5 Sheets—Sheet 1

# A. W. PORTER.

## Carbureter.

**No. 206,196.** **Patented July 23, 1878.**

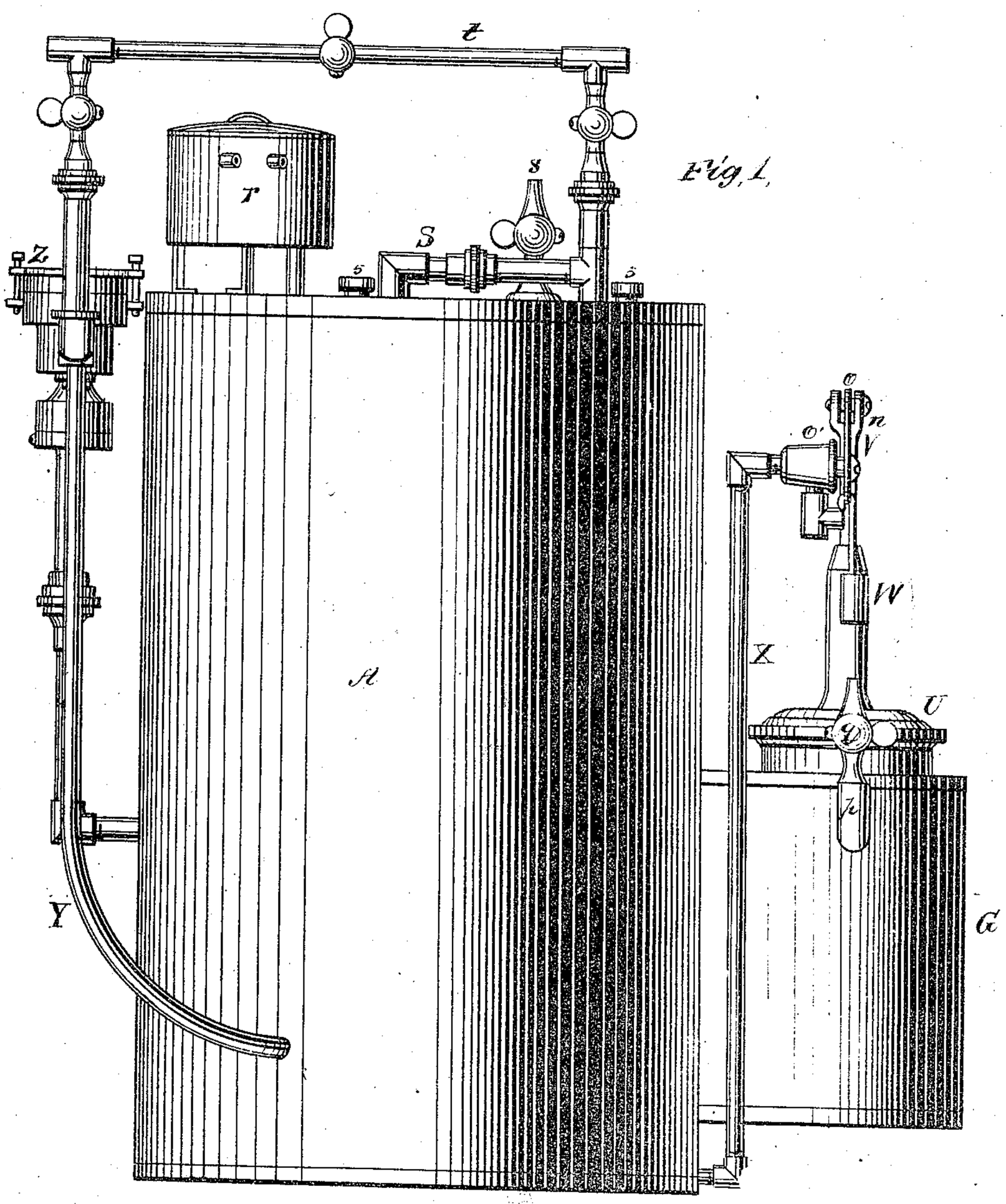


Fig. 1.

WITNESSES

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## Carbureter.

