No. 657,770.

Patented Sept. 11, 1900.

S. E. HEDRICK

CARBURETER.

(Application filed Nov. 20, 1899.)

(No Model.)

2 Sheets—Sheet 1.

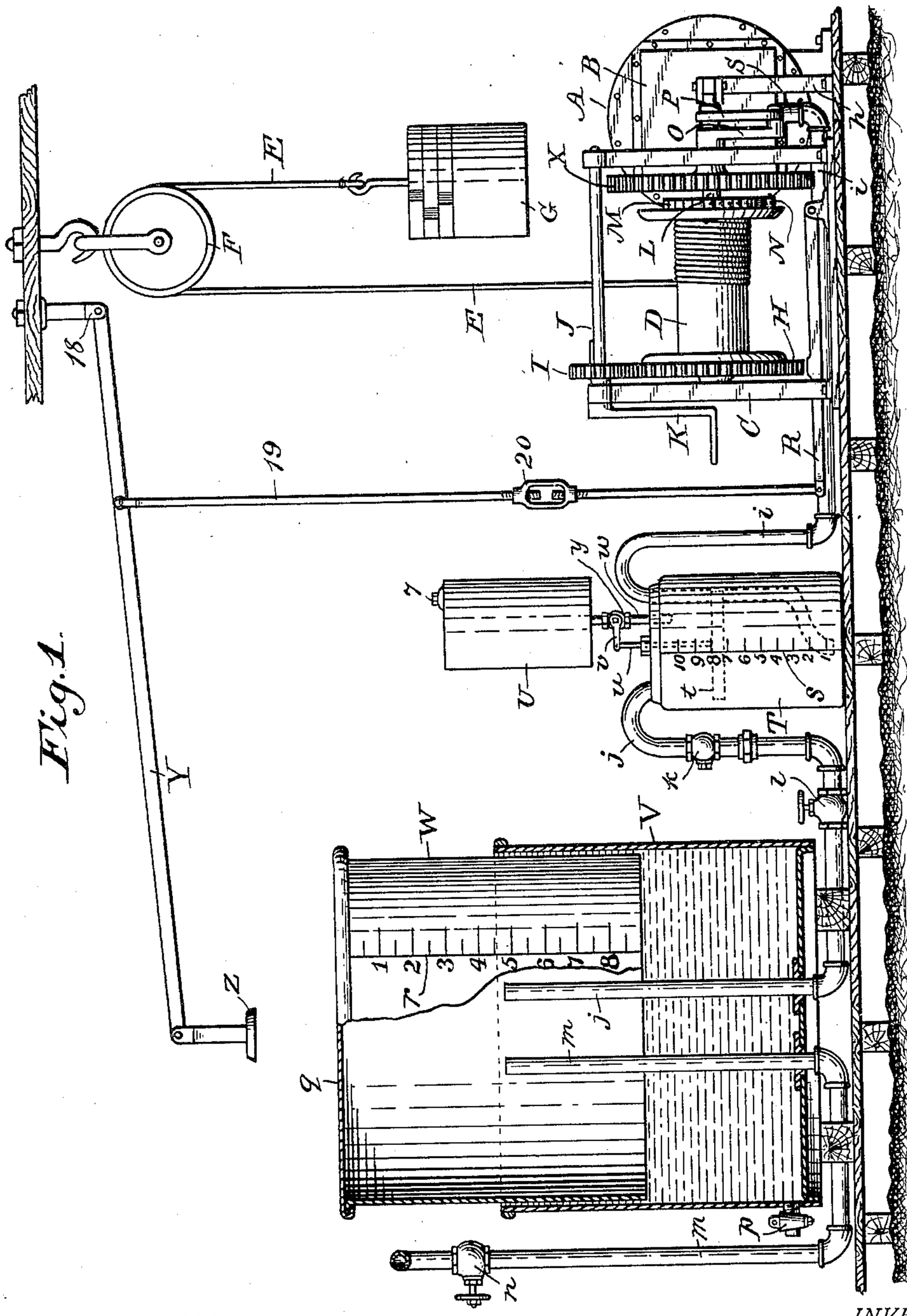

