

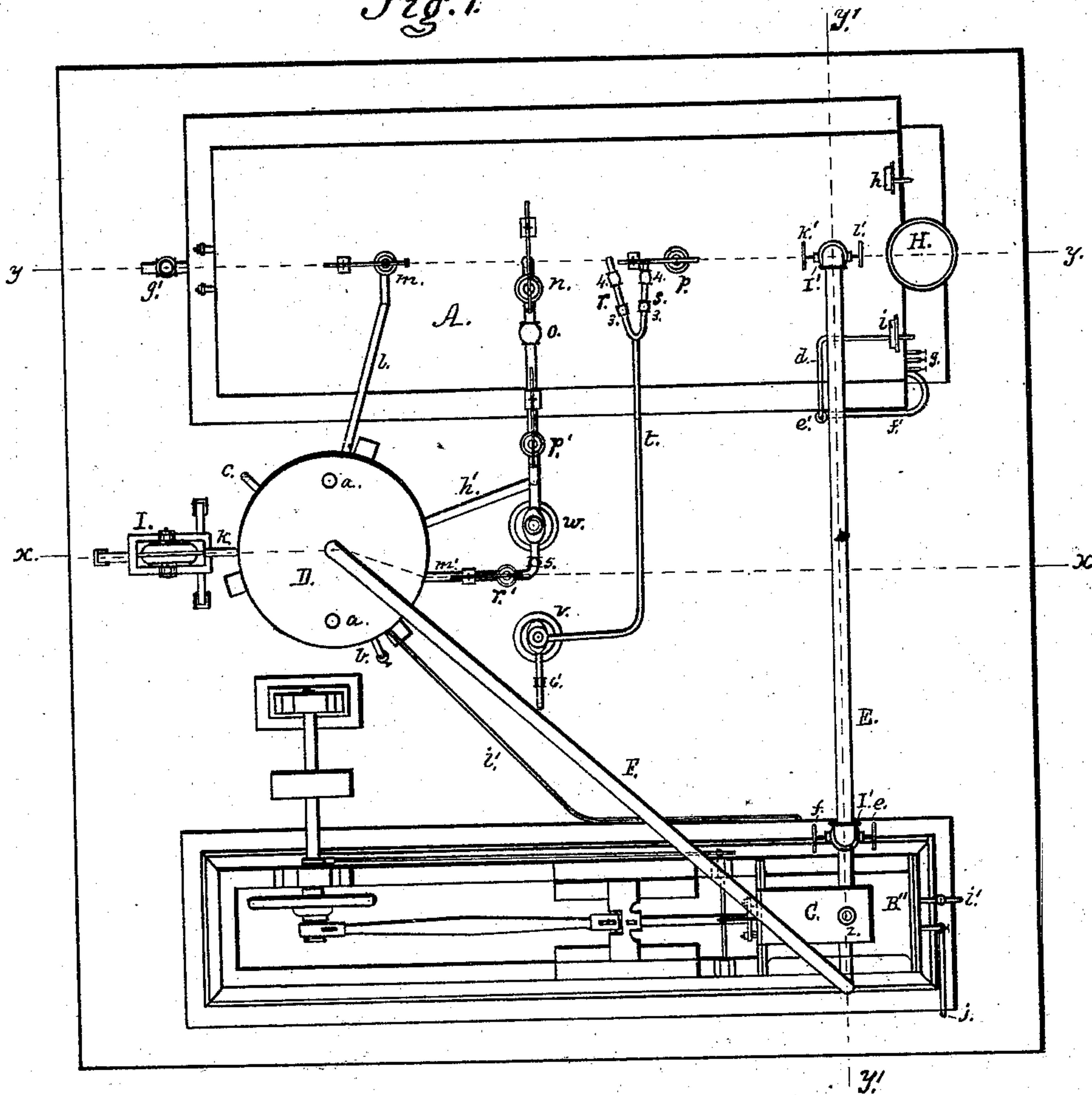
W. S. COLWELL.

Motor and Apparatus for Utilizing it.

No. 219,622.

Patented Sept. 16, 1879.

fig. 1.



