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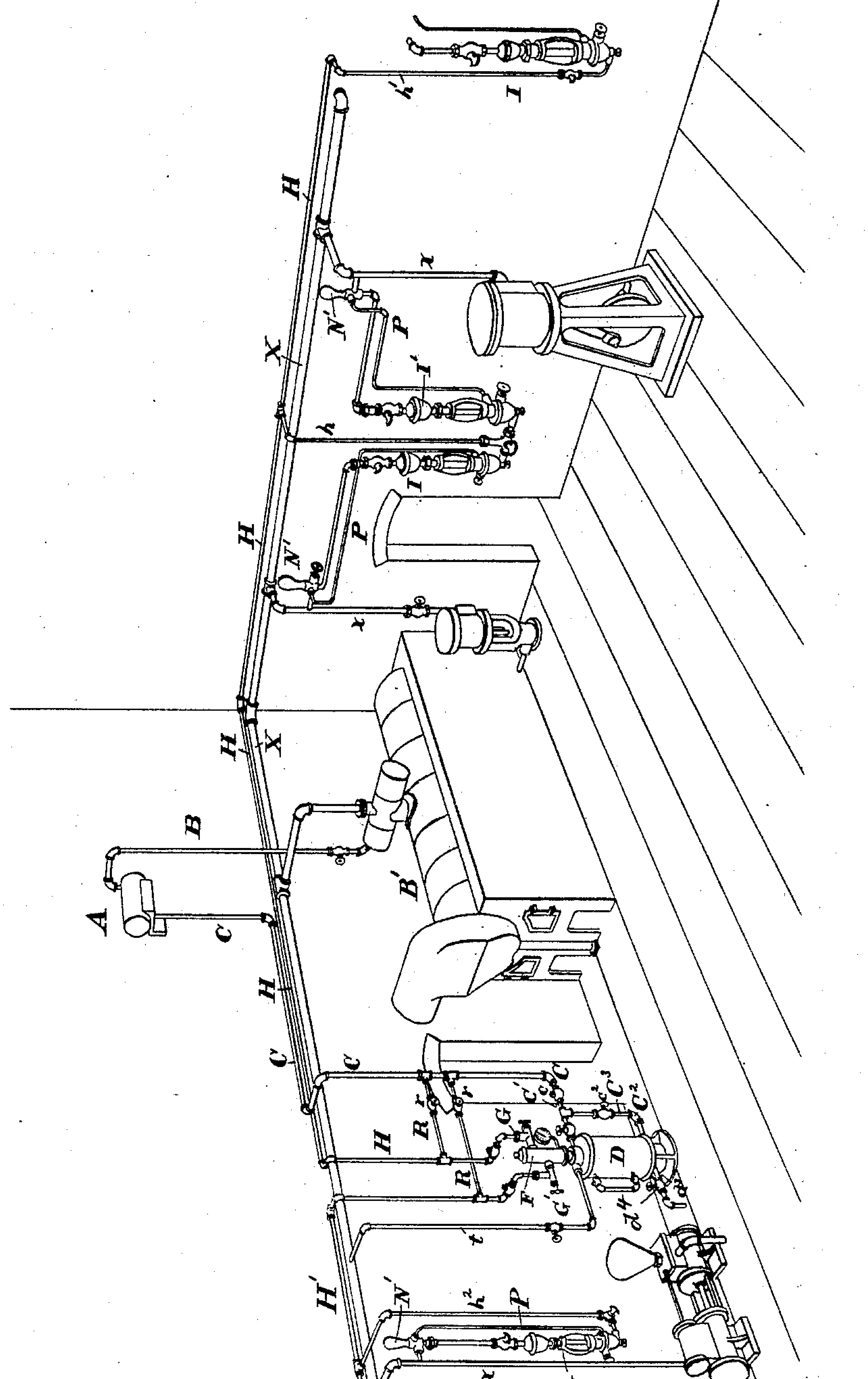
J. RYAN.

AUTOMATIC LUBRICATING APPARATUS.

No. 363,682. Patented May 24, 1887.

Fig. 1.



Attest:
Charles Pickles
John W. Herthel.

Inventor:
Joseph Ryan
per Herthel & Co

N. PETERS, Photo-Lithographer, Washington, D. C.

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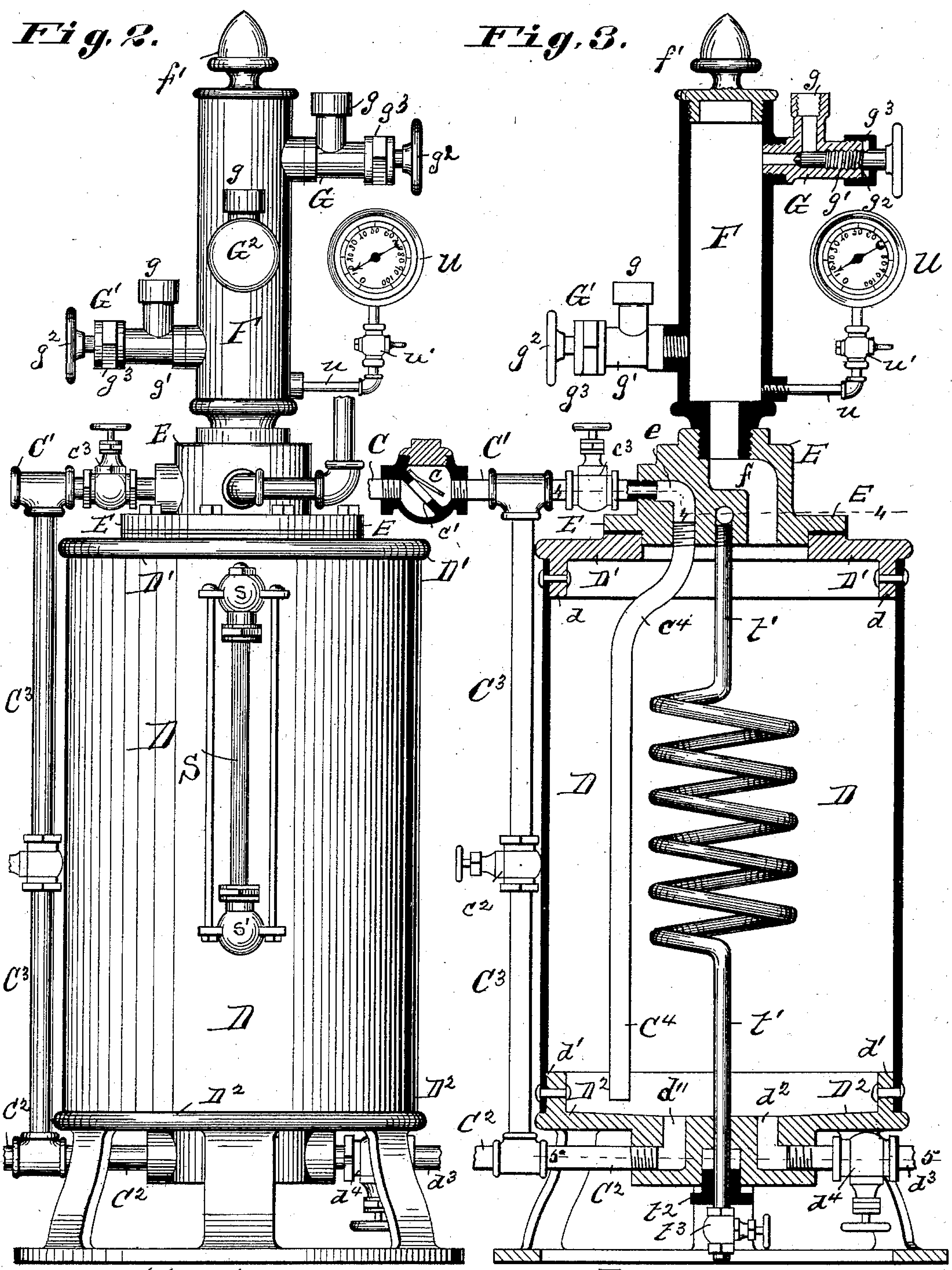
Fig. 2. Fig. 3.