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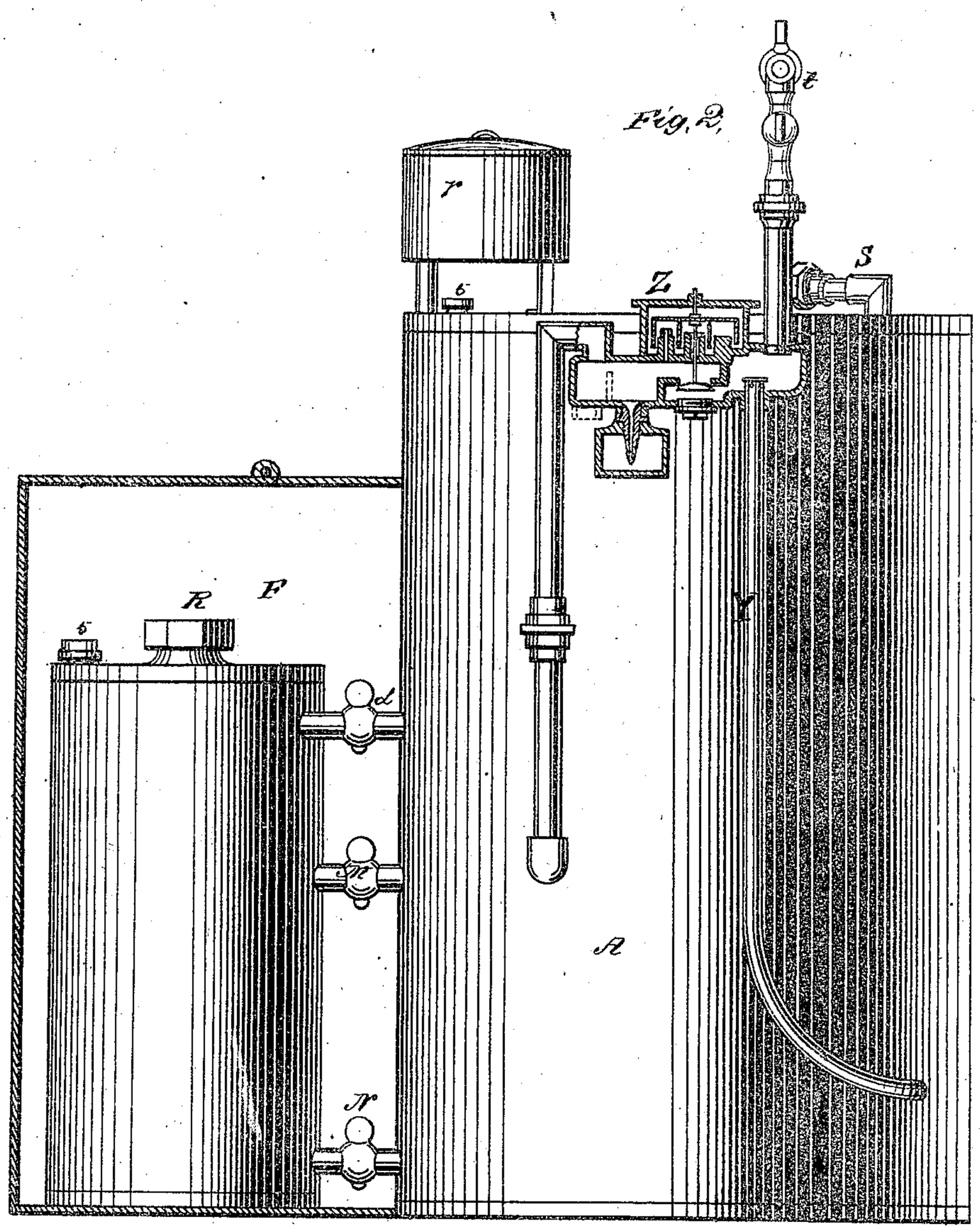
Fig. 2.