Witnesses

James I. Johnston  
A. S. N. Johnston

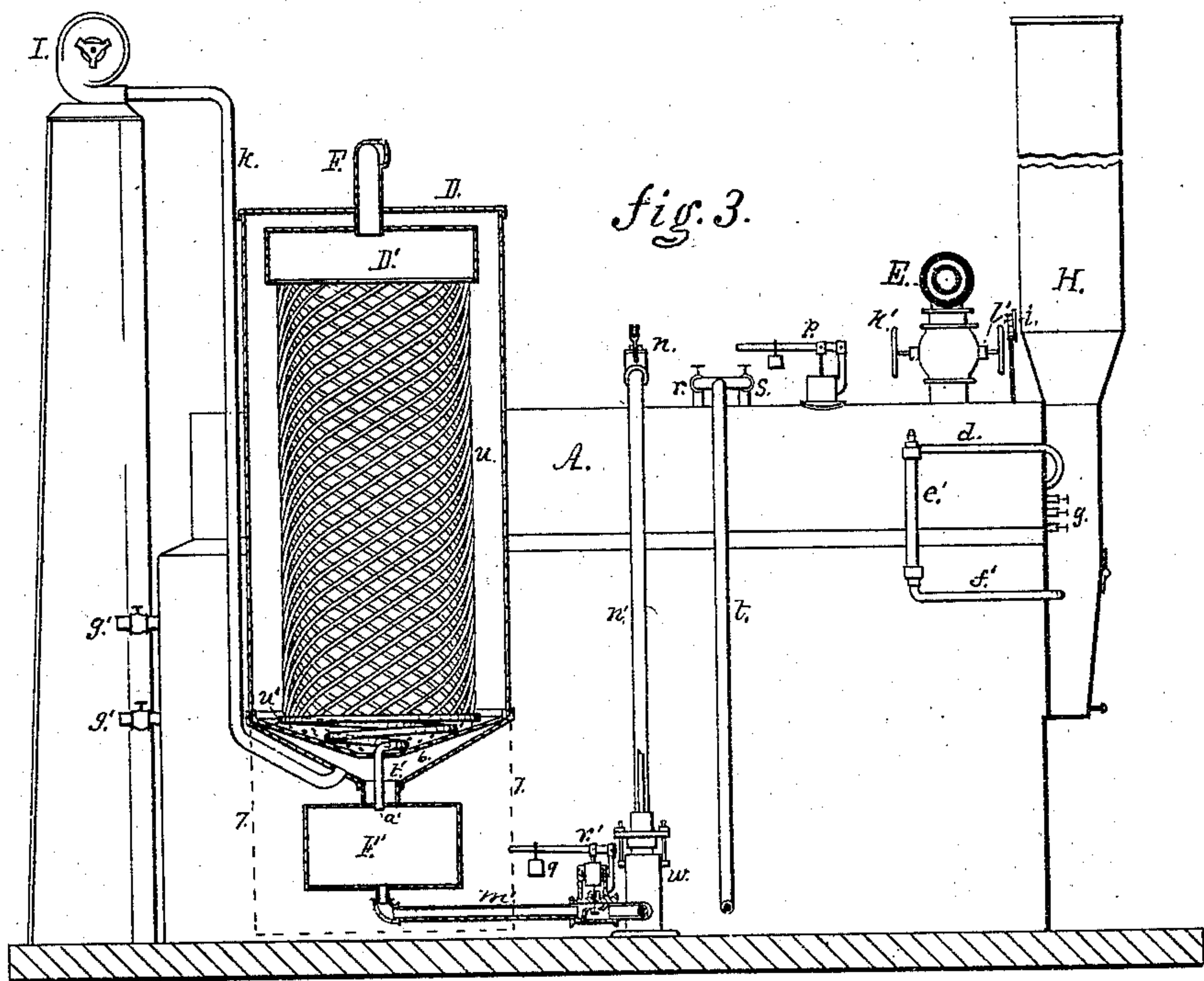
