(No Model.) 5 Sheets—Sheet 1.

# A. T. WELCH.

## PUMP FOR GAS MACHINES OR PLANTS.

No. 452,116. Patented May 12, 1891.

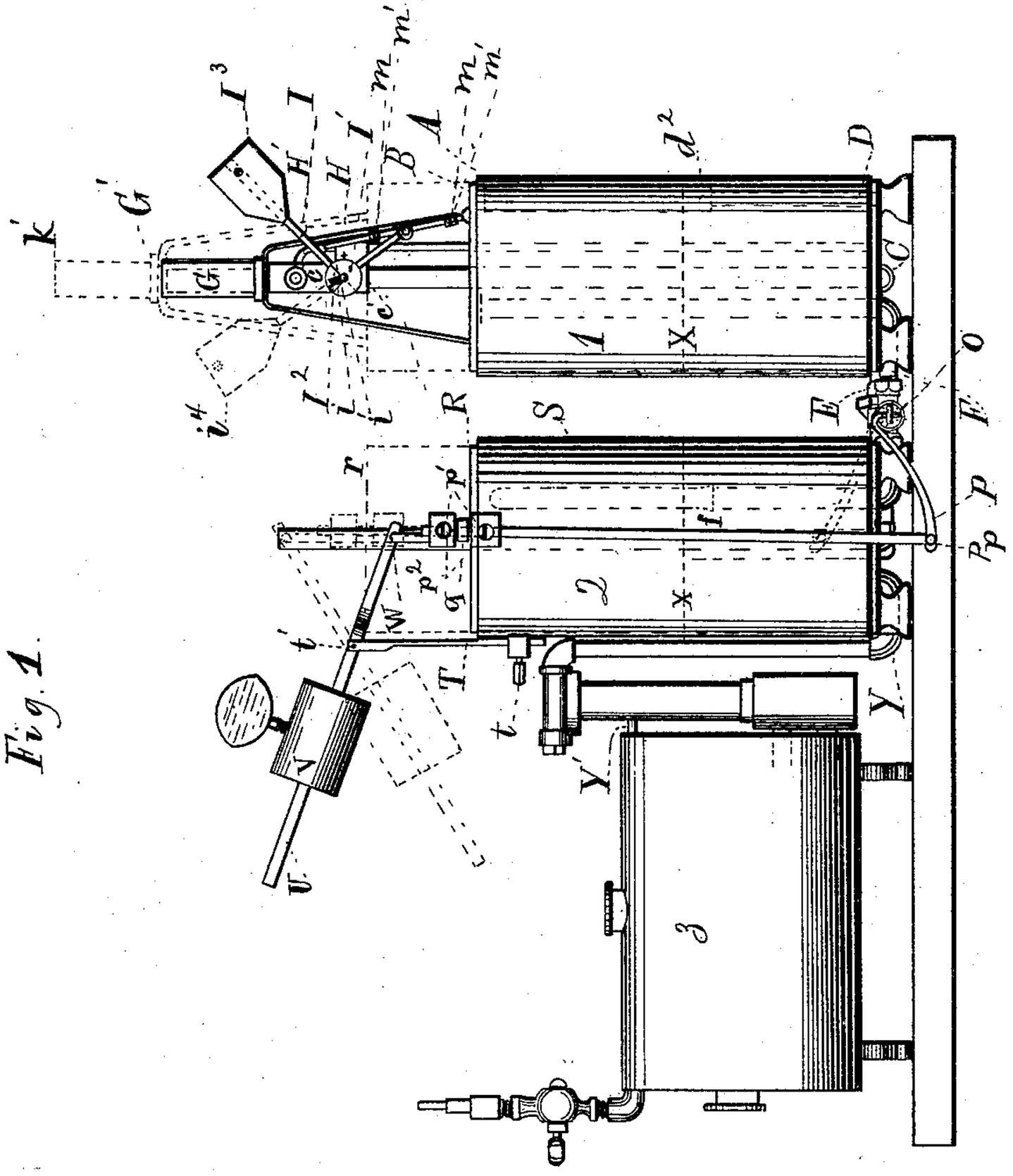

Fig. 1.

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per

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Att'y.

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## PUMP FOR GAS MACHINES OR PLANTS.

