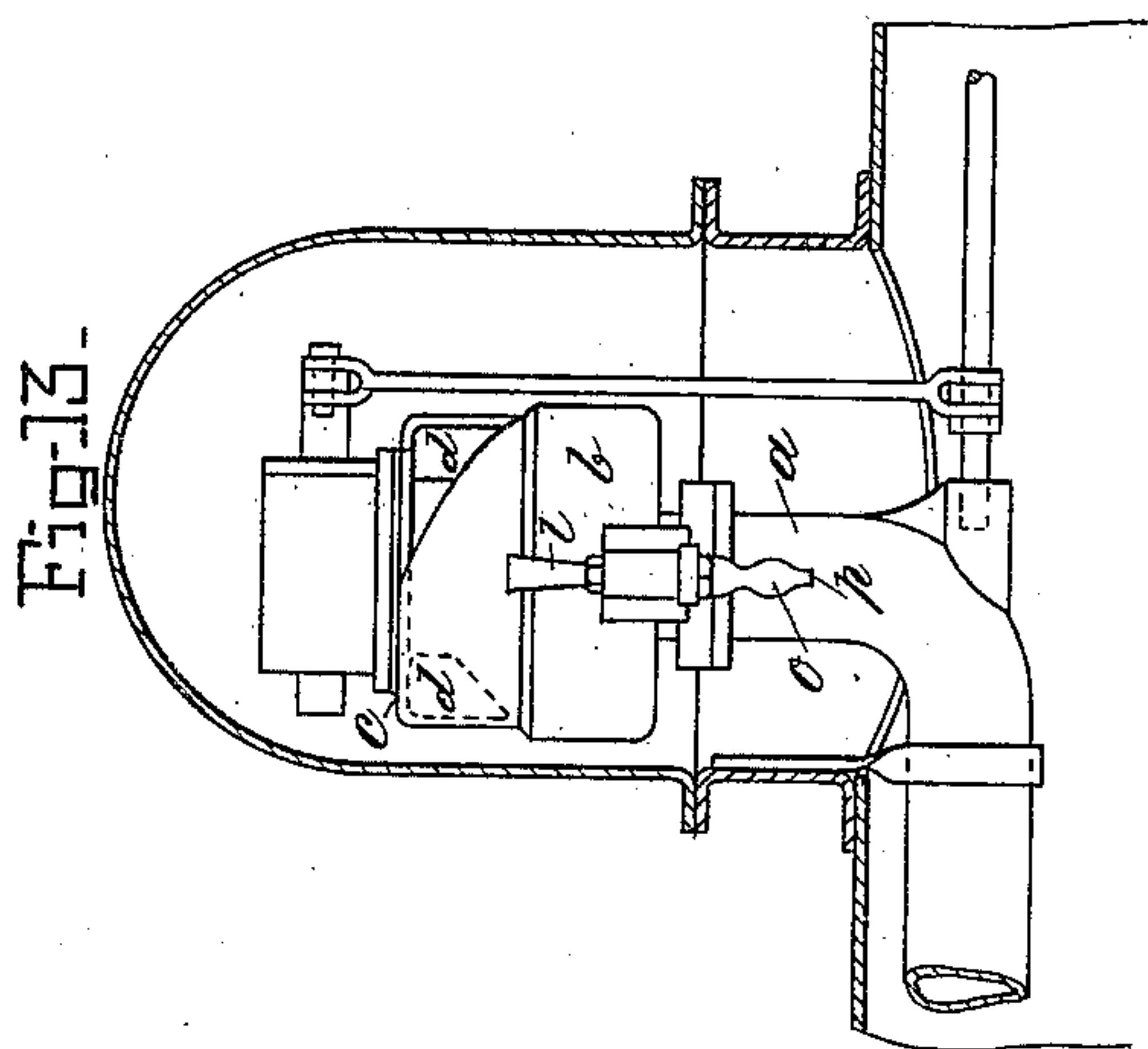
(No Model.)

8 Sheets—Sheet 8.

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STEAM SEPARATOR.

No. 424,013.

Patented Mar. 25, 1890.



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UNITED STATES PATENT OFFICE.

CARL J. MELLIN, OF NEW YORK, N. Y.

STEAM-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 424,013, dated March 25, 1890.

Application filed June 17, 1889. Serial No. 314,596. (No model.)

To all whom it may concern:

Be it known that I, CARL J. MELLIN, a citizen of Sweden, residing at New York city, in the county and State of New York, have invented certain new and useful Improvements in Steam-Separators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention consists of improved contrivances for more effectually separating the steam from the water prior to being drawn off from the boiler through the throttle-valve, in which it is sought to provide better means for first effecting the separation by a downward direction of the steam to and an abrupt lateral or upward turn into the passage to the valve above a lower space, so as to project the water past the passage into said lower space by its momentum; second, to impart a further tendency of separation by centrifugal action, and, third, to utilize the influence of suction induced by the flow of the steam to the throttle-valve for the removal of the water from the separator, all as represented in the accompanying drawings, in which I have represented my invention separately in some cases and in others as applied to various forms of throttle-valves, mostly such as are used in locomotive-boilers, and in some different conditions, as for application in a steam-dome, where there is ample space above the level of the water, and also where the space above the water is limited for lack of a steam-dome, the separator being located within the boiler; but it may be located outside, if preferred.