Attest:
Charles Pickles
John W. Herthel.

Inventor:
Joseph Ryan
per Herthel & Co

N. PETERS, Photo-Lithographer, Washington, D. C.

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Fig. 4.

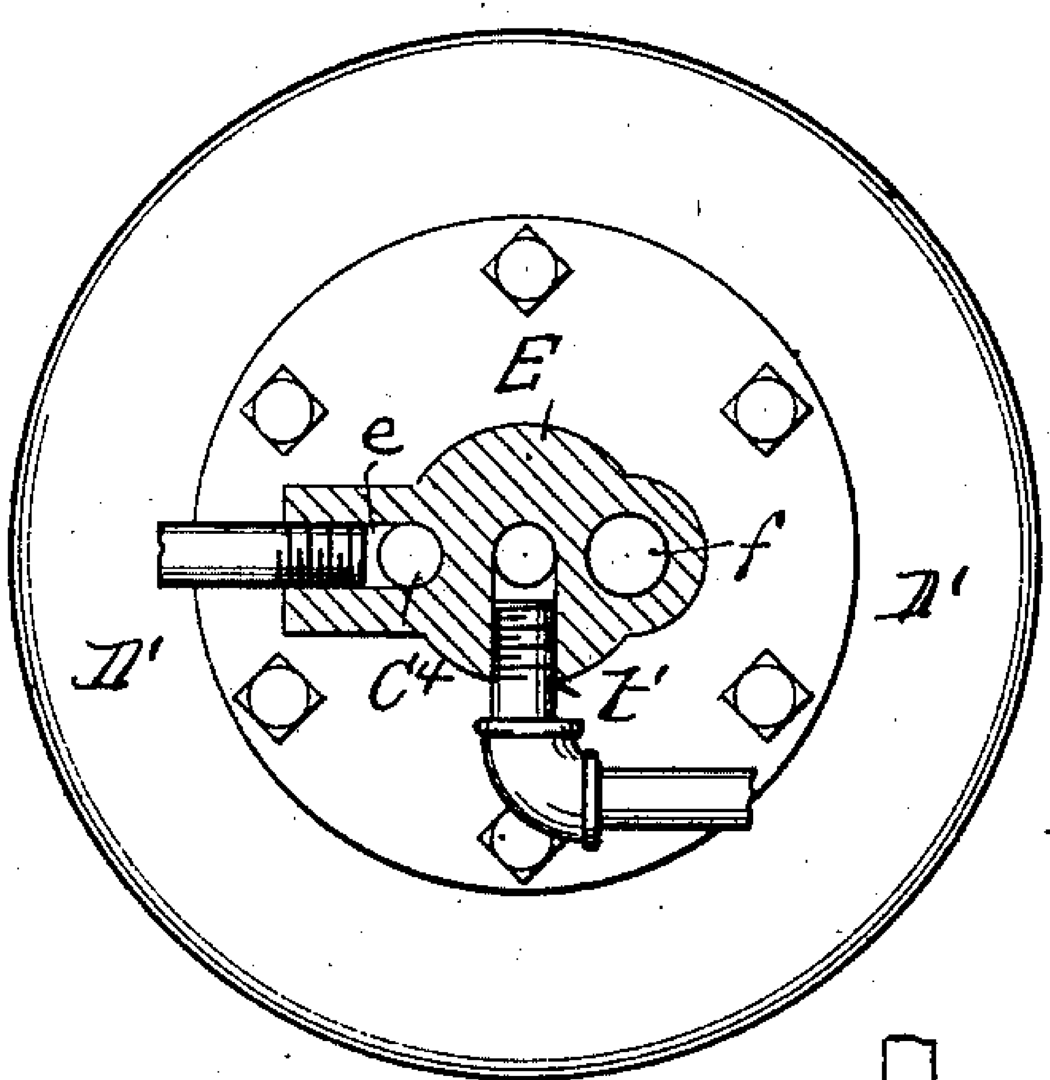


Fig. 6.

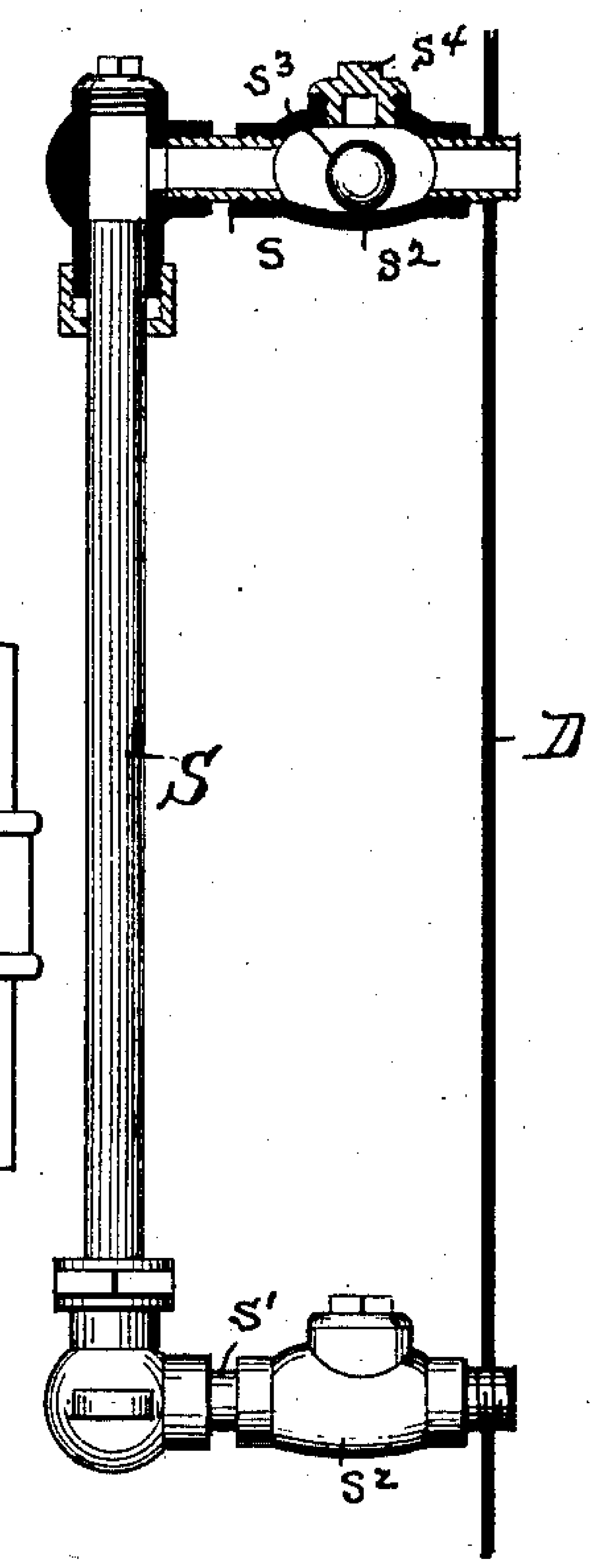


Fig. 10.

