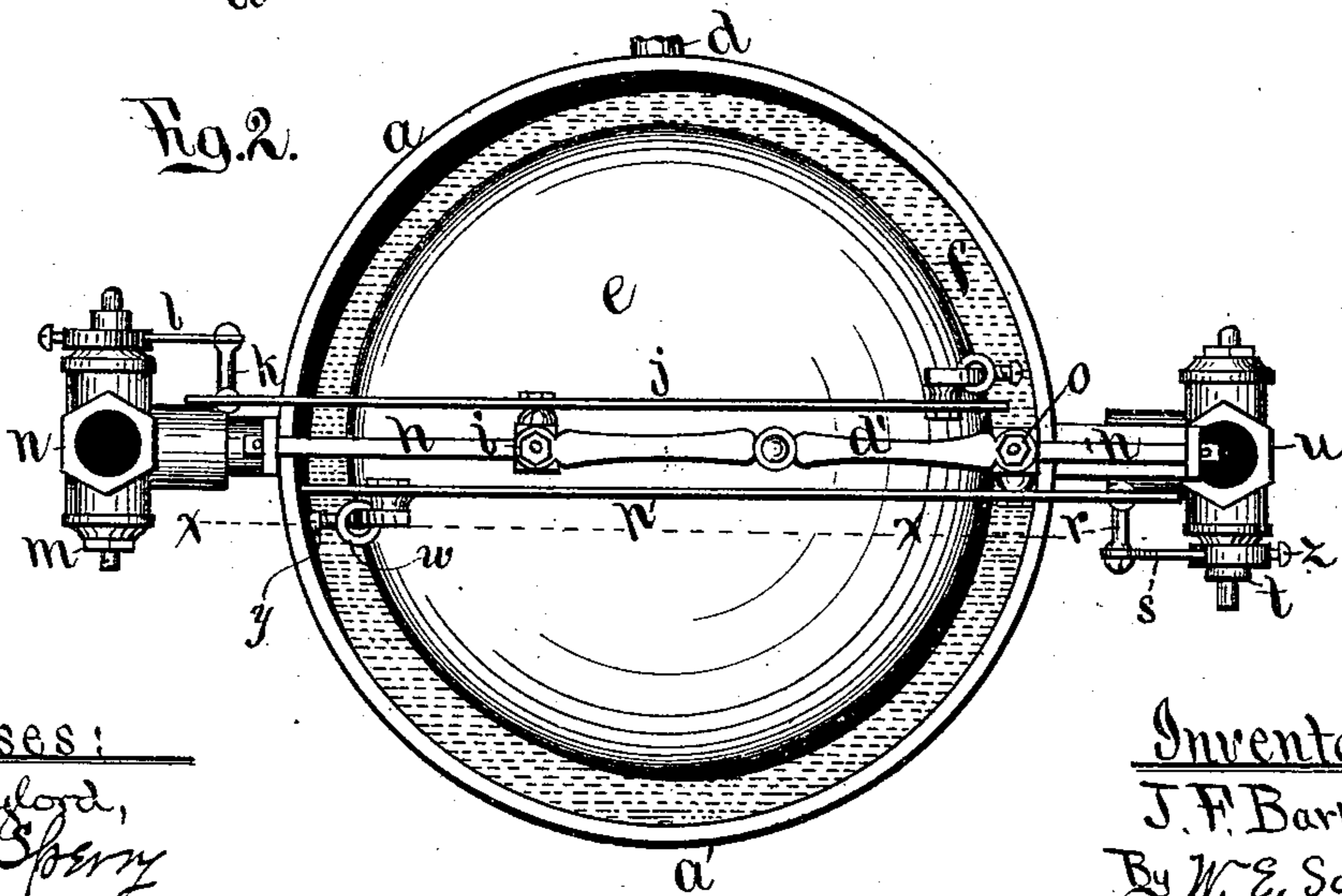