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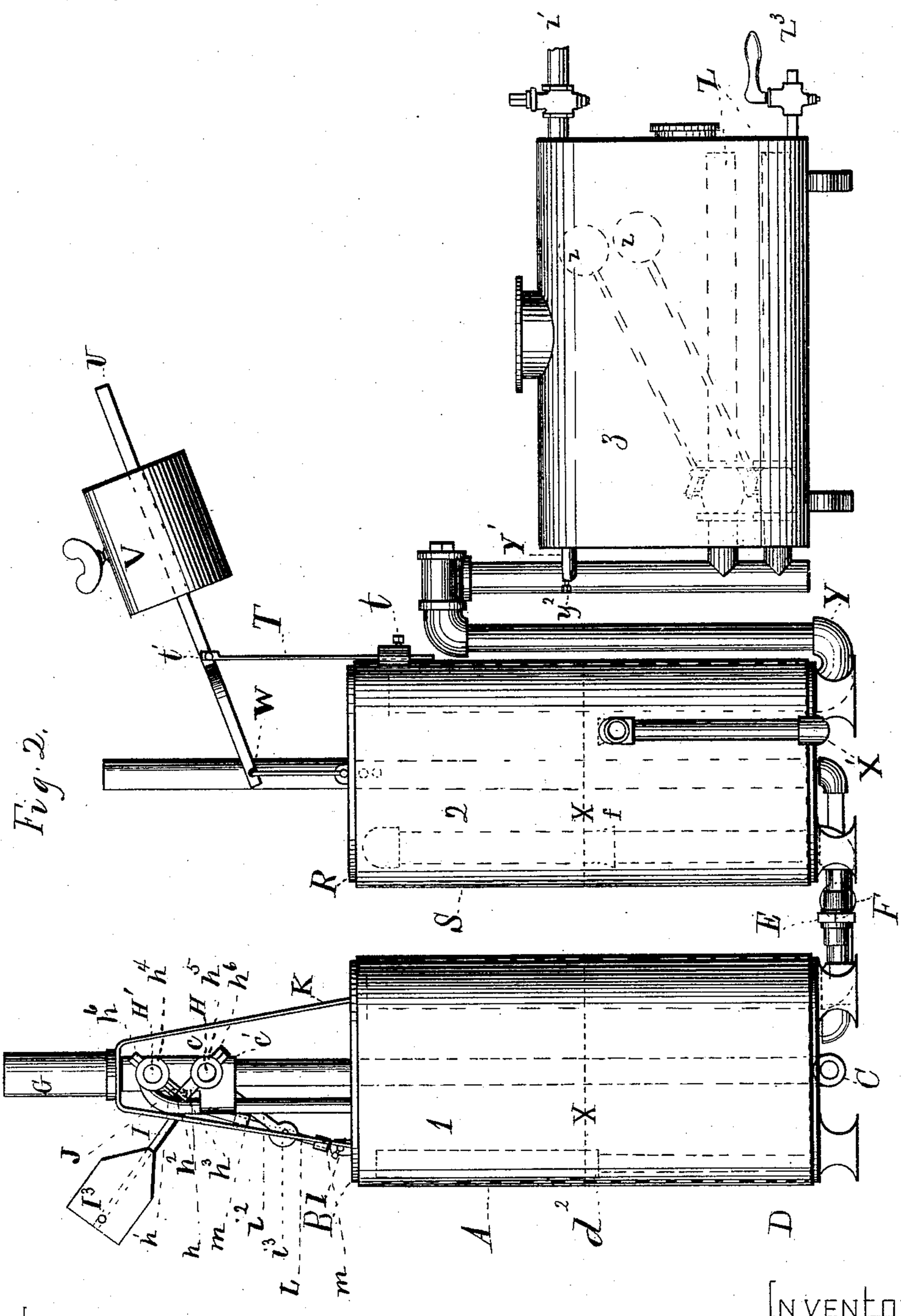


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# A. T. WELCH.

## PUMP FOR GAS MACHINES OR PLANTS.

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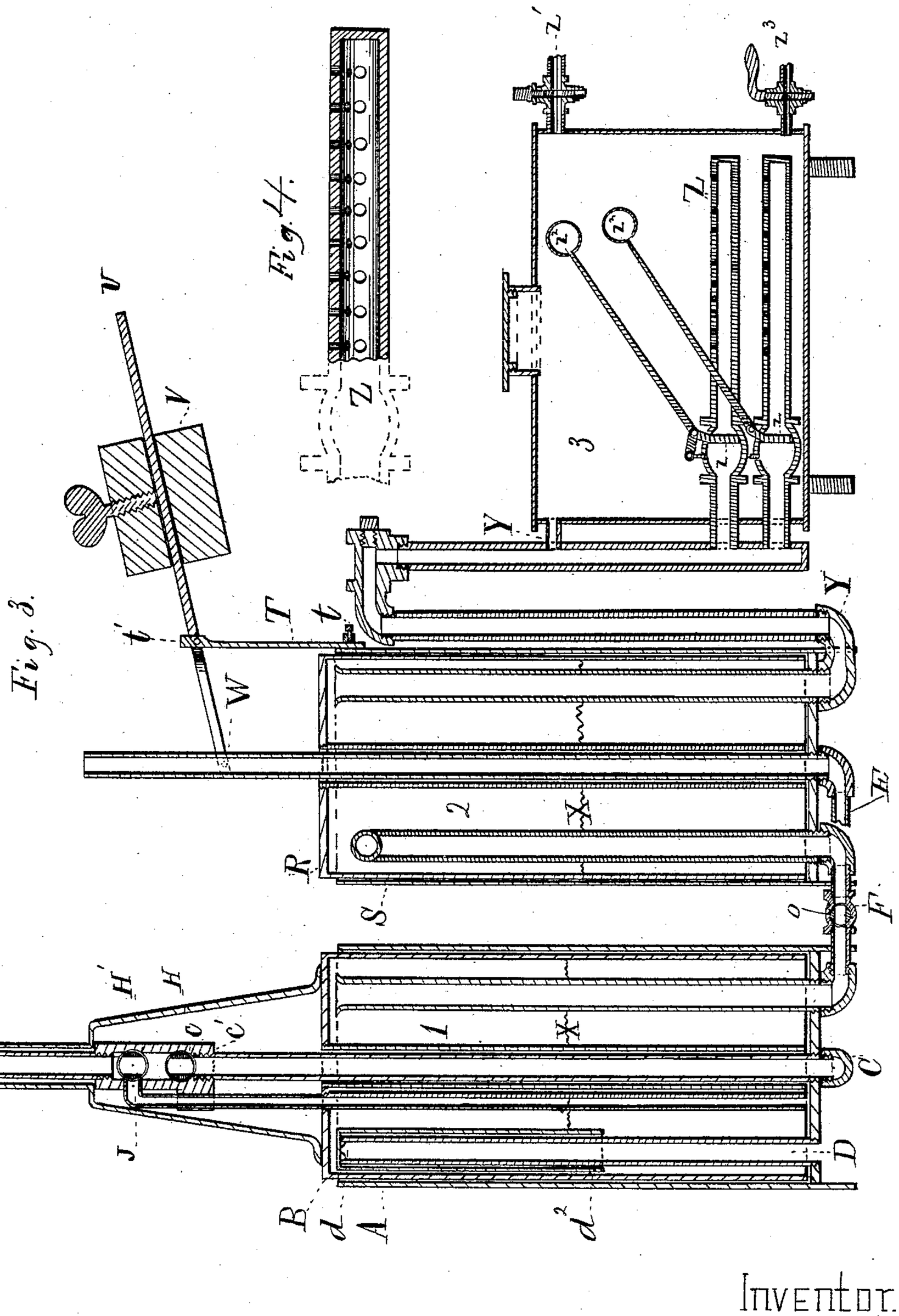


