(No Model.)

J. M. GOLDSMITH.

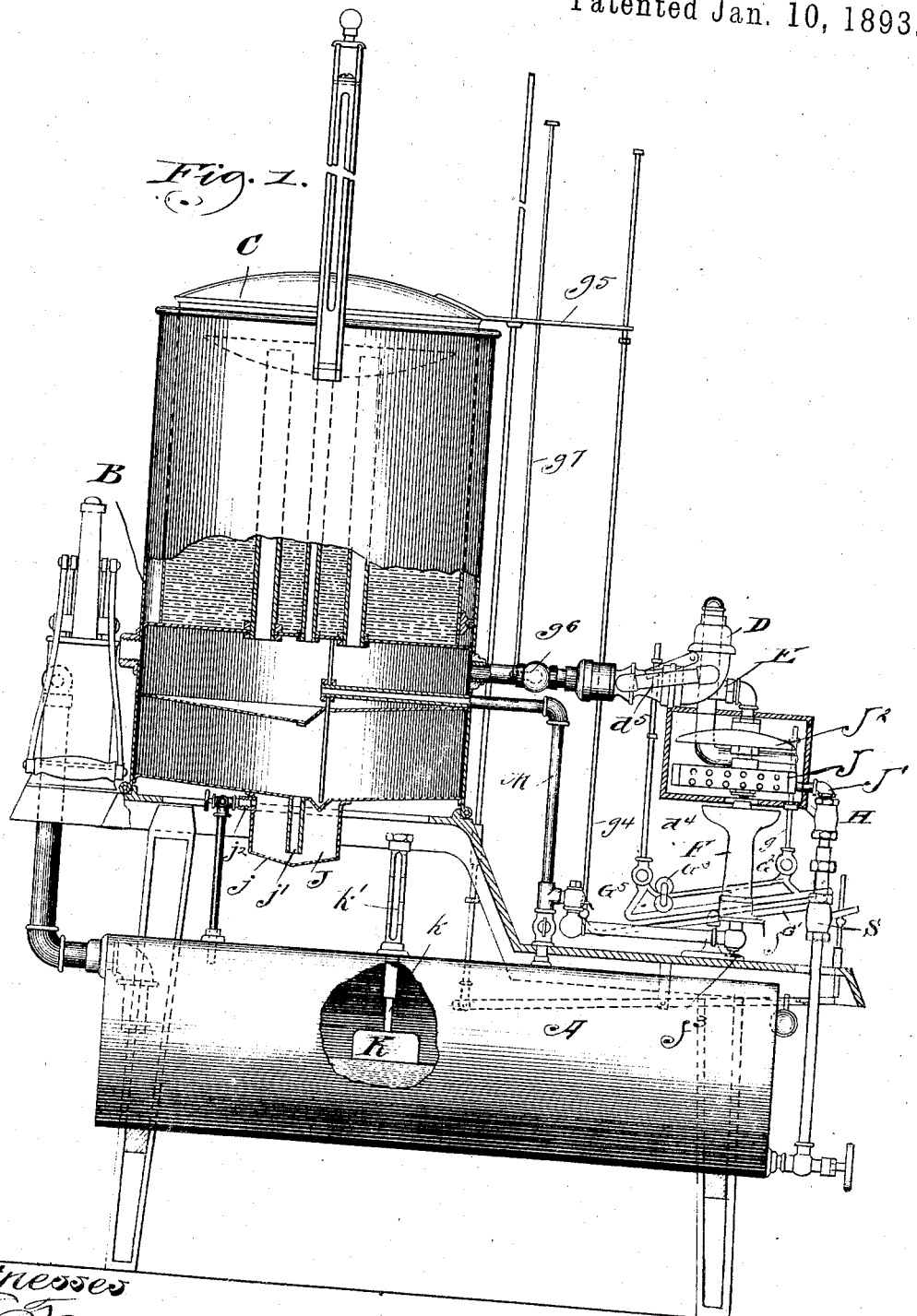
9 Sheets—Sheet 1.

GAS GENERATING APPARATUS.

No. 489,737.

Patented Jan. 10, 1893.

Fig. 1.



Witnesses
D. D. Mann,
D. D. Griffiths

Inventor,
Jacob M. Goldsmith
By Banning & Banning & Payson.
Attys.

(No Model.)

J. M. GOLDSMITH.

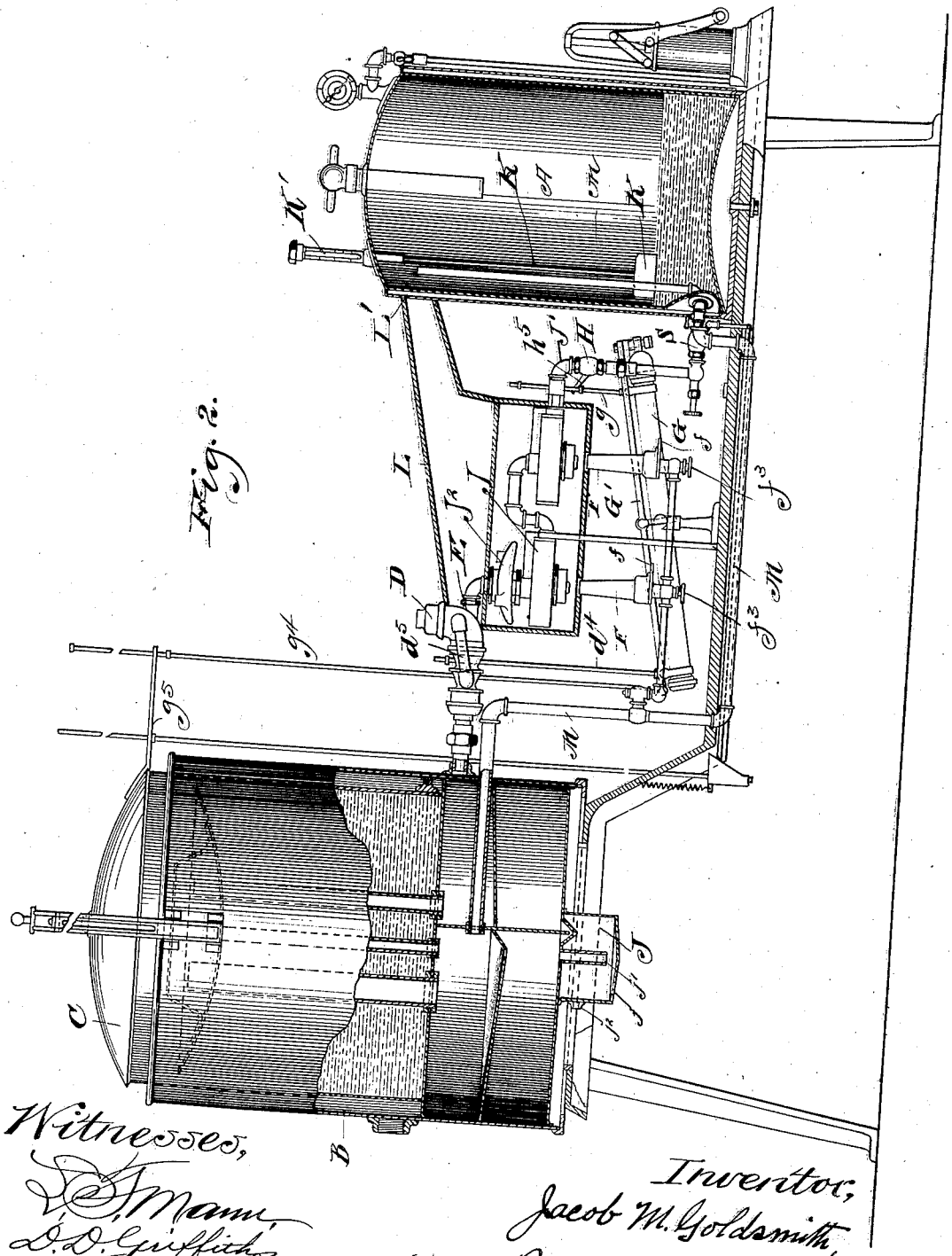
9 Sheets—Sheet 2.

