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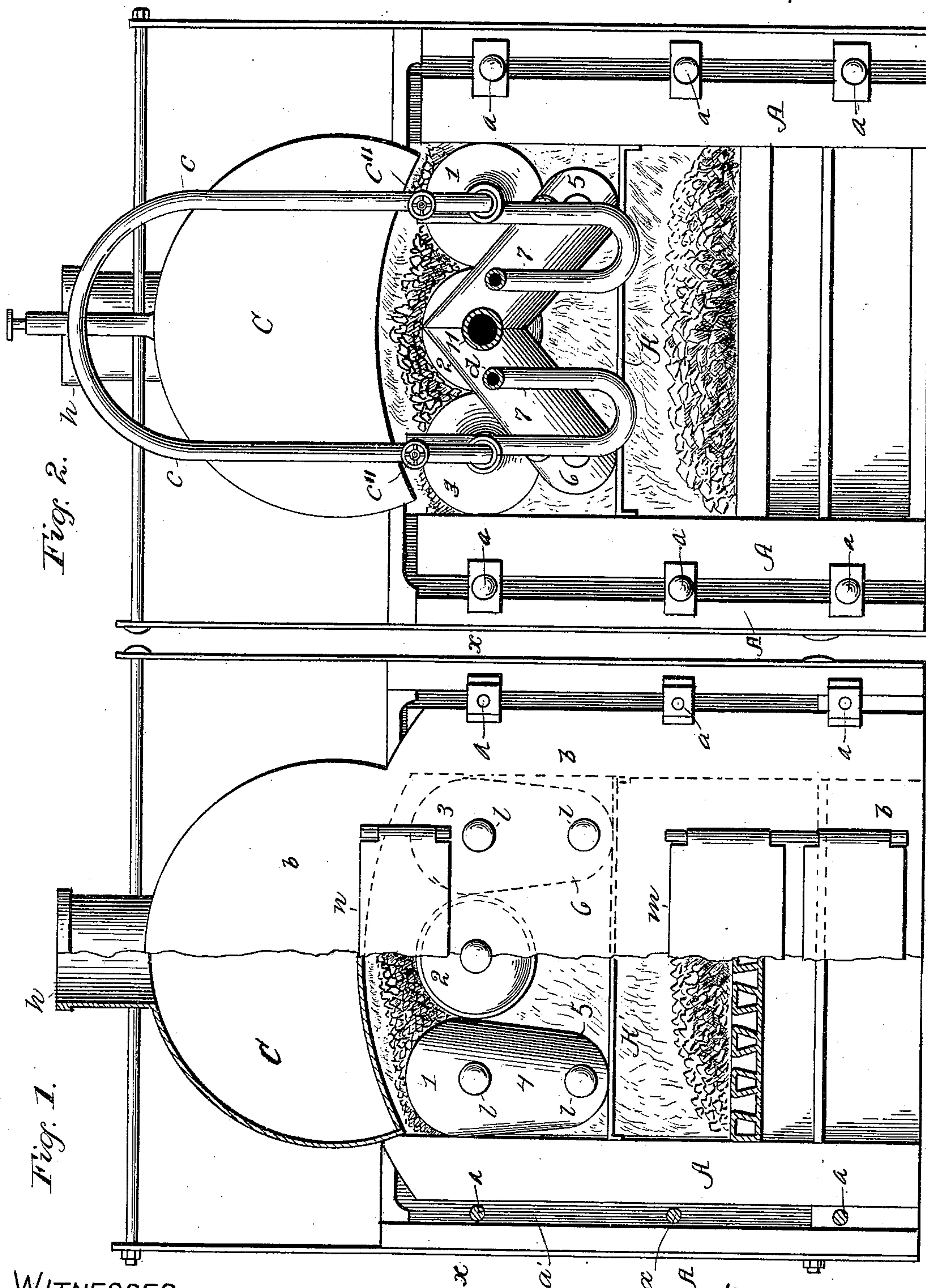
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G. M. S. WILSON.

APPARATUS FOR THE MANUFACTURE OF GAS.