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(No Model.) 5 Sheets—Sheet 4.

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## PUMP FOR GAS MACHINES OR PLANTS.

No. 452,116. Patented May 12, 1891.

*Fig. 6.*

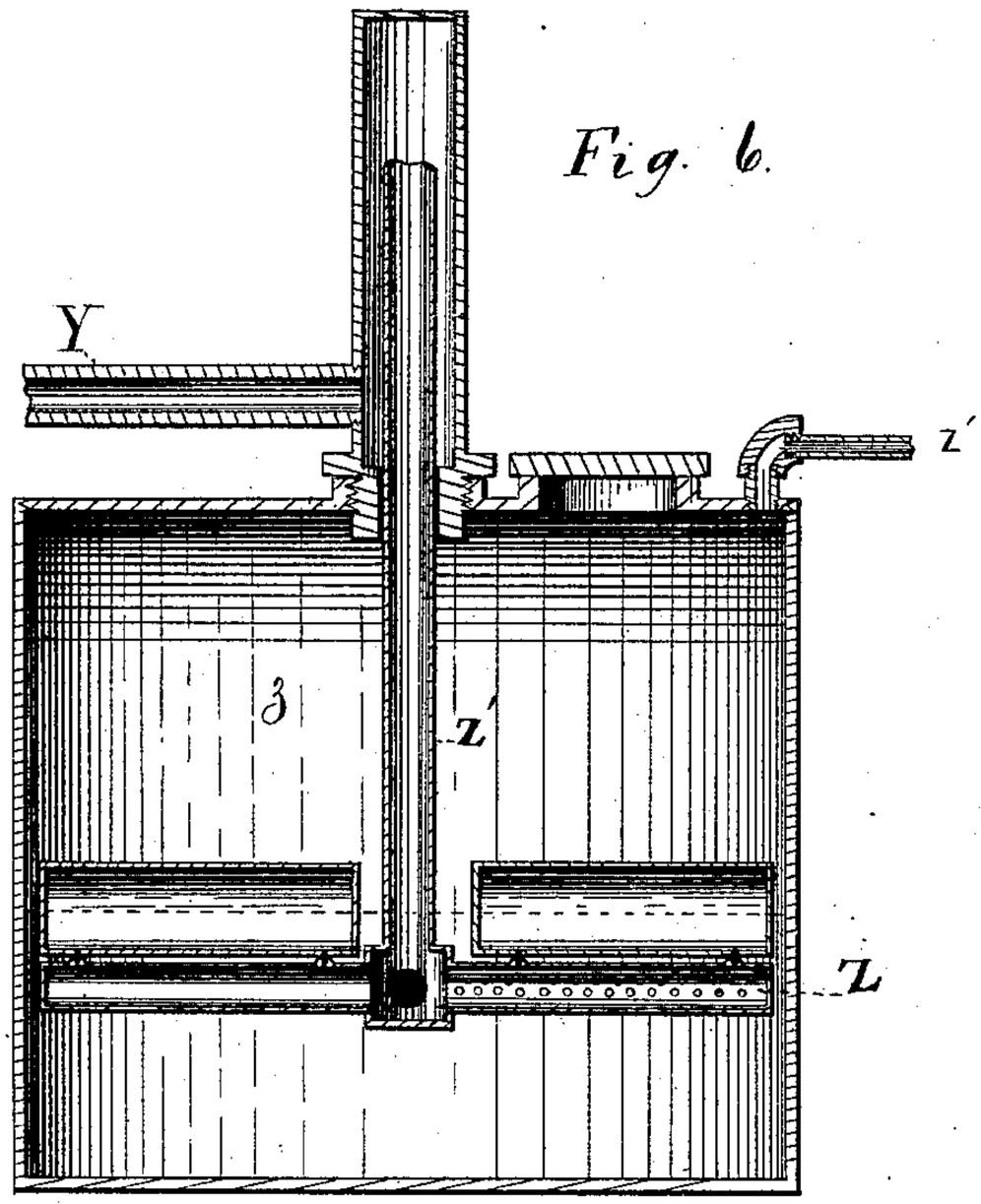
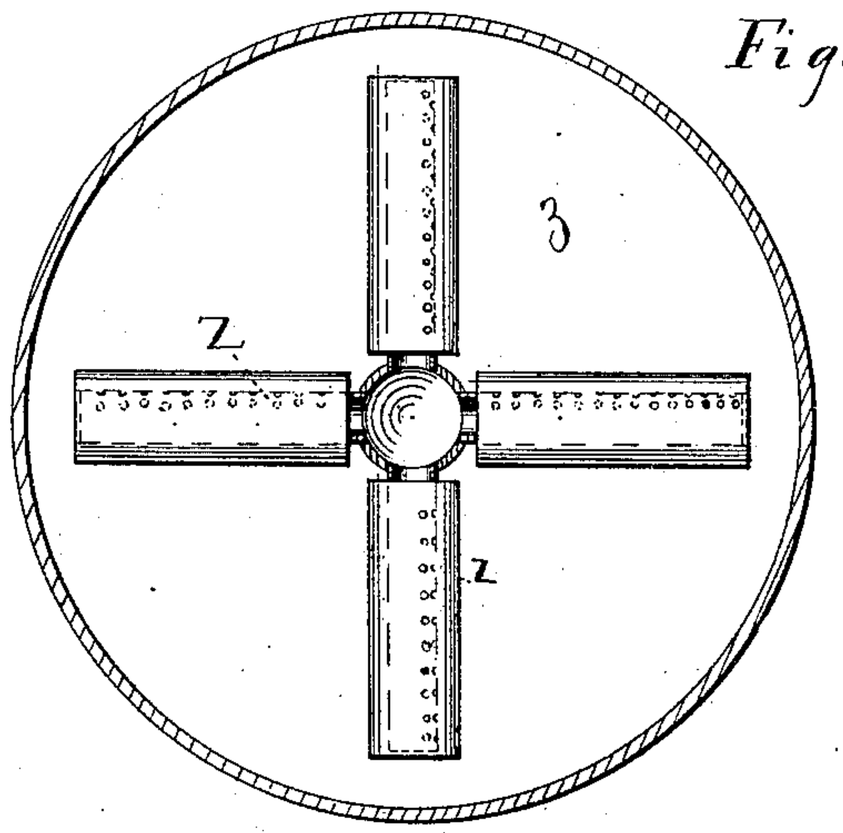