GAS GENERATING APPARATUS.

No. 489,737.

Patented Jan. 10, 1893.

Fig. 2.



Witnesses,
D. D. Mann
D. D. Griffiths

Inventor,
Jacob M. Goldsmith,
By Banning & Banning & Payson
Att'ys.

(No Model.)

J. M. GOLDSMITH.

9 Sheets—Sheet 3.

GAS GENERATING APPARATUS.

No. 489,737.

Patented Jan. 10, 1893.

Fig. 3.

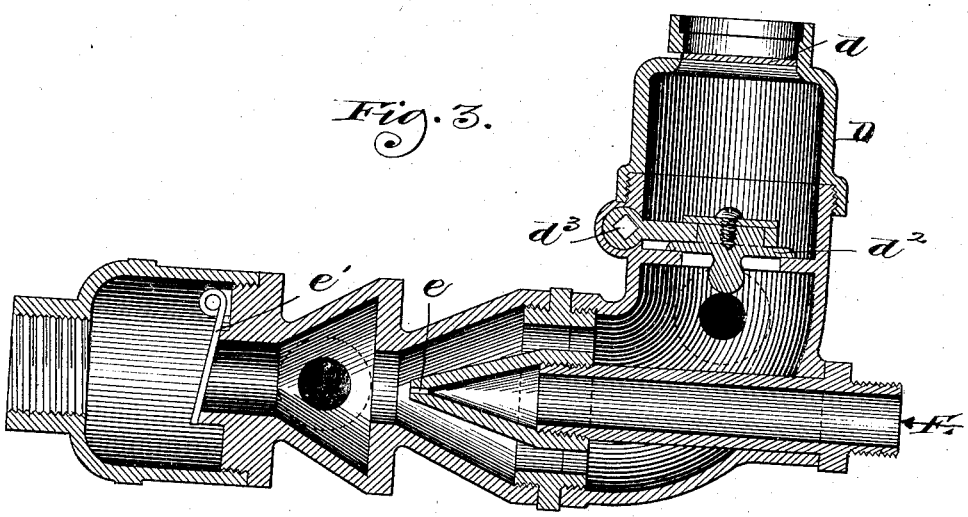
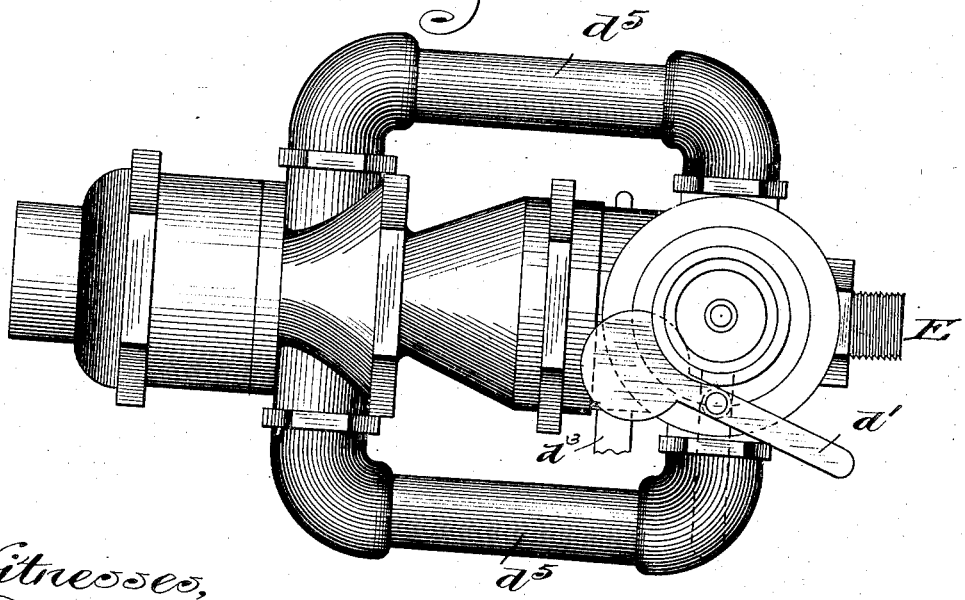


Fig. 4.



Witnesses,
D. S. Mann,
D. D. Griffiths.

Inventor,
Jacob M. Goldsmith,
By Banning & Banning & Payson.
Attys.

(No Model.)

J. M. GOLDSMITH.

9 Sheets—Sheet 4.

GAS GENERATING APPARATUS.

No. 489,737.

Patented Jan. 10, 1893.

Fig. 5.

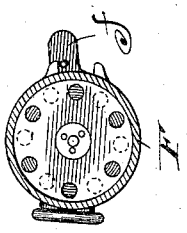


Fig. 6.

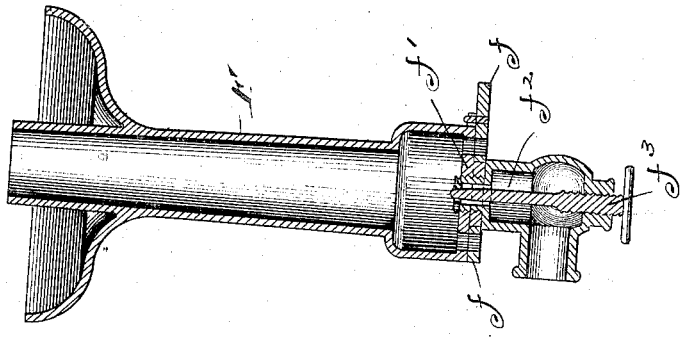
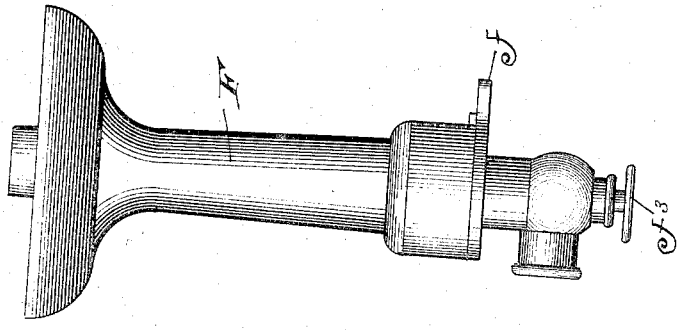


Fig. 7.



Witnesses,
D. D. Mann
D. D. Griffiths

Inventor;
Jacob M. Goldsmith,
By Banning & Banninger Payson,
Attys.

(No Model.)