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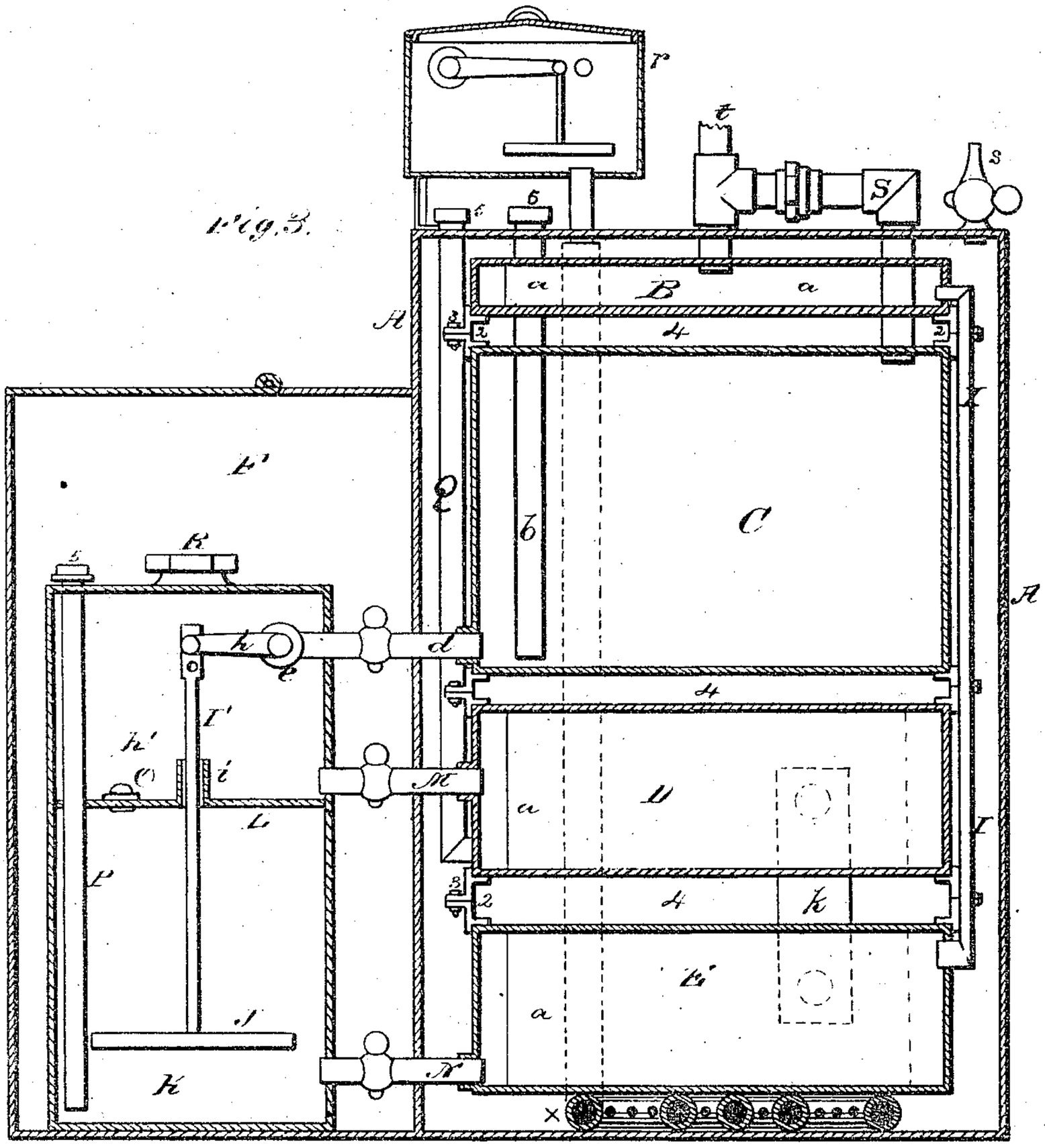
## Carbureter.

No. 206,196. Patented July 23, 1878.

Fig. 3.