*Fig. 5.*

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(No Model.) 5 Sheets—Sheet 5.

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## PUMP FOR GAS MACHINES OR PLANTS.

No. 452,116. Patented May 12, 1891.

Fig. 7.

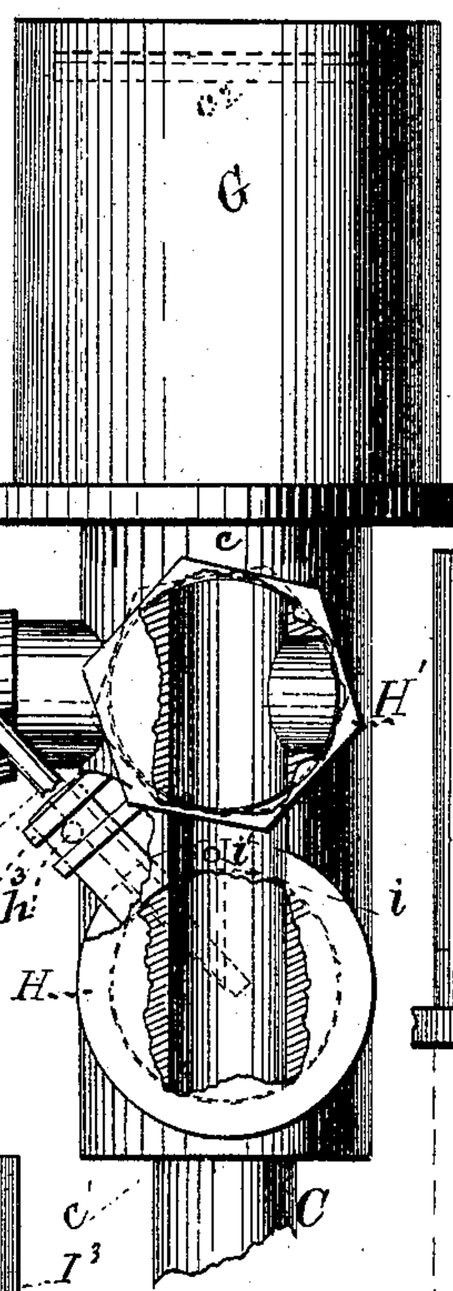



Fig. 8.