J. M. GOLDSMITH.

9 Sheets—Sheet 5.

GAS GENERATING APPARATUS.

No. 489,737.

Patented Jan. 10, 1893.

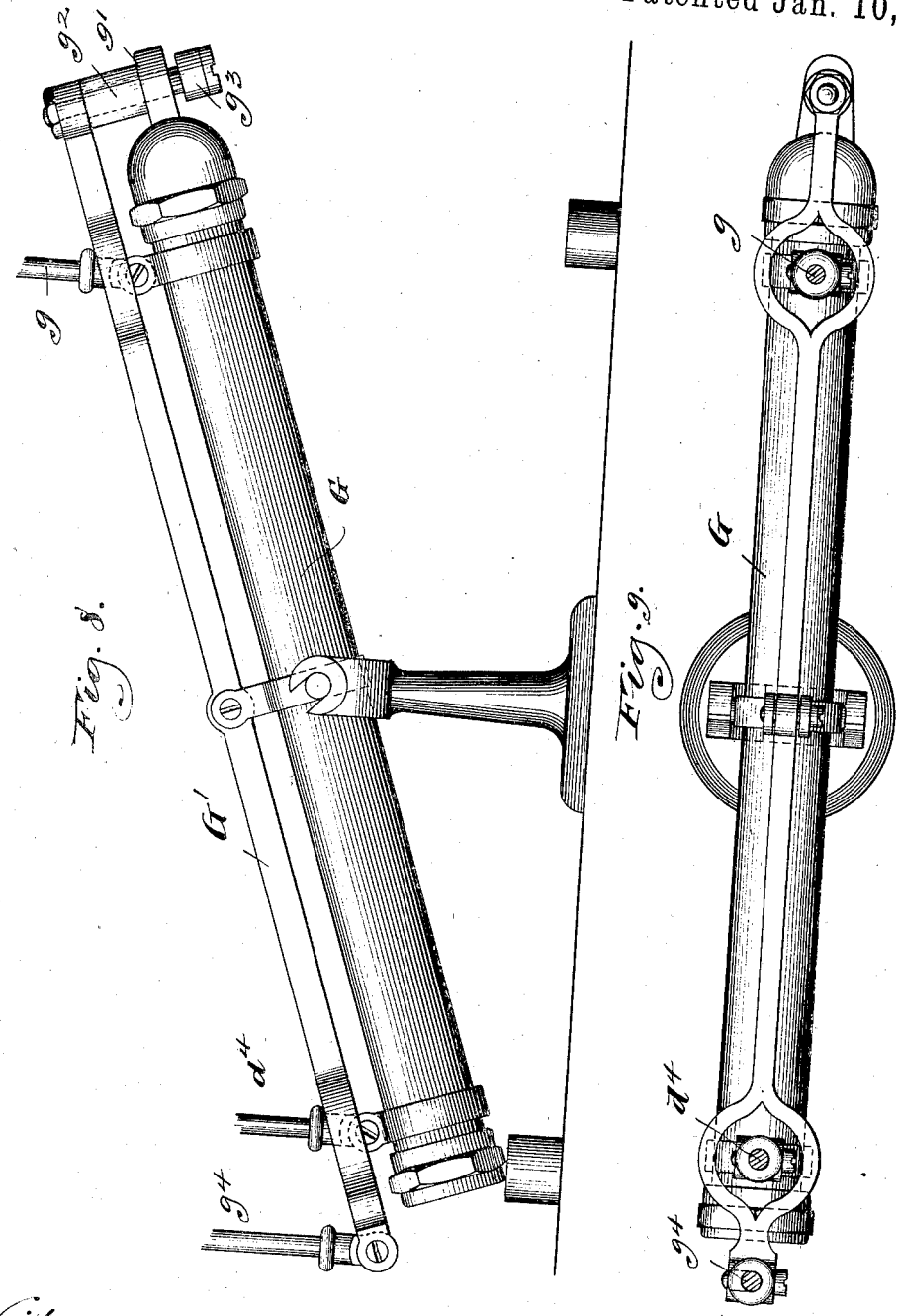


Fig. 8.

Fig. 9.

Witnesses,
D. E. Mann,
D. D. Griffiths

Inventor,
Jacob M. Goldsmith
By Banning & Banning & Dyson,
Attys,

(No Model.)

J. M. GOLDSMITH.

9 Sheets—Sheet 6.

GAS GENERATING APPARATUS.

No. 489,737.

Patented Jan. 10, 1893.

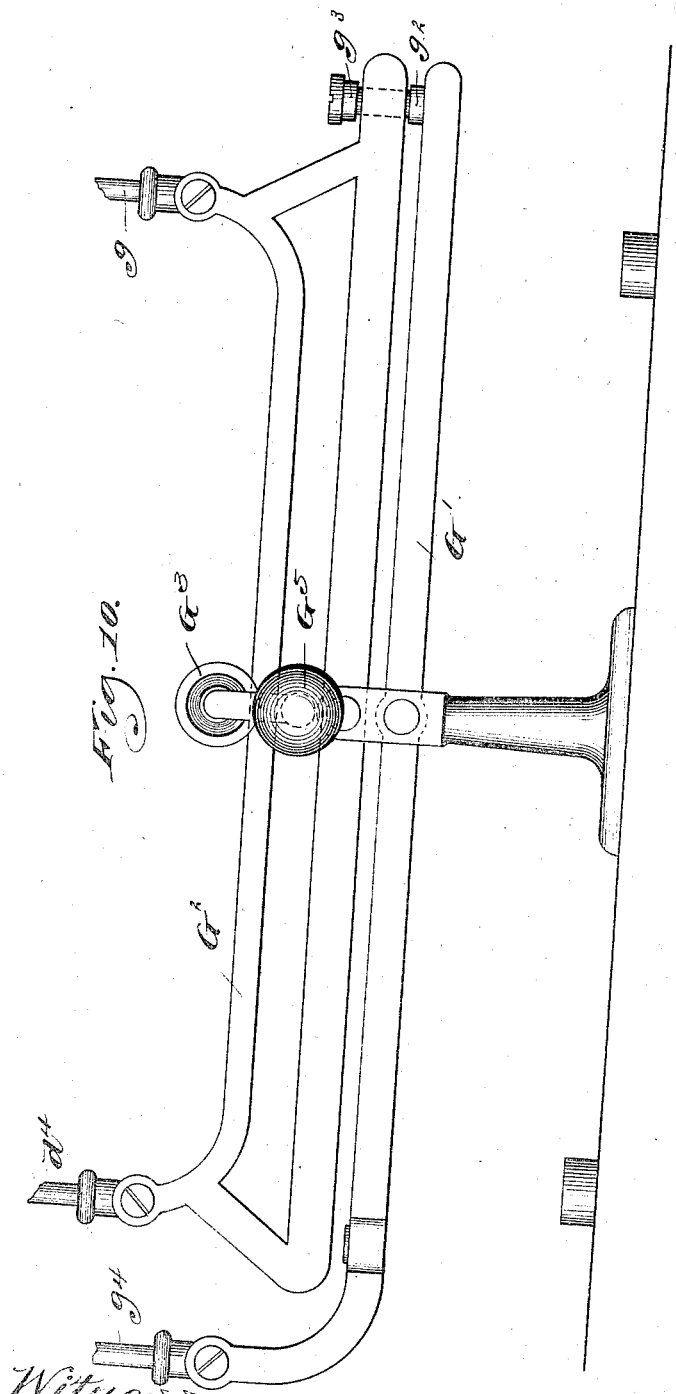


Fig. 10.