No. 463,799.

Patented Nov. 24, 1891.



WITNESSES.

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R. B. Moore

INVENTOR.

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ATTORNEY.



(No Model.)

4 Sheets—Sheet 2.

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Fig. 4.

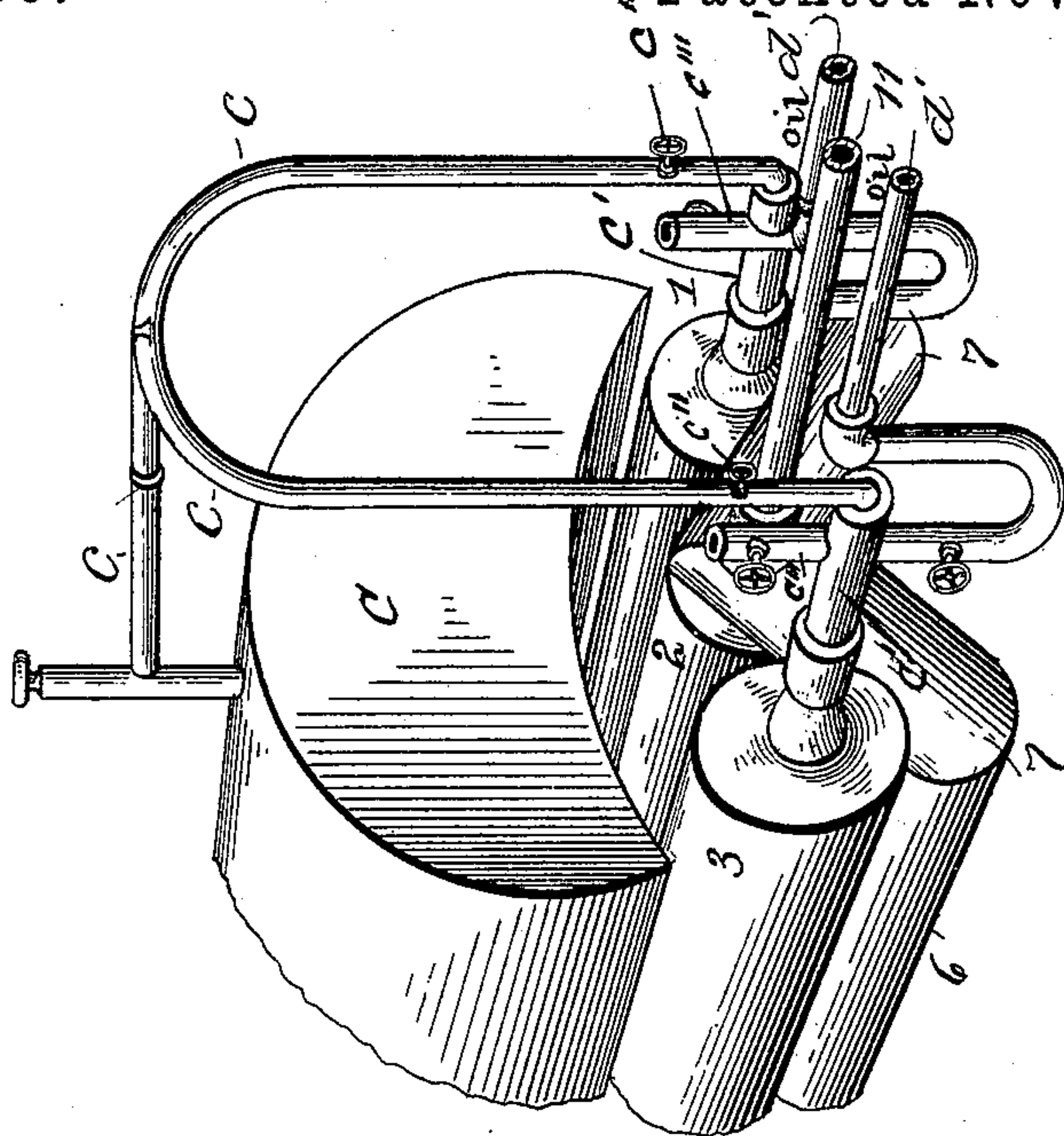
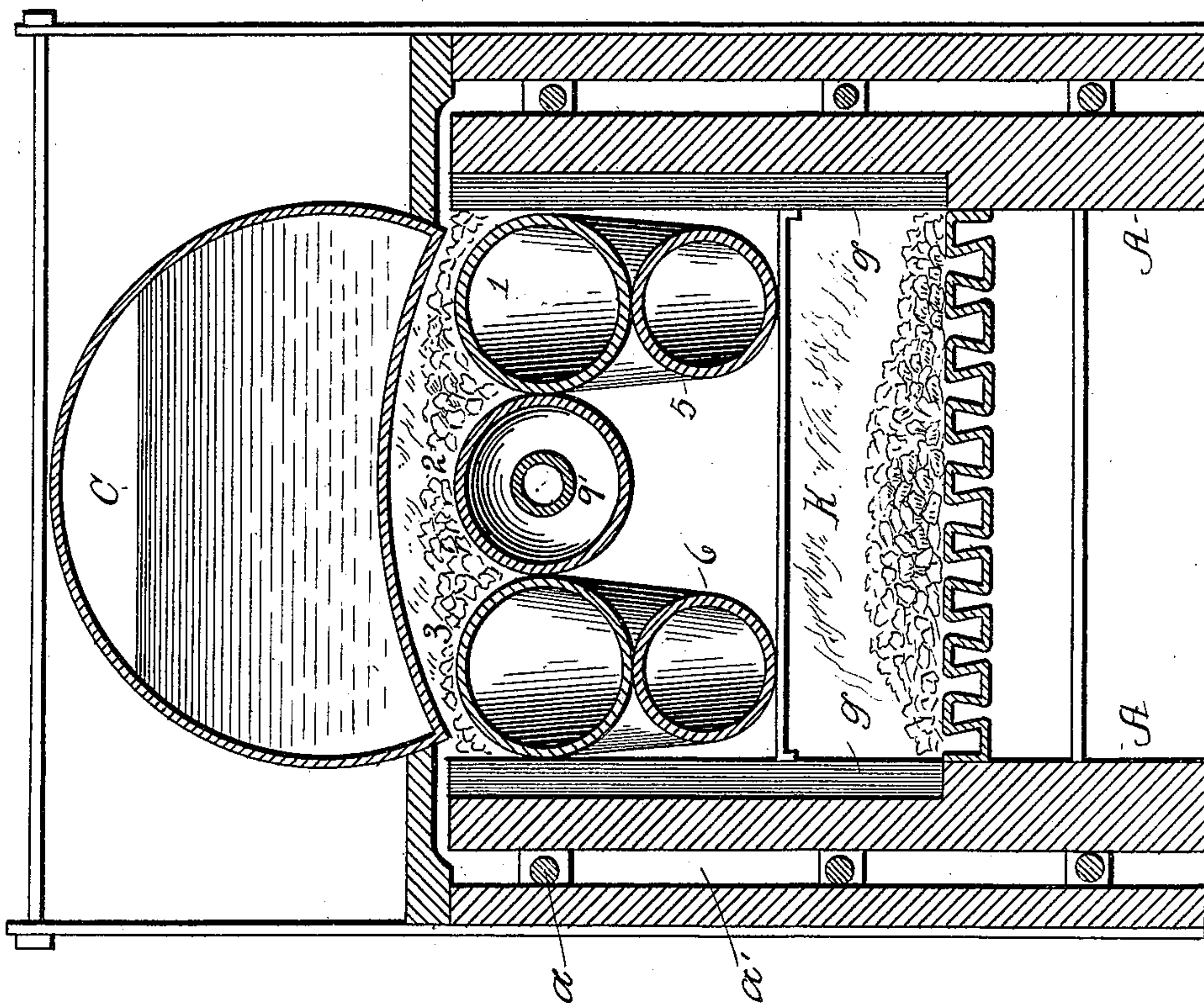


Fig. 3.