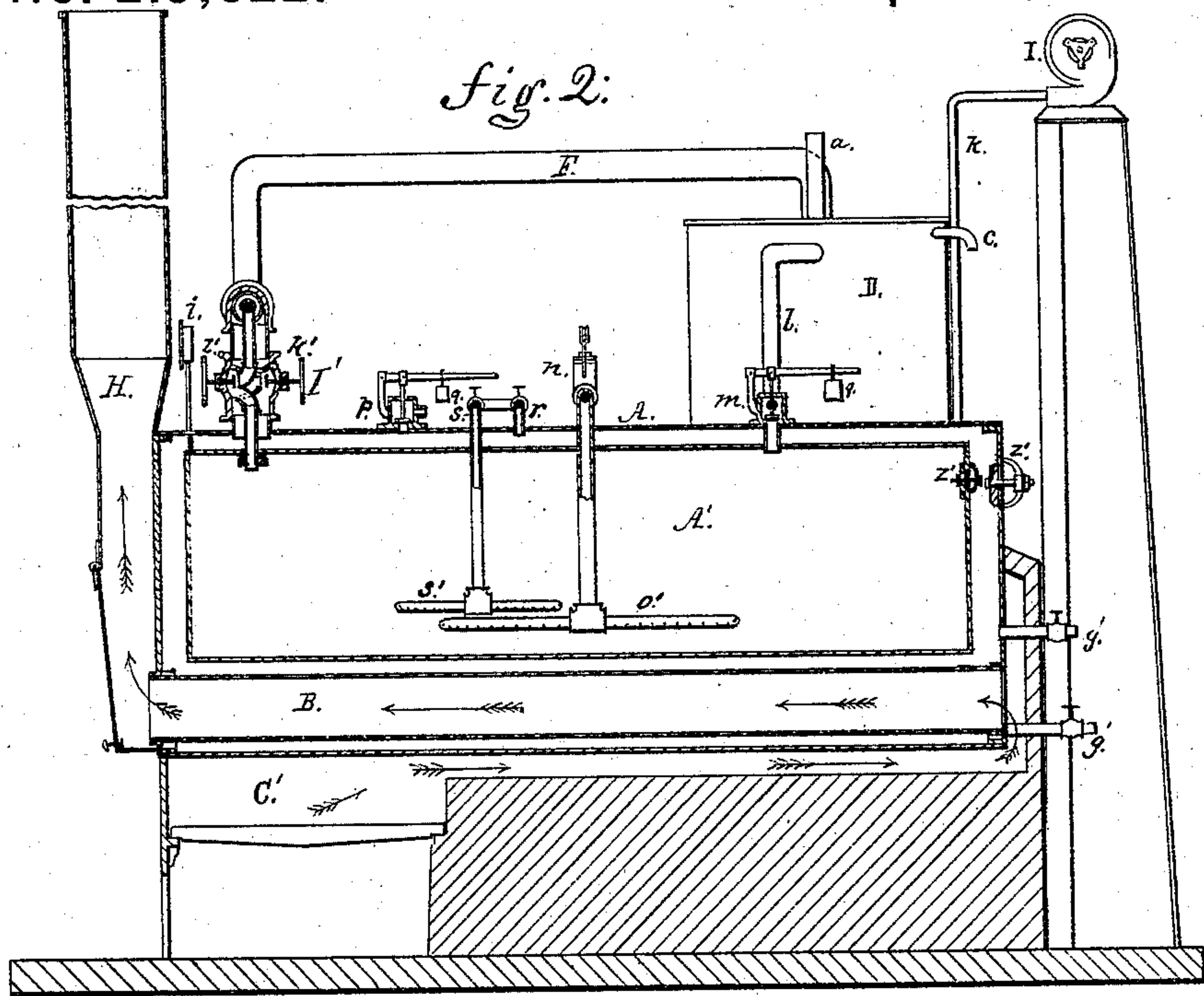
Inventor