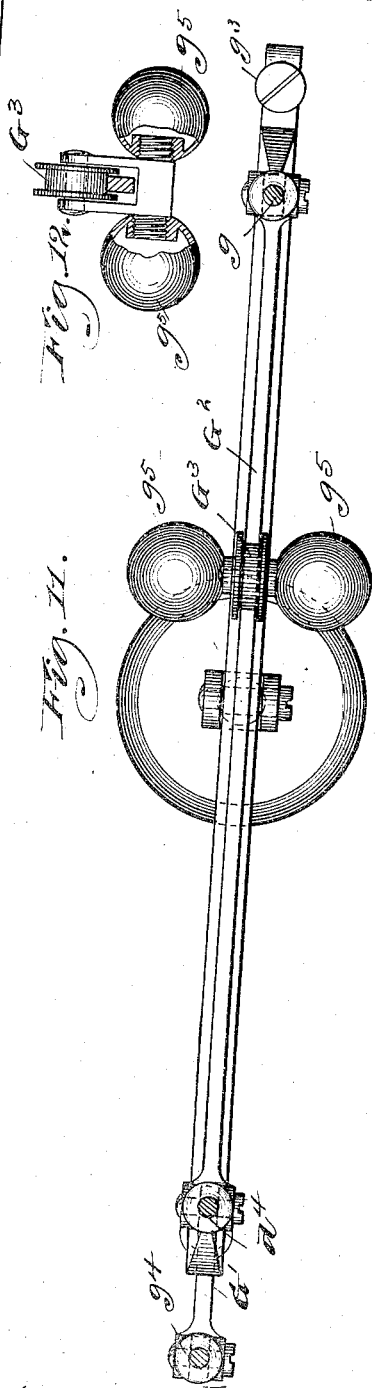


Fig. 11.

Fig. 12.

Witnesses,
[illegible]
D. D. Griffiths

Jacob M. Goldsmith, Inventor,
By Banning & Banning & Payson,
Attys.

(No Model.)

J. M. GOLDSMITH. 9 Sheets—Sheet 7.

GAS GENERATING APPARATUS.

No. 489,737. Patented Jan. 10, 1893.

Fig. 13.

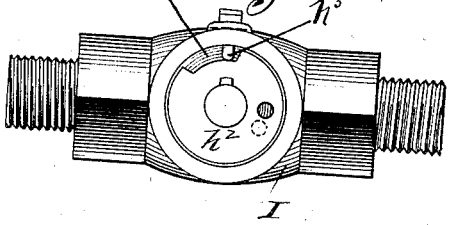


Fig. 15. Fig. 17.

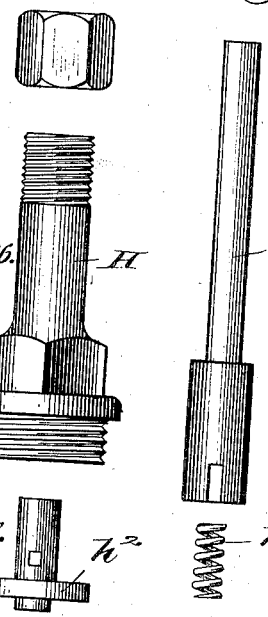


Fig. 14.

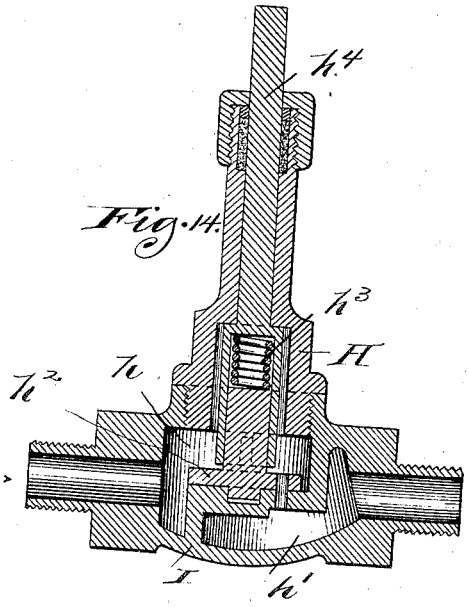


Fig. 16.

Fig. 18.

Fig. 19.

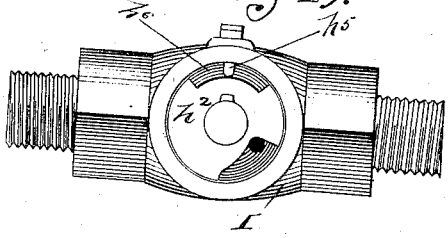


Fig. 20.

Witnesses,
D. E. Mann,
D. D. Griffiths

Inventor,
Jacob M. Goldsmith,
By Banning & Banning & Capron,
Attys.

(No Model.)

J. M. GOLDSMITH.

9 Sheets—Sheet 8.

GAS GENERATING APPARATUS.

No. 489,737. Patented Jan. 10, 1893.

Fig. 21.

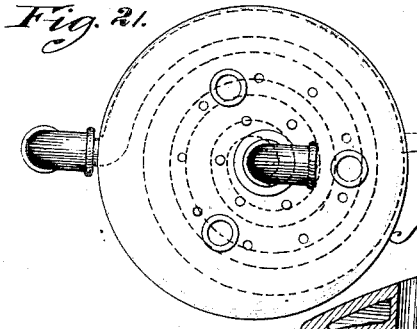


Fig. 22.

Fig. 23.

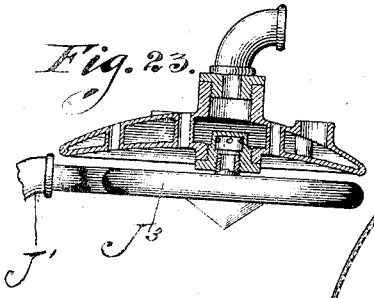
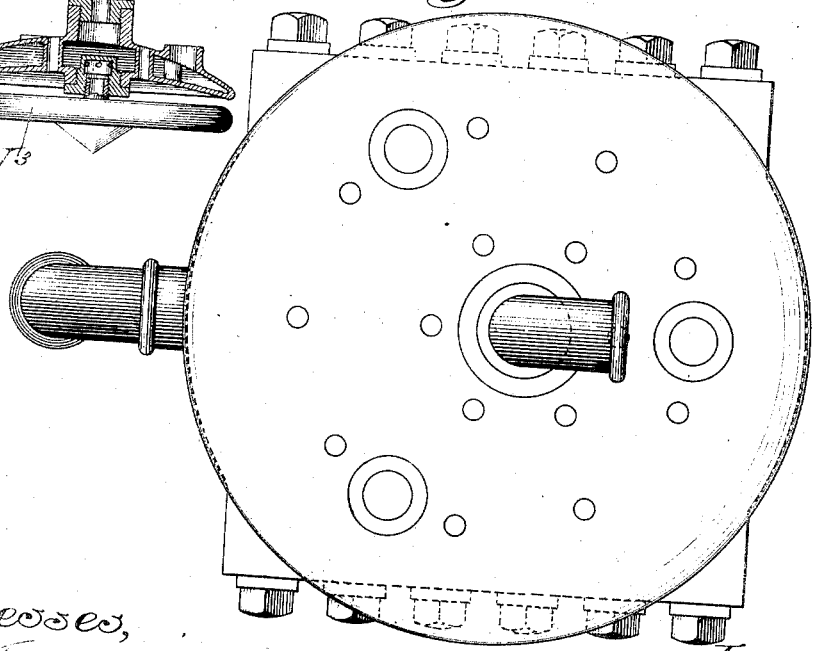


Fig. 24.