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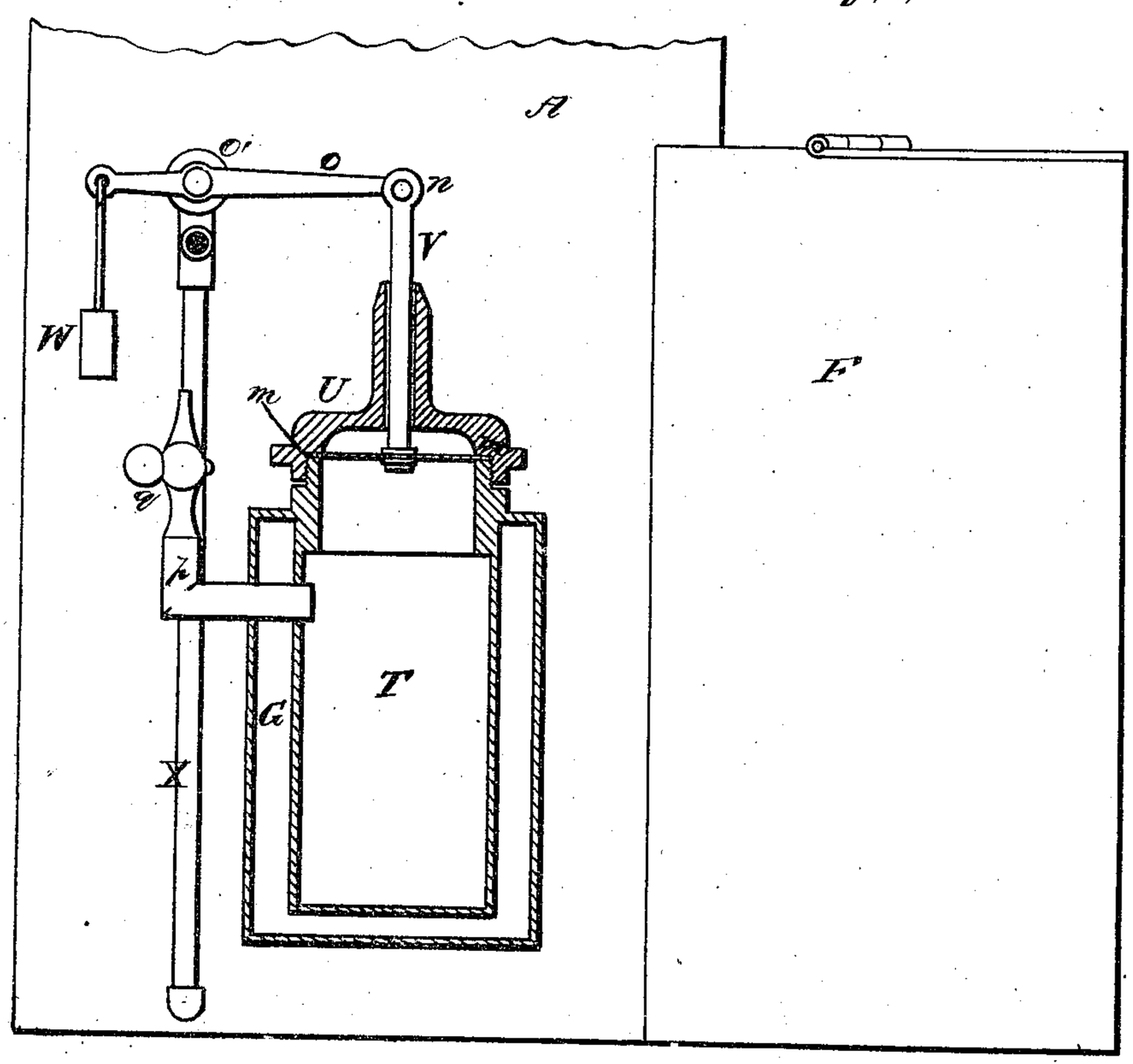
## Carbureter.

No. 206,196. Patented July 23, 1878.

Fig. 4.

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5 Sheets—Sheet 5

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## Carbureter.

No. 206,196. Patented July 23, 1878.

