

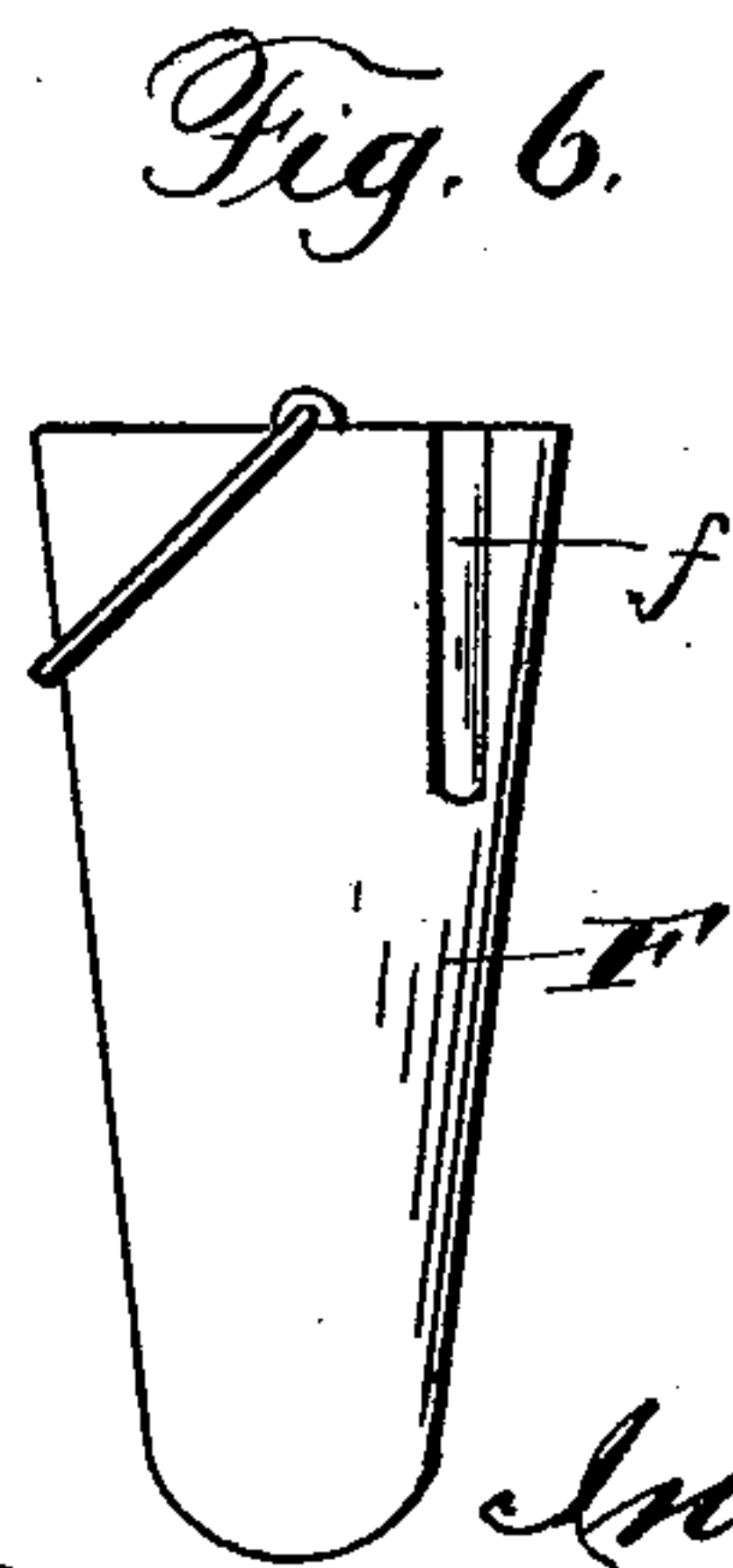
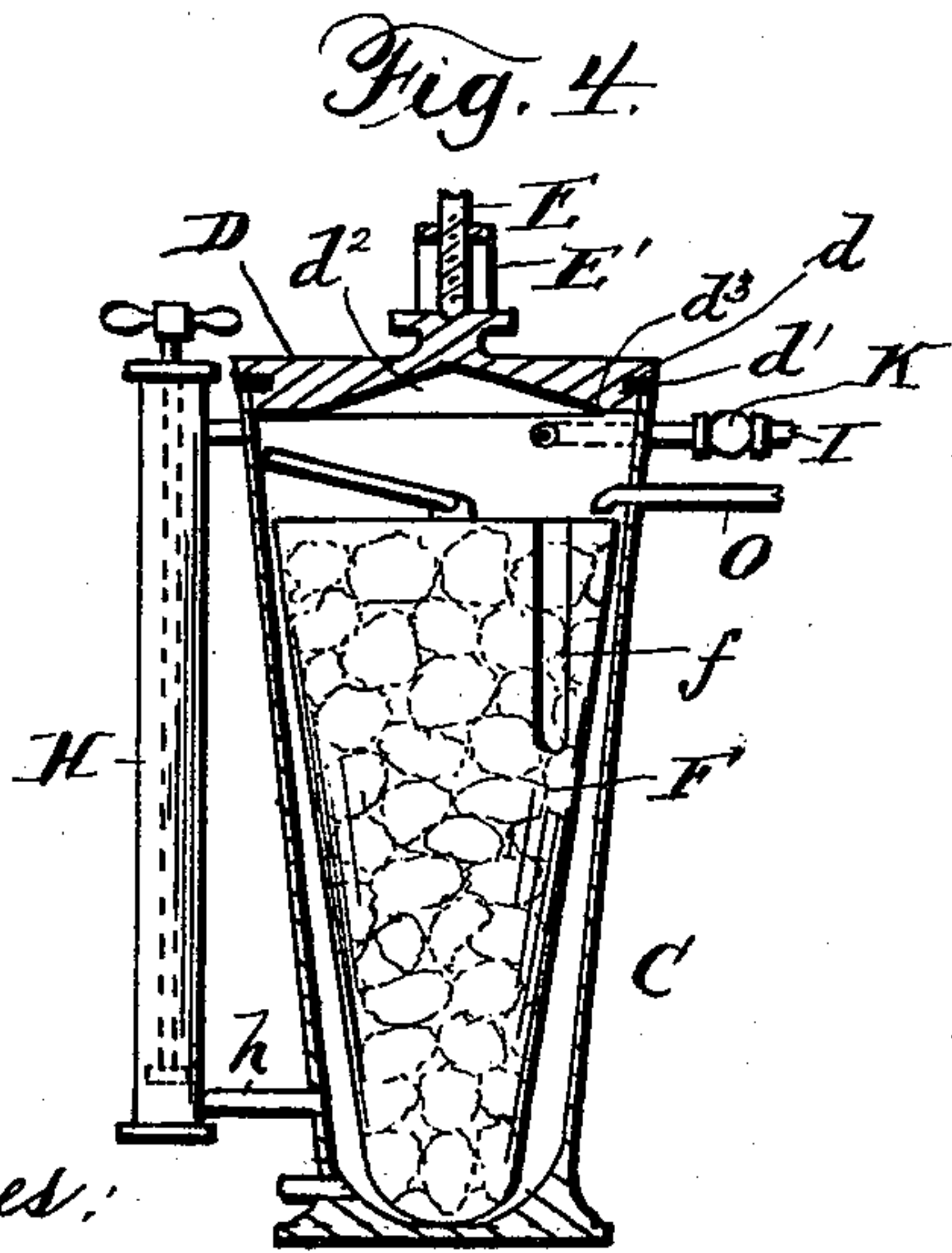