Witnesses,
D. S. Mann
L. D. Griffiths

Inventor:
Jacob M. Goldsmith,
By Banning & Banning & Payson,
Attys.

(No Model.)

J. M. GOLDSMITH.

9 Sheets—Sheet 9.

GAS GENERATING APPARATUS.

No. 489,737.

Patented Jan. 10, 1893.

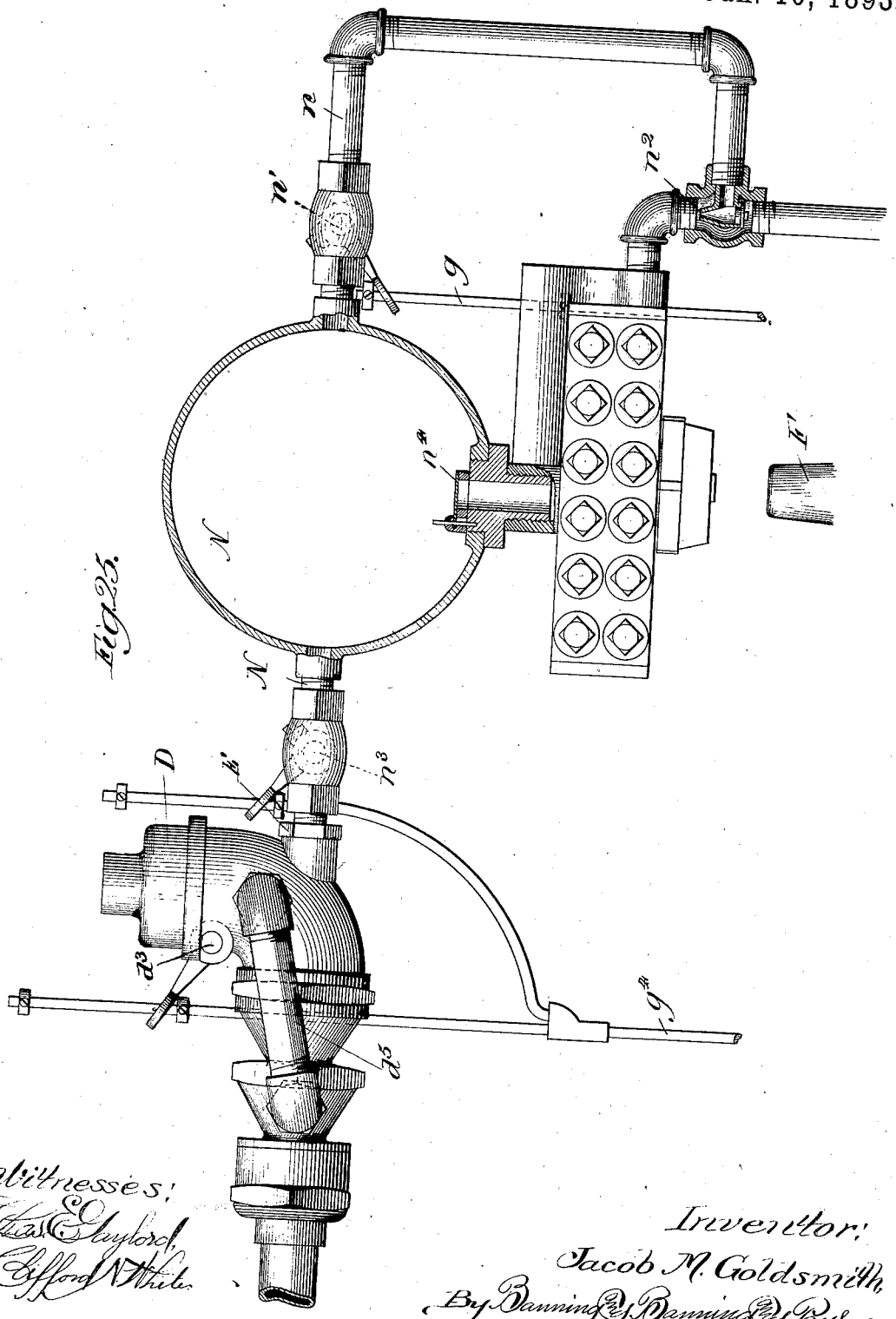


Fig. 25.

Witnesses:
Chas. E. Gaylord
Clifford N. White

Inventor:
Jacob M. Goldsmith,
By Banning & Banning & Payson,
Attys.

UNITED STATES PATENT OFFICE.

JACOB M. GOLDSMITH, OF CHICAGO, ILLINOIS.

GAS-GENERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 489,737, dated January 10, 1893.

Application filed January 25, 1892. Serial No. 419,242. (No model.)

To all whom it may concern:

Be it known that I, JACOB M. GOLDSMITH, a citizen of the United States, residing at Chicago, Illinois, have invented certain new and useful Improvements in Portable Gas-Generating Apparatus, of which the following is a specification.

The object of my invention is to make certain further improvements on the gas generator described and claimed in an application heretofore made by me, Serial No. 378,816, filed January 23, 1891, Patent No. 476,261, dated June 7, 1892; and my invention consists in the features and details of construction hereinafter described and claimed.

In the drawings, Figure 1 represents a side elevation, partly in section, of one arrangement of my improved gas works; Fig. 2 represents a side elevation, partly in section, of another form of my improved gas works; Fig. 3 represents a longitudinal section of a compound air injector used by me; Fig. 4 represents a plan view of the same; Figs. 5, 6 and 7 are details of the burner used in connection with my improved gas works; Figs. 8, 9, 10, 11 and 12 show details of the automatic valve trip used with my improved gas works; Figs. 13 to 20 inclusive are details of the oil valve used by me; Figs. 21, 22, 23 and 24 show details of the particular kind of retort which I prefer to use in connection with my improved gas works; and Fig. 25 is a side elevation, partly in section, of a modified arrangement for securing the flow of oil to the retort.

In making my improved gas works, I make them in many respects like the one described and claimed in my said patent No. 476,261. The oil supply tank or reservoir, the water tank or receptacle, the gas holder, and the generator for converting the crude oil or petroleum into gas, may be made substantially as described and claimed in my other application, and operated in substantially the same way. I introduce, however, a number of modifications or details, which I consider improvements, and in respect to which I desire a patent. The oil supply tank or reservoir may be located with reference to the water reservoir and gas holder, either as shown in my other application, or as shown in Fig. 1 of my present application. I have designated the oil reservoir as A, the water reservoir as B, and the gas holder as C. The other parts I will designate and letter as I describe them. The oil—petroleum or other oil—is intended to be stored in the tank A, whence it passes through a pipe to a retort, where it is heated and converted into gas. From thence it passes into the holder C, through an appropriate pipe, to raise the holder, which is arranged in the water reservoir B until it has reached the proper limit, and from whence it passes through appropriate pipes to the place of use.