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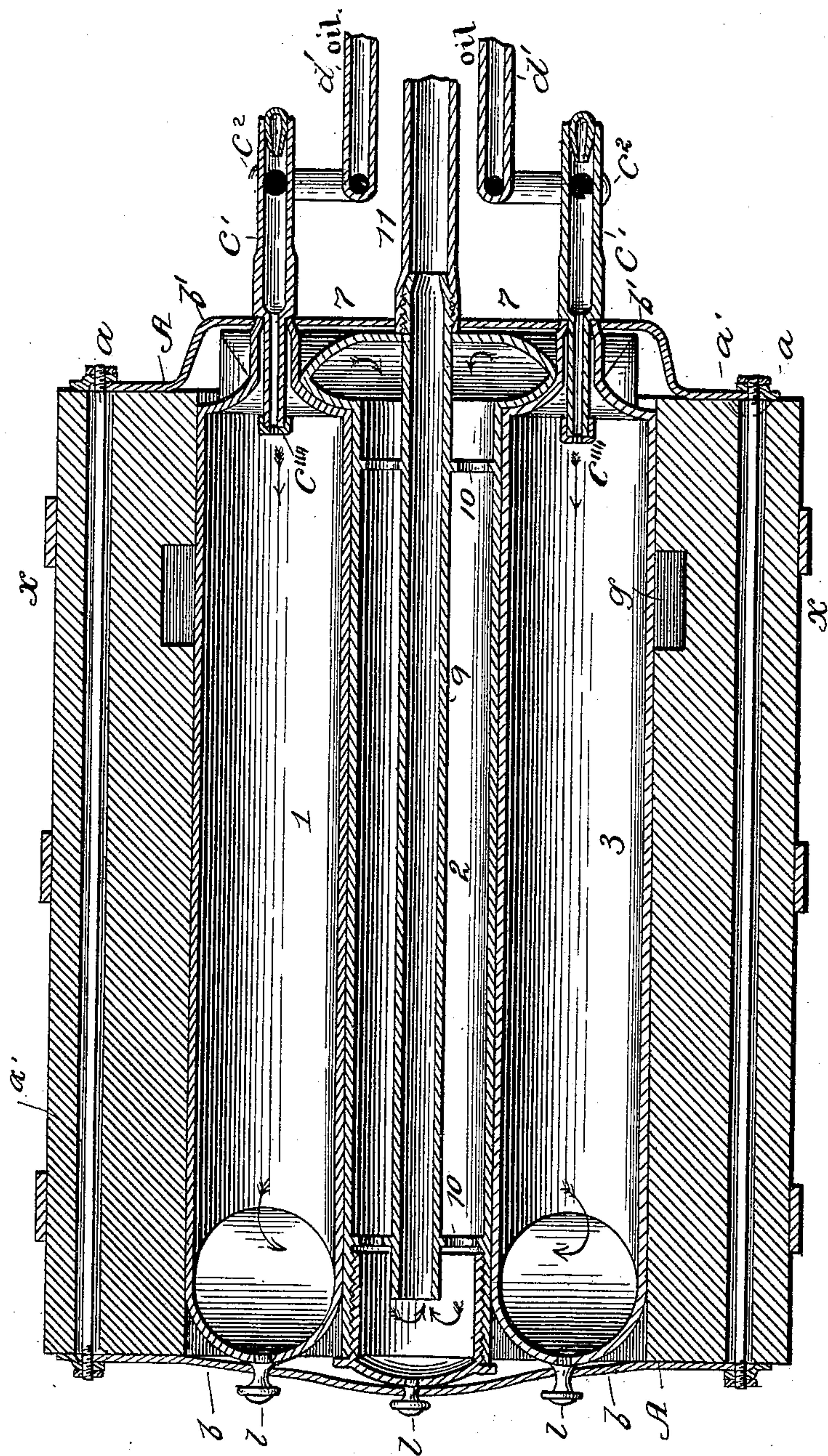
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Fig. 5.