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 2

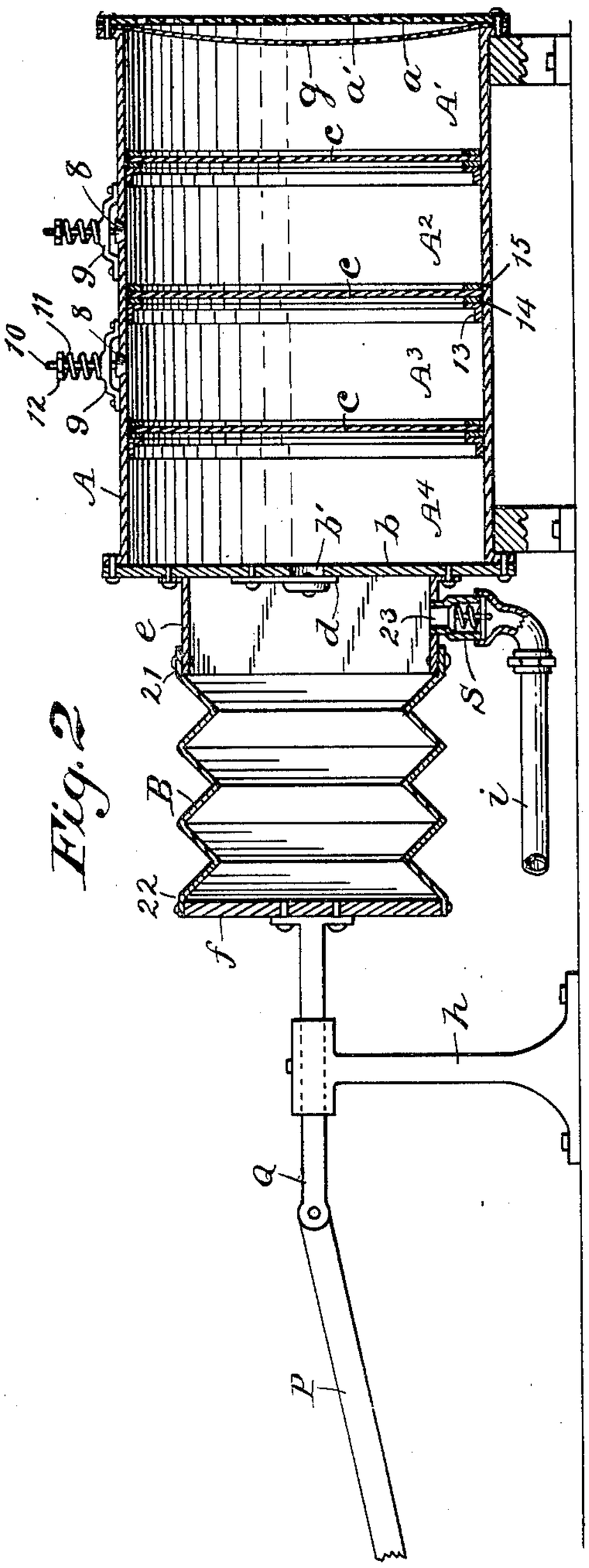


Fig. 6.

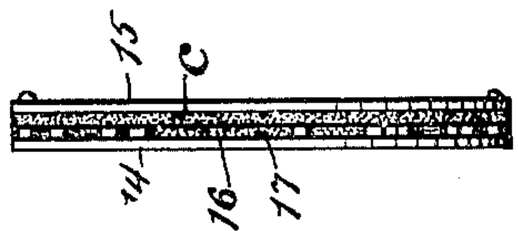


Fig. 5.

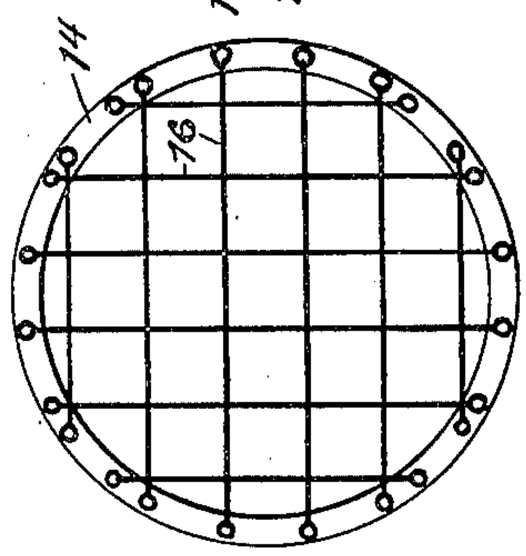


Fig. 4.