First. The first improvement that I desire to describe is a compound air injector, located in the gas pipe between the retort and the gas holder, and I will designate this injector as D. It is shown in detail and enlarged in Figs. 3 and 4 of the drawings. In Fig. 3 I have shown a longitudinal section through the injector, and in Fig. 4 a plan view. The injector is intended to be open at the top to admit of the desired quantity of air intended to be mixed or mingled with the gas and pass with it into the gas holder. Near the opening of the injector I have shown a cut-off plate d, provided with a handle d', by which it may be slid or moved into position either to entirely close the opening to the injector, or to leave enough opening to admit the required quantity of air, as desired. Farther down in the injector I have arranged a valve d^2, mounted on a rock shaft d^3, by which it may be raised or opened to admit the air, as desired in the operation of the works. This shaft has a rod d^4 shown in Figs. 1 and 2, connected with its end, which extends down to connect with the end of an automatic valve trip, to be hereinafter described, so that the valve d^2 will be automatically opened and closed in the operation of the machine. After the air has passed the valve d^2, a portion of it passes along the main pipe of the injector, as shown in Fig. 3, and the remaining portion passes through an auxiliary pipe or pipes d^5, shown in Fig. 4. A gas pipe E, leading from the retort, carries the gas into the main injector pipe, and discharges it at a point intermediate the place where the auxiliary pipes depart from and return to the main injector pipe. As the gas rushes through the gas pipe, it is discharged into the main injector pipe through a nozzle e, which creates a suction that draws the air along with it, and causes

it to commingle with the gas to pass forward through a flap valve e', which opens against the pressure of the gas in its forward course, but which closes against any back pressure of the gas, so that the gas and air mingled with it may pass forward into the gas holder, but cannot pass backward out of such holder. The air that passes through the auxiliary pipe or pipes d^5 again enters the main pipe beyond the nozzle e of the gas pipe, so as to be mingled with the gas and carried forward into the holder. There will thus be provided means for the admission of air into the pipe to commingle with the gas at two places, one supply coming from the main injector pipe, and the other entering from the auxiliary pipes. The arrangement and operation of these parts will be apparent from an examination of Figs. 3 and 4, in connection with the above description.

Second. The next improvement that I desire to describe is in relation to regulating the admission of gas into the burners F, located under the retorts, by which the retorts are heated. It is necessary in some cases to have a greater supply of gas than others, as affected by variations of climate and amount of heat required in the retorts. To effect this regulation, I employ means as illustrated in Figs. 5, 6 and 7 of the drawings. At the entrance to the burner I arrange a disk f, provided with a number of holes, which are adapted to register with holes in the bottom f' of the burner. By moving this disk in the one direction or the other, these holes may be opened for the admission of air, or closed to exclude it, either in whole or in part. The gas passes into a chamber f^2, and along through the holes, preferably three of them, shown particularly in Fig. 5, to the nozzle of the burner. These holes are constantly open. In order to increase the supply of gas beyond what will be furnished through these three holes, I arrange a pin valve f^3, which passes through the plate f, and through the bottom of the burner f', and protrudes into the burner through the larger central hole shown in Fig. 5. This pin is tapered at the point, so that by screwing it back a space will be left around the point for the admission of gas, and by screwing it forward, the space will be diminished or entirely filled by the pin, thus making the hole variable in size of opening. By the use of the disk f, with its holes registering with the holes in the bottom of the burner, I can regulate the supply of air admitted to the burner, and by screwing the pin valve farther in or out, I can increase or diminish the quantity of gas that shall be admitted to the burner over and above the regular supply that constantly passes through the three holes around the pin. The arrangement and operation of these parts will be readily understood from an examination of Figs. 5, 6 and 7, in connection with the above description.

Third. The next improvement that I desire to describe is in reference to the means for automatically tripping the valves to shut off or regulate the supply of oil, gas and air that shall pass through their respective pipes. I have illustrated this improvement in Figs. 8, 9, 10, 11 and 12, of the drawings. In the latter of these figures I have shown a modified form of trip. In both cases, however, the trip is intended to be automatic. In Figs. 8 and 9 I have shown a nicely balanced tube G, intended to be partially filled with some unstable liquid that will run from one end to the other, as the one end or the other is depressed. Near one end of this pivoted tube is a rod or link g, that connects with the arm or handle of a valve in the oil supply pipe, to admit or shut off the supply of oil to the retort. Near the other end is a rod or link d^4 heretofore mentioned, that connects the handle of the shaft d^3, to open or close the valve d^2 in the air injector. Mounted above the pivoted tube G is a leverage bar G′, which is arranged to oscillate with it. At one end this bar is connected to the end of the pivoted tube by means of an extension g', between which and the end of the bar a rubber cushion g^2 may be arranged, and, if desired, another rubber cushion g^3 is also preferably arranged on the bolt connecting the bar G′ with the extension g' on the end of the pivoted tube, and immediately beneath such connection. These rubber cushions prevent any sudden jarring or movement, and insure an easy and regular movement of the parts. At the other end of the bar G′ is a rod or link g^4, which extends up by the side of the water reservoir, so as to be engaged by an arm g^5, extending from the top of the gas holder, by which it may be raised or lowered, as the holder is raised or lowered when certain limits in its movement have been reached. In Figs. 10, 11 and 12, I have shown a modified form of this automatic valve trip. In these figures I have pivoted a bar G^2 at a central point, instead of using a pivoted tube containing an unstable liquid, and below it I have pivoted the bar G′, connected at one end to the bar G^2, with rubber cushions g^2 and g^3, as in the other case. The top of this bar G^2 is arranged to have a weighted roller G^3, mounted on it, adapted to roll toward the one end or the other, as the bar G^2 tips in the one direction or the other. This roller G^3 rides on the bar G^2, and is balanced on it and sufficiently weighted by means of the weights g^5. By thus using the bar G′ in these different arrangements, movements may be transmitted from the holder to the end of the pivoted tube or pivoted bar farthest from the holder, through the medium of the long leverage afforded by the superimposed bar G′, instead of by a direct action on the end of the pivoted tube or pivoted bar. The object of this is to not only prevent any sudden jar of the gas holder as it strikes the stops on the rod g^4 in its up or down movements, which would occasion a fluctuation in the pressure

of the gas supply from the holder, so as to affect the uniformity and constancy of the lights or burners being supplied with gas from the holder, but to increase the leverage power by which the holder in its movement actuates the pivoted tube or bar. The arrangement and operation of these automatic trips will be fully understood from an inspection of Figs. 8 to 12 of the drawings, inclusive, in connection with their description above. It is intended by the use of the automatic trips above described to shut off the supply of oil from the retort whenever the gas holder has been raised by the supply of gas to the pre-determined limit of its upward movement. In case of a failure for any cause to thus shut off the supply of oil, so that gas would continue to be generated, notwithstanding the holder had been lifted to the limit of its intended upward movement, I consider it desirable to employ means to prevent the passage of gas from the retort into the holder. To effect this, I arrange an emergency valve g^6 in the gas pipe, as shown in Fig. 1, and have carried a rod or link g^7 from the arm or handle of this valve up through the out-projecting arm g^5 from the top of the gas holder, and have provided such rod or link with a stop at its upper end. If the gas holder should for any reason rise above its intended limit, the arm g^5 would come into contact with the stop on the upper end of the rod or link g^7, and by carrying such rod up, turn the valve g^6, so as to shut the gas pipe leading from the retort to the holder and prevent the passage of more gas into the holder and the consequent lifting of the holder beyond its intended limit and the breaking of the water seal. The arrangement and operation of these parts will be easily understood from an examination of Fig. 1 of the drawings.