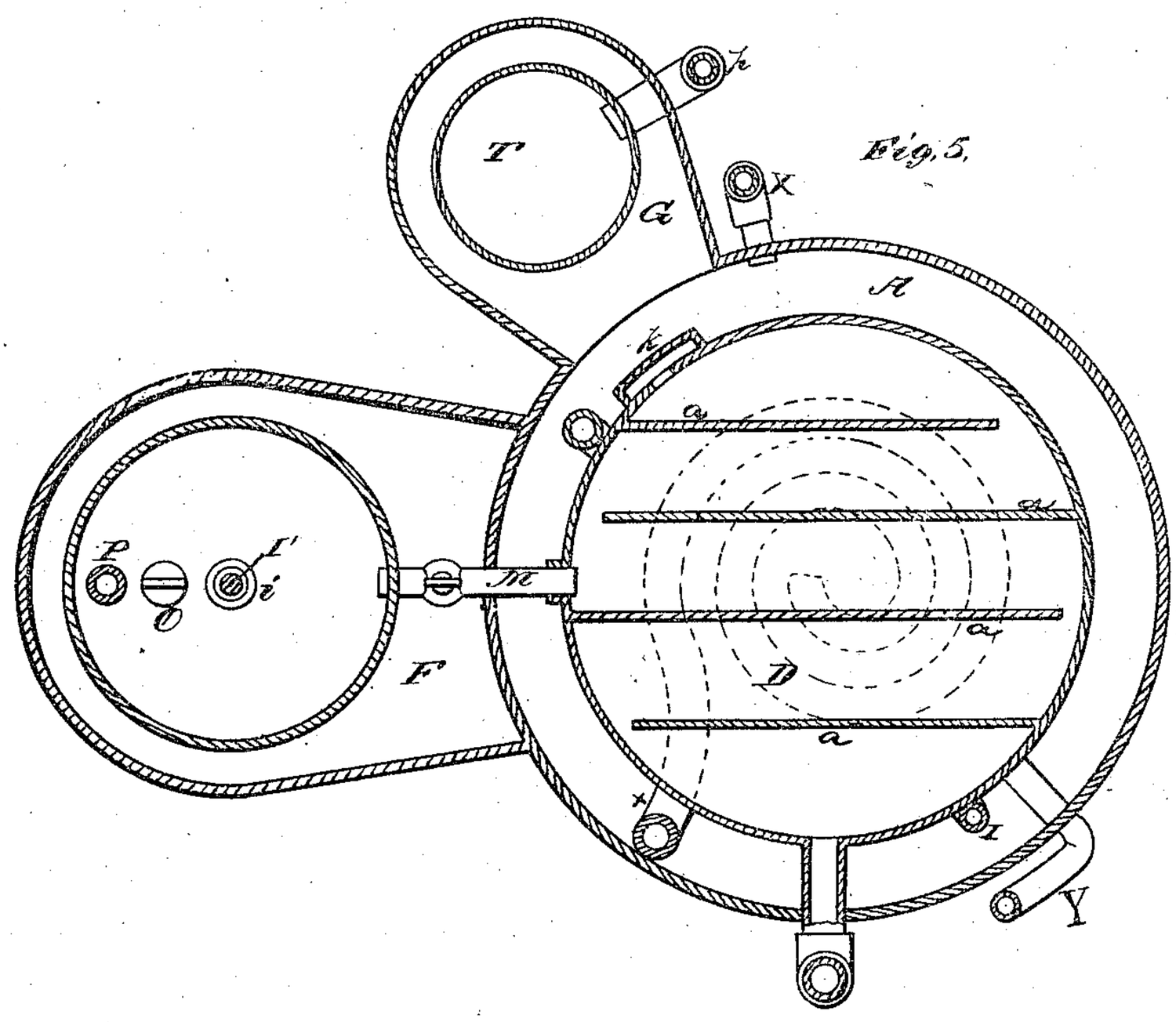


Fig. 5.

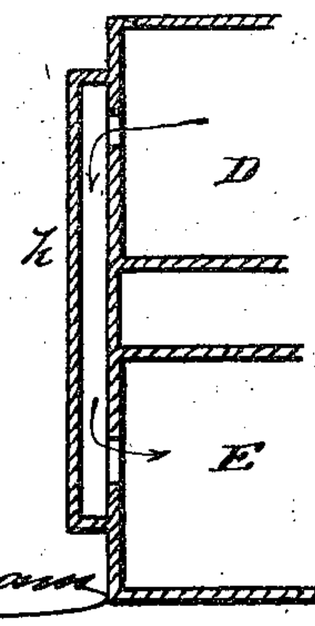


Fig. 6.

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# UNITED STATES PATENT OFFICE.

ALONZO W. PORTER, OF NEW YORK, N. Y., ASSIGNOR OF ONE-TENTH HIS RIGHT TO GEO. L. SHOREY, OF LYNN, MASSACHUSETTS.

## IMPROVEMENT IN CARBURETERS

Specification forming part of Letters Patent No. **206,196**, dated July 23, 1878; application filed June 22, 1878.

*To all whom it may concern:*

Be it known that I, ALONZO W. PORTER, of New York, in the county of New York and State of New York, have invented a new and valuable Improvement in Carbureters; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a representation of a side elevation of my carbureter; and Fig. 2 is a side elevation, part sectional. Fig. 3 is a longitudinal vertical sectional view thereof. Fig. 4 is a central sectional view of the hydro-thermostat. Fig. 5 is a horizontal sectional view of the same, and Fig. 6 is a detail view of my carbureter.

This invention has relation to apparatus for carbureting air or gas for illuminating purposes, and is an improvement on the apparatus described in Letters Patent granted to Porter and Grimes, dated April 18, 1876.

The novelty of this invention consists in automatic means for effectually unifying the temperature of the hydrocarbons with the air or gas at the time of mingling the same for illuminating purposes.

It also consists in providing an improved pressure-regulator for the gas passing through the carbureter.

It further consists in an improved return-drip, for passing the condensation of the fluids from the gas-pipes and regulator back to the well of the machine.

It further consists in an improved counterbalance, attached to the operating device of the hydro-thermostat, for securing safety in the operation of the thermostat; also, in the means for adjusting or setting the working parts of the hydro-thermostat; also, in means for cutting off a portion of the carbureting-surface in case the gas or air becomes supercharged with hydrocarbon vapors from any sudden increased temperature of the surrounding atmosphere; also, in the novel construction of the apparatus, whereby economy is secured in making and repairing the same; and, finally, in the novel combination and arrangement of parts, as will be hereinafter more fully set forth.