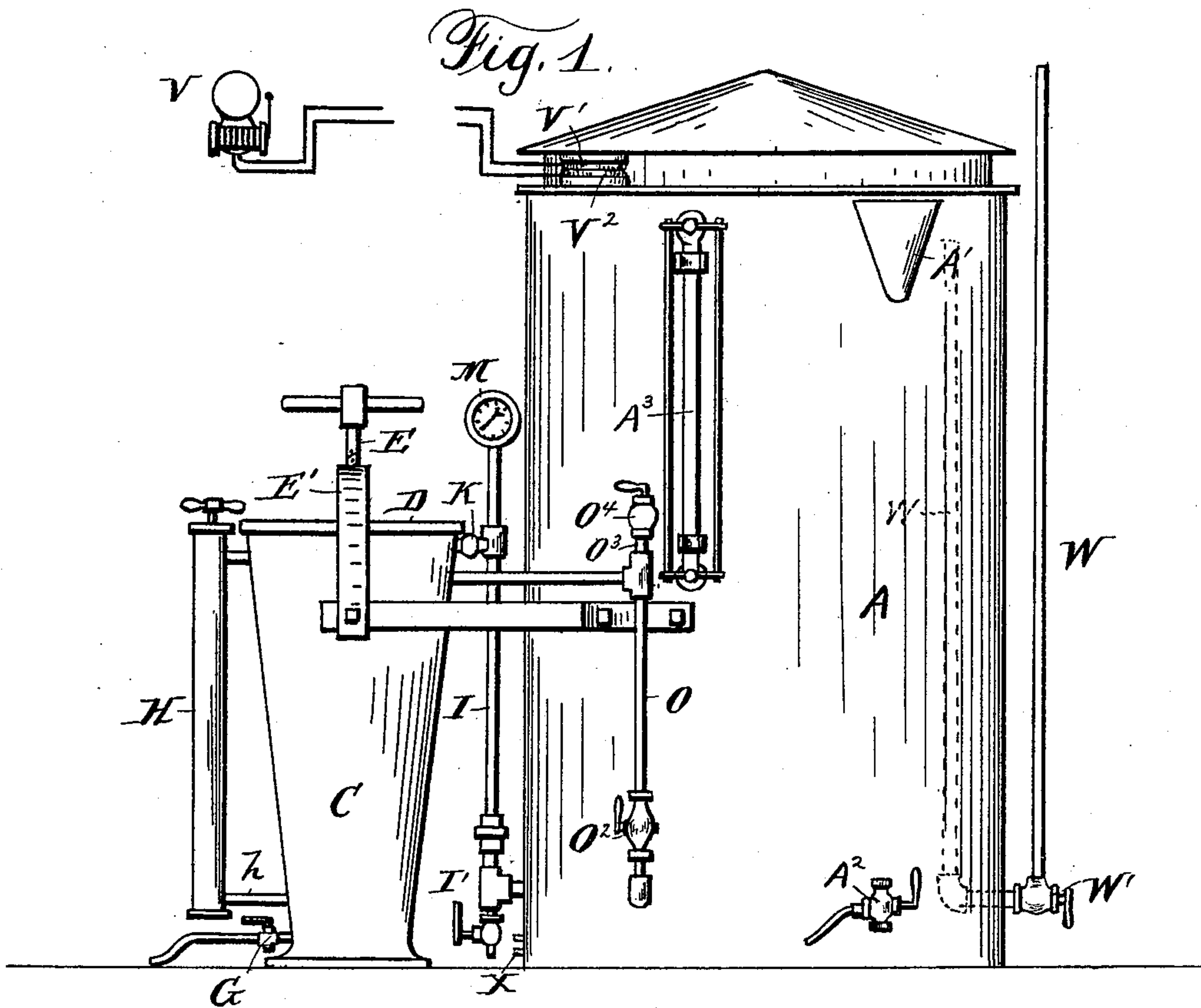
(No Model.)

