

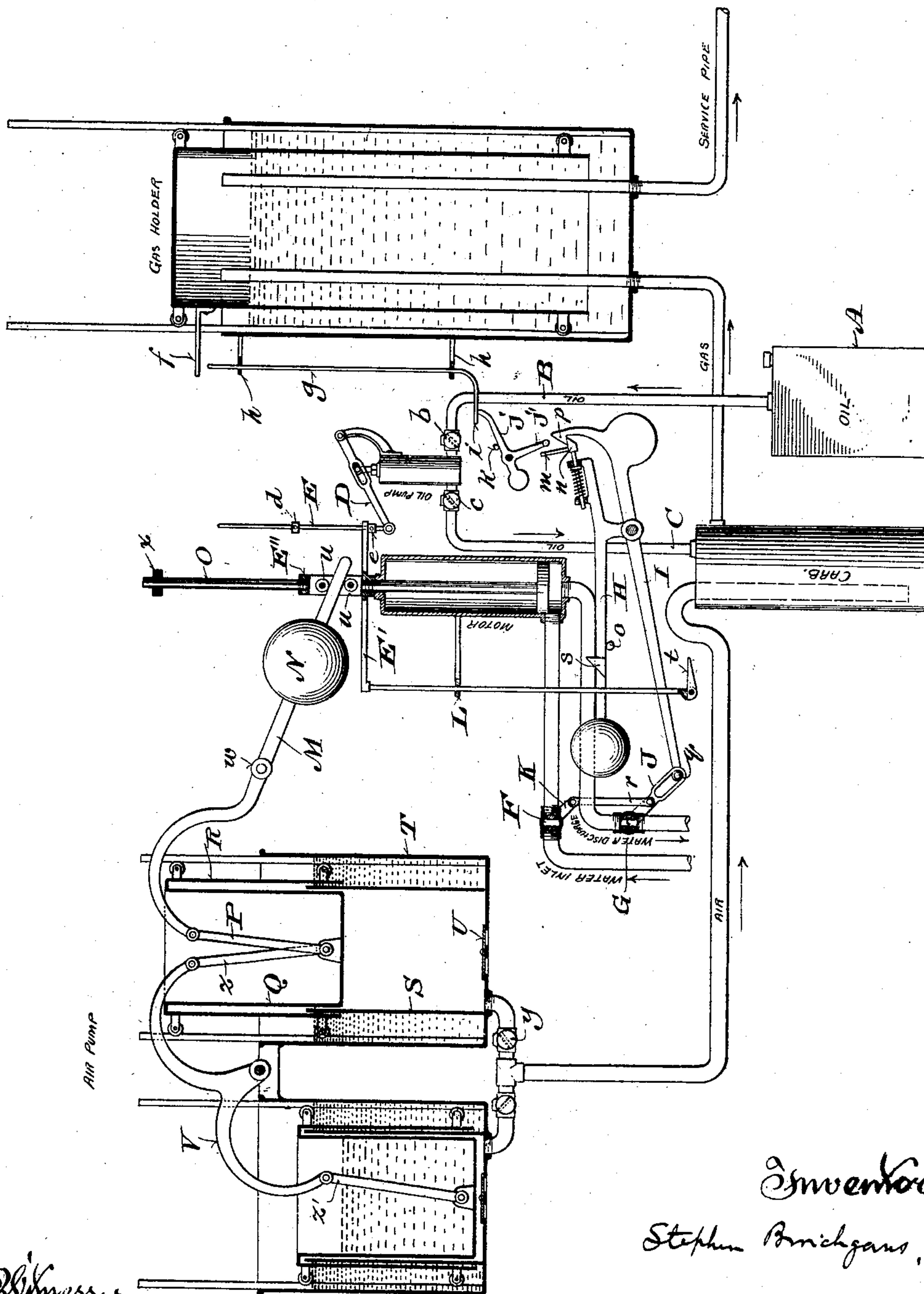
No. 606,703.

S. BROICHGANS.  
GAS APPARATUS.

Patented July 5, 1898.

(No Model.)

(Application filed Sept. 13, 1897.)