Figures 1 and 2 are sectional views of the simplest form of my separator adapted for boilers having limited space above the water-level, and in which the separation is effected by the downward projection of the water past and into a space below the lateral openings for the steam into the steam-pipe. Figs. 3 and 4 are section and side views, respectively, also adapted for boilers having limited space above the water-level, and in which the separation is effected by the downward projection and centrifugal force, and the discharge of the separated water is facilitated by the suction of the flow of the steam into the steam-pipe.

Figs. 5 and 6 are plan and sectional views, respectively, also adapted for limited steam-space, and in which the downward projection, centrifugal action, and suction are combined for the separation and discharge of the water. It is to be understood that all the above instances of my invention said to be adapted for limited steam-space are alike useful where there is ample steam-space; but in the following-described figures the invention is represented in the more favorable forms that ample steam-space affords, and together with various forms of throttle-valves as they are commonly arranged in the steam-dome of a locomotive-engine, and showing how the contrivance of my improved separator favors the combination with it of the throttle-valve in a simple manner. Fig. 7 is a sectional elevation, and Fig. 8 mainly a side view, but partly a sectional view, of the invention applied to a rock-valve. Figs. 9 and 10 are sectional elevation and side view, respectively, of the said invention applied to a laterally-working valve, sometimes called a "double-beat valve." Fig. 11 is a sectional elevation of the invention as represented in Fig. 1, together with the contrivance for utilizing the suction of the steam flowing into the steam-pipe for the discharge of the water, and with a throttle-valve working lengthwise of the steam-pipe at its end and located within the separator and being composed in part of parts of the separator. Fig. 12 is a sectional elevation of the invention as contrived for all the three mentioned influences for separating and discharging the water, but with some of the suction apparatus omitted and applied to the same form of throttle-valve as in Fig. 11. Figs. 13 to 16, inclusive, are sectional elevations of steam-domes and side views of the separator, and the several forms of valves represented in Figs. 7 and 8, 9 and 10, 5 and 6, and 12, respectively, on a reduced scale, it being supposed that in the form represented in Figs. 5 and 6 the throttle-valve is in the steam-pipe below the separator, as indicated by the arrangement of the valve-rod in Fig. 15. These figures are merely introduced to indicate the feasibility of the application of and of access to the apparatus through the man-hole at the top of the dome, as in Figs. 15 and 16, when

made that way, as well as when the dome is constructed for being taken apart a short distance above the base, as in Figs. 13 and 14.

For directing the steam into the steam-pipe 5 *a*, I employ a cup *b*, which in the simplest form of the apparatus is open at the top, as in Figs. 1, 2, and 11, when it is not designed to utilize centrifugal force as an element in effecting the separation; but when such force 10 is also to be utilized I then provide said cup with a cover *c*, having helical inlet-passages *d*, as in all the rest of the figures, to impart a gyrating action of the entering steam for impelling the water by centrifugal force to 15 the water-escape passage or passages *e* through the shell of the cup at the bottom, to which the water tends, whether having the gyrating action or not, while the steam is made to take a lateral course centrally of the 20 cup and either upward or downward into the steam-pipe *a*, according as it is arranged through a passage or passages *f*, diverging from the downward course a short distance above the bottom of the cup, as is represented in various forms in all the figures, in 25 which it will be seen that the downward projection of the water being set in motion by the steam entering at the top of the cup, and, whether gyrated or not, causes the water to 30 pass on into the bottom below said steam-passages, and thereby become separated from the steam which escapes through said lateral passages; but of course the centrifugal force of the gyrating action will facilitate more effective separation by forcing the water to the 35 shell of the cup, so as not to be drawn into the steam passage or passages to such extent as it is evident some will be when the steam enters the open cup and passes directly downward. 40 Whichever way the steam-pipe conducts the steam away from the cup after being thus relieved of the water, whether upward or downward, the said steam passage or passages will lead into it in some form or other, either 45 through a throttle-valve or not, as is plainly represented in the drawings, and will be readily understood without further description thereof, it being understood that I consider the location and arrangement of the throttle-valve in the separator part of my invention. 50 The way of providing the said lateral passage or passages *f* above the bottom of the cup may be varied at will. In Figs. 1, 2, and 11 there is a cast-metal center attachment *h* to the bottom 55 of the cup, having cored passages through the shell and merging in the outlet-passage of the steam-pipe *a*, said passages opening into the cup a suitable distance above the bottom of it, the said steam-outlet passage being downward in Figs. 1 and 11 and upward in Fig. 2. 60

In the other figures there is a shallow pan *i*, of smaller diameter than the cup, located on the bottom, between the top of which and the lower end of a drop-tube *j*, suspended 65 from above the said passage *f*, is seen in annular form. As in this form some water will fall into the pan because of the annular por-

tion opening upward around the smaller drop-tube above, said pan is provided with small orifices *k* at the bottom, through which the 70 water so collected may escape.