3 Sheets—Sheet 1.

F. A. MITCHELL.
ACETYLENE GAS GENERATOR.

No. 583,761.

Patented June 1, 1897.



Witnesses:

H. K. Boulton

C. Northrup

Fig. 6.

Inventor:

Frank A. Mitchell,
By Wm E. Boulter,
Attorney.

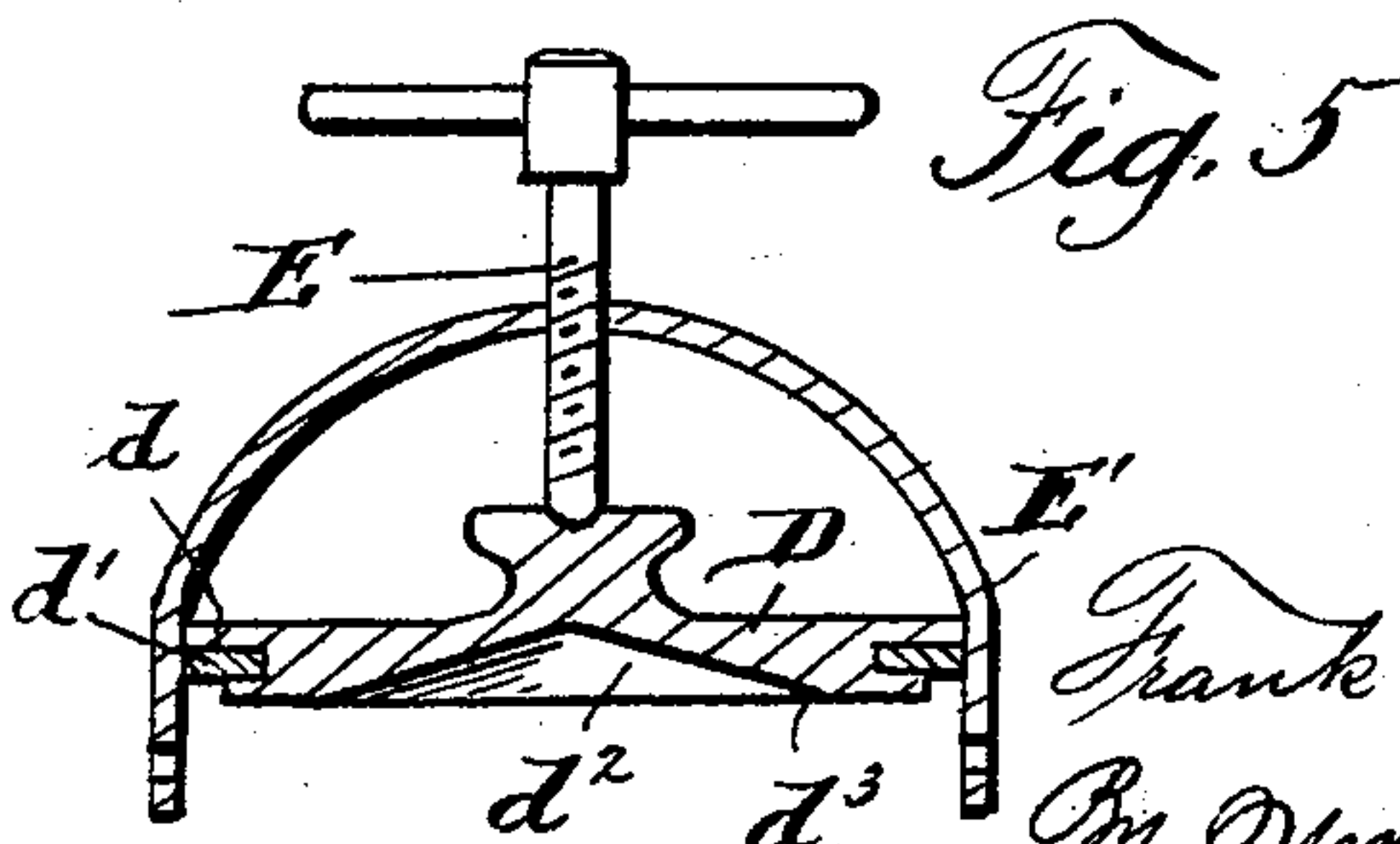
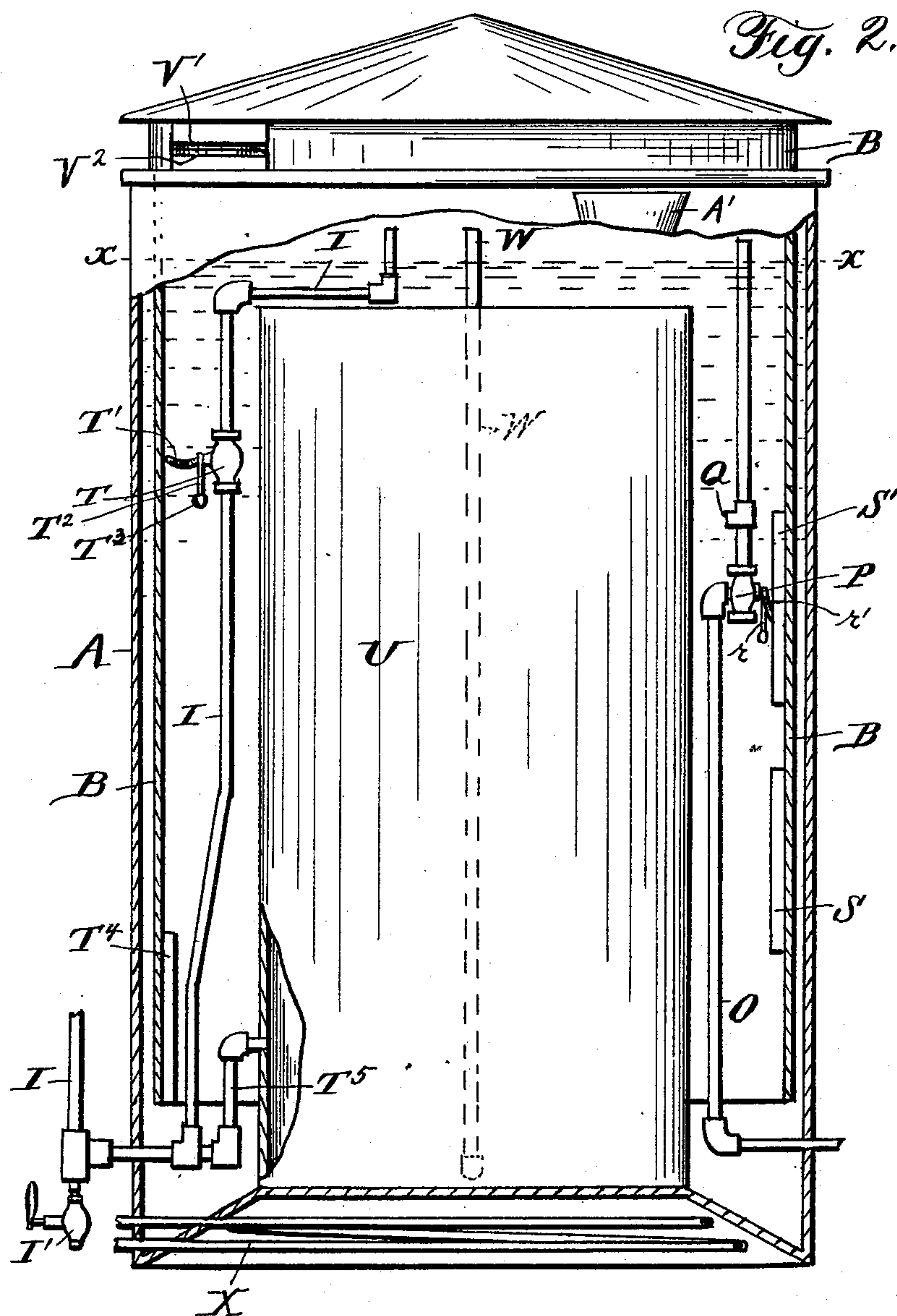
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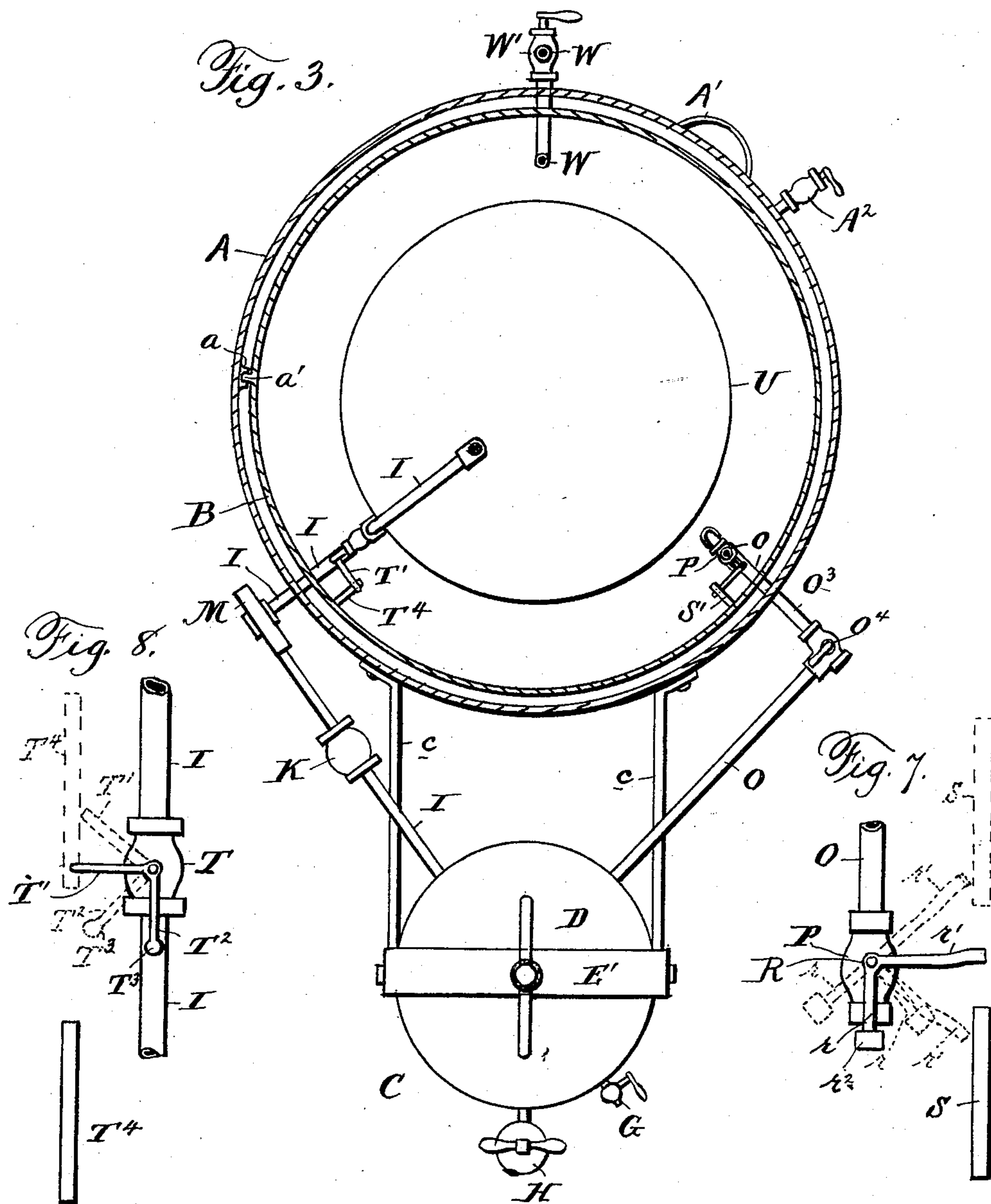
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Witnesses:

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C. S. Horthrup

Inventor:

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Attorney

UNITED STATES PATENT OFFICE.

FRANK A. MITCHELL, OF WILMINGTON, DELAWARE.

ACETYLENE-GAS GENERATOR.

SPECIFICATION forming part of Letters Patent No. 583,761, dated June 1, 1897.

Application filed February 12, 1897. Serial No. 623,177. (No model.)

To all whom it may concern:

Be it known that I, FRANK A. MITCHELL, a citizen of the United States, residing at Wilmington, in the county of New Castle and State of Delaware, have invented certain new and useful Improvements in Apparatus for the Manufacture of Acetylene 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.

My invention has relation to apparatus for the manufacture of acetylene gas, and among the objects in view is to provide an apparatus of the character referred to wherein danger of bursting of the apparatus or blowing out of the gasometer due to undue pressure of the generated gas is avoided; to provide an apparatus which shall be adapted to give an alarm when the carbid is completely or nearly exhausted; to prevent flooding of the generator with water; to prevent freezing of the water within the water-reservoir when the apparatus is placed in exposed positions or when used in cold climates; to provide means whereby the escape of gas into the room when the generator is uncovered for re-charging is avoided; to provide for the complete utilization of all carbid placed within the generator and prevent the formation of a crust upon the surface of the carbid, and also prevent possible bursting of the holder or blowing out of the bottom thereof; to provide an apparatus which is entirely safe and which needs no attention from the time the same is started until all carbid is exhausted; to provide an apparatus which is extremely compact and requires but little space, thus adapting it for convenient packing and shipment; and with the above and other objects in view, all of which will hereinafter appear, the invention consists in the novel construction, arrangement, and combinations of parts, as hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the appended claims.

In the drawings, Figure 1 is an elevation of the complete apparatus constructed in accordance with my invention. Fig. 2 is a vertical sectional view, partly in elevation and upon an enlarged scale. Fig. 3 is a horizontal sectional view, partly in plan, of the ap-

paratus. Fig. 4 is a vertical sectional view of the generator and carbid-holder and elevation of the pump. Fig. 5 is a sectional view, slightly enlarged, of the cover for the generator and the means for confining the same in position. Fig. 6 is an elevation of the carbid-holder removed from the generator. Fig. 7 is a sectional detail view of the automatically-operated valve in the water-pipe and the means for operating it. Fig. 8 is a similar view of the automatically-operated valve in the gas-pipe and the means for operating it.

Many of the apparatus of this character as heretofore constructed are open to many objections more or less serious, some of which objections are the great amount of space required for setting the same up, complex working parts, and liability to get out of order and necessitating more or less frequent attention, and the present apparatus is designed to overcome all objections heretofore encountered.

In order that my invention may be clearly understood, I will describe the same in detail, reference being had to the accompanying drawings.

A indicates a casing of suitable material, as galvanized iron, steel, and the like, which casing may of course be made of various dimensions and shapes. I show a casing which is cylindrical, and the same is closed at its bottom and open at its top and is designed to serve as a water receptacle or reservoir. It may be provided with any suitable and convenient means for filling it—as, for instance, a funnel A', attached thereto near its upper edge. It may also be provided with a draw-off or drain cock A², located near the bottom, and to which cock a hose may be attached. If desired, the reservoir may be charged with water through said cock. The water-reservoir is also provided at the side with a water-gage A³, adapted to indicate the level of the water within the reservoir.

Arranged within the water-reservoir and adapted to rise and fall therein is a casing B, the open end whereof is arranged downward and the closed end upward, the said lower end of which casing dips within the water in reservoir A. The casing is adapted to serve as a gasometer for the generated gas, and the

water serves as a seal to prevent the escape of the gas from within the gasometer. The gasometer may be constructed of metal similarly to the water-reservoir, and it may also
 5 be varied somewhat in shape, it being shown in the present instance as cylindrical.

In order that the gasometer may be properly guided in its rising and falling movements and the proper position maintained,
 10 suitable guides may be provided—as, for instance, a grooved or channeled rib *a*, attached to the inner wall of the reservoir, and within which rib fits and slides a rib *a'*, attached to the outer wall of the gasometer.
 15 The capacities of the water-reservoir and gasometer may of course be varied.

C indicates the generator, which I make of the conical or tapering shape shown, the larger end being uppermost, and this generator may
 20 vary in size and be made of any suitable material capable of withstanding more or less internal pressure.

D indicates a lid or cover for the generator, which cover is provided with a circumferential groove *d*, within which is seated a rubber or other suitable gasket *d'*, which when the cover is in position upon the generator
 25 seats upon the upper edge of the latter, so as to make a gas-tight joint therewith.