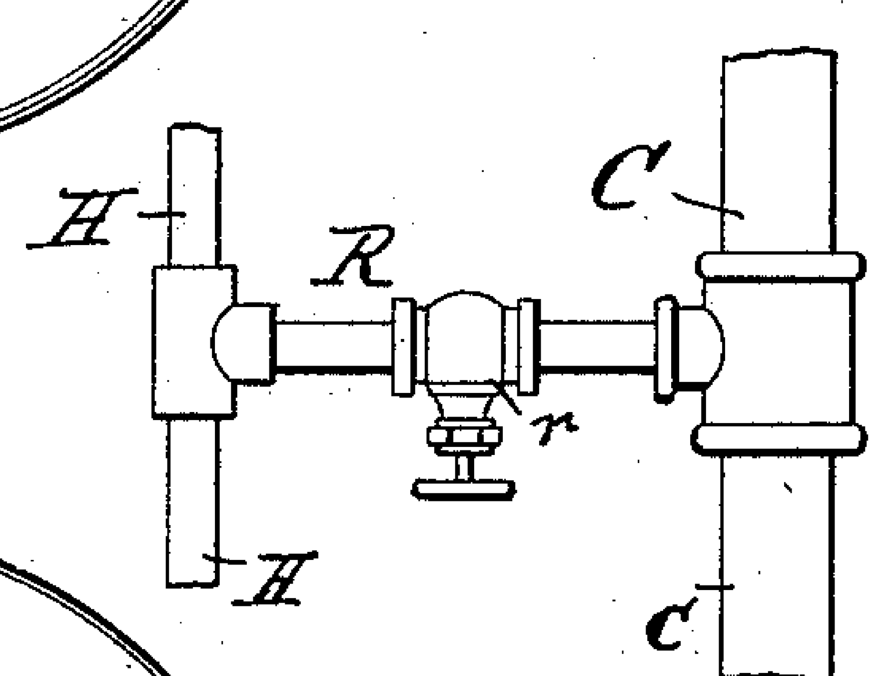


Fig. 5.

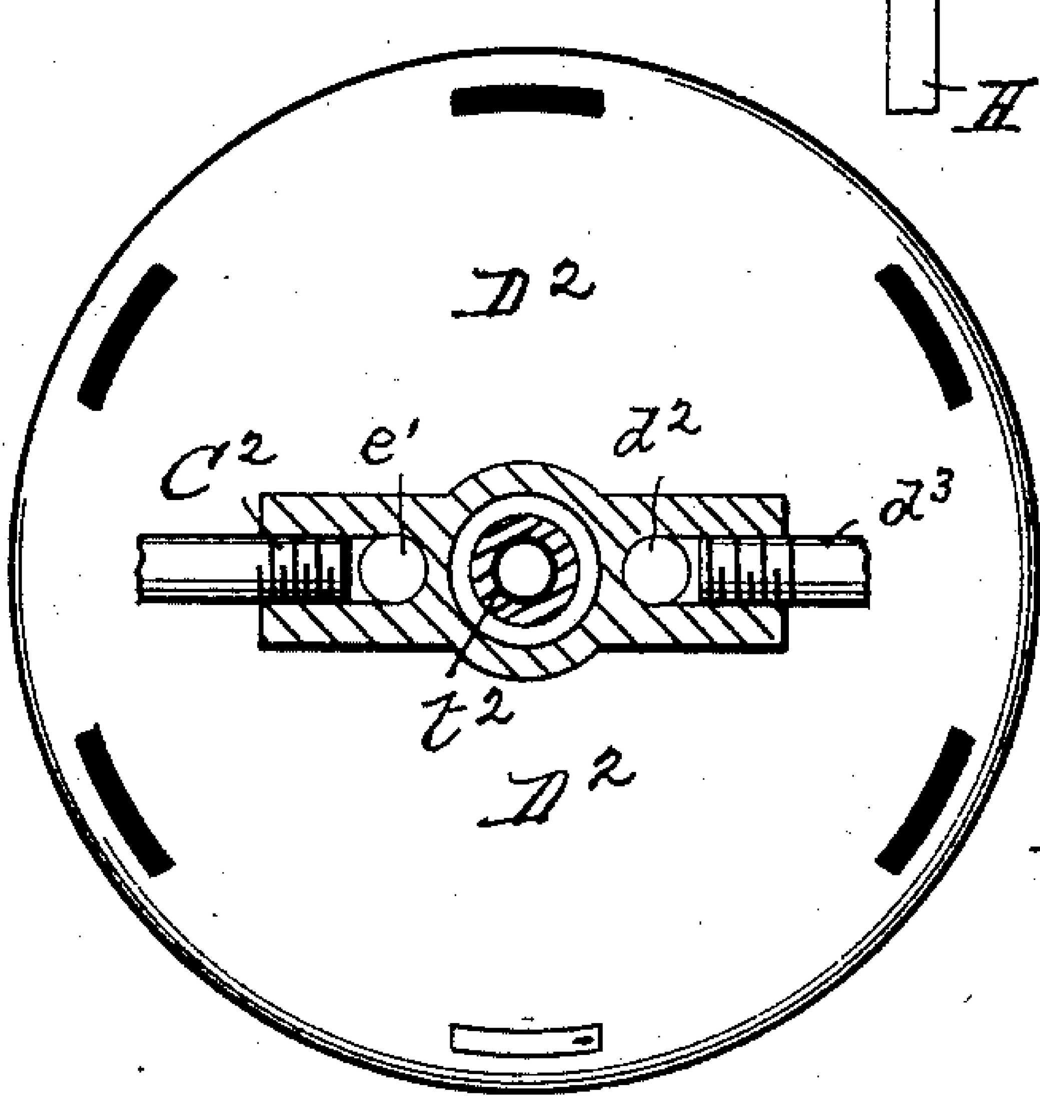
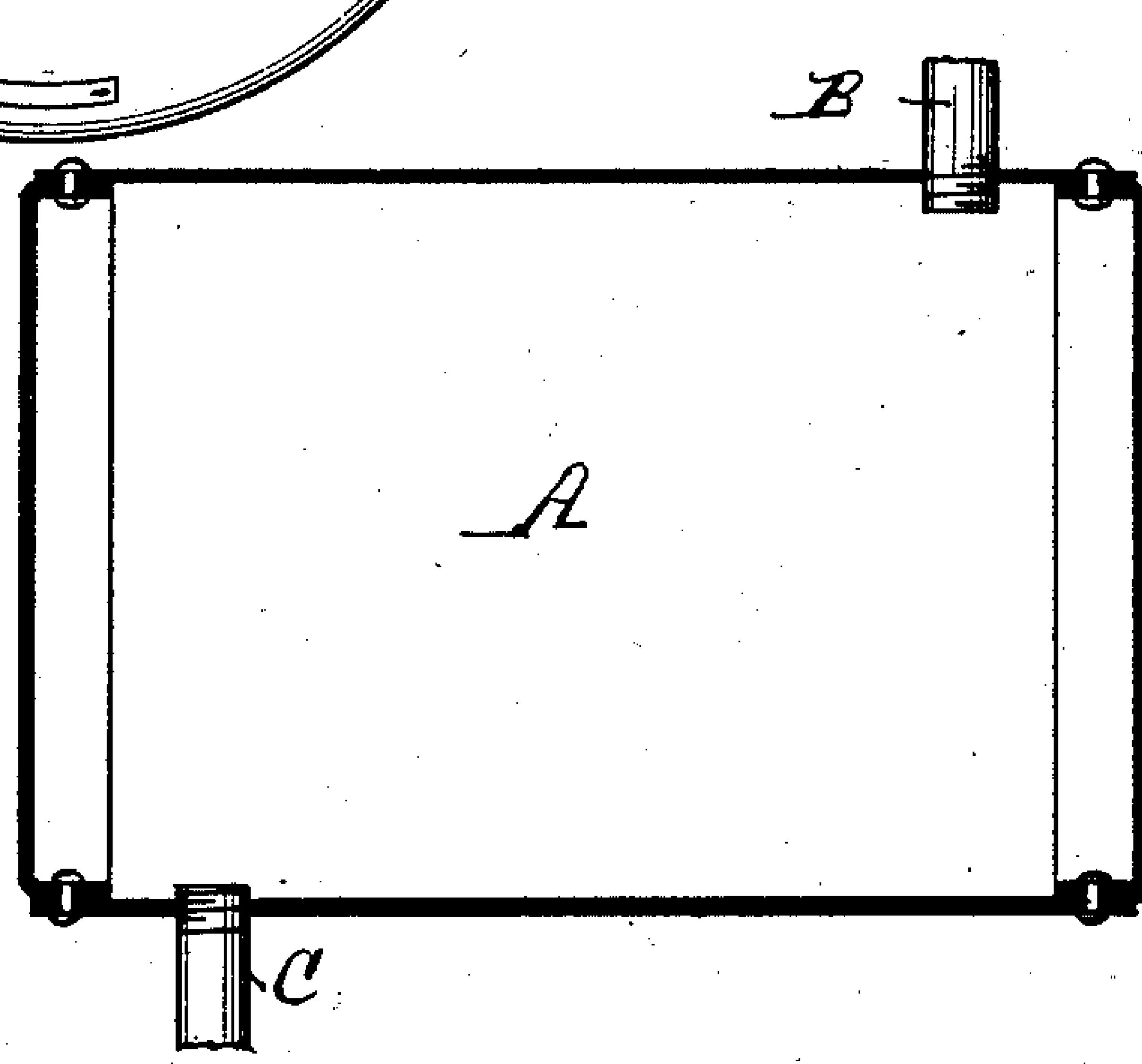