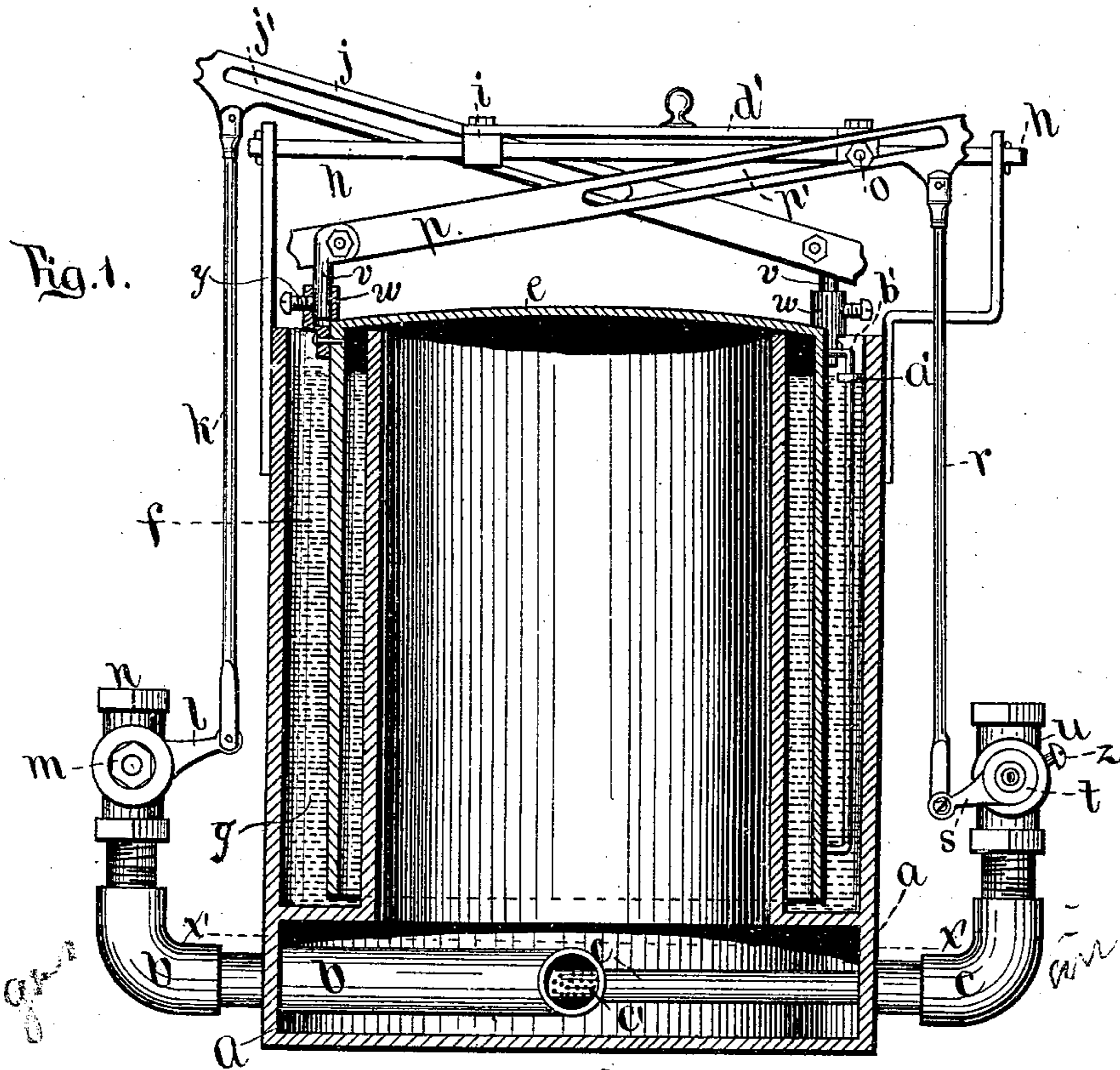