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# UNITED STATES PATENT OFFICE.

STEPHEN BROICHGANS, OF MILWAUKEE, WISCONSIN, ASSIGNOR OF TWO-THIRDS TO WILLIAM SAEFKE AND HENRY SAEFKE, OF SAME PLACE.

## GAS APPARATUS.

SPECIFICATION forming part of Letters Patent No. 606,703, dated July 5, 1898.

Application filed September 13, 1897. Serial No. 651,463. (No model.)

*To all whom it may concern:*

Be it known that I, STEPHEN BROICHGANS, a citizen of the United States, and a resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Gas Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention has for its object to provide a simple, economical, easy-operating, and high-capacity domestic-plant apparatus for automatic production of gas suitable for illuminating and heating purposes.

It therefore consists in certain peculiarities of construction and combination of parts, hereinafter particularly set forth with reference to the accompanying drawing and subsequently claimed.

The drawing is a diagram illustrating the relative arrangement and connection of parts embodied in my improved gas apparatus, some of said parts being shown in elevation and the others in section.

Referring by letter to the drawing, A represents a tank for liquid hydrocarbon, gasoline-oil being the preferred material, and leading from the tank is a pipe B, connected by an ordinary check-valve coupling *b* with the inlet of an oil-pump cylinder, the outlet of the latter being connected by another ordinary check-valve coupling *c* with a pipe C in connection with a carbureter of any suitable construction, a cylinder filled with absorbent material being ordinarily employed.

The oil-pump is of any suitable construction, and the one herein clearly illustrated is of the lift variety, having its plunger-rod in loose-play connection with a lever D, fulcrumed at one end to a bracket fast on the cylinder portion of said pump. The other end of the pump-lever has pivotal connection with a vertical rod E, for which suitable guides may be provided, this rod being in loose engagement with a cross-head E' and provided with stops *d e* above and below said cross-head, the upper stop being adjustable longitudinally of said rod to regulate lift of the pump-plunger. The cross-head is fast to the rod of a piston that has reciprocation in a cyl-

inder, the latter and a piston constituting a motor that derives its power from a source of fluid under pressure, water from a city-service system being a suitable motive force for operating said piston in one direction. The motor-cylinder is shown as having its lower end coupled to a water-inlet pipe and a water-discharge pipe. The water-inlet pipe is controlled by a valve F, and another valve G controls the water-discharge pipe, these valves being automatically actuated by mechanism hereinafter specified.

An ordinary gas-holder constitutes part of the apparatus, and this gas-holder consists of an open-bottom cylinder reciprocative in a tank containing a volume of water, this cylinder being preferably provided with anti-friction-pulleys operative on vertical tracks upon the inside of the water-tank. Gas is supplied to the holder by a pipe leading from the carbureter, and this gas has its outlet from said holder through a service-pipe, both pipes being extended up into the aforesaid holder above the water-level.

A lug *f*, extending from the reciprocative gas-holder, operates in a downward direction on a rod *g*, that is loose in guides *h* on the water-tank, and a foot *i* of the rod rests on an arm *j* of a weighted bell-crank, a stop *k* being arranged to limit upward tilt of this bell-crank. The other arm *j'* of the bell-crank opposes a stem *m*, extending from a spring-controlled sliding latch *n*, that has its guides on the short arm of a lever H, the latter being herein shown at rest upon a stop *o* and having a common fulcrum with another lever I, the short arm of the latter lever being provided with a bevel-point hook-catch *p* for the engagement of said latch. The long arm of lever H is provided with a weight, and the short arm of lever I is also provided with a weight.

The long arm of lever I is shown provided with an antifriction-roller *q*, engaged with a longitudinal slot in a crank J, that has connection with the valve G, controlling the water-discharge pipe of the motor, and a link *r* connects this crank with another crank K, having connection with the valve F, controlling the water-inlet pipe of said motor. Hence it



will be seen that movement on the part of said lever will operate both valves at the same instant, one being opened and the other closed.

The long arm of lever II is provided with a lateral lug *s*, and depending from the cross-head *E'* is a rod *L*, provided with a pivotal foot *t*, that operates, in conjunction with said lug, as a lift and a trip for said lever.