Fig. 7.



Attest;
Charles Pickle
John W. Herthel.

Inventor;
Joseph Ryan
per Herthel & Co

N. PETERS, Photo-Lithographer, Washington, D. C.

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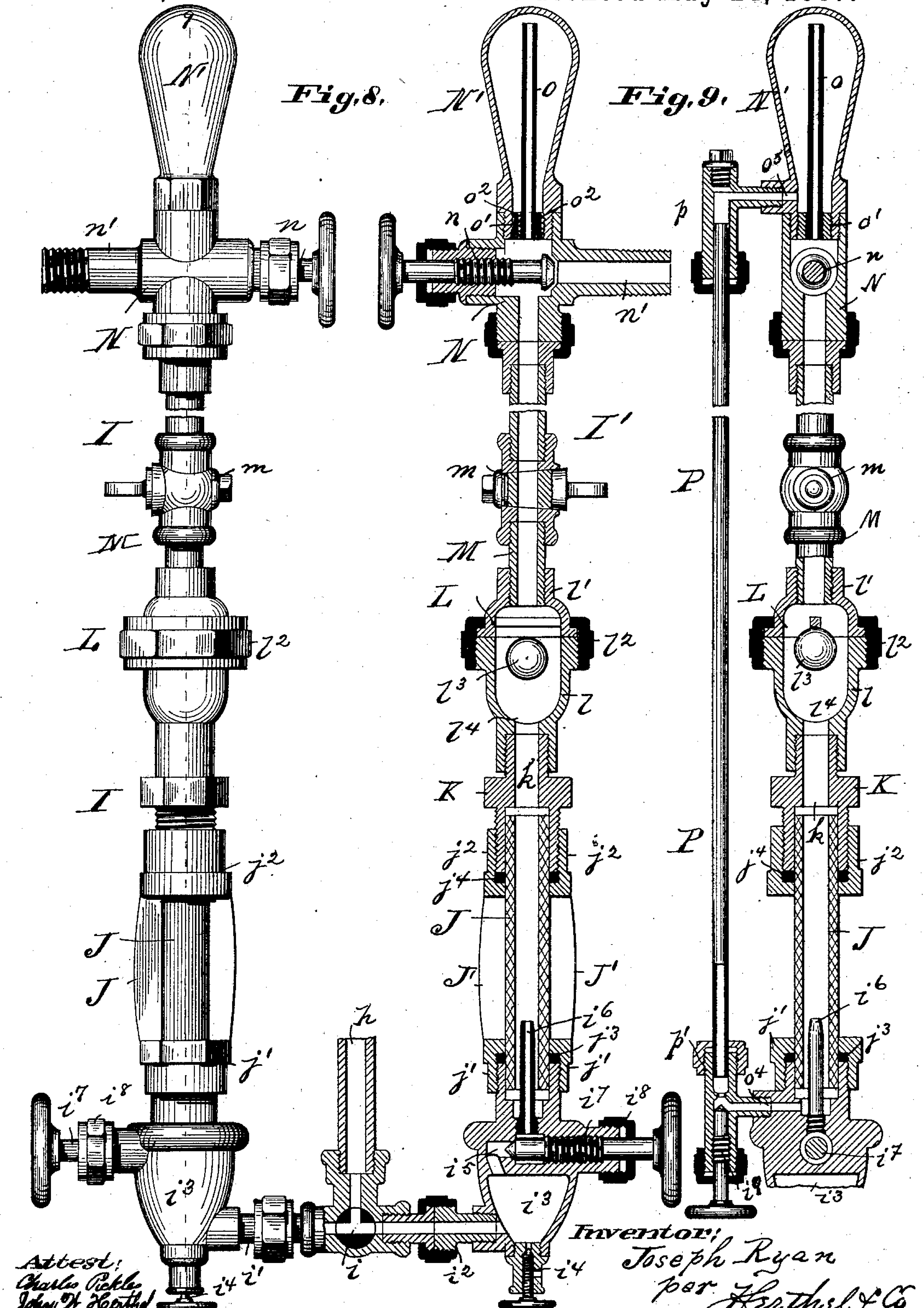