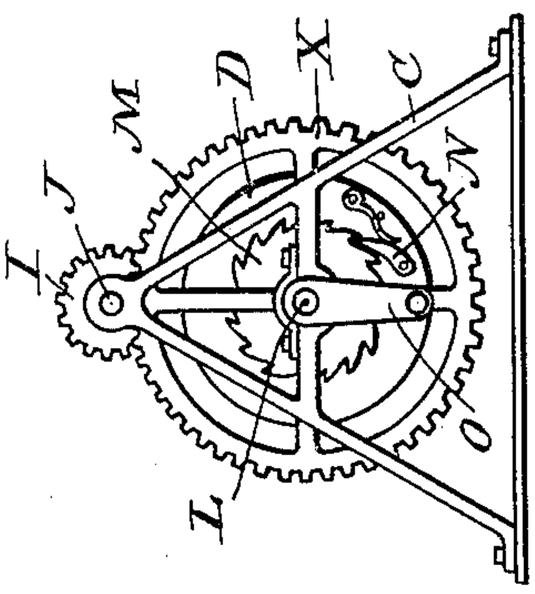
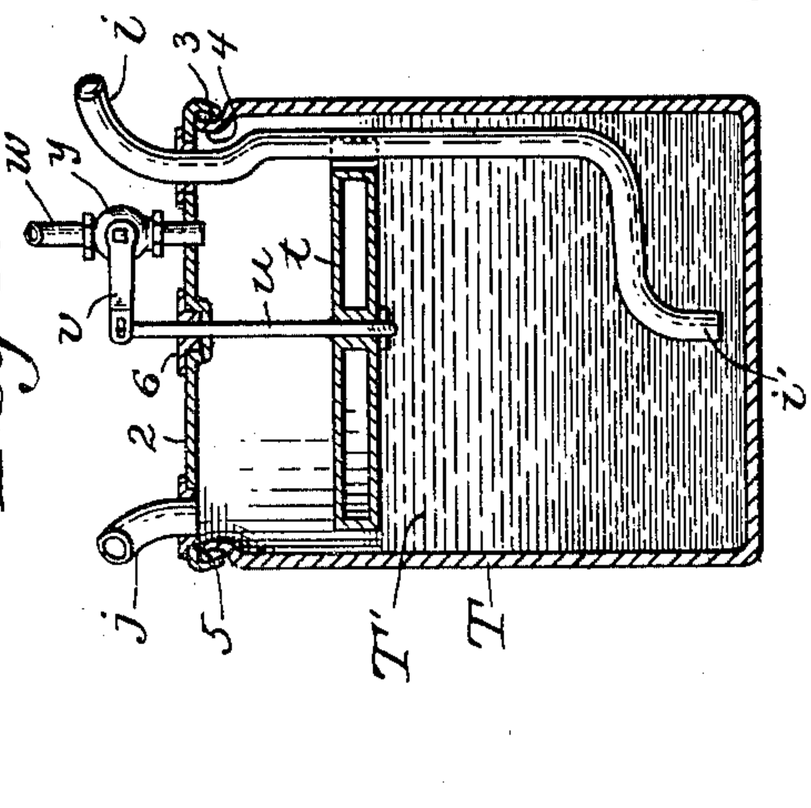


Fig. 3.



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SAMUEL E. HEDRICK, OF SPENCER, INDIANA.

CARBURETER.

SPECIFICATION forming part of Letters Patent No. 657,770, dated September 11, 1900.

Application filed November 20, 1899. Serial No. 737,672. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL E. HEDRICK, a citizen of the United States, residing at Spencer, in the county of Owen and State of Indiana, have invented certain new and useful Improvements in Apparatus for Obtaining Gas; and I do 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to such apparatus as are employed for obtaining combustible gas from the atmospheric air and liquid hydrocarbon; and it consists in certain novel improvements in the details of construction of the carbureter and of the means whereby the air is drawn from the dialyzer and forced through the carbureter; and the invention consists, further, in the parts and combination and arrangement of parts whereby the improved devices are adapted to operate automatically, as will be fully described hereinafter and claimed.