A vertical open bracket *E''*, herein shown as an integral part of the cross-head *E*, contains antifriction-rollers *u*, that impinge opposite edges of one end of a lever *M*, fulcrumed at *w* and provided with a weight *N* between the fulcrum and said cross-head bracket. Extending upward from the aforesaid bracket is a rod *O*, that has loose play in a guide *x*, and in practice this rod and bracket may be considered as extensions of the motor piston-rod. The other end of the lever *M* is connected by a link *P* with a lug on the bottom of a pot *Q*, and in continuous flange union with the upper edge of this pot is the corresponding end of a jacket *R*, said pot being one form of an elongated piston pertaining to a preferred form of air-pump constituting a necessary element of my improved gas apparatus. The space between the elongated piston and its jacket is engaged by a cylindrical wall *S*, rising from the bottom of a tank *T*, containing water up to a height nearly that of said wall, the length of said piston and jacket being such that some of the same is always below the water-level.

The jacket portion of the air-pump piston is shown provided with antifriction-rollers that operate on vertical tracks inside the water-tank *T*, and the air-chamber within the cylindrical wall *S* has an inlet-aperture controlled by a flap-valve *U*, the outlet of said air-chamber being connected by an ordinary check-valve coupling *y* with a pipe leading to the aforesaid carbureter.

From the foregoing it will be understood that there is but little friction incidental to operation of the air-pump piston herein shown and that the surface of water exposed to air-pressure is reduced to such limits that there is no appreciable disturbance of said water or leakage of air under pressure of said piston.

The capacity of the gas apparatus in proportion to the motive force is increased by the employment of two air-pumps, so arranged and coupled as to have one ejecting air when the other is taking the same, and therefore a twin of the above-described air-pump is herein shown in check-valve coupling with the pipe leading to the carbureter, the tank portions of these pumps being connected by bearings for trunnions of a rocker *V*, having its extremities connected by links *z z'* with the lugs on the bottoms of the pots constituting parts of the pump-pistons. A volume of water is shown in the pot portion of the piston that belongs to the duplicate air-pump; but this piston may be otherwise weighted, it being understood that the descent of the primary air-

pump piston is due to power of the motor, while the secondary air-pump piston depends on gravity for its descent and compression of air. The weighted air-pump piston also co-operates with the weighted lever *M* in forcing down the motor-piston when the water-inlet pipe is cut off and the water-discharge pipe opened. The various parts of the gas apparatus being in the relative positions herein shown, it will be understood that further descent of the gas-holder will cause the lug *f* thereof to depress rod *g* and thereby actuate the weighted bell-crank to retract spring-latch *n* from the catch portion of lever *I*, tilt of the latter, incidental to descent of its weighted short arm, operating the valve mechanism to simultaneously open the valve *F* of water-inlet pipe and close valve *G* of the water-discharge pipe.

Ascent of the motor-piston, incidental to an inflow of water under pressure to the motor-cylinder, causes lift of the cross-head *E'* and weighted lever *M*, whereby a charge of the liquid hydrocarbon is lifted by the oil-pump and a charge of compressed air forced through the carbureter to form gas, that finds its way into the holder, the latter being elevated by gas-pressure therein. In the meantime the foot *t* of rod *L* has caught under lug *s* on lever II, and thus this lever is tilted to cause the latch carried thereby to again engage the catch of lever *I*, by which the aforesaid valve is automatically operated. Owing to the weight on the long arm of lever II, return of the latter to original position after the foot *t* of rod *L* has cleared lug *s* will operate to return lever *I* to like position, whereby there is a reversal of the valve mechanism to cut off the water-inlet pipe and open the water-discharge pipe of the motor. This operation having taken place, there is gravity descent on the part of the motor-piston, whereby the previously-lifted charge of liquid hydrocarbon is expelled from the oil-pump into the carbureter. It also follows that if there be a single air-pump the latter will have its piston on ascent coincident with descent of the motor-piston; but if two air-pumps be employed, and coupled substantially as herein shown, the secondary one of the pair will have its piston on downstroke to force another charge of air through the carbureter.