N. PETERS, Photo-Lithographer, Washington, D. C.

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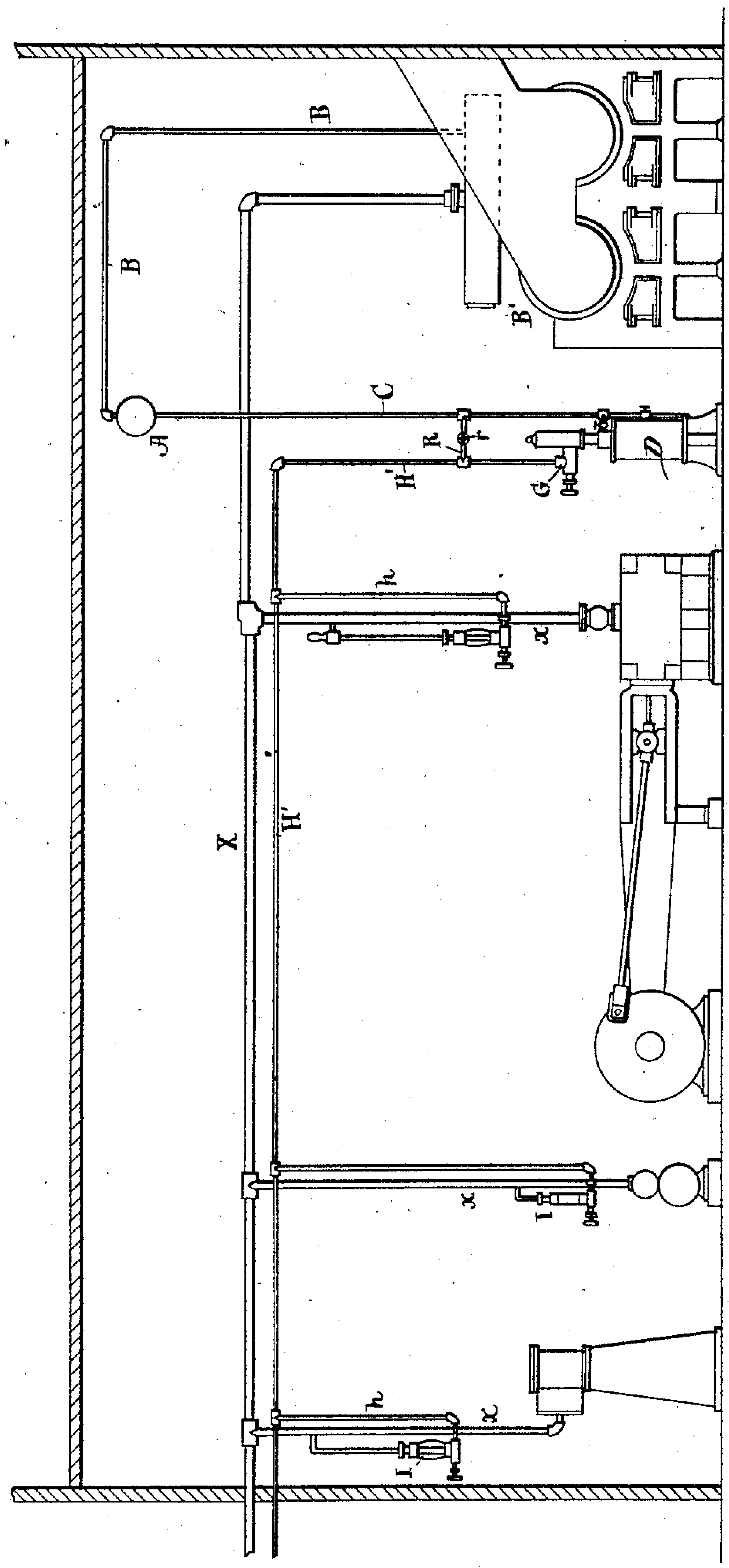
AUTOMATIC LUBRICATING APPARATUS.

No. 363,682. Patented May 24, 1887.

Fig. 11.



Attest:
Jas. K. McCathran
L. W. Hopkins.

Inventor:
Joseph Ryan,
By, Knight Bros.
Attorneys.

UNITED STATES PATENT OFFICE.

JOSEPH RYAN, OF ST. LOUIS, MISSOURI.

AUTOMATIC LUBRICATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 363,682, dated May 24, 1887.

Application filed December 2, 1884. Serial No. 149,354. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH RYAN, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented a certain new and useful Improved Automatic Lubricating Apparatus, of which the following is a specification.

My invention relates to that class of lubricators which are adapted to supply the wearing parts of any desired number of machines or engines from one reservoir common to all; and it consists in features of novelty, which are hereinafter particularly pointed out in the claims, being first duly described with reference to the accompanying drawings, in which—

Figure 1 is a perspective view showing at a glance my entire improvements as practically applied and adapted to lubricate one or more engines. Fig. 2 is a front elevation on an enlarged scale of the oil-reservoir and its parts, including the water pipes and their connections, the branches for the oil-pipes, the indicator in front, and pressure-gage near top. Fig. 3 is a sectional elevation of the same parts shown in Fig. 2. Figs. 4 and 5 are horizontal sections on the lines 4 4 and 5 5, respectively, Fig. 3. Fig. 6 shows the attachment of the indicator to the oil-reservoir, the upper branch being shown in section to disclose the valve-chamber and its valve. Fig. 7 is a sectional view of the water-supply tank or condenser with its respective upper steam pipe and bottom water-pipe connections. Fig. 8 represents double feeders, with which a single oil-pipe communicates at bottom, the internal construction of one of said feeders being shown in section. Fig. 9 is a sectional elevation of a single feeder having in conjunction therewith a side pipe connecting at top with a condensing-chamber and at bottom with said feeder. Fig. 10 is a detail view of the wash-out, consisting, essentially, of a pipe communicating with the main water-pipe between the water-supply tank and oil-reservoir and with the main oil-pipe between the oil-reservoir and the part to be lubricated. Fig. 11 is a view showing in elevation the simplest embodiment of the invention. The apparatus shown in Fig. 1 differs from that here shown only in that the latter is provided with but a single pipe for conveying the oil from the oil-tank to the parts to be lubricated, while the former is provided with more than one, whereby it is better adapted for lubricating a larger plant.

Similar letters refer to similar parts throughout the several views.

A is the main water-supply tank, from which the hydrostatic pressure, conjointly with steam, acts to force the oil to the feeder, as will hereinafter appear. Further, by referring to Fig. 1 it will be noted that the water-supply tank is located higher than any oil-pipe of the entire apparatus, the purpose being to achieve the water-pressure due to said difference of height, which, when further augmented by the pressure of the steam above the water in tank A, will produce sufficient pressure to force the oil to the nipple or feed-tube of the feeder, however remote said feeder may be from the oil reservoir.

C is the main water-pipe, through which this pressure in the tank A is communicated to the oil in the various pipes and parts of the apparatus until the nipple of the desired feeder is reached. The upper end of this water-pipe C, I therefore connect to the water-tank A, while the lower end of said tank can communicate with the oil-reservoir through either of the branch water-pipes C′ or C², as shown in Figs. 1, 2, 3. In either case, whether the main water-pipe communicates at the bottom or the top of the oil-reservoir, I have provided an automatic check-valve, *c*, which therefore can be located in either of the branch pipes C′ or C². By means of this check-valve, (see Fig. 3,) in case of varying pressures arising in the boiler, or in "shutting down" the boiler, or the creation of a vacuum in same, or similar contingencies producing back-pressure, the said valve closes against its seat *c*′ and prevents reaction of the oil or contents from the oil-reservoir, the pipes, and tank entering the steam-boiler, and otherwise arrests all back-pressure throughout the lubricator apparatus instantaneously.