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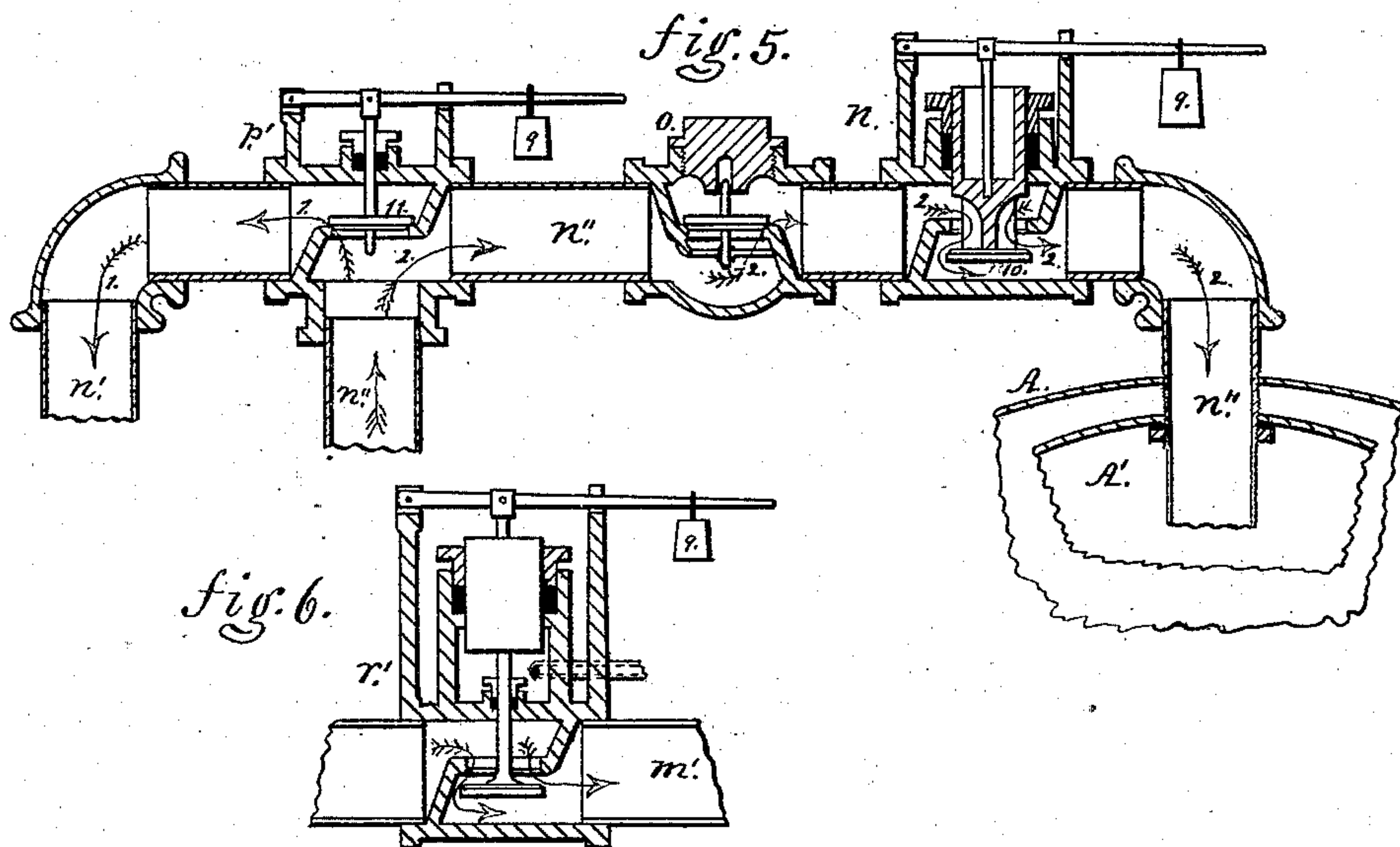
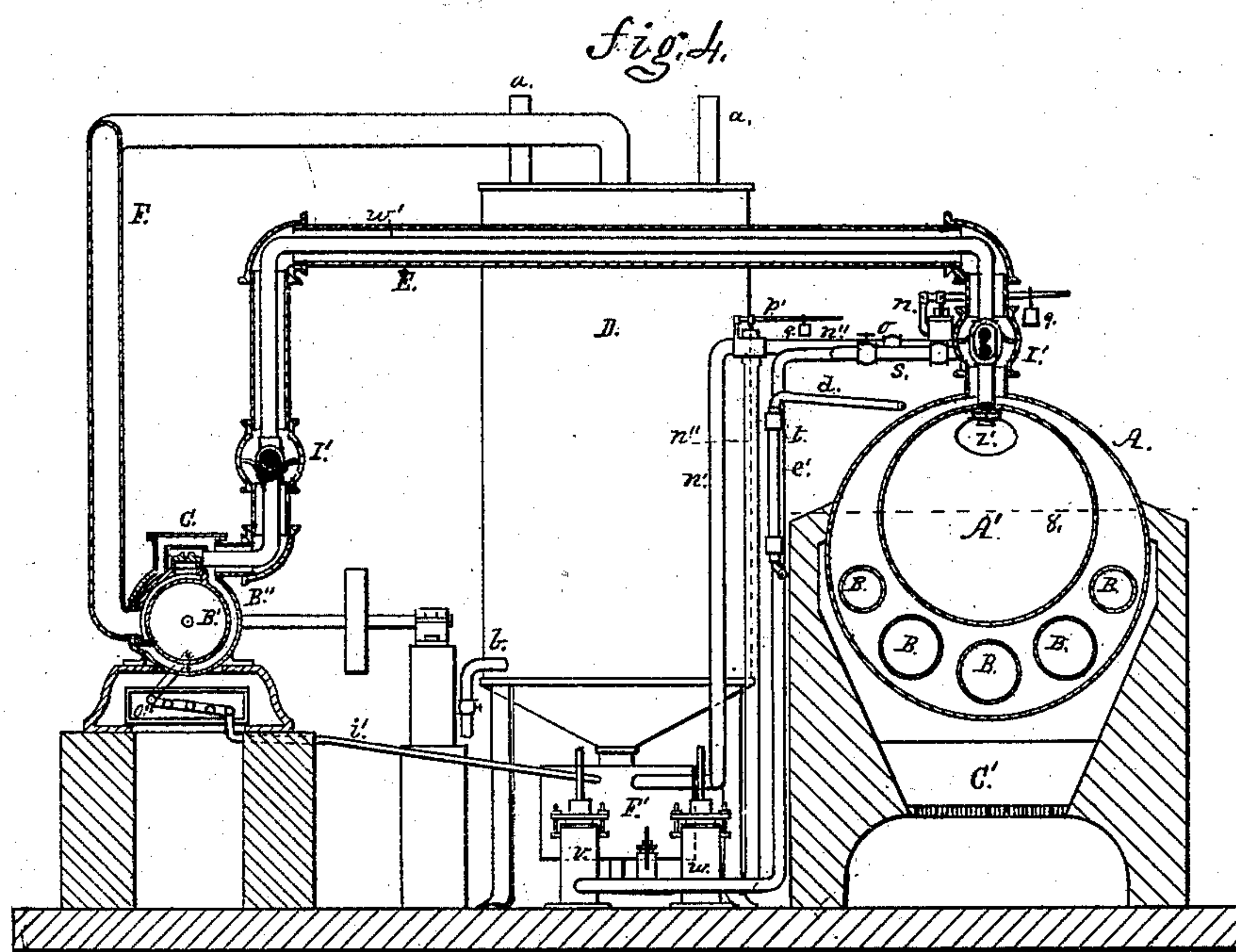