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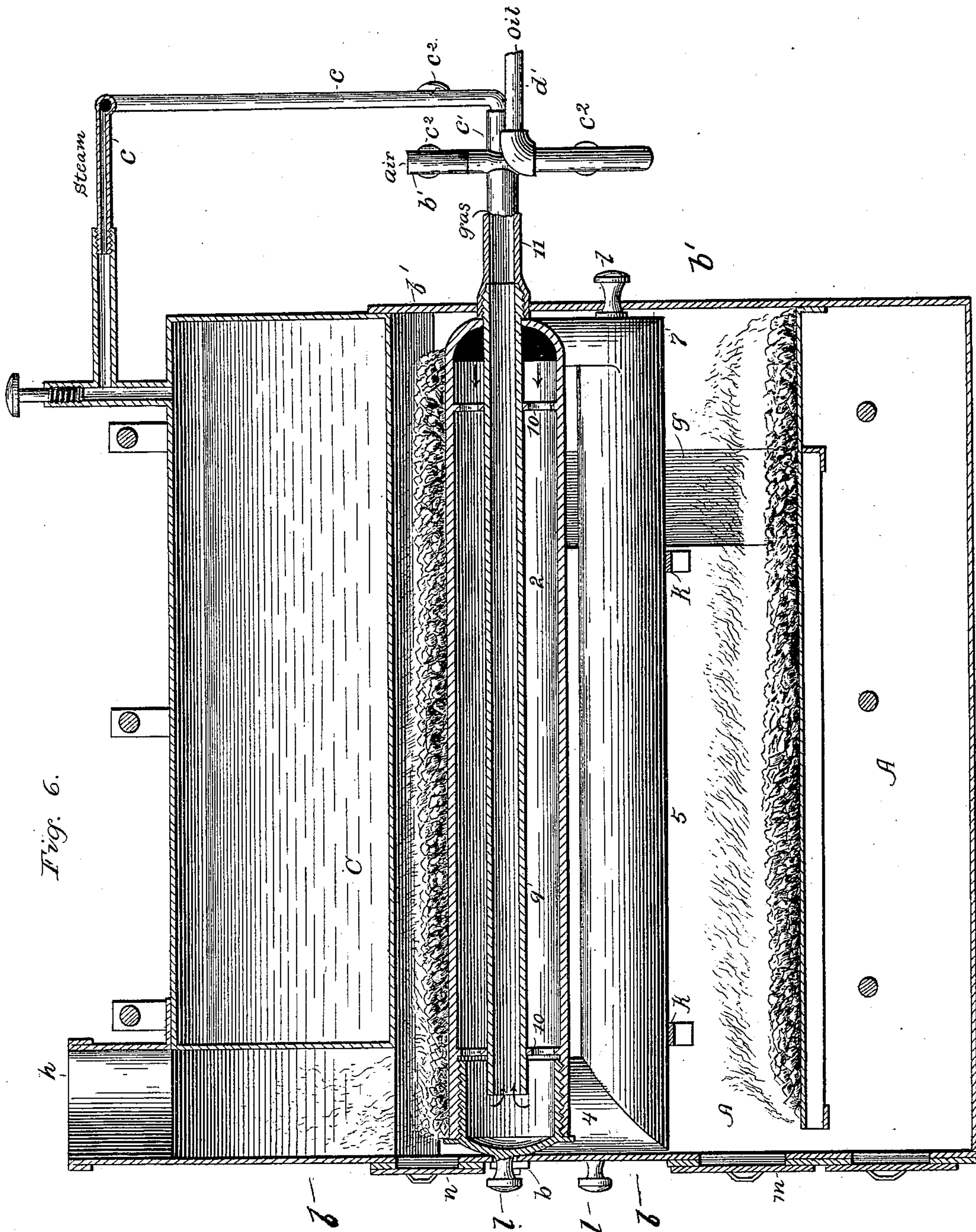
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# UNITED STATES PATENT OFFICE.

GEORGE M. S. WILSON, OF TORONTO, CANADA.

## APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 463,799, dated November 24, 1891.

Application filed April 23, 1891. Serial No. 390,103. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE M. S. WILSON, a citizen of Canada, residing at Toronto, in the county of York and Province of Ontario, Canada, have invented certain new and useful Improvements in Apparatus for the Manufacture of Gas; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to apparatus for manufacturing gas of the variety in which hydrocarbon oil is vaporized and combined with steam or water and air for the production of the gas.

The invention consists in the improved construction of retorts for such apparatus as hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation of the apparatus complete, the immediate front being broken away at the left of the center to show the parts in the rear thereof, and left standing at the right of the center to show the relation and construction of the front. Fig. 2 is a rear elevation of the apparatus with the rear plate removed and disclosing the retorts and their supply-tubes and the boiler above the same. Fig. 3 is a cross-section of the apparatus complete on a line corresponding substantially to the line  $xx$ , Fig. 5, and looking toward the front of the apparatus. Fig. 4 is a perspective view of the rear portion of the retorts and their connected pipes and tubes and the boiler over the retorts. Fig. 5 is a horizontal view looking down and taken substantially on line  $xx$ , Fig. 1. Fig. 6 represents a central longitudinal vertical section of an embodiment of the invention.

In the manufacture of gas from hydrocarbon oils one of the main difficulties encountered in the production of the gas is the perfect decomposition of the vapor so as to convert it wholly into a fixed gas. Usually it occurs in apparatus designed for this purpose that a large percentage of the oil escapes in one form or another with the waste product, leaving in many instances only a comparatively small percentage actually converted into gas. It is desirable that the largest available percentage should be converted, and the

present invention is so constructed as to make this larger product available by reason of the arrangement and construction of the retorts, the method of heating the same, and the combination which is formed with steam and air in the retorts.

In the drawings, A represents the inclosing wall of the apparatus, made of brick, as usual, and provided with longitudinal stay-rods  $a$ , running through the intervening air-space  $a'$ , between the outer and inner walls from end to end, and serving to secure the detachable end plates  $b b'$  at the respective ends of the furnace. This means of holding the end plates enables said plates to be readily removed to give access to the retorts at either end and to the inside of the furnace when occasion requires.

The retorts consist of five several pipes or tubes arranged as shown, and an inside return-pipe within the central upper tube. The three upper tubes 1, 2, and 3 occupy the full width of the inside of the furnace, set substantially against one another along their contiguous sides and against the walls at each side, so as to furnish a bed for a fire to be built upon the same, especially for heating the retorts upon their upper sides and serving at the same time to heat the boiler C. The commingled oil, air, and steam are forced into these retorts, as shown. Thus I provide a steam-supply pipe  $c$ , which enters a pipe  $c'$ , projecting through the back plate of the furnace and entering the rear extremity of the outer upper tubes 1 and 3. Suitable valves  $c''$  on the steam-pipes serve to govern the flow of steam, which is admitted under the necessary pressure in the form of a jet into the pipe  $c'$ . Air likewise is admitted under valve control to the pipe  $c'$  through the small pipes  $c'''$ , and oil under suitable control is admitted through the extension of the pipe  $c'$  and the pipe  $d'$ , as shown, the air and the oil making their entrance into the pipe  $c'$  in front of the jet of steam, so as to be carried by the force of said jet forward through said pipe  $c'$  into the respective tubes 1 and 3. The steam will of course contribute to the atomization and vaporization of the oil immediately in coming in contact therewith, and the oil, steam, and air issue together into the tubes 1 and 3 through perforated or other suitably constructed nozzles  $c''''$  within said tube, said