The apparatus is wholly automatic in its character so long as gas is being consumed, the production keeping pace with the consumption while the motive force is operative.

While a practical showing has been made of my improvements, the mechanical details of these improvements may be somewhat varied in practice without departure from what is sought to be covered, especially in connection with the air pump or pumps and motive-power-controlling mechanism. It is also to be understood that a motive force other than water under pressure may be utilized, if found more convenient.



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

1. An automatic gas apparatus comprising  
5 an air-pump consisting of a water-tank having an air-chamber therein higher than the water-level, this chamber being provided with a bottom outlet and valve-controlled inlet; an elongated piston having reciprocative en-  
10 gagement with the air-chamber, and an air-chamber jacket having its upper end in continuous flange union with the piston.

2. An automatic gas apparatus comprising a duplex air-pump consisting of a pair of wa-  
15 ter-tanks each having an air-chamber therein higher than the water-level, this chamber being provided with a bottom outlet and valve-controlled inlet; an elongated piston having reciprocative engagement with each air-cham-  
20 ber, an air-chamber jacket having its upper end in continuous flange union with each piston, and a power-actuated rocker connected to the pistons.

3. An automatic gas apparatus comprising  
25 a tank for liquid hydrocarbon, a pump for this liquid, an air-pump, a carbureter in valve-controlled pipe connection with the pumps, a reciprocative holder for gas generated in the carbureter, a valve-controlled fluid-pressure  
30 motor for said pumps, a lever having a long arm, in loose-play connection with the valve-gear of the motor, and a weighted short arm provided with a catch; another lever having a weighted long arm and a short arm provided  
35 with a spring-controlled latch engageable with the catch of the former lever, a latch-retracting mechanism arranged to be operated by the gas-holder, and a motor-actuated lift and trip for said weighted long arm of the latch-  
40 carrying lever.

4. An automatic gas apparatus, comprising a tank for liquid hydrocarbon, a pump for this liquid, an air-pump, a carbureter in valve-  
45 controlled pipe connection with the pumps, a reciprocative holder for gas generated in the carbureter, a valve-controlled fluid-pressure motor for said pumps, a lever having a long arm, in loose-play connection with the valve-  
50 gear of the motor, and a weighted short arm provided with a catch; another lever having a weighted long arm provided with a lateral lug and a short arm provided with a spring-controlled latch engageable with the catch of  
55 the former lever, a latch-retracting mechanism arranged to be operated by the gas-holder, and a motor-actuated reciprocative rod provided with a pivotal foot operative on the aforesaid lever-lug.

5. An automatic gas apparatus comprising  
60 a tank for liquid hydrocarbon, a pump for this liquid, an air-pump, a carbureter in valve-controlled pipe connection with the pumps, a reciprocative holder for gas generated in the carbureter; a fluid-pressure motor for said  
65 pumps, valves controlling the inlet and discharge of the motor, link-connected valve-stem cranks, a lever having a long arm in

loose-play connection with one of the valve-  
stem cranks and a weighted short arm pro-  
vided with a catch, another lever having a  
70 weighted long arm and a short arm provided with a spring-controlled catch-engaging latch, a latch-retracting mechanism operated by the gas-holder, and a motor-actuated lift and trip  
75 for the long arm of the latter lever.

6. An automatic gas apparatus comprising an air-pump, a carbureter in valve-controlled  
pipe connection with the air-pump, a recip-  
rocative gas-holder, a fluid-pressure pump-  
80 motor, valves controlling the inlet and discharge of the motor, cranks on the stems of these motor-control valves, a link connecting the valve-stem cranks, and mechanism in  
85 connection with one of these cranks operative in conjunction with the gas-holder and motor to automatically effect simultaneous action of said motor-control valves, whereby  
when either opens the other closes.