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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN MOTOR AND APPARATUS FOR UTILIZING IT.

Specification forming part of Letters Patent No. **219,622**, dated September 16, 1879; application filed July 26, 1879.

*To all whom it may concern.*

Be it known that I, WILLIAM S. COLWELL, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Motor and Apparatus for Utilizing it; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention consists, first, in vaporizing bisulphide of carbon in a chamber charged with plumbago or black-lead, water, and bisulphide of carbon, said chamber inclosed in a case for surrounding it with an unflammable liquid or vapor heated to a temperature that will evolve bisulphide of carbon, or a compound thereof, said vapor to be used for a motor for operating machinery, and the plumbago or black-lead as a protection for the inner walls and joints of the chamber in which the vapor of bisulphide of carbon is generated; second, in conveying the vapor of bisulphide of carbon, or a compound thereof, from the chamber in which it is generated to the cylinder of an engine and its piston through the medium of a pipe incased and surrounded with an unflammable liquid or vapor, whereby the vapor of the bisulphide of carbon is prevented from condensing in its passage from the generating-chamber to the cylinder and piston of the engine; third, in the application of the vapor of bisulphide of carbon, or a compound thereof, as a motor to the piston of an engine at the same temperature and pressure as that in the chamber in which it was generated by inclosing in a case the cylinder of an engine, its valve-chamber, and supply-pipe, and surrounding them with an unflammable liquid or vapor having a temperature which will evolve bisulphide of carbon into a vapor; fourth, in the combination, with a bisulphide-of-carbon engine, of a condenser in which a liquid is used as the condensing-medium and a current or currents of air are forced through said liquid for carrying off the heat absorbed by it in the operation of condensing; fifth, in the employment of a liquid from which a given pressure of vapor can only be obtained from a given quantity of the liquid used, and the combination of a

chamber for evolving said liquid into a vapor with a valve so constructed that it can be adjusted to regulate the flow of said liquid into said chamber in quantity corresponding to the desired pressure; sixth, in the combination of a supply-pipe and regulating-valve and a branch pipe and regulating-valve, said pipes communicating with a reservoir for bisulphide of carbon and a chamber for evolving it into a vapor, whereby the bisulphide of carbon is automatically returned to its reservoir by the reaction of the bisulphide of carbon in said supply-pipe caused by the closing of the first-mentioned valve when the desired quantity of the bisulphide of carbon has been forced into the vaporizing-chamber for obtaining the desired pressure of vapor for a motor; seventh, in the combination, with a bisulphide-of-carbon engine, of a double throttle-valve having a single inlet and outlet opening, and constructed so that two distinct fluids or vapors can pass separately through said valve at the same time, and in combination with conducting-pipes communicating with cylinders and chambers containing said distinct fluids; eighth, in the combination of waste-pipes with the cylinder of an engine and a reservoir for bisulphide of carbon, whereby the waste of the cylinder can be conveyed to said reservoir; ninth, in the combination of a conducting pipe and valve with a vaporizing-chamber, condenser, and reservoir for bisulphide of carbon, whereby the bisulphide of carbon can be vaporized in said chamber and conveyed through said pipe into said condenser, and condensed and collected in said reservoir when it is desirable to transfer the bisulphide of carbon from said vaporizing-chamber into said reservoir.