My object is to provide such apparatus as shall be simple and practicable for use as isolated independent plants for supplying gas for dwellings, stores, small workshops or factories, which may be operated inexpensively and safely without requiring expert attendance.

Referring to the drawings, Figure 1 represents a view in elevation of apparatus constructed in accordance with my invention; Fig. 2, a central vertical sectional view of the dialyzer and the bellows-pump; Fig. 3, a central vertical sectional view of the carbureter; Fig. 4, an end elevation of the motor; Fig. 5, a front elevation of a frame and reinforcing-netting for a dialyzer-membrane, and Fig 6 a side elevation of a membrane and its frame.

Similar reference characters designate similar parts in the several figures of the drawings.

In carrying out my invention I adopt the method now well known of obtaining the greatest practicable amount of oxygen from the atmosphere and forcing it through a liquid hydrocarbon, but in such a manner as to produce gas of the most uniform power or quality, the result being attained by employing certain appliances and devices in connection with the carbureter, as will be further described in detail hereinafter. I also employ a novel form of inexpensive pump in connection with the dialyzer, whereby the latter is operated most effectively.

The dialyzer A is suitably composed of a metallic shell, preferably of tubular form, and placed horizontally, having a removable head *a*, having suitable perforations *a'*, and an opposite head *b*, having a valve-opening or outlet-aperture *b'*, but otherwise closed, the whole being supported by a suitable frame or base by which it may be anchored, the interior of the shell having membranes *c c c* of suitable substance, as parchment, caoutchouc, or such material as may be best adapted for permitting the oxygen of the air to pass therethrough more readily than the nitrogen. These membranes are stretched in frames, each preferably comprising two counterpart rings 14 and 15, between which is the membrane, which is preferably attached to the latter, while to the former is attached a series of reinforcing-bars, preferably composed of open-mesh wire-netting, the interstices between the rings caused by the netting being packed with putty 17 or the like, and the frames are suitably attached to angle-iron rings 13 suitably, secured to the shell. Thus four compartments A' A^2 A^3 A^4 are provided, as is usual in dialyzers of this character. In order to protect the membranes from the accumulations of dust, which are invariably carried by the atmosphere, I provide a screen *g* at the inner side of the head *a*, so as to be accessible for cleaning by simply removing the head, the screen being composed of suitable woven fabric adapted to arrest the dust, while permitting air to pass through it.

At the top of the compartments A^2 and A^3 are sensitive valves 8 8, so designed that they shall close when a partial vacuum is formed by the pump B in the chambers, but which shall open against the normal exterior atmospheric pressure when the vacuum is destroyed and under the influence of the lighter nitrogen accumulated in the compartments above the heavier oxygen and incoming atmospheric air. This action may be best obtained by employing a suitable casing

or bridge 9 to retain and guide the stem 10 of the valve, an adjusting-nut 12 at the extremity of the stem, and a spring 11, seated between the bridge and the nut, so that the spring has a slight tendency to raise the valve when not seated by reason of the vacuum. When the pump is not in operation, the valve should be approximately balanced, so as to act quickly in either direction under moderate force of the influences above mentioned.

In order to avoid the severe strains and damage of the membranes caused by the action of the piston-pump, I employ a novel form of bellows-pump, which produces what may be termed an "elastic vacuum," by reason of the flexible structural elements, and such a pump also permits a more positive action of the release-valves 8 8, since a continuous acting rotary fan-blower, as heretofore employed, must cause the valves to remain closed unless artificially held open permanently, and thus preventing the formation of the effective vacuum necessary.

The bellows-pump B is characteristically similar to the well-known accordion-bellows, comprising an elongating folding or flexible truncated body portion and two opposing ends or heads. In the present case I preferably provide a base *e*, which is suitably attached to the head *b* of the dialyzer, which supports the bellows and serves also as a head therefor, the aperture *b'*, communicating with the pump, being provided with a valve, as *d*, opening into the base *e*, and to the latter is attached the end 21 of the folding or flexible portion of the bellows. At the opposite end 22 a head *f* is attached, to which is connected suitable means for actuating the head *f* to perform the functions of a piston. The base *e* has an outlet-aperture 23, connected by a branch pipe *i*, provided with a suitable check-valve S, which is adapted to normally remain closed except when forced open by pressure of the pump. The branch pipe extends to and discharges its contents into a carbureter T, as is the usual practice well known.