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No. 234,904.

Patented Nov. 30, 1880.



Witnesses:  
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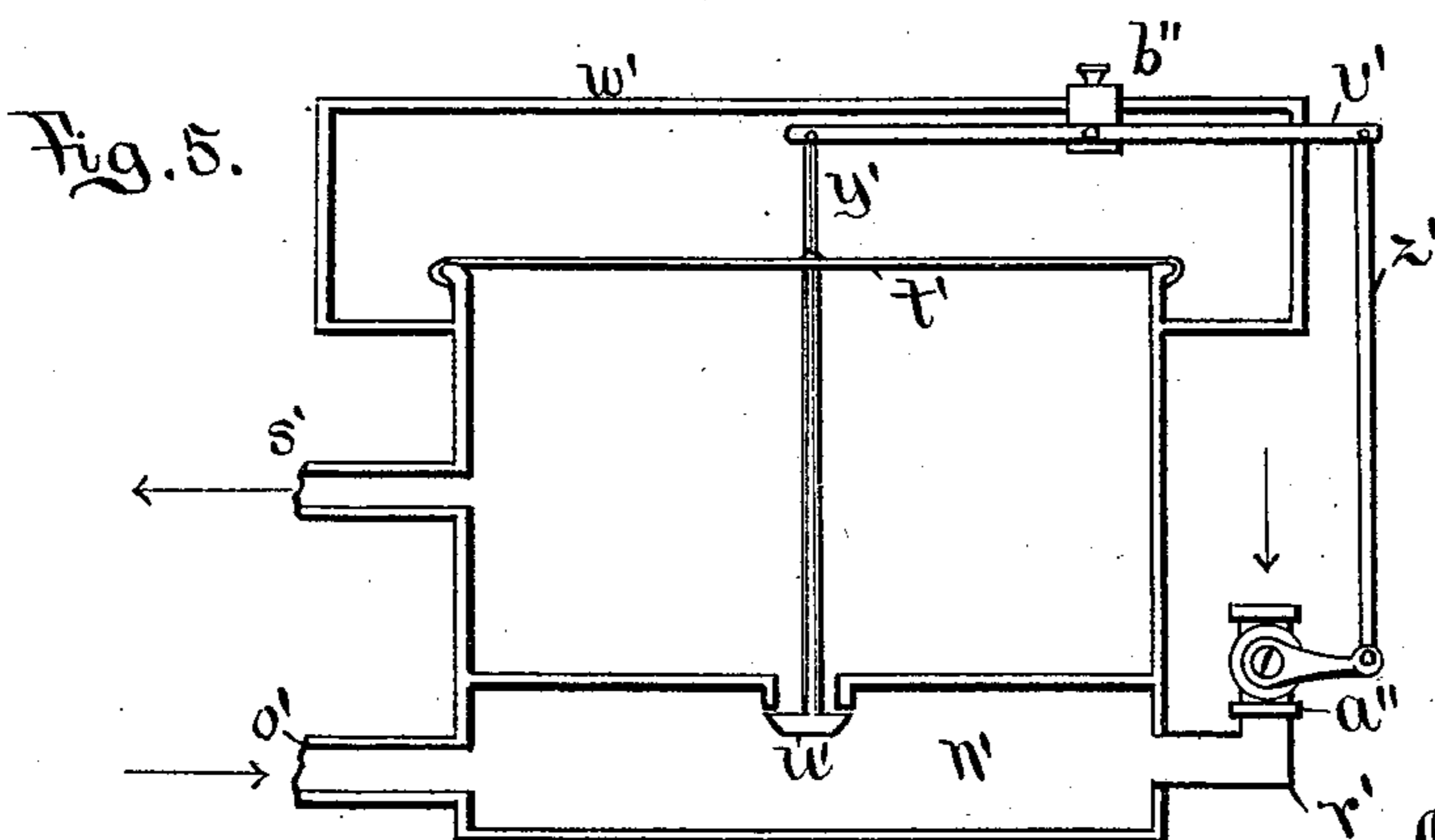
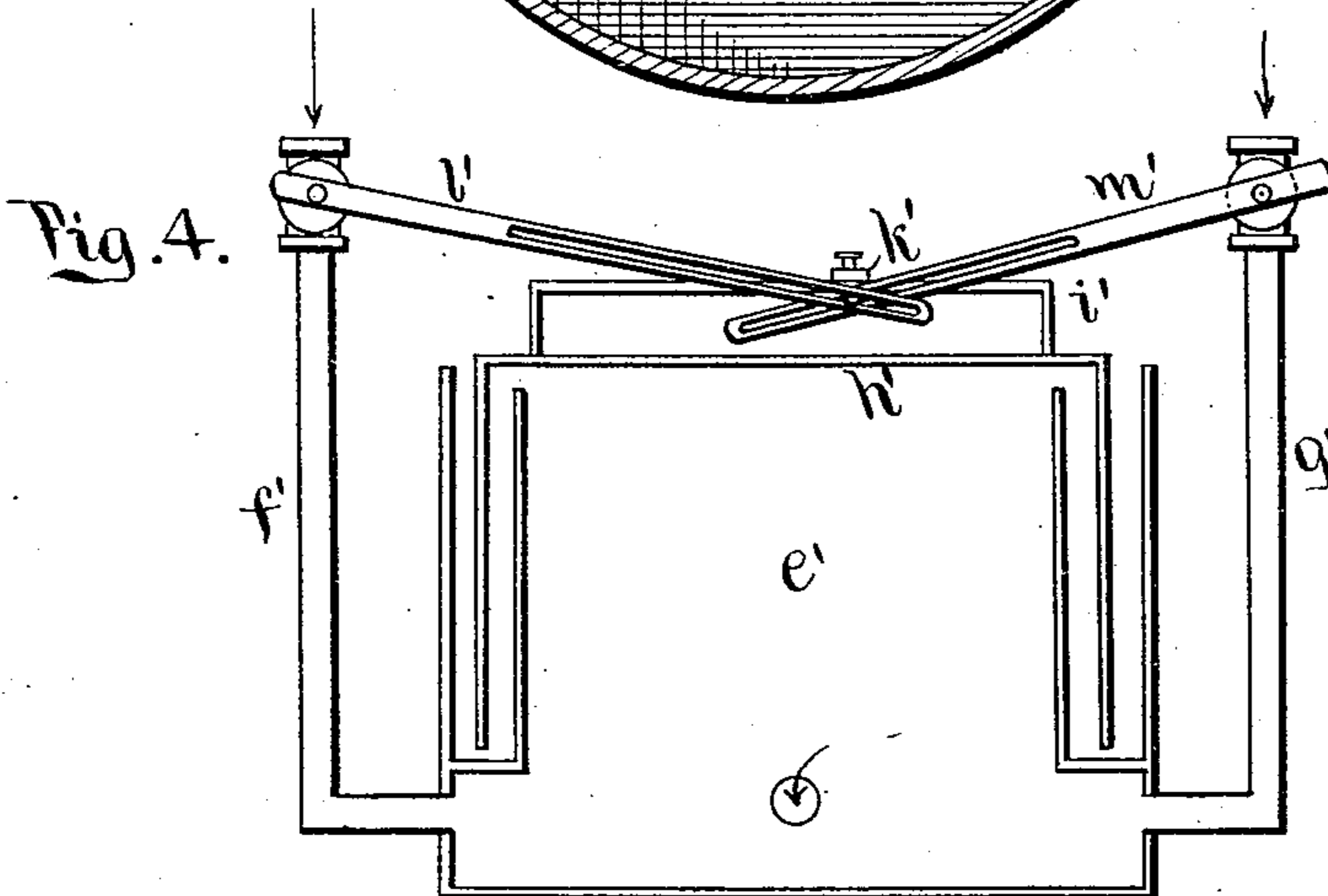