C³ is an additional water-pipe, which communicates with both the upper and lower branch pipes, C′ C². (See Figs. 2 and 3.) This pipe C³ has a cock or valve at *c*². Similarly, the upper branch, C′, has a like valve at *c*³, both being to control the inlet of the hydrostatic pressure to the oil-reservoir.

The oil-reservoir D consists of the upright cylindrical body properly joined to the flanges *d d′* of the respective top and bottom plates, D′ D^2, which close said cylindrical body in manner shown in Figs. 2 and 3.

In the opening of the top plate, D′, is fitted the cap-piece E, having the port or duct *e*, which establishes communication between the upper branch, C′, of the water-pipe and the leg or water-pipe C^4 inside the oil-reservoir. (See Fig. 3.) The bottom plate, D^2, has also a port or duct, d^2, with which the lower branch, C^2, of the water pipe connects to establish hydrostatic pressure from the bottom of the oil-reservoir upward through same. (See Fig. 3.) Thus the hydrostatic pressure can be introduced from the top of the oil-reservoir down same or from the bottom up through the same, as may be desired. When said pressure is introduced from the top of the oil-reservoir, the cock c^2 is shut and said reservoir is filled by the water-pressure escaping down the leg C^4. By opening the cock c^2 and shutting the upper cock, c^3, the same pressure fills the reservoir from the bottom. In either case the oil, by its lighter specific gravity, remains on top of the water and passes from the reservoir through the oil-pipes; also, by means of these two cocks c^2 c^3 the operator can control, regulate, or entirely shut off the water-pressure.

For exhaust, emptying the oil-reservoir, and "blow-off" purposes the bottom plate, D^2, of the oil-reservoir D is provided with a duct, d^2, which communicates with an outlet-pipe, d^3, controlled by a cock, d^4. (See Figs. 1, 2, 3, 5.)

F is the upper chamber of the oil-reservoir, whence the oil is delivered to the various feeders through branch pipes controlled by steam-valves.

Communication is established between the oil-reservoir D and its upper chamber, F, so that the oil rising, by reason of the pressure of the water beneath it in the reservoir, will constantly fill said upper chamber, whence it escapes to supply the lubricating-pipes. An acorn-shaped cover, *f′*, closes the open top of the chamber F, through which the oil is admitted to fill both the main oil-reservoir D and its upper chamber, F.

G G′ G^2 represent the several branches with which the upper chamber, F, of the oil-reservoir may be provided to establish communication simultaneously, if desired, with any or all of the oil-pipes and feeders connected to the same. (See Figs. 1, 2, 3, 8, and 9.) Each of these branches consists of a vertical tube, *g*, and lateral tube *g′*, each of the latter having, further, a screw-stem valve, g^2, passing through a suitable stuffing-box, g^3, as shown in Figs. 2 and 3. By means of these screw-stem valves g^2 the passage or port that delivers the oil to the vertical tubes *g* can be readily controlled, thereby controlling the feeding of the oil to the oil-pipes.

To the tube *g* of the branch pipe G the main oil-pipe H connects, and to the tube *g′* of the branch pipe G′ or G^2 a like oil-pipe, H′, may connect, both or all these oil-pipes being arranged below the water-tank, and preferably in close proximity to the main steam-pipe X, as shown in Fig. 1, so that the oil shall be kept always at such temperature as to cause it to flow freely.

The steam-pipe X, provided with any necessary number of branches *x*, supplies the steam to the various pumps, engines, or steam mechanisms that it is desired to operate from a common steam source, and similarly, by means of the arrangement shown, the same pumps, engines, or steam mechanisms can be kept constantly and properly lubricated from a common source. Each of the main oil-pipes H H′ passes up from the oil-reservoir to a height near to that of the steam-pipe X (which latter must, therefore, be below the level of the water-tank) and follow the lead of said steam-pipe close by the same in order to obtain the benefit of the heat radiating therefrom, being provided at any desired points with branches *h h′* h^2, &c., (see Figs. 1, 8,) which deliver the lubricant to the bottom chamber or oil-tube of each feeder employed.

It can be here stated that by the said arrangement of the parts so far described there is achieved, besides the steam-pressure in the water-tank, the hydrostatic pressure due to the elevation of said tank above the oil-pipes. I utilize this hydrostatic column so derived only to force the oil from the main oil-reservoir, through its oil-pipes, to the nipple or feed-tube of the feeders, (whence it is conveyed to the part to be lubricated by gravity, as hereinafter explained,) and to effect a complete washing out of the entire apparatus, as will hereinafter appear.

The feeders I show more distinctly in Figs. 8 and 9. They can be made either single or double and with or without a side pipe for the circulation of water from an auxiliary condenser. I will first describe the double feeders shown in Fig. 8. As shown, the branch oil-pipe *h* connects with these feeders at the bottom, a three-way cock, *i*, being placed at the intersection of the pipe *h* and branches *i′* i^2, which latter communicate with conical-shaped chambers i^3 at the bottom of the respective feeders. The oil-chamber i^3 has an opening at bottom controlled by a screw-valve, i^4, which serves as a blow-off for the feeder.

i^5 is a small passage cored to be in vertical line with the feed tube or nipple i^6, said port or passage being controlled by the screw-stem valve i^7, operating through a proper stuffing-box, i^8. It is this port i^5 that directs the oil interposed between the hydrostatic column and the feeder to be fed to the feed-tube or nipple, so that the oil escaping from the same can pass by virtue of its lighter specific gravity in the central line of the current or column of water contained in the said feeder. As apparent, the oil can be made to escape drop by drop, or in a continuous stream, from the feed-tube or nipple i^6 by a proper adjustment of the hand-valve i^7; or it may be entirely shut off, as may be desired.

J is the transparent chamber or sight-tube seen through the usual side openings of its surrounding metal bracket J'. This glass sight-tube J passes centrally through the bracket J', its lower end being secured within a socket formed in a projection from the top side of the bottom or chamber-piece of the feeder, while its upper end is secured within a corresponding socket formed in the lower end of a coupling-piece, K. This projection and also the lower end of the coupling-piece K are externally screw-threaded for engaging corresponding screw-threads formed in sockets in the respective extremities j' j^2 of the bracket J', packing-rings j^3 j^4, surrounding the tube, being interposed between the extremities of said projection and coupling piece and the bottoms of the sockets in the bracket J', into which they respectively screw for preventing leakage.

L is a self-acting check-valve interposed between the sight-tube of the feeder and its final outlet-branch that delivers the oil to the pipe to be conveyed to the engine. The valve-chamber consists of two parts, l l', coupled together by a union, l^2, and within this chamber is a ball-valve, l^3. (See Fig. 8.) As indicated, the valve rises from its seat to allow the normal passage upward of the current of oil or oil and water, but closes against its seat l^4 by gravity, pressure, or both, as soon as reaction takes place. In case of breakage or accident happening to the sight-tube, causing leakage, this valve closes by the force of reaction and shuts off the return of all pressure from the steam-engine backward through the lubricating apparatus. The valve-chamber is in line with the central passage of the feeder, which passage is continued by the further branch or connecting pipe M, controlled by the stop-cock m. (See Fig. 8.) To the upper end of the pipe M is secured the head-piece N, carrying an auxiliary water supply or condensing chamber, N'. This head-piece has a hand-valve, n, fitted to control the outlet-branch n', to which latter the pipe connects that conveys the lubricant to the valve-gear of the engine.