The bellows-pump being singularly free from frictional retarding influence is particularly susceptible for operation by the simple forms of either spring or weight actuated motors, an illustration of the latter being given herein, a similar type of which I preferably employ in order to render the operation of my invention economical. A suitable frame C has a shaft L journaled therein and also a suitably-journaled shaft J, and other shafts may be employed for compounding the gearing, if desired. A drum D is mounted rotatably on the shaft L and at one end has a toothed wheel H secured thereto and engaging a smaller toothed wheel I, which is carried by the shaft J, having a crank K for manually raising the weight G, attached to a cable E, running over a suitably-supported pulley F and attached to the drum. Any other suitable arrangement of multiple pulleys may be employed in order to increase the length of the cable. At the opposite end of the drum D is a ratchet-wheel M, secured to the shaft L and engaged by a pawl N, pivoted to the drum and spring-pressed, so that the descent of the weight shall cause the shaft L to rotate, thus actuating the crank O, attached to the shaft, and the connecting-pitman P, which is connected to a bar Q, attached to the pump-head *f* and suitably supported, as by guides and posts *h*. A toothed wheel X is shown as attached to the shaft L, illustrating the manner in which motion may be transmitted to additional wheels and shafts in compounding, in which case the crank O would be attached to such supplemental shaft, as is well known.

The carbureter T consists of a transparent glass vessel having, preferably, an exterior gage *s*, and has a removable closed top 2 secured hermetically thereto in a suitable manner, as by a flange 3, extending over the neck 4 of the vessel and retained by cement 5 between the two parts. The pipe *i* extends through the top down one side of the vessel and has its lower end *i'* bent over to the center of the vessel, near the bottom thereof. An outlet-pipe *j* for the gas is connected to the top 2 and extends to a receiver or tank comprising two parts V and W, of familiar form, preferably having a gage *r* and from which extends a distributing-pipe *m*, having a stop-valve *n*. A cleaning-valve *p* is connected at the bottom of the water vessel V. In the smaller sizes I dispense with counterweights for the gas-receiver W, being only sufficiently heavy to maintain the desired pressure for supplying short distributing-pipes. The pipe *j* preferably has a check-valve *k* and a stop-valve *l*. In obtaining gas by means of such a carbureter the supply of the liquid hydrocarbon T' would gradually become diminished and then exhausted, so that the quality of gas would vary and cause trouble in adjusting the burners. I therefore provide a reserve-supply tank U for the carbureter and automatic devices, whereby the carbureter is constantly supplied with the liquid hydrocarbon as rapidly as it is required in consumption, so that a uniform quantity is maintained. The tank U is placed in any convenient position above the top level of the carbureter and is connected therewith by a pipe *w*, which is provided with a valve *y*, having a lever *v*. In the carbureter is a float *t*, preferably hollow and air-tight, to which is attached a stem *u*, extending through a packing-gland 6 and connected to the lever *v*, so that as the float descends upon the top of the liquid the valve *y* is slightly opened and admits a small quantity until, the float rising slightly, the valve is again closed, or nearly so, thus maintaining a supply equal to the demand. The tank U is replenished through a filling-cap 7. An advantage in the use of such a float, which has a plane metallic upper surface, is in the manner in which the

quality of the gas is improved. The liquid, as naphtha, dropping from the pipe *w* upon the float vaporizes to some extent and mixes with the gas rising from the liquid below, thus enriching it before it is expelled through the pipe *f*.

Automatic devices are provided whereby the motor may be stopped when a supply of gas beyond that desired may have been produced. As I preferably construct such devices a lever R is pivoted at one end to the base of the frame C and is adapted to engage the teeth of the wheel H, the free end of the lever being connected by the rod 19, having an adjusting turnbuckle 20, with a lever Y, which is pivoted at one end to a suitable support, as at 18, and has at its free end a contact-piece Z to be engaged by the top *q* of the receiver W when forced to the desired height by the ingoing gas, thus pushing up the levers Y and R until the latter engages the wheel H, preventing further motion thereof until released by a reverse action caused by the descent of the receiver and a gravitation of the levers.