The under face of the cover is provided with a concavity, as indicated at *d*², which may be rounded or slightly conical in shape, and the edge *d*³ is adapted to lie practically
 30 in a vertical plane with the circumferential upper edge of the carbid-holder, presently described more fully, when said holder is in place and the cover seated upon the generator. The object of this construction and arrangement is to cause the water of condensation,
 35 which will naturally collect upon the under face of the cover within the concavity, to run down along the inclined surface and drip into the carbid-holder, to thus assist in generating gas, and thus I avoid the accumulation of such water of condensation, which
 40 in generators as heretofore constructed collects in the bottom of the generators and has to be frequently drawn off, or else acts upon the carbid when accumulated to a great extent to produce gas in a dangerous quantity.

The cover is adapted to be tightly secured in place upon the generator by means of a screw-rod or spindle E, which screws within a
 45 bail E', pivotally connected to the sides of the generator, and the lower end of said screw-rod is adapted to bear upon the upper face of the cover, so that when screwed tightly down said cover will be firmly held in position and be capable of resisting considerable pressure from
 50 the gas within the generator, in fact more than will in practice be brought to bear upon it.

When it is desired to empty the exhausted carbid from the generator and holder and charge with a fresh supply, the screw-rod is
 55 screwed up and the bail swung down to free the cover, when the latter may be easily removed.

F indicates my improved carbid-holder. The same is made tapering or conical, similar to the generator, within which latter it is
 60 placed, though I prefer to taper said holder somewhat more than the generator, so that there will be formed between the two a gradually-widening space from the top downwardly, which will thus facilitate the easy removal of the holder when desired. I also give
 65 a rounded shape to the holder at its bottom, whereby the said holder may be more readily cleaned of its exhausted carbid, which would, if the bottom were flat, collect in the corners or angles and render the perfect cleansing of the holder difficult. The upper circumferential edge of the holder is designed to be adjacent to the inner wall of the generator, with
 70 a slight intervening space. By reason of the relative shapes of the holder and generator and their relative arrangement the holder may be readily removed from the generator when necessary, and, furthermore, by reason of the holder being conical the exhausted carbid can
 75 be readily dumped out of it, leaving no particles thereof to remain within the holder. This would not be the case were the holder made of cylindrical shape, as heretofore practiced. I also prefer to give a rounded shape
 80 to the bottom of the generator and provide a draw-off or drain cock G for drawing off any water that may collect in the bottom of the generator.

With generators as heretofore constructed, when the covers thereof are removed for cleaning and recharging, such gas as is contained
 85 in the generators (and there is always more or less of said gas present) will escape into the atmosphere, and as this gas possesses a very pungent noxious odor it is desirable to avoid this contingency. For this purpose I provide means for removing all gas remaining in the generator and conveying it into the gasometer, said means consisting of a suitable pump,
 90 as H, the connecting-pipe *h* entering the generator adjacent to its bottom, said pump being thus adapted to force the gas through the pipe I, which leads from the generator near its upper end downwardly through the reservoir A near the lower end of the latter, and
 95 thence upwardly within the reservoir and discharging the gas at a point above the highest water-level therein, such level being indicated by the line *xx*. Thus by operating the pump for a few moments the generator is freed from gas and the cover may be removed without any gas escaping into the atmosphere.

I locate a suitable check-valve K in the pipe I, which opens in a direction to permit the gas to pass from the generator to the gasometer, but prevents any return flow.

A suitable pressure-gage M is applied to the pipe I to indicate the gas-pressure within the apparatus. I would state that in practice this gage does not, under normal conditions—that is to say, when the gasometer is not abnormally charged with gas—indicate
 100 any pressure beyond atmospheric pressure

and only begins to indicate the pressure of the gas when the storage tank or holder presently described is filling with gas.

The generator is held to the water-reservoir by supporting-straps *c*, whereby the entire device is capable of being transported or shipped as an integral machine.

The lower end of the pipe *I* just before it enters the water-reservoir may have a drain-cock *I'* for drawing off any water of condensation from pipe *I*, though this cock is not absolutely necessary. I, however, prefer to use it, as the pipe *I* may then be kept free of any water.

For the purpose of conveying water from the reservoir to the generator for the purpose of generating gas I provide a pipe *O*, which leads from within the upper portion of the reservoir at a point above the high-water level, downwardly and through the wall of the reservoir adjacent to its bottom, and thence upwardly and into the generator near its upper end. Said pipe *O* is provided at a point somewhat below the high-water level with a branch *Q*, through which water feeds into the pipe *O* until the level falls below said branch pipe, in which latter event the water-reservoir will need recharging to restore the level to a point above said branch. In apparatus of this character it is desirable to automatically cut off or regulate the supply of water fed to the generator when the quantity of gas generated increases to a certain extent and also to increase the supply of water fed to the generator when the consumption of the generated gas increases, and for these purposes I provide means operated automatically by the rising and falling movements of the gasometer. These means comprise a cock or valve *P* in the pipe *O*, upon the extended plug of which valve is rigidly mounted an angular lever *R*, one arm *r* of which is weighted at *r*², the arrangement being such that in the normal position of the lever (represented in full lines, Fig. 7) the plug of the valve will be in a position to supply water to the fullest extent through the passage, but that when the lever is partially turned in either direction, as indicated in dotted lines, Fig. 7, the supply will be diminished or entirely cut off, according to the extent to which the lever is turned. The inner wall of the gasometer is provided with two blades or ribs *S S'* in practically the same vertical plane, there being a space of greater or less extent separating said blades. These blades are adapted to strike the arm *r'* of the lever *R* when the gasometer rises and falls, and thus turn the plug of the cock from its normal or fully-open position.