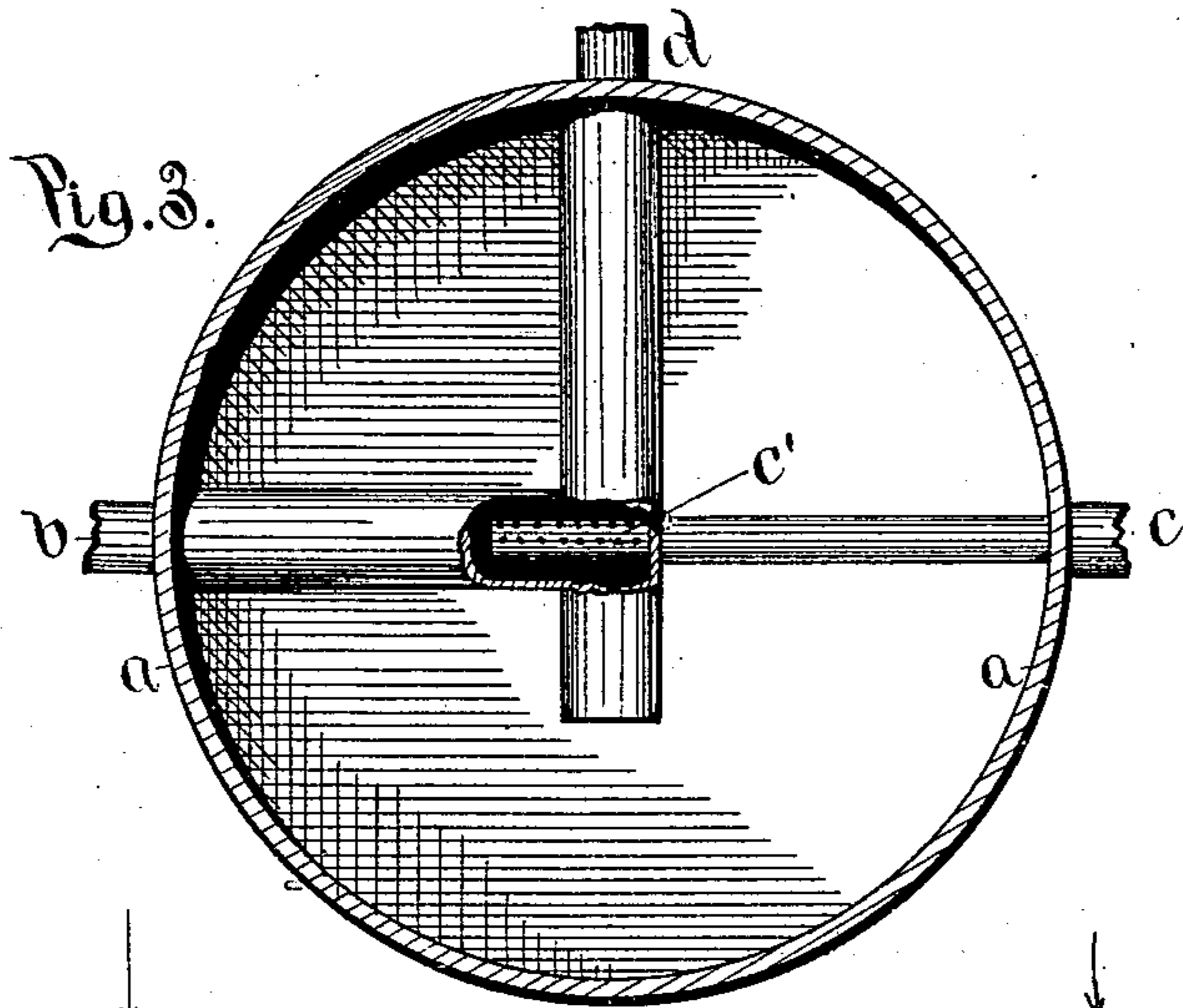
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# UNITED STATES PATENT OFFICE.