7. An automatic gas apparatus comprising  
90 an air-pump, a carbureter in valve-controlled pipe connection with the air-pump, a reciprocative gas-holder, a fluid-pressure pump-  
motor, valves controlling the inlet and discharge of the motor, link-connected valve-  
95 stem cranks, a lever having a long arm, in loose-play connection with one of said cranks, and a weighted short arm provided with a catch; another lever having a weighted long  
100 arm and a short arm provided with a spring-controlled latch engageable with the catch of the former lever, a latch-retracting mechanism arranged to be operated by the gas-holder, and a motor-actuated reciprocative lift and trip for said weighted long arm of the latch-  
105 carrying lever.

8. An automatic gas apparatus comprising a tank for liquid hydrocarbon, a pump for this liquid, an air-pump, a carbureter in valve-  
110 controlled pipe connection with the pumps, a reciprocative holder for gas generated in the carbureter, a motor for said pumps, a lever having a long arm, in loose-play connection with the motor-control mechanism, and a  
115 weighted short arm provided with a catch; another lever having a weighted long arm and a short arm provided with a spring-controlled latch engageable with the catch of the former lever, a latch-retracting mechanism arranged to be operated by the gas-holder and  
120 a motor-actuated reciprocative lift and trip for said weighted long arm of the latch-carrying lever.

9. An automatic gas apparatus comprising a tank for liquid hydrocarbon, a pump for this liquid, an air-pump, a carbureter in valve-  
125 controlled pipe connection with the pumps, a reciprocative holder for gas generated in the carbureter, a motor for said pumps, a lever having a long arm, in loose-play connection with the motor-control mechanism, and a  
130 weighted short arm provided with a catch; another lever having a weighted long arm and a short arm provided with a spring-controlled latch engageable with the catch of the former



lever a stop arranged under the weighted long arm of the latch-carrying lever, and a motor-actuated reciprocative lift and trip for said stop-opposed lever-arm.

- 5 10. An automatic gas apparatus comprising a tank for liquid hydrocarbon, a pump for this liquid, a duplex air-pump, a carbureter hav-  
10 ing valve-controlled pipe connection with the pumps, a reciprocative holder for gas gener-  
ated in the carbureter, a motor for said pumps,  
a lever having a long arm, in loose-play con-  
15 nection with the motor-control mechanism, and a weighted short arm provided with a catch; another lever having a weighted long  
arm and a short arm provided with a spring-  
controlled latch engageable with the catch of  
the former lever, a latch-retracting mechan-  
20 ism arranged to be operated by the gas-holder, and a motor-actuated reciprocative lift and  
trip for said weighted long arm of the latch-  
carrying lever.

11. An automatic gas apparatus comprising  
a tank for liquid hydrocarbon, a pump for this  
liquid; a carbureter, a gas-holder and a du-  
25 plex air-pump, the latter having one weighted  
piston and a rocker in connection with both  
pistons; a motor having a reciprocative ele-  
ment operative in connection with the liquid-  
pump, a weighted lever in connection with  
30 the lighter air-pump piston and reciprocative

element of the motor, a lever having a motor-  
control long arm and weighted short arm pro-  
vided with a catch, another lever having a  
weighted long arm and a short arm provided  
with a spring-controlled catch-engaging latch, 35  
a latch-retracting mechanism operated by the  
gas-holder, and a motor-controlled lift and  
trip for the long arm of the latter lever.

12. An automatic gas apparatus comprising  
a tank for liquid hydrocarbon, a pump for this 40  
liquid; a carbureter, a gas-holder, and a du-  
plex water-seal air-pump; a motor having a  
reciprocative element in operative connection  
with the pumps, a lever having a long arm, in  
loose-play connection with the motor-control 45  
mechanism, and a weighted short arm pro-  
vided with a catch, another lever having a  
weighted long arm and a short arm provided  
with a spring-controlled catch-engaging latch,  
a latch-retracting mechanism operated by the 50  
gas-holder, and a motor-controlled lift and  
trip for the long arm of the latter lever.

In testimony that I claim the foregoing I  
have hereunto set my hand, at Milwaukee, in  
the county of Milwaukee and State of Wis- 55  
consin, in the presence of two witnesses.

STEPHEN BROICHIGANS.

Witnesses:

N. E. OLIPHANT,  
B. C. ROLOFF.