When the quantity of generated gas increases considerably and the gasometer accordingly rises to a considerable extent, the blade *S* will strike the arm *r'* and turn the lever and plug of the valve so as to gradually cut off the feed of water to the generator until finally the feed will be entirely cut off, and as the gas is consumed the gasometer will

begin to fall and the blade *S* will gradually permit the lever *R*, under the influence of its weighted arm *r*, to resume its normal position, the feed of the water in the meantime gradually increasing until the arm *r'* clears the blade *S*, at which moment there will be a full flow of water to the generator. Should the carbid become exhausted and the gasometer begin to fall, the blade *S'* will strike arm *r'* and gradually turn the plug of the valve until the supply of water is entirely cut off from the generator. In this way flooding of the generator is prevented.

The pipe *O* is provided with a regulating-valve *O*², which can be set to control the quantity of water fed through said pipe.

In order to provide for admitting water to the generator in considerable volume—as, for instance, when it is desired to generate gas quickly, as in the beginning of the operation of the machine—I provide a branch pipe *O*³, leading from the interior of the water-reservoir and joining the pipe *O* and being provided with a valve *O*⁴. By turning the latter valve water will be admitted in considerable volume into the pipe *O* and thence into the generator, and as the gasometer begins to rise, due to the generating gas, the cock or valve *O*⁴ is closed and the necessary water for further generation will be supplied automatically through the valve *O*² in the manner hereinbefore explained. This valve *O*⁴, which I term an “emergency-valve,” is not intended to be used excepting in the beginning of the operation, or where at any time it is desired to obtain gas quickly. The regular feed of water is to take place through valve *O*², as above mentioned.

By the described arrangement of valves, weighted lever, and operating-blades the machine, after having once been started, will be automatic in its operation, with no danger of generating too great a quantity of gas or flooding of the generator, and will require no attention after being once started until all the carbid is exhausted.

In order to avoid any danger of blowing out of the gasometer due to considerable gas-pressure caused by accumulation of considerable gas within said gasometer, I provide a valve *T*, located in the gas-pipe *I*, the plug of which valve carries an angular lever, the arm *T*² being weighted at *T*³ and the arm *T'* lying in the path of and adapted to be struck by a blade or rib *T*⁴ on the inner wall of the gasometer near its lower end.

Should the gasometer rise very high, the blade will strike the arm and turn the same and the plug of the valve to cut off the flow of gas into the gasometer, and any further accumulation of gas will flow by branch pipe *T*⁵, joining the pipe *I*, adjacent to the bottom of the apparatus, and into a storage or overflow tank or holder *U*, arranged within the gasometer, which tank thus serves as a reserve or overflow receptacle, and is capable of withstanding considerable pressure.

By reason of the tank U being located within the gasometer and surrounded by water any gas therein will be cooled, and said tank by occupying considerable space within the gasometer reduces the quantity of water necessary for operating the apparatus.

In order that an audible alarm or signal may be given to indicate that the carbid is becoming exhausted, I provide a bell V, adapted to be operated mechanically by the gasometer when the latter is reaching its lowest limit of movement, or said bell may be operated electrically by providing contact-plates $V'V^2$, one on the gasometer and the other on the water-reservoir, and providing suitable electrical connections between said plates and the bell.

In some apparatus of this character as heretofore constructed it has been customary to feed the water onto the carbid over its upper surface. This causes the uppermost strata of the carbid to first become exhausted and form a thick and hard crust which prevents almost absolutely the penetration of water to the lower strata of the carbid. In this way great quantities of carbid are wasted and frequent recharging becomes necessary. In order to avoid said disadvantages, I so feed the water to the holder that the lowermost strata will be first acted upon, and the gas generated from said lower strata will rise through the remaining carbid and tend to open up or separate the particles, which thus are prevented from becoming clogged and rendering the water more easy of access between the particles. In order to accomplish the described feed of the water, I arrange the inner discharge end of the water-supply pipe at a point just above the upper edge of the holder, so that the water flowing through said end will flow down along the inner wall of the holder to the bottom thereof to act upon the lower strata of carbid, and as the different strata become exhausted the same will not affect the strata above them. This I consider a very important feature of my invention, and the advantageous results obtained by this method of feeding the water will be at once apparent in the practical operation of the apparatus. Inasmuch as the inner discharge end of the water feed-pipe projects slightly beyond the upper edge of the carbid-holder said end might obstruct the free removal of said holder, and to avoid any obstruction I provide the upper portion of the holder with an indentation or depressed portion f , so that by turning the holder around to bring the said depressed portion directly beneath the projecting end of the pipe said holder may be readily lifted out of the generator.

W indicates the gas service-pipe, which leads from a point above high-water level downwardly within the gasometer and out through the reservoir-casing, and thence to the point at which the gas is to be used. A suitable valve W' is provided in the pipe W for regulating the quantity of gas delivered by said pipe.

Inasmuch as it is desirable to avoid freezing of the water within the apparatus, which might result in bursting the water-reservoir or other parts of the apparatus, I provide any suitable means for maintaining the temperature of the water above freezing-point at all times, and these means may consist of a burner or burners supplied with gas from the main service-pipe, or they may, as shown, consist of a coil of pipe X, arranged beneath the bottom of the apparatus and supplied with a heating medium from any suitable source.