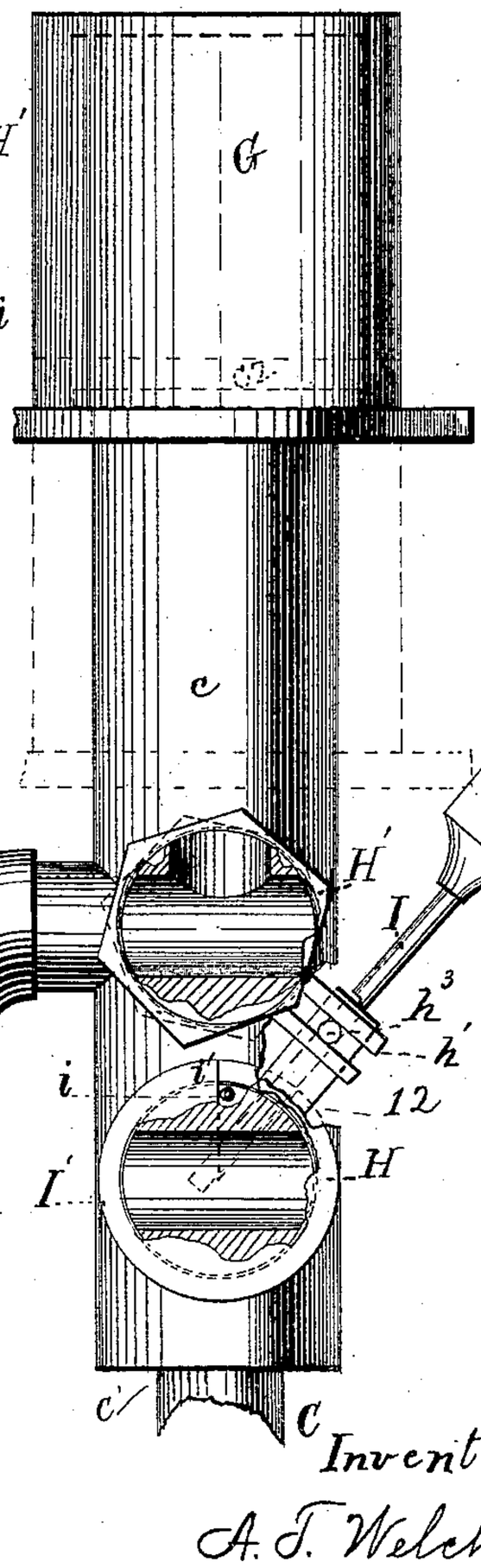



Fig. 9.

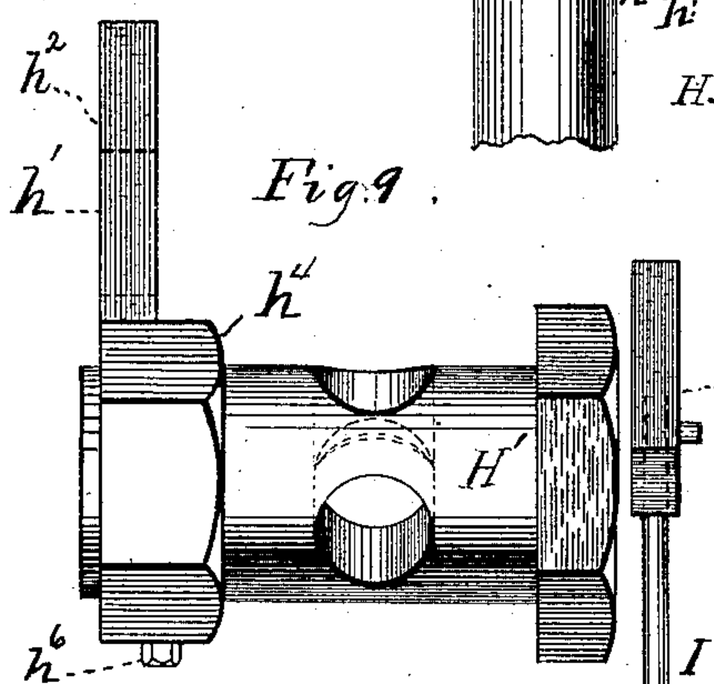
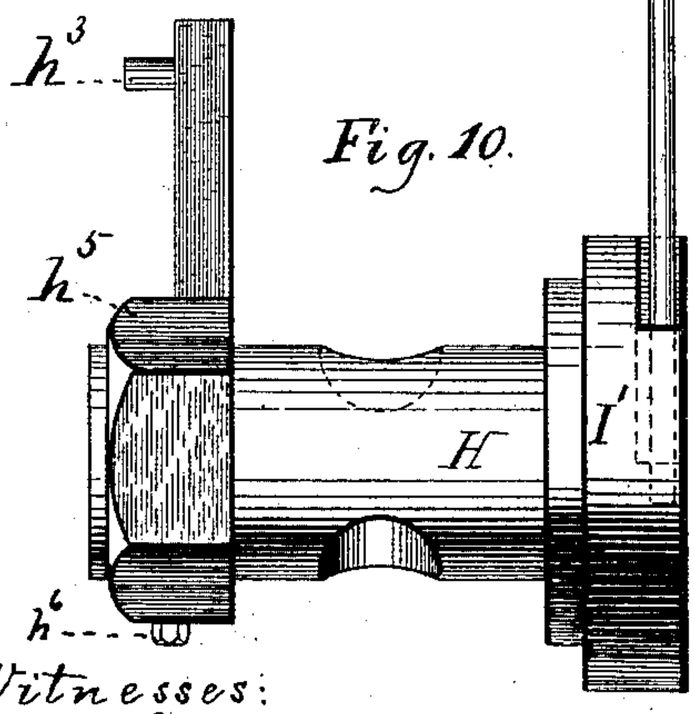



Fig. 10.