Fourth. The next improvement that I desire to describe relates to the construction and operation of the valves for supplying the oil to the retorts, and is illustrated in Figs. 13 to 20, inclusive, of the drawings. There are two valves shown in these figures, one of which may be termed the service oil supply valve, and the other the emergency valve. The service supply valve is the one which is used under ordinary circumstances to supply the oil to the retort to be converted into gas. It is particularly shown in Figs. 13 and 14 of the drawings. This valve may be designated by the letter H. The oil coming in, as indicated by the arrow, passes into a chamber h. Before it can pass out and along to the retort it must come into the chamber h'. Arranged between these chambers is a disk h^2, provided with a hole adapted to register with a hole passing through the partition into the chamber h'. As the disk is turned, however, its hole will pass away from the hole leading into such chamber, and cut off the supply of oil. The holes register when the oil is intended to pass from the oil tank into the retort, and do not register when the oil supply is cut off. This valve disk is provided with a stem, and is held against its seat by means of a spring h^3, which in turn is held in a sleeve provided with a stem h^4, which may be turned, and with it the valve disk h^2, by means of an arm h^5, connecting with the rod or link g on the pivoted tube or bar. In this way, as the pivoted tube or bar rises or falls the valve disk h^2 will be turned so as to have its hole register or otherwise with the hole leading to the chamber h', to admit or shut off the supply of oil. The emergency valve is particularly shown in Fig. 19. It may be designated by the letter I. It differs from the service valve only in the form of the valve disk h^2, which is unprovided with a hole, but which is adapted to pass back and forth across a hole through which the oil from the oil tank or reservoir passes, so as to shut off the supply when the exigency requiring its use arises. By dispensing with the hole in the emergency valve disk, a slower and graduating effect is secured in shutting of the supply of oil than by the use of the hole in the service valve disk. This is the principal reason for using a valve disk of this form, instead of one provided with a hole, as shown in Fig. 13. The emergency valve is intended to be operated for the same purpose, and by substantially the same means as in my other application, and need not be further described in detail. The valve disk h^2 in both the valves shown, is provided with a stop pin h^5 protruding into a notch h^6 in the edge of the valve disk to insure the proper location and limit the movements of the valve disk. The construction, arrangement and operation of both of these valves, and all their parts, will be easily understood by an examination of Figs. 13 to 20, inclusive, in connection with my description above.

Fifth. The next improvement that I desire to describe relates to the automatic drip from the chamber, in which particles of condensation from the gas holder are collected. This drip, which I will designate by the letter J, is shown in Figs. 1 and 2 of the drawings. At the bottom of the chamber, below the water reservoir, in which particles of condensation collect, is arranged a trap j. A pipe j' opens from the bottom of the chamber into this trap, and permits the particles of condensation to pass or drop down into the trap. The pipe j leading from the bottom of the chamber into the trap prevents the accumulation of condensation in the chamber, and as the trap is filled, it affords a seal to prevent the escape of gas. A pipe j^2 leads from the trap j, from which the particles of condensation may be piped or carried off by a pipe, as shown in Fig 1, back into the oil tank, when the same is free from pressure, so as to again pass through the retort and be converted into gas.

Sixth. The next improvement I desire to describe relates to the arrangement of an oil gage, shown particularly in Figs. 1 and 2, to indicate the quantity of oil, from time to time, in the oil reservoir or tank. To do this, I ar-

range a float K, connected with a rod that rests on the surface of the oil contained in the tank under pressure, and moves up and down with it. A rod k extends up into a glass or other transparent pipe k', preferably inclosed in a slotted tube to prevent its becoming broken, and through which the end of the rod, as it moves up or down, may be observed from time to time to note the consumption of oil in the tank, so that the supply may be replenished as required. I employ this kind of a gage or indicator in preference to a glass tube at the side of the tank, in which the oil may rise and fall, as in that case the breakage of the tube would permit the oil which is under pressure to flow out and cause liability to fire or other damage.

Seventh. The next improvement that I desire to describe relates to means for supplying the oil tank with heat, so as to raise and maintain the temperature both of the oil and of the air in the oil tank, by which the pressure on the oil to make it flow is secured. This improvement is shown in Fig. 2 of the drawings. I have surrounded the retorts with a hood L, which communicates with an annular jacket L', around the oil supply tank. The heat passes from this hood into the jacket or chamber surrounding the oil supply tank, so as to heat such tank, and thereby heat the oil and the air contained in the tank above the oil which had been pumped in to secure the necessary pressure on the surface of the oil. As the oil in the tank diminishes, the heat causes the air within the tank to sufficiently expand, and thus to maintain a pressure on the surface of the oil without frequent replenishment of air from the pump. This improvement will be understood by an examination of Fig. 2, in connection with the description above.

Eighth. The next improvement that I desire to describe relates to the means for supplying carbureted air to the burner when the fire is started. This improvement is also shown particularly in Fig. 2 of the drawings. A pipe M is arranged within the oil tank with its top open but above the highest surface of the oil in the tank. This pipe extends down and along, preferably beneath the bed plate, and opens into the same chamber that the gas is supplied to from the gas holder. It is provided with a suitable cock or valve, so that it may be opened or closed, as required. When it is desired to start the fire to heat the retort, the requisite quantity of air is pumped into the oil tank to create the desired pressure, and after it has become carbureted, the valve or cock in the pipe M is opened, so that carbureted air passes along such pipe and into the chamber which communicates with the gas holder. It passes up into the holder and raises it until the pressure is equalized in the oil tank and in the gas holder. By then swinging the burners into place under the retort, the pipe conveying gas from the gas holder to the burners is opened, and the carbureted air passes to the nozzle of the burners. When the fire is lighted, the retorts become heated, and the operation of manufacturing gas is carried along as intended. The cock in the pipe M should be closed after a sufficient quantity of carbureted air has been supplied, so that there will be no further passage of air from the oil tank to the gas holder. By taking the carbureted air from the oil tank to the gas holder in this way, an even pressure is secured, which would not be the case if the carbureted air were taken from any other source, and alcohol or other liquids dispensed with in starting the fire. The arrangement and operation of this improvement will be understood by a reference to Fig. 2 of the drawings, in connection with my description.