The operation of the apparatus may be briefly described as follows: The holder having been charged with the carbid of calcium, the cover firmly secured, and water having been supplied to the water-reservoir until the high-water level is reached, the valve O^4 is opened to permit a full feed of water to flow through pipes O^3 and O into the generator and down the inner wall of the holder to act upon the carbid therein. The cock or valve O^4 is kept open for a few moments only and is then closed, and as the gas generates in the generator it flows through pipe I and is discharged within the gasometer above the water-level. As the generation of gas continues the gasometer rises and the upper blade S' gradually frees the arm r' to permit the plug of the valve P to gradually open, which it does to its greatest extent when the blade clears the arm, and as the gasometer continues to rise the lower blade S will strike against the arm and gradually close the valve, thus cutting off gradually the supply of water to the generator. As soon as the generation of gas ceases the gasometer will remain stationary until the consumption of gas at the burners reduces the quantity within the gasometer, when the latter will begin to fall, the blade S permitting the arm to turn to cause a corresponding increase in the water-feed until when said blade fully clears the arm there will be a full feed of water, which will act to again cause a full generation of gas, and so on during the entire time that there is unexhausted carbid in the holder. Thus it will be seen that there is an automatic operation of the parts, the apparatus generating gas only when it is needed and cutting off the generation when the burners are not consuming gas. As the carbid becomes exhausted the gasometer will descend gradually lower until the cock actuated by the blade S' will have entirely cut off the feed of water, as indicated in Fig. 2, and the alarm will be actuated to give warning of the exhaustion of all carbid, and the generator may then be emptied of its exhausted carbid and fresh carbid placed in the holder, in the manner hereinbefore described. Should the generation of gas be such that the gasometer will rise to an extent sufficient to cause the blade T^4 to act upon the arm T' to close the valve T, the overflow of gas will then flow into the holder U through branch pipe T^5 .

Thus the apparatus is entirely safe, inas-
 much as there is no chance of the gas-pres-
 sure becoming abnormally high in the gas-
 ometer at any time, and owing to the provi-
 5 sion of the automatically-operating valves
 there can be no supply of water to the car-
 bid when the quantity of gas already gen-
 erated exceeds a certain limit. It will be
 noted that the gas-cut-off valve is located at
 10 a higher level than the water-cut-off valve,
 whereby the latter is adapted to be operated
 to cut off the water-supply before the gas-cut-
 off valve is operated.

It will be understood that various changes
 15 may be made in the arrangement and details
 of construction of the parts without depart-
 ing from the principle or scope of the inven-
 tion.

What I claim, and desire to secure by Let-
 20 ters Patent, is—

1. In an apparatus for the manufacture of
 acetylene gas, the combination with a water-
 reservoir, and a gasometer, of a generator, a
 valved water-supply pipe between the reser-
 25 voir and the generator, and a valved branch
 water-pipe communicating with the generator
 whereby to provide independently-control-
 lable water-feed connections between the gen-
 erator and the water-reservoir.

30 2. In an apparatus for the manufacture of
 acetylene gas, the combination with a water-
 reservoir, of a gasometer adapted to rise and
 fall therein, a generator, a gas-pipe leading
 from the generator into the gasometer, a valve
 35 in the gas-pipe, a weighted arm on the plug
 of the valve, and a blade or rib on the gas-
 ometer adapted to operate the arm when the
 gasometer rises to a predetermined height to
 cut off the flow of gas to the gasometer.

40 3. In an apparatus for the manufacture of
 acetylene gas, the combination with a water-
 reservoir, of a gasometer adapted to rise and
 fall therein, a generator, a gas connection be-
 tween the generator and the gasometer, a
 45 water connection between the reservoir and
 the generator, a valve in the water connec-
 tion, a lever on the plug of said valve, and
 blades or ribs on the gasometer adapted to
 strike and operate said lever in both the up-
 50 ward and downward movements of the gas-
 ometer, for the purpose specified.

4. In an apparatus for the manufacture of
 acetylene gas, the combination with a water-

reservoir, of a gasometer, a generator, a gas
 connection between the generator and the gas- 55
 ometer, a water connection between the res-
 ervoir and the generator, a valve in the gas con-
 nection adapted to be operated by the gasome-
 ter when the latter rises to a predetermined
 point to cut off the flow of gas to the gasometer, 60
 a valve in the water connection adapted to be
 operated by the gasometer when the latter
 rises to a predetermined point, the parts be-
 ing so arranged that the water-valve will be
 operated to cut off the water-supply prior to 65
 the operation of the gas-cut-off valve.

5. In an apparatus for the manufacture of
 acetylene gas, the combination with a water-
 reservoir, of a gasometer adapted to rise and
 fall therein, a generator, a gas connection be- 70
 tween the generator and the gasometer, a
 water connection between the reservoir and
 the generator, a valve in the water connec-
 tion, a lever on the plug of the valve, verti-
 cally-arranged blades or ribs secured to the 75
 gasometer and adapted to strike and operate
 said lever in the upward and downward move-
 ments of the gasometer and said blades or
 ribs being in different horizontal planes sepa-
 rated by a space whereby in both the upward 80
 and downward movements of the gasometer
 the valve will be in a position to give a full
 supply of water to the generator from the
 time that the lever is freed from one blade
 until it is engaged by the other blade, sub- 85
 stantially as set forth.

6. In an apparatus for the manufacture of
 acetylene gas, the combination with a gener-
 ator, of a carbid-holder arranged therein, a
 cover removably seated on the generator and 90
 having a more or less conical-shaped recess
 on its under face, the outer circumferential
 edge of the recess terminating in a vertical
 plane not beyond the circumferential edge of
 the holder, whereby moisture condensed with- 95
 in the recess will flow along the walls of the
 latter and be discharged into the holder along
 its inner circumferential wall, for the pur-
 pose specified.

In testimony whereof I affix my signature 100
 in presence of two witnesses.

FRANK A. MITCHELL.

Witnesses:

WILLIAM S. STACKHOUSE,
 G. H. GROVES.