Witnesses:
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# UNITED STATES PATENT OFFICE.

ABRAM T. WELCH, OF PORT CARBON, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO ROBERT ALLISON, E. F. KNITTLE, C. R. ALLISON, AND W. W. TURNER, ALL OF SAME PLACE.

## PUMP FOR GAS MACHINES OR PLANTS.

SPECIFICATION forming part of Letters Patent No. 452,116, dated May 12, 1891.

Application filed September 17, 1890. Serial No. 365,239. (No model.)

*To all whom it may concern:*

Be it known that I, ABRAM T. WELCH, a citizen of the United States, residing at Port Carbon, in the county of Schuylkill and State of Pennsylvania, have invented certain new and useful Improvements in Pumps for Gas Machines or Plants; and I do hereby 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 relates to an automatic gas machine or plant; and the object of my invention is to provide an automatic machine or plant for manufacturing gas from crude petroleum or its products in which water and air are used alternately as a motive power, and by means of which the air can be uniformly supplied to the gas-generator and intermixed with the gas simultaneously with the process of manufacturing the same, so that the gas can be consumed directly from said generator without any unsteadiness or fluctuation of the flame. I attain said object by a certain construction, combination, and arrangement of parts fully described in this specification and illustrated in the accompanying drawings, in which—

Figure 1 is a side view in elevation of my invention complete. Fig. 2 is a similar view of the opposite side. Fig. 3 is a longitudinal sectional view in elevation. Fig. 4 is a broken sectional view of one of the perforated pipes of the gas-generator 3. Figs 9, 5, and 6 are detail views of parts to be referred to hereinafter. Figs. 7, 8, 9, and 10 are enlarged detail views illustrating the valve-operating mechanism near the top of the inlet water-pipe of the pump 1.

Referring to the drawings, the dotted lines indicate the relative position of parts when the machine is being operated, and similar letters and figures refer to similar parts throughout the respective views.

My invention comprises two telescopic cylindrical pumps 1 and 2, the mechanism for operating the same, and the gas generator or tank 3.

The cylindrical pump or blower 1 consists of the outer and larger cylinder A, open at the top, and the inner and smaller cylinder B, open at the bottom, which closely fits in the cylinder A and works vertically therein. In the bottom of the cylinder A there are four pipes—namely, the inlet water-pipe C, the inlet air-pipe D, the outlet water-pipe E, and the outlet air-pipe F. The air-pipe D extends to near the top of the cylinder A and is provided upon its top with the projecting flanged portions $d$, with the intervening portions broken away. Said portions are broken away with a view of allowing the air to enter the cylinder when the larger casing or tube $d^2$ is forced down over said air-pipe. The lower end of the tube $d^2$ extends slightly under the water-line $x$ in the compressing-cylinder B of pump 1, thereby preventing the escape of the air after it has entered said cylinder. The inlet water-pipe C extends some distance above the top of the pump 1 and contains an enlarged section or collar $c$, which may be unscrewed from the lower section of said pipe at $c'$. The extreme top end of the pipe C is provided with a piston $c^2$, which works in the cylindrical tube G. The enlarged section or collar $c$ contains a combination-valve or two stop-cocks H H′, which are alternately opened and closed by means of the oscillating or pendulum movement of the right-angled lever or bell-crank I. In other words, upon the sleeves $h^4$ $h^5$ of each one of the projecting ends of said stop-cock there are the cross projections $h$ $h'$. The cross projection $h'$ has a slot $h^2$ in the lower end of same, into which is adjusted the projecting arm $h^3$ of the sleeve $h^5$ of the stop-cock H. (See Figs. 10 and 11.) It will be observed that the other end of the stop-cock H projects sufficiently far to serve as an axle or fulcrum, upon which the wheel I′ of the right-angled lever or bell-crank I is mounted. This wheel I′ contains upon the outer side a reduced segment $I^2$, in which works the projecting arm $i$, which is secured in the end of the rod of the stop-cock H. As the wheel I′ of the right-angled lever I oscillates upon its axle, the projecting arm $i$ comes in contact with the shoulder $i'$ of the

wheel I′ and turns the stop-cock H, which has the arm $h^3$ adjusted in the slot $h^2$ of the stop-cock H′, by means of which the stop-cocks H H′ are opened and closed alternately.

Upon the side of the enlarged section *c* there is a pipe J, communicating with the water-pipe C at the junction of the stop-cock H′ and said water-pipe. Said pipe J conveys the water back into the cylinder B when the stop-cock H′ is opened.