To enable others skilled in the art with which my invention is most nearly connected to make and use it, I will proceed to describe its construction and operation.

In the accompanying drawings, which form part of my specification, Figure 1 is a top view or plan of my improvement for utilizing the vapor of bisulphide of carbon as a motor for operating machinery. Fig. 2 is a vertical section of the same at line *yy* of Fig. 1. Fig. 3 is a vertical section of the same at line *xx* of Fig. 1. Fig. 4 is a vertical section of the



same at line  $y' y'$  of Fig. 1. Figs. 5 and 6 are detail views of the regulating-valves and supply-pipe, representing enlarged views of them in vertical section.

In the accompanying drawings, A represents the casing for inclosing the vaporizing-chamber A', which is suitably suspended in the former, leaving a space between it and the latter, and each is provided with a man-hole and man-head,  $z'$ .

The casing A is furnished with a series of flues, B, which communicate with the furnace C' and its stack H.

The vaporizing-chamber is provided with a fluid-indicator consisting of pipes  $f' d$  and a glass tube,  $e'$ , pressure-gage  $i$ , and a blow-off valve,  $g'$ , and the casing A is furnished with water-gages  $g$ , safety-valve  $p$ , and blow-off valve  $g'$ , all of ordinary construction.

The engine is of ordinary construction, excepting that its cylinder, valve-chamber, and supply-pipe are inclosed in a casing, B'', leaving a space between the casing and them.

The vaporizing-chamber A' and cylinder B' communicate with each other through the medium of a pipe,  $w'$ , which is inclosed in a pipe, E, leaving a space between them which communicates with the spaces between the vaporizing-chamber A', cylinder B', and the casing A and B''.

The pipes E and  $w'$  are provided with two double throttles, I' I', furnished with valves  $l' k'$ , and each of said throttles having a single inlet and outlet opening.

The cylinder B' is provided with pipes  $i'$ , which pass down and traverse a condenser,  $o''$ , placed under the bed of the engine. Said pipes  $i'$  communicate with the reservoir F' for the bisulphide of carbon.

The casing B'' of the cylinder B' is furnished with drain-pipe  $j$  for drawing off the water in the space between the cylinder and its casing.

The vaporizing-chamber A' and the space around it communicate with a water-supply through the medium of a pipe,  $t$ , connected to a pump,  $v$ .

The pipe  $t$  is provided with two branches,  $r$  and  $s$ , each furnished with a check-valve, 4, and stop-valve 3. The branch  $s$  communicates with the vaporizing-chamber A', and terminates in a perforated pipe,  $s'$ , arranged longitudinally in said chamber. The branch  $r$  of pipe  $t$  communicates with the space between the case A and vaporizing-chamber A'.

The condenser D consists of an outer casing, within which is an exhaust-chamber, D', to the under side of which a series of pipes,  $u$ , communicate, and, running down in a spiral direction, connect with a circular pipe,  $w'$ , which terminates in a coil, the lower end of which passes vertically through a chamber,  $t'$ , and enters, as indicated at  $a'$ , the reservoir F' for the bisulphide of carbon.

The lower part of the casing of the condenser D is divided by a perforated partition, 6, forming the chamber  $t'$ , to which is at-

tached a pipe,  $k$ , connected to a fan or other air-blast device. (Shown at I.)

To the upper end of the condenser D are attached two pipes,  $a$ , for carrying off the air after it has performed its office in the condenser.

To the exhaust-chamber D (which receives the exhaust of the engine) is attached the exhaust-pipe F, which communicates with the exhaust-port of the engine. The reservoir F' may be inclosed by extending the casing of the condenser D, as indicated by the dotted lines 7 7.