In the annexed drawings, A represents a water-jacket or tank, within which is contained a series of compartments, B, C, D, and E, and side compartments F and G.

The compartment B is a chamber for equalizing the temperature of the gas or air as it passes from an inlet-pipe, *t*, through sinuous passages *a a*, thence downward through the conduit I into the lower carbureting-compartment E, where it is mingled with the vapors of the hydrocarbon spirits at a temperature coincident therewith.

The compartment C contains the hydrocarbon fluid or spirits, and is filled by the supply-pipe *b*. The compartment D is the upper carbureting-chamber, and E the lower one.

The compartments B, C, D, and E are constructed with all their seams and joints to the outer side or surface, whereby free and easy access can be had for the discovery and repair of any leaks. These compartments are securely, but removably, connected and held apart by means of shouldered lugs 2 and bolts 3, to form intermediate spaces 4 between them for the free and uninterrupted flow of water around and between the compartments. These parts can be easily removed or taken apart by means of these lugs or bolts.

The side compartment F is the automatic feed-box for supplying the hydrocarbon spirits from the compartment or holder C to the carbureting-chambers. This feed-box is provided with a supply-pipe, *d*, communicating with the hydrocarbon-holder C. Said pipe *d* is provided with a stop-cock, *e*, an oscillating disk-valve, and lever *h*. To the lever *h* of the oscillating disk-valve is attached the vertically-adjustable rod F', carrying at its lower end a float, J, which rises and falls in the lower or float chamber K of the feed-box. This feed-box is also provided with a shelf or partition, L, separating the upper or valve chamber K' from the lower or float chamber K.

The shelf L has an opening or pipe, *i*, through which the vertical rod F' is passed from the valve to the float. The pipe *i*, in the opening through which the vertical float-rod passes, extends above the shelf L, and a short distance

above the top of the middle pipe M, through which the hydrocarbon spirits flow into the upper carbureting-compartment D, from whence the hydrocarbon spirits pass down the overflow-pipe *k* to the lower carbureting-compartment, E, and thence backward, through the lower return-pipe N, into the float-chamber K of the feed-box.

To the upper surface of the shelf L in the feed-box is attached a plug, O, closing an opening therein, for the purpose of preventing a direct flow of hydrocarbon spirits to the float-chamber, thus causing the hydrocarbon to collect upon the shelf L, and rising nearly to the top of the pipe *i* above the passage of the middle pipe M, through which it flows into the upper carbureting-chamber D, as above mentioned.

By removing the plug O from the opening in the shelf L a direct passage is provided, through which the hydrocarbon fluid will flow directly to the lower or float chamber, thence through the pipe N into the lower carbureting-compartment, E, thus preventing the fluid from accumulating on the shelf L and passing through the middle pipe. By this change the upper carbureting-compartment is not fed with hydrocarbon spirits, and ceases to carburet the gas or air passing through the same, and thereby a portion of the carbureting capacity of the machine is thrown into disuse.

This feed-box is also provided with a pump-pipe, P, extending from the top of the case to near the bottom of the float-chamber, for the purpose of removing residuum from the lower carbureting-chamber. The residuum is removed from the upper carbureting-compartment, D, by means of the pump-pipe Q. These pump-pipes are provided at their upper ends with screw-caps 5, by means of which the chambers are sealed.

A removable top or cap, R, is attached to the upper end of the feed-box, covering a hand-hole, by means of which access can be had to the interior of the valve-chamber K′ of the feed-box to adjust the slotted head of the float-rod I′, to remove the plug O from the opening in shelf and return the same when required, to remove the oscillating valve for repairs, also to provide for detaching and adjusting these parts without removing the apparatus from the premises.

Whenever any of the above-named parts of the feed-box are being adjusted or repaired the cocks of the communicating pipes are shut to prevent any escape of gas, and communication between the feeding-compartment and the carbureting-compartments, whereby the gas may continue to pass without interruption through the machine while the working parts of the feeding device are being adjusted or repaired.

The other side compartment, G, is the hydro-thermostat, by means of which the water in the jacket A surrounding all the compartments is kept at any desired temperature. This hydro-thermostat G consists of an air-tight box, T, sealed by a membranous septum resting upon the top of the box, and held firmly thereto by means of a shoulder, *m*, in the screw-cap U, which cap is screwed down upon the same. The space above the septum allows sufficient room for the septum to move upward and downward, to accommodate the expansion and contraction of the confined air in the box.