It will be observed that the combination-valve or the stop-cocks H and H′, are arranged and constructed with a view of accurately regulating the upward-and-downward movement of the inner cylinder B. Each of the sleeves $h^4$ $h^5$ of said stop-cocks are provided with the set-screw $h^6$, whereby the speed of the cylinder B in both rising and falling can be nicely regulated in proportion to the opening of the combination-valve or stop-cocks H and H′, which is accomplished by adjusting said sleeves accordingly. This causes less wear and tear and less jump and commotion of the water in the outer cylinder. The cylinder B is provided upon its top with the arch K, which is constructed with the cylindrical tube G upon its top, which has the lower end of same open. In this cylindrical tube the piston $c^2$ works. The downwardly-projecting arm $i^2$ of the right-angled lever I has upon its lower end the sliding knuckle-joint $i^3$. This knuckle-joint works vertically upon the rod L, which is rigidly secured to the top of the inner cylinder B. Near the bottom of the rod L there is a cross-head *l*. Upon the rod L there are also two sliding blocks *m*, which are moved from point to point upon said rod, according to the height it is desired to elevate the cylinder B. These blocks are secured at any point upon the rod by means of the thumb-screws *m′*. It is well to note at this point that the right-angled lever I being thus constructed, arranged, and connected, answers the purpose of a balance and check to regulate the cylinder B in its upward-and-downward movement. The size of the weight $I^3$ upon the end of the right-angled lever I is mathematically determined and proportioned according to the relative size of the combination-valve or stop-cocks H and H′. Hence there is a uniform steady movement.

The cylindrical pump 1 is connected to the cylindrical pump or pressure-regulator 2 by means of the outlet air-pipe F and the outlet water-pipe E. The outlet air-pipe F extends under and through the bottom of the outer cylinder S of the pump 2, thence to the top of the cylindrical pump 2, where it is curved over and extends backward to *f*, and slightly under the water-line X. This prevents the air from being forced out into the cylindrical pump or water-motor 1. It is well to mention the fact that the air entering each of the cylindrical pumps or blowers 1 and 2 enters through the air-pipe D to the top of same, thence it passes down to the lower end of the tube $d^2$ and the flanged mouth *f* of the air-pipe F, both of which are located under the water-line X. In other words, the air in entering is conducted into the water, thence it bubbles up into the cylindrical pumps 1 and 2, respectively. Such being the case, it is impossible for the air to escape through the way by which it enters each of said motors or pumps. There is located in the air-pipe F, between these cylindrical pumps, a stop-cock O, which is opened and closed by means of the L-shaped lever P, which has a cross-head at *p*. Said lever is attached to a projecting arm *q* on the top of the inner cylinder R of the cylindrical pump 2, and is operated by means of the vertical movement of the cylinder R. This lever is provided with the sliding blocks *p′*, which are secured at any point thereon by the set-screws $p^2$. The outlet water-pipe E of the pump 1 extends through the bottom of cylinder A, thence under and up through the bottom of the outer cylinder S of the pump 2, thence through the center of the top of the inner cylinder R, thence some distance above the top of the pump 2. It will be observed that the cylindrical pump 2 is composed of the smaller and inner cylinder R, opened at the lower end, which fits closely and works vertically within the larger and outer cylinder S, which is opened at the top. There is upon the top rim of the cylinder S a sliding post T, which can be made higher or lower by means of the thumb screw or key *t*. In the top of this post there is a slot *t′*, in which is located and pivoted the lever U, which has upon the end thereof the sliding weight V. Said weight can be secured at any point upon the lever U, between the fulcrum *u* and the outer end of same. The pivoted lever U is attached to the top of the cylinder R by means of the knuckle-joint W, and serves, in connection with the weight V, as a check and balance for the inner cylinder R in its vertical movement, making said movement uniform and steady, and free from jerks or jar. There is also in the bottom of the outer cylinder S a pipe X′ for the escape of waste water. It will be seen that said pipe is elbow-shaped and extends upward to the top of the water-line X.

The pump or pressure-regulator 2 is connected with the tank or gas-generator 3 by means of the pipe Y, which communicates with the perforated pipes Z, which extend longitudinally the entire length of said tank. Said perforated pipes Z may, however, be differently arranged, as shown in Figs. 5 and 6—that is, they cross each other at right angles and are secured upon a pipe Z′ of the tank 3, so that they will freely revolve when the air is forced in and much gas is being consumed. This keeps the oil stirred and counteracts the refrigerating process, &c. To each of these pipes there is attached the float-valves *z*, which are operated by the floats $z^2$, which are of sufficient size to open and close them according to the height of oil above each of said perforated pipes respectively. These

float-valves close as gradually as the oil in the tank is consumed, thereby preventing the escape of air through said perforations when the oil ceases to cover the pipe to which said valve is attached.

There is located at any suitable point upon this tank a suitable main or pipe $z'$, through which the gas is conveyed to the point of storage or consumption. Said tank is provided with an outlet-cock $z^3$, through which the refuse oil is let off, and also it may have an inlet-pipe, through which water under pressure is admitted, by means of which the tank is thoroughly cleansed.

Y' Y' represent a pipe that connects the gas-space in the upper part of the tank 3 with the air-pipe $y$. Said pipe is provided with a regulating-cock $y^2$, by means of which the air is intermixed in any quantity desired with the gas after the same is manufactured. By the use of the regulating-cock $y^2$ I am able to change the flame instantaneously (while my machine is in operation) from the candle-flame to the Bunsen burner blue flame, either of which will be as steady as a coal-oil lamp.