JOHN F. BARKER, OF SPRINGFIELD, MASSACHUSETTS.

## APPARATUS FOR MIXING AERIFORM FLUIDS.

SPECIFICATION forming part of Letters Patent No. 234,904, dated November 30, 1880.

Application filed February 14, 1880.

*To all whom it may concern:*

Be it known that I, JOHN F. BARKER, of Springfield, in the county of Hampden and State of Massachusetts, have invented certain  
5 new and useful Improvements pertaining to Apparatus for Mixing Aeriform Fluids, of which the following is a description, reference being had to the accompanying drawings, where—

10 Figure 1 is a side view of an apparatus embodying my invention with its fore part represented as cut in vertical section, the plane of this section being denoted by dotted line  $x$  in Fig. 2. Fig. 2 is a top view of the same  
15 mechanism. Fig. 3 is a view of the same mechanism in horizontal section on the plane denoted by the dotted line  $x' x'$ , Fig. 1, the view showing the parts below such plane. Figs. 4 and 5 are diagram views illustrating modified  
20 applications of the main principles of my invention, which will be more particularly referred to hereinafter.

This invention relates to an apparatus for mixing or mingling aeriform fluids. The ap-  
25 plication thereof which is particularly useful to me at present is the mixing of what is commonly termed "gasoline-gas"—*i. e.*, air charged with the vapor of light hydrocarbon oil—  
30 and the invention will be described herein with reference to that application of it. Many factories, mills, and other large buildings are and have been heretofore lighted with this so-called "gasoline-gas," which is commonly pro-  
35 duced by a rotary air-pump or blowing apparatus forcing air through a carbureter or generator wherein the hydrocarbon oil is stored. This "gas," as I shall term it hereinafter, as it comes from the carbureter, is generally too rich in carbon to be burned eco-  
40 nomically or to produce the best illuminating effect with the apparatus generally used in mills and factories without dilution with common air. To effect such dilution an air-supply  
45 pipe usually leads from the air pump or blower to the pipe which takes the gas from the carbureter to the burners, and the adjustment of the port in such air-supply pipe is commonly effected by hand manipulation. A prominent  
50 defect or difficulty incident to such a hand-manipulated apparatus is readily illustrated:

Given gas of a certain richness in carbon, and the port in the air-supply pipe so adjusted that proper proportions of gas and common air are being supplied to one hundred lighted burners, 55 now if fifty of those burners be turned off the supply of common air will be altogether disproportionate to and in excess of the supply of gas, with the result that the lights will grow dim and perhaps go out altogether. 60

One prominent advantage incident to the use of my present invention is that when this improved apparatus is once adjusted to furnish proper proportions of gas and air those proportions are substantially maintained in 65 the illuminating-fluid supplied to the burners, whether their number be greater or less, and no further adjustment of the apparatus is required till the quality of the gas supplied from the carbureter substantially changes. 70

Referring now to Figs. 1, 2, and 3 of the drawings, the letter  $a$  denotes a vessel within which the gas and air are mixed, which may well be called the "mixing-chamber."

$b$  denotes the gas-pipe bringing gas from 75 the carbureter, and  $c$  denotes the air-pipe bringing air from the pump or blower. The delivery ends of the gas and air pipes meet, and the latter is provided with fine perforations  $c'$  to effect the intimate commingling of the air 80 with the gas.

The letter  $d$  denotes the burner-pipe which takes the mingled air and gas to the burners.

The letter  $e$  denotes a metallic diaphragm very like an ordinary gasometer, which rises 85 and falls with the varying pressure and volume of the aeriform fluid within and passing through the apparatus. It is sealed from the outer air by the fluid  $f$  contained within the annular chamber or trap  $g$ . The fluid used 90 within the chamber  $g$  is glycerine, it being less subject to evaporation and to solidification from cold than water.

From the vessel  $a$  there rise two standards bearing a cross-bar,  $h$ , which, from the pur- 95 pose it serves, I term the "adjusting-bar." On this adjusting-bar is a fulcrum,  $i$ , for the lever  $j$ , one end or arm of which lever is pivotally and adjustably connected to the diaphragm, and the other end or arm of which is 100 jointed to the connecting-rod  $k$ , which rod is jointed at its other end to the lever or arm  $l$ ,

fast on the plug *m* of the cock *n*, the operation being that as the diaphragm falls the gas-port opens or enlarges, and as the diaphragm rises the gas-port gradually lessens till, at the point when the lever *j* is parallel with the adjusting-bar, the port is entirely closed. On this adjusting-bar there is also a fulcrum, *o*, for the lever *p*, one end or arm of which lever is pivotally and adjustably connected to the diaphragm, and the other end or arm of which is jointed to the connecting-rod *r*, which rod is jointed at the other end to lever or arm *s*, fast on the plug *t* of the cock *u*, the operation being that as the diaphragm falls the air-port enlarges, and as the diaphragm rises the air-port gradually lessens till, at the point when the lever *p* is parallel with the adjusting-bar, the port is entirely closed.