From the center of the septum, through an opening in the top of the cap, arises a vertical rod, V, having a slotted head, *n*, to which is connected a lever, *o*, attached to a waste-water cock, *o′*. This lever has at its outer end a weight, W, to counterbalance the weight of the vertical rod V and its attachments. The waste-water cock *o′* is attached to a siphon-pipe, X, communicating with the lower portion of the water-jacket. (See Fig. 1 of the drawings.) Advantage is thus taken of the contracting and expanding power of confined air caused by the temperature of surrounding water to operate the mechanical devices necessary to open and close the waste-water cock of the water-jacket.

From the sealed air-box T extends a small pipe, *p*, communicating with the outer air. This communication is opened and closed by means of an air-valve, *q*. Whenever said valve is opened the air is free, and therefore the expansion and contraction thereof in the box ceases to operate upon the septum. The valve is closed when a desired temperature is imparted to the air in the box. Any variation from the given temperature of the confined air will act upon the septum and cause a corresponding rising and falling of the same, and a consequent opening or closing of the waste-water cock. Thus it will be seen that the object of this pipe *p* and its valve *q* is to set the hydro-thermostat and regulate the same at will.

The contraction and expansion of the air in the sealed air-box T are effected and utilized as follows: This sealed air-box is surrounded by an extension of the water-jacket. Now, as the air expands one cubic inch to every four hundred and ninety cubic inches of its volume for every degree of heat added thereto, and contracts in the same ratio for every degree taken from its temperature, it follows, if any change in the temperature of the water surrounding all the compartments of the machine is made, such change is imparted to the air in the sealed box, which will contract or expand with a power exactly proportioned to the number of cubic inches of air contained in the box; and all force thereby gained or lost is exerted to raise or lower the septum, thereby operating the mechanical devices for opening or closing the waste-water valve, which by opening starts, and by closing stops, the flow of warm water to the water-jacket.

The mechanical admixture of the vapors of hydrocarbon with gas or air for illuminating purposes must be effected at or near a coincident temperature of the two gases, in order to secure a homogeneous combination of the gas and vapor. This union secures brilliancy in

light and comparative freedom from condensation in the gas-pipes, as a greater degree of cold is required to condense the gases so united than in case the same were mingled at widely-differing temperatures.

The advantages gained by this homogeneous admixture are greater uniformity of illuminating-power and increased saving of gas. This desired coincidence of temperature of the hydrocarbon vapors and gas or air is secured by maintaining the temperature of water surrounding the compartments containing said gases by means of the hydro-thermostat, operating in the manner above described.

In the carbureting of gas or air a slight condensation is liable to take place in the pipes after the gas has passed through the pressure-regulator. Heretofore this condensation, on its return down the rising-pipe, has been arrested by the partition in the outlet-chamber of the pressure-regulator, where it formed a trap, cutting off the supply of gas to the burners. To overcome this difficulty a small tap-screw was placed at the bottom of the outlet-compartment. I have, however, substituted a drip-pipe, Y, leading from the bottom of the regulator to the bottom of the lower carbureting-chamber, as shown in drawings. The lower end of the drip-pipe Y is sealed by the hydrocarbon liquids in the bottom of the said chamber, thus furnishing a return-drip to the well of the machine and removing the obstruction above stated.

The pressure-regulator Z is constructed substantially like that shown in the patents to Kidder, granted in 1852 and 1853, with the following improvements: First, the metallic portions of said regulator are coated with beeswax, or its equivalent, to prevent contact with the mercury and oxidation of the metal; second, to prevent insensible evaporation of the mercury, I seal the same with glycerine or non-volatile liquid; third, in attaching a small tap-screw, to be used as a gage-screw for drawing off the glycerine, whenever it becomes unfit for further use, and replace the same with fresh glycerine, without disturbing the mercury.

On the top of the machine is placed a small tank, *r*, containing a float and valve, regulating the supply of warm water to the water-jacket surrounding the various compartments, and also arresting the pressure of the water from the heater or boiler. This tank is provided with a side overflow-pipe, so that, in case the water should ever run into the tank faster than it passes into the water-jacket, the surplus would be carried into a sewer or drain.

At the top of the machine is also arranged an outside pipe, S, extending from the inlet-pipe *t* to a point in the top of the hydrocarbon-holder C, so that in case of intense heat from fire and the boiling of the hydrocarbon spirits in the holder, the vapors are allowed to escape through this vent-pipe S to the inlet-pipe *t*, thence backward through the meter into the street gas-main, thereby preventing all danger of the machine from bursting and increasing the conflagration.