O is a stand-pipe passing through and secured in a perforation formed through a plug-piece, O', fitted in the bottom of the auxiliary condensing chamber N', so that the steam from the engine can communicate directly to said condenser, said plug being provided with further perforations, O^2, through which the water of condensation escapes into the feeder, filling the same, and constitutes the vertical column through which the oil passes upward from the nipple i^6 to the outlet-pipe n' by reason of its less specific gravity.

The separate operation of the feeder shown in Fig. 8 can be stated as follows: The hand-valve n and the air or blow-off cock i^4 are both opened, (the three-way cock i being turned to cut off the supply of oil through the pipe h,) whereupon the steam from the engine fills entirely the feeder or feeders, expelling the air at i^4 and adapting the same for automatic action. When so filled with steam, and the air or blow-off cock i^4 is closed, the steam condenses from the lowest point of the nipple or feed-tube i^6 upward, filling the feeder with water. This done, the three-way cock i can be opened, and the feeding of the oil can then take place, either drop by drop or in a stream, according to the adjustment of the regulating-cock i^7, floating upward through the feeder, and finally out through the branch n' to the engine. At the same time as the oil floats out of the branch n' the steam enters the condenser by way of said branch and the stand-pipe O, and condensation is kept up. The water of condensation accumulates near the bottom of the auxiliary condenser, and finds its outlet therefrom through the small ports o^2, flowing into the feeder, and, after overflowing the latter, flows through outlet pipe n' to the engine. There is thus a column of water kept constantly in the feeder to float the oil upward, and at the same time a circulation of hot water from the condenser through the outlet-branch n'. The hot water so circulating through said branch prevents the oil from becoming heavy, gummy, or sticky, all of which is liable to occur, owing to said branch being highly heated.

In Figs. 1 and 9 I have so modified the feeder that the water of condensation coming from the auxiliary condenser is delivered into the said feeder at bottom instead of at top, whereby a constant upward current of water therethrough is produced. This result is accomplished by dispensing with the perforations O^2 through the plug O' and providing the auxiliary condensing-chamber, near its bottom, with a duct, O^5, which is connected by means of a pipe, P P p', with a similar duct, O^4, formed in the base-piece of the feeder and communicating with the interior of said feeder near the bottom of the nipple i^6. The upper extremity of the main portion P of this pipe is connected with the port O^5 through the medium of an elbow, p, while its lower extremity is connected with the port O^4 by means of a T-coupling, p', one arm of which forms a bearing for the screw-threaded stem of a hand-valve, i^9, whereby the flow through said pipe may be regulated or stopped entirely at will. The circulation from the auxiliary condenser is therefore through the upper small port, O^5, down the side pipe, P, through the port O^4 to the interior of the feeder, upward through the feeder, and thence to the engine or other part to be lubricated through the pipe n'. This circulation carries the oil with it to commingle with the steam and pass to the part to be lubricated, and during its passage the temperature of the water serves to keep the temperature of the fluid throughout the apparatus above the freezing-point. This arrangement also performs the function of a "wash-out" to cleanse the sight-chamber, keep it constantly clear and bright, and otherwise, by its force of circulation, the oil is kept from gumming at any of the points on its way to lubricate the engine.

The complete operation of the parts so far described is as follows: In starting the apparatus, the cocks g^2 of the oil-pipes are closed, the upper chamber, F, of the oil-reservoir is opened, and steam from the boiler is allowed to condense and fill the oil-reservoir. The cocks c^3 (or c^2) can then be closed, shutting off the water of condensation at that point, and the blow-off cock d^4 is opened, permitting the water to exhaust out of the oil-reservoir. This done, the oil-reservoir is filled with oil to near top, the cover f' is screwed on, and the water-cock c^3 (or c^2, as the case may be) opened to establish communication between the hydrostatic column from the tank A and the oil-reservoir. The oil cocks g^2 can next be opened to permit the said hydrostatic pressure to force the oil through the oil-pipes or any or all of the feeders. It will be observed that the oil is forced from the reservoir to the feeder by the pressure of the hydrostatic column already mentioned, augmented by the pressure of the steam upon the top of said column. When the oil reaches the chamber i^3 of the feeder, the latter performs the final function, by its own column of water, of floating the oil to its final destination. The circulation of the lubricant is therefore automatic, the hydrostatic column aforesaid keeping the feeder constantly supplied by forcing thereinto through the nipple i^6 a quantity of oil, depending upon the adjustment of the valve i^7, and from said nipple the oil floats through the column of water in the feeder, by reason of its lighter specific gravity, to the discharge-pipe n', whence it flows with the water of condensation to the part to be lubricated, as shown in Fig. 8; or else, instead of flowing upward through a column of water in the feeder, it is carried upward by a current of water passing therethrough, as shown in Figs. 1 and 9.

In Figs. 1 and 10 I show the further-needed parts to adapt the hydrostatic column from the water-tank to serve as a wash-out for the complete apparatus, including the oil reservoirs and feeders. This wash-out simply consists in the addition of the branch water-pipe R, controlled by cock r, uniting the main water-pipe c to the main oil-pipe H. This feature is duplicated for the remaining oil-pipe H', &c., by the like branch pipe and cock. (See Fig. 1.) Of course, during the normal operation of the automatic lubricator the cocks r are closed and the wash-out described is not used; but, when desired, a complete cleansing of the oil-pipes, the reservoirs, the feeders, and their connections can be had.

By closing the valves c^2 or c^3 in the pipe C, opening the blow-off cock d^4, and then opening the cock r, hot water and steam will be blown through the oil-reservoir, dissolving all hard gummy oil and expelling it, together with other sedimental matter that may have accumulated. By opening the blow-off cock i^4 at the bottom of the feeder, and then opening the cock r, (the valves c^2 and c^3 being closed or open,) a current of hot water and steam will be blown through the oil pipes, thereby thoroughly cleansing them. The cleansing of the feeder alone is effected, as before described, without the use of the cock r, by simply closing the cock i and opening the blow-off i^4, (and, in case the feeder is constructed as shown in Figs. 1 and 9, closing the valve i^9,) permitting the hot water and steam to rush downward through the same.

In Figs. 1, 2, and 6 I have shown the oil-reservoir provided with an indicator, S. It consists of a glass tube, S, mounted in the upper and lower branch pipes, s s', and communicating with the side of the oil-reservoir. This indicator shows the level or height of oil and water in the reservoir. Further, the branches of the indicator are each provided with a check-valve, (see Fig. 6,) consisting of a conical chamber, s^2, deepest at the central point, and a ball-valve, s^3, which is introduced into this valve-chamber through an opening closed by a cap, s^4. This valve, during the proper operation of the lubricator, always retains the lowest point in its chamber, the oil passing over it during the time the lubricant is drawn off from the oil-reservoir. In case, however, a leakage occurs, or breakage of its glass tube, so as to cause a rush of fluid through the valve-chambers, the pressure raises and forces the valves against the outer ends of the said branches, thereby preventing the escape of steam, oil, water, &c. The quantity of oil in the reservoir will be apparent from the difference in the colors of the two fluids, as seen through the indicating-tube.