nozzles serving to break up and spray the oil, air, and steam or the vapor of the oil, as it may be admixed with the air and steam at this point. This compound or admixture is now in condition to be converted into a fixed gas by a proper decomposition in the retort tubes, and said tubes are heated to a sufficient degree to produce this result. To accomplish this result exposure to the requisite degree of heat and a considerable distance of travel of the gas is required to make the decomposition complete. Hence the gas travels first the full length of the tubes 1 and 3 to the front ends thereof, whence it is conducted through the elbows 4 to the lower tubes 5 and 6. The gas then again travels back the full length of said tubes to the rear ends thereof, whence it passes through the elbows 7 into the middle upper tube 2. Here it is required again to traverse the whole length of the said upper middle tube to the front end thereof, where it flows into the interior smaller pipe or tube 9, supported centrally within said tube 2 on suitable supports 10, so constructed as to permit the gas to flow freely through them. Through this inner pipe 9 the gas flows into the discharge-tube 11, which goes to the washer. In this way I get such perfect exposure of the gas to the heat of the furnace and detain the same such length of time within the retorts as to practically decompose all the hydrocarbon vapor and convert the same, with the air and steam, into a fixed gas which is exceptionally clean and free from condensation.

In operation and by reason of the perfect exposure of the retorts to a practically even heat upon all sides the retorts become uniformly red, even to the small internal pipe 9, and there is no point at which the heating is not even and perfect after the gas enters the rear ends of the pipes 1 and 3. It may be said that the gas enters these pipes at the coolest place in the furnace, if there be one place cooler than another, because these extremities lie just behind the side flues *g*, through which the products of combustion from the fire-place beneath the retorts pass up over the retorts and beneath the boiler, and thence forward under the boiler to the front thereof and up and out of the flue, which is at the immediate front of the apparatus, as seen in Fig. 1. Suitable cross-bars *k* are fixed in the furnace at intervals, upon which the retorts rest, and a sufficient space is left between the upper surface of the three upper retorts and the concave bottom of the boiler to maintain a fire therein to heat said retorts above and to heat the boiler, as before described. Each retort is provided at its end with a removable plug *l*, projecting, preferably, through corresponding openings in the front and rear plates of the furnace so as to be accessible for removal in the event a retort is to be blown out. I have not found that even in a long use of the apparatus there is any serious accumulation of carbon or other deposit within the re-

torts which requires removal; but in case any such deposit or accumulation should occur it is particularly convenient to clean the same by removing the plugs and turning on a volume of steam through the steam-supply pipes *c*, the steam in this case being available to blow out the retorts and thoroughly cleanse them of all objectionable deposits.

It will be observed that by my construction I am enabled to expose a large area of the retorts to the heat of the furnace both from above and below, and that I cause the gas to traverse the entire length of the furnace four different times before it is permitted to escape. This exposure and detention of the gas is essential to its perfect decomposition and admixture, and when it returns finally through the inner tube 9, which, as before stated, becomes red-hot, it passes through said tube in a materially compressed form by reason of the small diameter of the tube, and this gives such final exposure that the work of decomposition is successfully accomplished. A door *m* in the front plate gives access to the fire-place or chamber beneath the retorts, and a door *n* gives access to the fire-chamber above the retorts and beneath the boiler.

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

1. In a gas apparatus, a series of retorts 1 2 3, the retorts 1 and 3 arranged in substantially the same direction within the furnace, being provided with supply-pipes at their rear ends, two separate retorts 5 and 6, also extending in substantially the same direction as retorts 1 2 3 and each having one of their ends communicating with the front ends of retorts 1 and 3, respectively, and their other ends communicating with the rear end of retort 2, and an outlet-pipe 9 within the retort 2, leading from a point near the front end of said retort and extending through to the rear end thereof, substantially as shown and described.

2. In a gas apparatus, a series of retorts 1 2 3, arranged side by side in a horizontal plane, so as to form a fire-bed, the retorts 1 and 3 being provided with suitable supply-pipes at their rear ends, two separate retorts 5 and 6 beneath said series and on opposite sides of the furnace, the retorts 5 and 6 having one of their ends communicating with the front ends of retorts 1 and 3, respectively, and their other ends communicating with the rear end of retort 2, and an outlet-pipe 9 within the retort 2, leading from a point near the front end of said retort and extending through to the rear end thereof, substantially as shown and described.

Witness my hand to the foregoing specification this 3d day of April, 1891.

GEORGE M. S. WILSON.

Witnesses:

H. T. FISHER,

NELLIE L. McLANE.