That portion of the water-jacket which surrounds the automatic feed-box is designed to have a hinged lifting top, to admit access to the top of the feed-box and its parts.

Operation: The hydrocarbon spirits are introduced into the holder C through pipe *b*. From thence they pass through supply-pipe *d* into the upper chamber of the automatic feed-box F, and, rising therein to the level of the middle pipe M, they flow through the same into the upper carbureting chamber D, whence they pass down the overflow-pipe *k* into the lower carbureting-chamber, E. From this chamber they pass through return-pipe N into float-chamber K, raising therein the float J and closing valve *e*, thereby stopping the flow of hydrocarbon and resting the feeding devices.

The gas or air from the equalizing-chamber B enters the lower carbureting-chamber E, by means of the connecting-pipe I, and passes through sinuous passages therein, and up through the overflow-pipe *k* to the upper carbureting-chamber, D, through similar sinuous passages to the outlet of the upper chamber, and finally through the pressure-regulator to the burner.

The sinuous passages of the carbureting-compartments are provided with yarn absorbents on reels, from which the gas or air takes up the hydrocarbon spirits.

To fill the water-jacket A, cold water is poured into the tank *r*, the vent-cock *s* is opened, and the water flows into the jacket around and between the compartments until the jacket is filled, or nearly so; then a warm-water pipe from the heater or boiler is connected with the small tank. The air-cock *q*, attached to the sealed air-box, is opened and the waste-water cock opened, causing some cold water to flow out and warm water to flow in through the perforated pipe *x*, thereby raising the temperature of the confined water to the desired degree. The air-cock *q* is then shut, and the air-box sealed. A few more degrees of temperature are added to the water, which will expand the confined air in the box, thereby causing the waste-water cock to shut automatically and stop the inflow of warm water, and the hydro-thermostat will be at rest.

Rapid evaporation of the hydrocarbon spirits in the carbureting-chambers will produce cold, thereby lowering the temperature of the surrounding water, which change will contract the confined air, pull down the septum by partial vacuum thus formed, and open the waste-water cock. Some cold water will then flow out and some warm water will flow in, until the same or former temperature is restored, as before.

Should the seal in the air-box of the hydro-thermostat ever, by accident or otherwise, become broken, the counterbalance-weight at the end of the lever will shut the waste-wa-

fer-cock attached to the siphon-pipe and stop the flow of water, so that overheating of the hydrocarbon spirits by an accidental overflow of warm water is rendered impossible.

In the construction of the hydro-thermostat, I prefer to use a membranous septum; but I do not wish to confine myself to such use. I prefer such septum because it is more flexible than a metallic diaphragm and much cheaper than a mercury-cup for confining the air in the box.

The improved pressure-regulator hereinbefore described forms the subject-matter of another application, filed by Francis M. Grimes and myself, bearing even date herewith.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The process of carbureting gas or air for illuminating purposes, which consists in heating the hydrocarbon spirits and gas or air in separate compartments to the same temperature, mixing them at or near the coincident temperature to secure a homogeneous combination of the gas and vapors, and at the same time maintaining the uniform temperature of the gas or air and hydrocarbon spirits, as set forth.

2. The combination, with a carbureter, of the pressure-regulator Z, having its metallic portions coated with bees-wax and the mercury thereof sealed with glycerine, substantially as described.

3. The combination, with a carbureter and its pressure-regulator, of a drip-pipe, Y, leading from the regulator to the lower carbureting-chamber, substantially as and for the purpose set forth.

4. The combination, with a carbureter having a hydro-thermostat, of a counterbalance-weight attached to the operating devices of the hydro-thermostat, which will automatically close the waste-cock when the proper action of the thermostat is interrupted by wear or breakage of the seal in the air-box, substantially as described.

5. The combination, with a carbureter, of a hydro-thermostat having an air-cock for setting the working parts of the hydro-thermostat to any temperature, as and for the purpose set forth.

6. In combination with the carbureting-compartments D E, an automatic feed-box having a partition, L, with an opening and a plug, for feeding all or a part of the carbureting-compartments at the will of the operator, whereby a portion of the carbureting capacity of the machine is thrown into use or disuse, substantially as described, and for the purpose set forth.

7. The separate compartments B, C, D, and E, constructed with their seams and joints to the outer surface, and connected together and held apart by means of lugs and bolts, for the purposes set forth.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

ALONZO W. PORTER.

Witnesses:
J. FRED. ACKER, JR.,
GEORGE E. UPHAM.