In Fig. 3 I show the oil-reservoir provided with a heater for purposes of preventing its oil congealing or becoming thick and heavy and retaining it at such temperature as will insure its flowing freely and best adapt it to serve best as a lubricant. This heater consists simply of a branch steam-pipe, t, from the main steam-pipe X, (see Fig. 1,) communicating with the upper end of a pipe, t', which passes through the head-piece E into the oil-reservoir, where it is preferably coiled. (See Figs. 3 and 4.) The bottom end of the heating-pipe passes through a stuffing-box at t^2, and its outside end is controlled by the cock t^3. (See Fig. 3.)

U is a suitable pressure-gage connecting by pipe u, having a cock, u', to the upper chamber, F, of the oil-reservoir. By means of this pressure-gage the pressure in the oil-reservoir may be ascertained, which, of course, will be (approximately) the same per square inch as the pressure in the steam-boiler, the only difference being the pressure of the hydrostatic column in the pipe C and tank or condenser A.

The invention shown and described in this application possesses some features which are common to the inventions shown and described in my pending applications which were filed on the 27th day of January, 1886, and numbered 189,950 and 189,951, respectively. I do not claim in this application any feature or features particularly claimed in either of said other applications.

What I claim is—

1. In an apparatus for feeding lubricant to

two or more machines or parts of machinery, the combination of a single oil-reservoir, a single water-supply located above and remote or away from the oil-reservoir, a pipe connecting said water-supply and oil-reservoir for delivering water into the latter for expelling the oil therefrom, and branched pipes forming communication between said oil-reservoir and a plurality of objects to be lubricated, a separate branch being provided for communicating with each of the plurality of objects to be lubricated, whereby any number of machines or parts of machinery may be lubricated by the lubricant forced from a single oil-reservoir by water furnished from a single source, substantially as set forth.

2. An apparatus for feeding lubricant, consisting of an oil-reservoir, a water-supply located above and remote from the oil-reservoir, and a pipe connecting said water-supply and reservoir, in combination with an oil-pipe provided with branches forming communication between said oil-reservoir and the objects to be lubricated, and valves and feeders located in said oil-pipe and branches, the whole being arranged in such a manner that the oil is caused by said water-supply to pass from the reservoir and through said oil-pipes and its branches to the parts to be lubricated, regardless of intervening space or the bends in the pipe, substantially as set forth.

3. An apparatus for feeding lubricant, consisting of an oil-reservoir, a water-supply located above and remote from the reservoir, and a pipe connecting said water-supply and reservoir, in combination with an oil-pipe provided with branches forming communication between said oil-reservoir and the objects to be lubricated, and valves located in said oil-pipe and branches, the whole being arranged in such a manner that the oil is caused by said water-supply to pass from the reservoir and through said oil-pipes and its branches to the parts to be lubricated, regardless of the intervening space or the bends in the pipe, substantially as set forth.

4. In a lubricator, the combination, with an oil-reservoir, a feeder, a pipe forming communication between them, and a pipe for conveying the oil from said feeder to the object to be lubricated, of a water-supply having a pipe connecting it with the reservoir and an auxiliary water-supply having a pipe connecting it with the feeder, substantially as set forth.

5. The combination of the oil-reservoir, the water-supply pipe leading therefrom and having a branch, C′, communicating with the reservoir at top, said branch having a leg, C^4, extending nearly to the bottom of said reservoir, and the branch C^3, having portion C^2 communicating directly with said reservoir at bottom, substantially as and for the purposes set forth.

6. The combination, with an elevated water-supply tank, of an oil-reservoir having communication therewith, a feeder, a pipe connecting said reservoir and feeder, a cock for regulating the admission of oil to said feeder, and an auxiliary water-supply at a higher elevation than said feeder, having communication therewith, substantially as and for the purpose set forth.

7. The combination, with an elevated condenser, of an oil-reservoir having communication with said condenser, a feeder, an auxiliary condenser at a higher elevation than said feeder, and one common pipe for conveying steam to the latter condenser and oil from said feeder to the object to be lubricated, substantially as set forth.

8. The combination, with a feeder and means for supplying said feeder with oil under pressure, of a condenser, N′, above said feeder, having communication therewith, and a pipe for conveying oil from said feeder, substantially as set forth.

9. The combination, with an elevated condenser, of an oil-reservoir having communication therewith, a feeder, a pipe connecting said reservoir and feeder and delivering oil into the latter at the bottom, and an auxiliary condenser at a higher elevation than said feeder, having communication therewith, substantially as and for the purpose set forth.

10. The combination, with an oil-reservoir, a feeder, a pipe connecting them and communicating with the feeder at bottom, and a cock for controlling said communication, of a second pipe communicating with said feeder at top, and a blow-off at the bottom of said feeder, having a cock, substantially as and for the purpose set forth.

11. The combination, with the condenser A, of an oil-reservoir, D, having a blow-off, d^3, and a cock, d^4, for controlling the same, a pipe, C, connecting said condenser and reservoir, a pipe, H, for conveying the oil from said reservoir, and a branch pipe, R, from said condenser-pipe connecting with said oil-pipe and having a cock, r, whereby the parts may be cleaned, substantially as set forth.

12. In a lubricator, the combination of the elevated condenser A, oil-reservoir D, a main water-pipe, C, forming a communication between the condenser and oil-reservoir, a feeder, I, having a sight-tube, J, and located remote from the condenser and reservoir, a main oil-pipe, H, forming a communication between the reservoir and feeder, a pipe, n', forming a communication between the feeder and object to be lubricated, and a branch pipe, R, provided with a valve, r, and forming a communication between the main water-pipe C and main oil-pipe H, whereby the latter, together with the feeder, may be washed out, substantially as set forth.

13. In a lubricator, the combination of the elevated condenser A, oil-reservoir D, placed remote from the condenser, a main water-pipe, C, forming a communication between the reservoir and object to be lubricated, and a branch pipe, R, provided with a valve, r, and form-

ing a communication between the main water-pipe and oil-pipe, whereby the latter can be cleaned, substantially as set forth.

14. In a lubricator, the combination, with an oil-reservoir, D, a feeder, and a pipe for conveying the oil from the former to the latter, of a pipe, n', communicating with the feeder for conveying the oil therefrom, and a condenser, also having communication with said feeder, said condenser being located entirely above the level of the pipe n', whereby said pipe is adapted to supply the condenser with steam, and at the same time to carry off all water of condensation in excess of an amount sufficient to fill the feeder, and the vertical pipe connecting it with the said pipe n', substantially as set forth.

15. The combination, in a lubricator, of the sight-tube J, provided with a valve and nipple at its lower end, coupling K, valve-chamber L, valve l^3, pipes M I', valve m, head-piece N, and pipe n', substantially as set forth.

In testimony of said invention I have hereunto set my hand.

JOSEPH RYAN.

Witnesses:

WILLIAM W. HERTHEL,
JOHN W. HERTHEL.