The operation of my machine or plant is as follows: The tank 3 is first partly filled with crude petroleum or its products until the same covers over several inches the perforated pipes Z. The water is then admitted into the inlet water-pipe C, which seeks its level and rapidly rises in said pipe until it reaches the topmost cylinder-head of the cylindrical tube G. The pressure of the water between the piston-head $c^2$ and the cylinder-head G' then forces up the cylindrical tube G until it reaches the point $k'$, which in turn forces the right-angled lever I to the point $i^4$, thereby closing the stop-cock H and opening H', respectively, when the water flows down the water-pipe C until it reaches the stop-cock H, which is closed. Consequently it passes off through H' to the pipe J, thence back into the cylinder B. As the water thus escapes, the cylinder B falls downward, owing to the displacement of the water in the cylindrical tube G, into the outer cylinder A, compressing the air which has rushed in to fill the vacuum in the cylinder B and forcing the same out through the outlet air-pipe F into the inner cylinder R of the motor or pump 2. The water of the motor or pump 1 in like manner escapes through the outlet water-pipe E into the cylinder R, which in like manner is forced to the point $r$, when the water again exhausts through the pipe X', which causes the inner cylinder R to fall into its normal position, which compresses the air through the pipe Y, thence into the perforated pipe Z, through which it escapes into the oil and bubbles through the surface of same a gas of the finest quality. Thus it is seen that the water-motor 1 pumps the air automatically into pressure-regulator 2, thence it is likewise forced into the tank or gas-generator 3, and as said air passes through the oil therein it becomes impregnated with the vapors. When the tank is newly charged, all of the floats are up, which opens to the full extent the float-valves. The air is therefore first forced through the top perforated pipe until the oil evaporates and lowers. This gradually closes the float-valves on said pipe. The air is then forced through the next lower pipe until the float-valve thereon likewise closes, and so on until all the oil in the tank is used. In other words, the air is forced through crude petroleum or its products, and is thereby enriched or carbureted sufficiently to be changed into gas.

As I have reduced my invention to practice and tested thoroughly by an operative machine the actual result of same, I deem it useless to enlarge upon its merits. Suffice to say it is thoroughly practical and of great value.

I do not wish to limit myself to the exact construction described in this specification and illustrated in the accompanying drawings, as it is evident that the same principle might be applied under a somewhat different construction.

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

1. In a gas machine or plant, the combination of the pump 1, consisting of an outer cylinder open at the top having suitably-located inlet air and water pipes, the air-pipe extending to near the top of said cylinder and provided with a casing extending over said pipe to the water-line, the water-pipe extending above the top of said cylinder and having upon its upper end a piston, the stop-cocks located in the enlarged section of said water-pipe, the weight pivoted upon the projecting end of the lower of said stop-cocks, the return water-pipe communicating at the junction of the upper of said stop-cocks and the enlarged section of said water-pipe, the rods connected by a knuckle-joint and connecting the lower end of said weight with the inner cylinder, the inner cylinder open at the bottom and fitting closely within the outer cylinder, the arch upon the top of the inner cylinder having upon its top the cylindrical tube open at the lower end, the outlet air and water pipes connecting said cylinders with the pressure-regulator 2, the stop-cocks located in the connecting air-pipe, the L-shaped lever operating said stop-cocks, the pressure-regulator 2, consisting of an inner and outer cylinder open at the bottom and top, respectively, the outer cylinder being provided with the bent air-pipe, the waste-water pipe, and the water-pipe extending above the top of same and the post upon its top, the inner cylinder having the lever attached to its top by means of a knuckle-joint and pivoted in the top of said post, the air-pipe connecting the pump 2 with the tank 3, and the tank having the perforated pipes provided with float-valves com-

municating with the air-pipe that connects pump 2 with the tank 3, all substantially as described, and for the purpose set forth.

2. In a gas-plant, the combination of the pump 1, consisting of an outer cylinder open at the top having suitably-located air and water pipes, the air-pipe extending to near the top of said cylinder and provided with a tubing extending over said pipe to the water-line, the water-pipe extending above the top of said cylinder and having upon its upper end a piston, the stop-cocks located in the enlarged section of said water-pipe, the weight pivoted upon the projecting end of the lower of said stop-cocks, the return water-pipe communicating at the junction of the upper of said stop-cocks and the enlarged section of said water-pipe, the rods connected by a knuckle-joint and connecting the lower end of said weight with the inner cylinder, the inner cylinder open at the bottom and fitting closely within the outer cylinder, the arch upon the top of the inner cylinder having upon its top the cylindrical tube open at the lower end, the outlet air and water pipes connecting said cylinders with the pump 2, the stop-cocks located in the connecting air-pipe, the L-shaped lever operating said stop-cocks, the pump or pressure-regulator 2, consisting of an inner and outer cylinder telescoped and open at the bottom and top, respectively, the outer cylinder being provided with the bent air-pipe, the waste-water pipe and the water-pipe extending above the top of same, and the air-pipe connecting the pump 2 with any suitable carburetor, all substantially as described, and for the purpose set forth.

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

ABRAM T. WELCH.

Witnesses:
B. G. SHISSLER,
JOHN L. SHISSLER.