The water escapes from the bottom of the cup directly, as in Figs. 1 and 2, by the gravitation of the water, and also by a slightly greater pressure in the bottom of the cup, due 75 to the compression thereat by the inertia of the moisture in the downward course and deflection of the steam into the lateral passage or passages. While this is very effective and satisfactory in many cases, I also propose in 80 some cases, whenever it may be preferred, to utilize another force, hereinbefore referred to as the suction of the outflowing steam, to facilitate the discharge of the water, which I effect by connecting with the escape-passage *e* from 85 the cup the ejector device, consisting of the upright or, in some cases, inclined nozzle *l*, opening at its upper and larger end into the steam-space of the boiler, the nozzle *m*, located immediately below the contracted lower end of 90 nozzle *l*, so that there is a small annular opening into the upper end of it surrounding said lower end of nozzle *l* and at its lower end discharging into the chamber *n* of the discharge-nozzle *o* below, and having a contracted 95 issue *p* into the steam-space of the boiler at a lower position than the receiving end of nozzle *l*, said chamber being subject to the suction of the current of steam flowing into or along the steam-pipe through the passage 100 *q* into *f* or into a specially-provided passage *f'* or *f''*, whereby the suction of the flowing steam makes a partial vacuum at *n*, the suction being much more powerful than the contracted issue *p* will relieve, which, with the 105 gravity of the water and the downfall of the steam thus induced through nozzle *l*, effects material additional influence for forcibly removing the water separated from the steam in the cup *b*. When the steam-space is limited in height, this ejector may be arranged 110 in the inclined position represented in Figs. 3 and 4, and it may be located outside of the boiler, the nozzles *l* and *o* and passage *e* being suitably connected, in which case it might 115 be called an "injector" as well. This ejector is alike applicable to the separating-cup, whether it is provided with the gyrating cover or not.

Two important functions are due to the 120 bottom of the cup a suitable distance below the lateral steam passage or passages with limited escape for the water: First, it prevents the steam from flowing upward directly to the escape passage or passages, as it otherwise would, 125 because it always takes the most direct course, and thus would defeat the purpose of the separator, which cannot be effective except by a downward flow of the steam to the lateral passage or passages, and, second, the water 130 separates from the steam in the compression-space thus provided better than without it, and is collected, so that the ejector is enabled to take better effect on it. In fact, the

separator would be practically inoperative without the bottom to prevent the flow of steam upward and compel it to enter the cup from above downward.

5 I claim as my invention—

1. The improved separator consisting of the cup receiving the steam at the top on its way to the steam-pipe, having a laterally-divergent passage or passages conducting the steam
10 from the inner lower portion thereof to the steam-pipe, and also having an annular water and steam compression space below closed against the upward flow of the steam, but with limited escape passage or passages for the
15 water therefrom open to the steam-space.

2. The improved steam-separator consisting of the cup having helical inlets of the top and receiving therethrough the steam on its way to the steam-pipe in a gyrating course,
20 also having a laterally-divergent passage or passages conducting the steam from the inner lower portion thereof to the steam-pipe and causing a downward current of the steam in the cup thereto, also a continuation of the
25 interior space of the cup below said lateral passage or passages, and also being practically closed at the bottom of said space to prevent the upward flow of steam, but having the passage for the escape of the water
30 from the bottom of the cup, substantially as described.

3. The combination, with the steam-separator constructed substantially as described, of the ejector connected with the water-escape passage of the said separator for reception of the water, and also connected with the steam-passage subject to the vacuum-producing suction of the steam in said steam-passage, substantially as specified.

40 4. The combination, with the steam-separator constructed substantially as described,

of the water-ejector consisting of the upper and lower nozzles open to the steam-space of the boiler, and the lower nozzle having chamber N, and the intermediate nozzle of larger
45 capacity than the others, and connected at the upper and lower extremities of the intermediate nozzle with the waste-pipe of the separator and the steam-passage, respectively, substantially as specified. 50

5. The combination, with the steam-separator consisting of the cup receiving the steam at the top on its way to the steam-pipe and having a laterally-divergent passage or passages conducting the steam from the inner
55 lower portion thereof to the steam-pipe, and a continuation of the interior space of the cup below said passage or passages closed against the upward flow of the steam, but having a limited escape-passage for the water, of the steam-pipe connected with and
60 receiving the steam from said cup centrally, substantially as described.

6. The combination, with the steam-separator consisting of the cup receiving the steam
65 at the top on its way to the steam-pipe and having a laterally-divergent passage or passages conducting the steam from the inner lower portion thereof to the steam-pipe, and a continuation of the interior space of the
70 cup below said passage or passages, of the steam-pipe connected with and receiving the steam from said cup centrally, and a throttle-valve located in said cup, substantially as described. 75

In testimony whereof I affix my signature in presence of two witnesses.

CARL J. MELLIN.

Witnesses:

W. J. MORGAN,
W. B. EARLL.