In practical use the carbureter T being first charged with a liquid hydrocarbon, such as naphtha, and the tank U also filled, the crank K is manipulated and the weight G caused to rise. The pinion I is then pushed along its shaft until disengaged from the wheel H, and the descent of the weight G will cause the bellows-pump to operate, producing a vacuum in the dialyzer A, so that the atmospheric air enters through the apertures *a'*, and being deprived of accompanying dust by the strainer *g* is diffused by the first membrane *c*, which arrests a part of the nitrogen of the air, so that it must return through the upper apertures in the head *a*. The air entering through the first membrane into the second compartment A^2 would gain relatively in oxygen, and there would be a further gain in passing through the second membrane into the third compartment A^3 and through the fourtb membrane to the compartment A^4, the dialyzed nitrogen, being lighter than the incoming air, escaping through the valves 8 8 during the intermittent pulsations of the pump, so that the gaseous air drawn by the pump from the compartment A^4 would consist, approximately, of equal proportions of oxygen and nitrogen. This is forced by the pump through the pipe *i* into the carbureter T, through the hydrocarbon T', and thence through the pipe *j* into the receiver, or otherwise distributed for such use as it may be desired, the float *t* at the same time operating the valve *y* and maintaining the proper quantity of hydrocarbon. Cheaply-produced gas of this character is best employed for illuminating purposes in connection with peculiar jet-burners well known to the trade, which are rendered more economical and less troublesome when the gas is of uniform quality. Hence the advantages of my improvements.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In apparatus for obtaining gas, the combination of the transparent carbureter vessel, the gage at the side of said vessel, the removable top or cover sealed upon said vessel, the circular disk-float, the vertical stem attached to said float and extending through said top, the packing-gland for said stem, the supply-pipe attached to said top above said float, the regulating-valve connected to said supply-pipe, the lever connected to said valve and to said stem above said top, the air-supply pipe, and the gas-outlet pipe, substantially as set forth.

2. In apparatus for obtaining gas, the combination of the pump or bellows, the check-valve, the air-supply pipe, the transparent carbureter vessel, the gage at the side of said vessel, the motor, the pivoted lever connected operatively with said motor, the reserve-supply tank, the feed-regulating valve, the float, the packing-gland, the stem working through said gland and connected to the float and to the feed-regulating valve, the receiver, and the lever engaging the receiver and connected operatively with said pivoted lever, substantially as set forth.

3. In apparatus for obtaining gas, the combination of the dialyzer, the bellows-pump attached to the head of the dialyzer, the check-valve connected with said pump, the air-supply pipe connected with said check-valve, the motor, the sliding bar attached to said pump and connected to said motor, the supporting-guides for said sliding bar, the pivoted lever connected operatively with said motor, the carbureter, the reserve-supply tank, the feed-regulating valve, the float, the packing-gland, the stem working through the packing-gland and connected to the float and to the feed-regulating valve, the receiver, and the lever engaging the receiver and connected with said pivoted lever, substantially as shown and described.

4. In apparatus for obtaining gas, the combination of the transparent carbureter vessel, the removable top or cover sealed upon said vessel, the circular disk float, the vertical stem attached to said float and extending through said top, the packing-gland for said stem at the center of said top, the supply-pipe attached to said top above said float, the regulating-valve connected to said supply-pipe, the lever connected to said valve and to said stem above said top, the air-supply pipe, the gas-outlet pipe, the reserve-supply tank, the receiver, and the bellows, substantially as set forth.

5. In apparatus for obtaining gas, the combination of the transparent carbureter vessel, the removable top or cover sealed upon said vessel, the liquid-supplying pipe attached to said removable top, the regulating-valve connected with said supplying-pipe, the reserve-supply tank connected with said supplying-

pipe, the air-supplying pipe connected to said removable top, the gas-outlet pipe connected to said removable top, the receiver, the check-valve in said outlet-pipe, the dialyzer, the bellows connected with the head of the dialyzer, and the check-valve in said air-supplying pipe, substantially as set forth.

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

SAMUEL E. HEDRICK.

Witnesses:
HENRY G. HEDRICK,
JOHN M. STEWART.