Ninth. The next improvement illustrated in Fig. 25, relates to the means of securing or compelling a flow of oil to the retort. In the use of this improvement I propose to dispense with the pump O and compressed air on the surface of the oil in the tank, and in their place to employ a receptacle or chamber N, arranged above the retort, into which the gas, as it is generated, passes. A pipe n leads from this receptacle back, around, and into the oil pipe intermediate the oil tank and the retort. By opening a valve n' in this pipe, a portion of the gas from the receptacle passes around and into the oil pipe, where it is delivered through a nozzle n^2, pointed in the direction of the flow of oil. The gas from the receptacle, and under pressure, rushing around to this pipe, enters the oil pipe with sufficient force to cause a suction in the direction of the retort, so as to draw or lead the oil to the retort, thus acting as an injector and producing the same effect as a body of compressed air on the surface of the oil in the tank. Another pipe N' leads from the receptacle on toward the air injector and gas holder. A valve n^3 is located in this pipe, and a valve n^4 is located at the entrance to the receptacle opening by the pressure of the gas from the retort. The valve n^3, the valve n' and the valve d^2 in the injector open and close automatically and simultaneously in the operation of the machine, to prevent the gas from passing from the receptacle N when pressure in such receptacle is needed, or to permit the gas to pass therefrom when desired. An examination of Fig. 25, in connection with the description above, will make this improvement plain. The object of this improved form of construction is to relieve the oil tank from pressure. The balance of the gas from the receptacle passes along the gas pipe into the holder, in the usual way, or in the same way as in the other forms of construction.

I prefer to use in connection with my improved gas works the forms of retort like those illustrated in Figs. 21 to 24 of the drawings, inclusive. The retort illustrated in these figures of the drawings is in all substantial respects the same as that described and claimed

in an application, Serial No. 372,815, filed by me November 28, 1890. I will not stop to describe in minute detail the various parts of the retort, but will refer to my application above mentioned for a fuller description of its construction and operation. I will simply say that J represents the retort in which there is a continuous tortuous passage intended to detain the fluid to be converted into gas in proximity to the burners as a source of heat. The oil enters through the pipe J′, and, after traversing the tortuous passage, the gas into which it is converted passes up through the pipe j until it strikes a baffle plate j', which breaks it into a number of streams that pass out through the small holes j^2 shown in the pipe just below the baffle plate into the hollow superheater J^2, which is provided with heating passages j^3, through which the heat passes to aid in heating the superheater sufficiently to further decompose or superheat the gas.

In Fig. 23 I have shown a modification of the retort, in which form the pipe J′ leads the oil into a flat coil J^3, which contains or affords a tortuous passage to detain it in proximity with the heat until it is converted into gas and passes up through the superheater to be further decomposed as in the other case. The retort found in Fig. 23 will be found particularly advantageous in connection with small works; while the retort shown in the other figures is particularly adapted for larger works.

In Fig. 1 of the drawings I have shown one retort, and in Fig. 2 I have shown two. It is obvious, however, that either one or more retorts may be used, as the amount of heat required may render convenient or desirable.

What I regard as new and desire to secure by Letters Patent is:

1. In portable gas works, the combination of an oil supply tank, a gas generating retort, a gas holder, pipes for conveying oil from the tank to the retort and gas from the retort to the holder and gas from the holder to the place of use, an air injector opening into the pipe between the retort and the holder, provided with an air inlet and with a valve mounted on a rock shaft to move it from or toward its valve seat to open or close it, an automatic valve trip, and a rod connecting the valve shaft with the valve trip, the pipe from the retort to the holder being provided with a discharge nozzle entering the main injector pipe between the valve and the holder, substantially as described.

2. In portable gas works, the combination of an oil supply tank, a gas generating retort, a gas holder, pipes for conveying oil from the tank to the retort and gas from the retort to the holder and gas from the holder to the place of use, an air injector provided with an air inlet and with a valve mounted on a rock shaft to move it from or toward its valve seat to open or close it, an automatic valve trip, and a rod connecting the valve shaft with the valve trip, and with an auxiliary pipe or pipes opening at the ends into the main injector pipe, the pipe from the retort to the holder being provided with a discharge nozzle opening into the main injector pipe between the points where the ends of the auxiliary pipe or pipes enter the main injector pipe, substantially as described.

3. In portable gas works, the combination of an oil supply tank, a gas generating retort, a gas holder, pipes for conveying oil from the tank to the retort and gas from the retort to the holder and gas from the holder to the place of use, an automatic valve trip comprising a pivoted member and a leverage bar connected to the pivoted member at the end farthest from the gas holder, and with a rod or link at the end nearest the gas holder movable up and down by the holder as it reaches the limits of its movements, substantially as described.

4. In portable gas works, the combination of an oil supply tank, a gas generating retort, a gas holder, pipes for conveying oil from the tank to the retort and gas from the retort to the holder and gas from the holder to the place of use, an automatic valve trip comprising a pivoted member and a leverage bar connected to the pivoted member at the end farthest from the gas holder and with a rod or link at the end nearest the gas holder, movable up and down by the holder as it reaches the limits of its movements, and means shiftable by the tipping of the pivoted member and bar from one end of the trip to the other, substantially as described.

5. In portable gas works, the combination of an oil supply tank, a gas generating retort, a gas holder, pipes for conveying oil from the tank to the retort and gas from the retort to the holder and gas from the holder to the place of use, a valve comprising chambers separated by a valve seat provided with a port, a valve disk fitted against the valve seat provided with a port and with a central projection, a valve stem provided with a hollow head engaging the projection on the valve disk, and a spring arranged in the hollow head of the valve stem and holding the valve disk constantly to its seat, substantially as described.

6. In portable gas works, the combination of an oil supply tank, a gas generating retort, a gas holder, pipes for conveying oil from the tank to the retort and gas from the retort to the holder and gas from the holder to the place of use, a valve comprising chambers separated by a valve seat provided with a port, a valve disk fitted against the valve seat provided with a port and with a central projection, a valve stem provided with a hollow head engaging the projection on the valve disk, a spring arranged in the hollow head of the valve stem and holding the valve disk constantly to its seat, and means for limiting the extent of movement of the valve disk, substantially as described.

7. In portable gas works, the combination of an oil supply tank, a gas generating retort, a gas holder, pipes for conveying oil from the tank to the retort and gas from the retort to the holder and gas from the holder to the place of use, the oil tank being provided with a hot air surrounding jacket, and a hood inclosing the retort and communicating with the interior of the oil tank jacket, substantially as described.

8. In portable gas works, the combination of an oil supply tank, a gas generating retort, a gas holder, pipes for conveying oil from the tank to the retort and gas from the retort to the holder and gas from the holder to the place of use, the oil tank being provided with a space above the surface of the oil for the reception of air under pressure, a pipe opening into the oil tank above the oil and leading to the gas holder, and a valve or cock in such pipe to permit or prevent the passage of carbureted air from the oil tank to the gas holder, substantially as described.

9. In portable gas works, the combination of an oil supply tank, a gas generating retort, a gas holder, pipes for conveying oil from the tank to the retort and gas from the retort to the holder and gas from the holder to the place of use, a gas pressure receptacle intermediate the retort and the gas holder, a pipe leading from the receptacle and entering the oil pipe intermediate the oil tank and the retort, and a valve in such pipe connected by a rod *g* with the automatic valve trip, whereby the valve is automatically operated to permit or prevent the passage of gas from the receptacle to the oil pipe to facilitate the flow of oil, substantially as described.

10. In portable gas works, the combination of an oil supply tank, a gas generating retort, a gas holder, pipes for conveying oil from the tank to the retort and gas from the retort to the holder and gas from the holder to the place of use, a gas pipe leading from the retort to a gas holder, an emergency valve in such pipe intermediate the retort and the holder, and means actuated by the holder when it rises above its normal limit for automatically operating the valve to close the gas pipe, substantially as described.

JACOB M. GOLDSMITH.

Witnesses:
THOMAS A. BANNING,
EPHRAIM BANNING.