The adjustment of both ports and their levers are such that they close at exactly the same time, and consequently commence to open at exactly the same time. The adjustable connection of the levers with the diaphragm is made by means of short connecting-rods *v*, jointed to the levers and passing into sockets *w* appurtenant to the diaphragm, and held to desired adjustment by set-screws *y*.

The arms or levers *l* and *s* are made rotarily adjustable on their respective cock-plugs, and are held to desired adjustment by set-screws *z*.

The diaphragm is held from lateral play in its vertical reciprocation by the guide-rods *b'* moving in the eyes *a'*. This device is peculiarly applicable to the office here required, as it works with very slight friction.

The fulcrum-pins on which the levers vibrate are, by preference, equipped with friction-sleeves.

The lever *j* is provided with slot *j'* to permit the fulcrum to be placed at different points on the adjusting-bar. The lever *p* is provided with slot *p'* for similar purpose.

It is obvious that by moving a fulcrum along the adjusting-bar the operation of the lever to which it is appurtenant will be correspondingly modified—that is, if the fulcrum *i* is moved (from position shown in the drawings) toward the center of the adjusting-bar, the outer end or arm of the lever will be lengthened, the other end or arm will be shortened, and the movement of the diaphragm will give a greater movement of the gas-port, and vice versa. It is by the adjustment of one or both these fulcrums that the air and gas ports are adjusted to admit gas and air in proper proportions, and when once properly adjusted gas and air will be admitted to be mixed in the same proportions however the volume consumed may vary, which will give the same quality of light at the burner whether one burner or one hundred be in use. For the purpose of making the adjustment speedy the two fulcrums are connected by the bar *d'*, so that as one lever is changed in the length of its arms or ends the other lever is correspondingly changed.

As will be shown hereinafter in describing the diaphragm shown in Fig. 5, it is not absolutely necessary that the fulcrum of the lever appurtenant to the gas-port should be adjustable; but the adjustment is more quickly attained if both fulcrums are adjustable.

The adjusting-bar and the lever appurtenant to the air-port are so constructed and arranged relatively to each other that the fulcrum appurtenant to that lever can be carried to a point immediately over the joint between such lever and the connecting-rod which runs down to the air-port, and in such an adjustment the vertical reciprocation of the diaphragm will not affect the air-port. This is desirable in order to allow the machine to operate and adjust just as long as the carbureter will furnish a gas of a quality good enough to furnish illumination.

The cocks used to form the air and gas ports may be common plug-cocks; but other forms of cocks, ports, or valves are desirable in some applications of this invention, notably that kind of valve sometimes called "angle-valve," wherein the valve-plate shuts down flatly on its seat; also, in some forms of apparatus a valve which moves on and off its seat like a water-gate.

The diagram view in Fig. 4 illustrates an application of the principle of this invention wherein simple instead of compound levers are used.

*e'* denotes the mixing-chamber; *f'*, the gas-pipe; *g'*, the air-pipe; *h'*, the diaphragm; *i'*, the adjusting-bar fast on the diaphragm; *k'*, a fulcrum for both levers movable on the adjusting-bar; *l'*, the lever appurtenant to the gas-port, and *m'* the lever appurtenant to the air-port.

The diagram view, Fig. 5, illustrates an apparatus where the gas-port is not adjustable and the diaphragm is a mere sheet of rubber or the like.

The letter *n'* denotes the mixing-chamber; *o'*, the gas-pipe; *r'*, the air-pipe; *s'*, the burner-pipe; *t'*, a diaphragm of rubber or the like, from which a rod depends supporting the valve *u'* appurtenant to the gas-port.

*v'* denotes a lever having a fulcrum adjustable on the bar *w'*, connected at one end by connecting-rod *y'* to the diaphragm, and at the other end by rod *z'* to the valve *a''* appurtenant to the air-port.