The chamber A' employed for vaporizing the bisulphide of carbon communicates with the exhaust-chamber D' of the condenser D by a pipe,  $l$ , provided with a blow-off valve,  $m$ . The chamber F' for the bisulphide of carbon communicates with a pump,  $w$ , by a pipe,  $m'$ , which may be provided with a check-valve, as indicated at 5, and a regulating-valve,  $r'$ . The force-pump  $w$  communicates with the vaporizing-chamber A' by a pipe,  $n''$ , which terminates in said chamber in a perforated pipe,  $o'$ , arranged longitudinally in said chamber. The pipe  $n''$  is provided with a check-valve,  $o$ , and a regulating-valve,  $n$ , and branch pipe  $n'$ , which communicates with the reservoir F' for the bisulphide of carbon, which branch pipe is also provided with a regulating-valve,  $p'$ . By placing the valve  $r'$  on the pipe  $m'$ , the valves  $n$  and  $p'$  may be dispensed with and a good result obtained; but a much better result will follow the employment of the two valves  $n$  and  $p'$ .

Having all the parts constructed and arranged with relation to each other as hereinbefore described, about twenty or thirty pounds of pulverized plumbago or black-lead is charged into the chamber A', (when it is of the size of a boiler required ordinarily for an engine of eight or ten horse power;) then the chamber is filled with water to about the dotted line 8 in Fig. 4; then from two to three pounds of the bisulphide of carbon is charged into the chamber A', or a quantity sufficient to start the engine; then the space between the chamber A' and the case A is filled with water to about the dotted line 8, (shown in Fig. 4;) then the weights 9 on the levers of the valves  $m$ ,  $n$ ,  $p'$ , and  $p$  are adjusted to correspond to the pressure desired, and so that no greater pressure than that desired can be generated in the chamber A'; then a fire is kindled in the furnace C', which will heat the water in the casing A, and it will heat the water in the vaporizing-chamber A', which will evolve the bisulphide of carbon into a vapor of sufficient force to operate the engine, which pressure will be indicated by the pressure-gage  $i$ . The operator then opens the valves  $l' k'$  of the throttles I' I', which will allow the steam in the casing A to pass through the pipe E into the casing B'', thereby heating the pipe  $w'$ , cylinder B', and its valve and piston. The operator then opens the valves  $l' l'$ , and admits the vapor of the bisulphide of carbon



to pass from the chamber A' through pipe *w'* into the cylinder B', for operating the engine and the machinery harnessed to it.

The weight on the lever of valve *n* being adjusted for obtaining the pressure desired—say, for example, fifty pounds to the square inch—and the weight on the lever of the valve *p'* adjusted so that the valve will resist a pressure a very little more than the valve *n*, and the weight on the lever of valve *m* adjusted to retain in the chamber A' a little more than fifty pounds to the square inch, and the valve *p* on the casing A being adjusted to the pressure desired for the steam in the case for heating the pipe *w'* and cylinder B', and the case of the condenser D filled with water, so as to cover the exhaust-chamber D', and the fan I being suitably geared, then the entire apparatus will be in a condition for operating the engine with a pressure of fifty pounds to the square inch acting on its piston. Said valves may in a similar manner be adjusted for any other pressure or force required.

If the pressure of the vapor of bisulphide of carbon in the chamber A' should become greater than that taken for the example—viz., fifty pounds to the square inch—then the vapor in chamber A' will press on the under side of the valve 10 of the regulating-valve *n* and close it, which will cause the bisulphide of carbon forced through the pipe *n''* to react in it and open the valve 11 of the regulating-valve *p'*, and flow back through the pipe *n'* into the reservoir F', and, flowing back to the pump *w*, will thus continue to travel in a circuit until the pressure in the chamber A' falls below fifty pounds to the square inch. Then the valve 11 will become seated and valve 10 will be forced open, and the bisulphide of carbon will enter the chamber A' through the perforated pipe *o'*, which is used for distributing it through the heated water in said chamber.

The arrows marked 1 in Fig. 5 indicate the course of the bisulphide of carbon when the valve 10 is closed, and the arrows marked 2 indicate its course when the valve 11 is closed.

The pump *v* and pipe *t* are used for supplying the chamber A' and case A with water. The supply of water in chamber A' is shown in the indicating-tube *e'*, and the supply of water in the case A is ascertained by the water-gages *g*. When the proper supply of water is in the chamber A' and case A the valves 3 3 are closed and the working of the pump is stopped.

The case of the condenser D is supplied with water through the pipe *b*, which communicates with a water-supply, and is attached to the case of the condenser at a point near its lower end, the waste water flowing off through the waste-pipe *c*.

During the operation of condensing the fan I forces currents of air up through the water for the purpose of carrying off through pipes *a a* the heat absorbed by the water during the operation of condensing the exhaust of the engine.