The fulcrum last mentioned is denoted by the letter *b''*. By moving it along on the bar *w'* the relative lengths of the two arms of the (compound) lever *v'* are changed, and the opening and closing movements of the valve *a''* are correspondingly changed and adjusted relatively to the gas-port.

It is known that heretofore there has been apparatus having different ports for admitting air from fluids to their meeting-point, the opening and closing movements of which ports were given by and from the diaphragm; but such opening and closing movements of said

ports were in a fixed relation to each other. They were not relatively variable and adjustable, without which feature the apparatus cannot be successfully applied to such a purpose as properly controlling the mixture of gasoline-gas and common air during those changes in the quality of the gas due to changes in the contained carbon of the gas. To reach such an end, however, it is not actually necessary that both or all the ports should be adjustably variable. (See Fig. 5 and the description thereof.) The relative character of the adjustable variability is attained when but one or less than all the ports is adjustably variable.

I claim as my invention—

1. In an apparatus for mixing aeriform fluids, a diaphragm having its motion given by the varying volume and pressure of the fluid passing through the apparatus, in combination, through suitable intermediate parts, with ports relatively variable and adjustable for admitting the different fluids to their meeting-point, having their movements given by the movements of the diaphragm, substantially as herein shown and described.

2. In combination, in an apparatus for mixing aeriform fluids, a diaphragm having its motion given by the varying volume and pressure of the fluid passing through the apparatus, ports relatively variable and adjustable for admitting the different fluids to their meeting-point, and levers intermediate between the diaphragm and the ports admitting of adjustment that causes a given movement of the diaphragm to give greater or less movements of the ports, all substantially as herein shown and described.

3. In an apparatus for mixing aeriform fluids, a diaphragm having its motion given by the varying pressure and volume of the fluid passing through the apparatus, in combination, through suitable intermediate parts, with ports relatively variable and adjustable, having their movement controlled by the movements of the diaphragm, adjusted to close at the same time, all substantially as herein shown and described.

4. In combination, in an apparatus for mix-

ing aeriform fluids, a diaphragm having its motion given by the varying volume and pressure of the fluid passing through the apparatus, adjustable levers, and ports relatively variable and adjustable for the admission of the different fluids to their meeting-point, which vary in the same ratio relative to each other whether their absolute movement be greater or less, all substantially as herein shown and described.

5. In combination, in an apparatus for mixing aeriform fluids, the mixing-chamber *a*, fluid-pipes *b c*, diaphragm *e*, levers *j p*, connecting-rods *k r*, arms *l s*, and cock-plugs *m t*, all substantially as shown and described.

6. In combination, in an apparatus for mixing aeriform fluids, the mixing-chamber *a*, fluid-pipes *b c*, diaphragm *e*, lever *j*, lever *p*, provided with adjustable fulcrum, connecting-rods *k r*, arms *l s*, and cock-plugs *m t*, all substantially as shown and described.

7. In combination, in an apparatus for mixing aeriform fluids, the mixing-chamber *a*, fluid-pipes *b c*, diaphragm *e*, slotted levers *j p*, provided with adjustable fulcrums, connecting-rods *k r*, arms *l s*, and cock-plugs *m t*, all substantially as shown and described.

8. In combination, in an apparatus for mixing aeriform fluids, the mixing-chamber *a*, fluid-pipes *b c*, diaphragm *e*, slotted levers *j p*, provided with united and adjustable fulcrums, connecting-rods *k r*, arms *l s*, and cock-plugs *m t*, all substantially as shown and described.

9. The combination of a diaphragm, *l*, a lever, *p*, a connecting-rod, *r*, jointed to the lever, a socket, *w*, appurtenant to the diaphragm, and a set-screw, *y*, all substantially as shown and described.

10. In combination, in an apparatus for mixing aeriform fluids, the mixing-chamber *a*, fluid-pipes *b c*, slotted levers *j p*, fulcrums *i o*, adjusting-bar *h*, connecting-rods *k r*, arms *l s*, and cock-plugs *m t*, all substantially as shown and described.

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