The bisulphide of carbon in chamber A', when not required for use as a motor, may be vaporized, and by opening the valve *m* is allowed to pass off through the pipe *l* into the condenser, where it is condensed, and, flowing down, is collected in the reservoir F'.

The plumbago or black-lead is used in combination with bisulphide of carbon and water for the purpose of protecting the joints and inner walls of the chamber A' by being spread over the surface of said walls and into the joints by the action and motion of the bisulphide of carbon and water when in a heated condition in said chamber, said motion causing a thin coating of the plumbago or black-lead to be deposited on said walls and forced into the joints thereof. The cylinder B' and its valves (for the purpose of lubrication and protection) should be supplied from time to time with plumbago or black-lead mixed with oil as a vehicle for conveying it to the valve and piston through the medium of an oil-cup, *z*, which is of ordinary construction.

The advantages of my improvement are, first, in the economy of fuel and heat by incasing the vaporizing-chamber A', cylinder B', and supply-pipe *w'*; second, in avoiding waste of the bisulphide of carbon by connecting the waste-pipes *i* with the cylinder B' and reservoir F', and the use of the condenser *o''*; third, in preventing the escape of the vapors of the bisulphide of carbon by inclosing the vaporizing-chamber A', cylinder B', and supply-pipe *w'* in a casing and surrounding them with an unflammable liquid or vapor, such as water or steam; fourth, in safety from fire by inclosing the vaporizing-chamber A', cylinder B', and supply-pipe *w'* in a casing and surrounding them with an unflammable liquid or vapor; fifth, in safety from over-pressure, and in the automatic supply of the bisulphide of carbon into the vaporizing-chamber A' by the employment of regulating-valves of peculiar construction and combination; sixth, in the employment of currents of air forced through the water for the purpose of carrying off the heat absorbed by the water in the operation of condensing the exhaust-steam of the engine; seventh, in the method of transferring the bisulphide of carbon from the vaporizing-chamber A' to the reservoir F', when not required for use for the purpose of a motor.

Having thus described my improvement, its construction, operation, and advantages, what I claim as of my invention is—

1. A motor for operating machinery, consisting of bisulphide of carbon, water, and plumbago or black-lead charged into a vessel and heat applied thereto, substantially as herein described, and for the purpose set forth.

2. A motor for operating machinery, consisting of bisulphide of carbon, water, and plumbago or black-lead charged into a vessel inclosed in a case and surrounded with an unflammable liquid or vapor, substantially as herein described, and for the purpose set forth.



3. Bisulphide of carbon or other liquid evolved into a vapor for a motor, conveyed from a generating-chamber to the piston of an engine through the medium of a pipe inclosed in a case and surrounded with an inflammable liquid or vapor, substantially as herein described, and for the purpose set forth.

4. The cylinder of a bisulphide-of-carbon engine and its valve-chamber, communicating directly with the case A and chamber A' through the pipes E *w'*, whereby steam of the same temperature as that used for evolving the bisulphide of carbon will surround said cylinder, valve-chamber, and pipe *w'*, substantially as herein shown and described.

5. In combination with a bisulphide-of-carbon engine, a condenser consisting of the chambers D and *t*, pipes *u u'*, perforated diaphragm, and a blast device, substantially as and for the purpose herein shown and described.

6. In the employment of a liquid from which a given pressure can only be obtained from a given quantity of the liquid used, the combination of a chamber for evolving said liquid into a vapor and a valve that can be adjusted to regulate the flow of said liquid into said chamber in quantity corresponding to the pressure desired, and automatically cut off the flow into said chamber when the pressure of the vapor in it becomes greater than that desired; substantially as herein described.

7. The combination, with a reservoir for bisulphide of carbon, or a compound thereof, of a vaporizing-chamber, adjustable valve or valves that will open and close automatically by a fixed pressure, a supply-pipe having a return branch, and a force-pump, said reservoir and vaporizing-chamber communicating with each other through the medium of said supply-pipe and its branch, substantially as herein described, and for the purpose set forth.

8. In a bisulphide-of-carbon engine, the combination of the double throttle valve or valves I' with the pipes E and *w'*, communicating with the chambers A, A', and B'', and the steam-ports of the cylinder B', substantially as and for the purpose herein shown and described.

9. Bisulphide of carbon evolved into a vapor and transferred to the condenser by means of valve *m* and pipe *l*, and condensed and collected in reservoir F', substantially as herein described.

10. The combination of cylinder B' and reservoir F', communicating with each other by means of coiled pipe *i'*, the latter passing through a condenser, arranged substantially as herein described.

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