

(No Model.)

2 Sheets—Sheet 1.

A. L. ALLEN.

APPARATUS FOR THE MANUFACTURE OF GAS.

No. 356,863.

Patented Feb. 1, 1887.

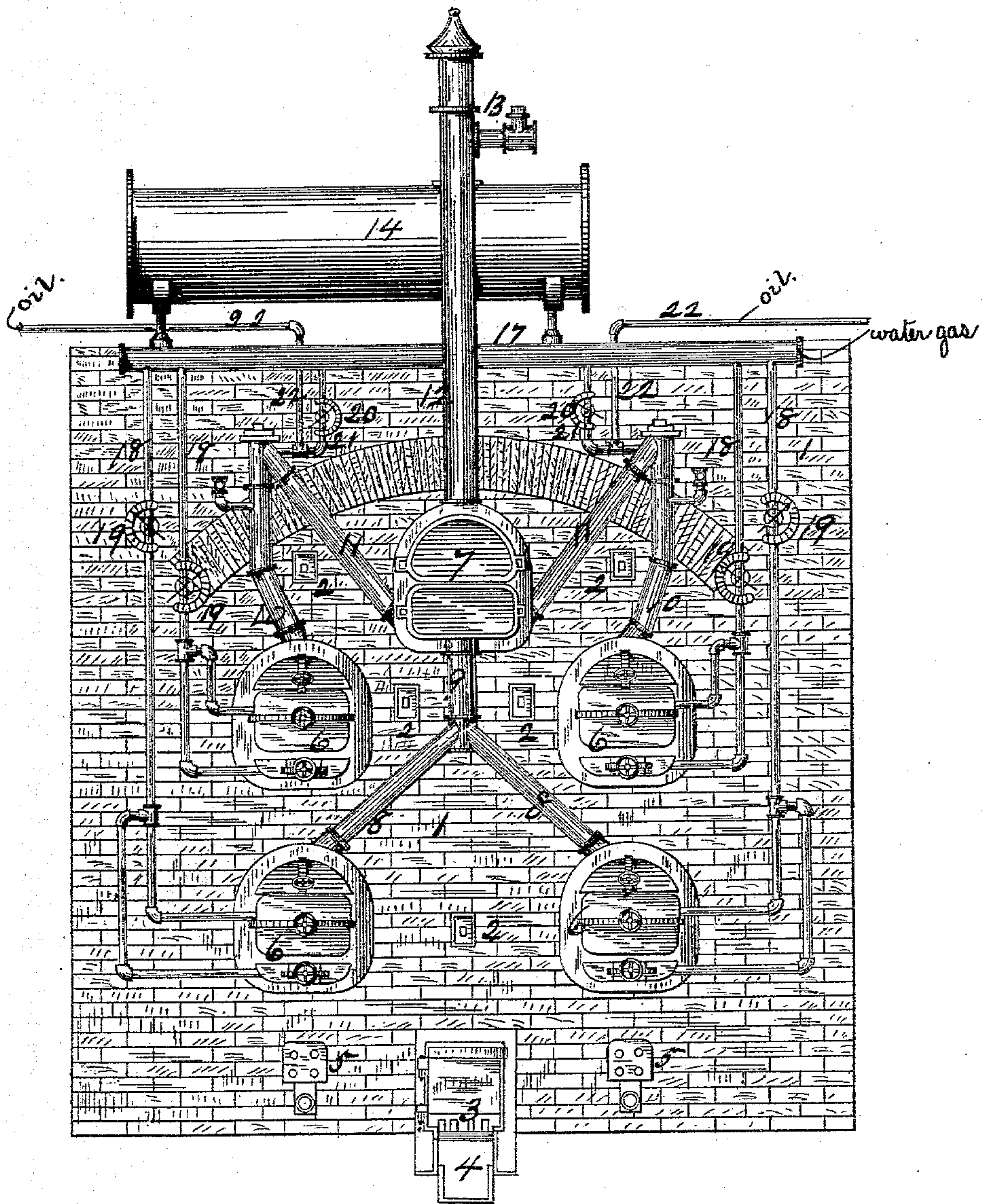


Fig. 1.

Witnesses

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Inventor

Augustus L. Allen
By *his Attorney F. W. Ritter Jr.*

(No Model.)

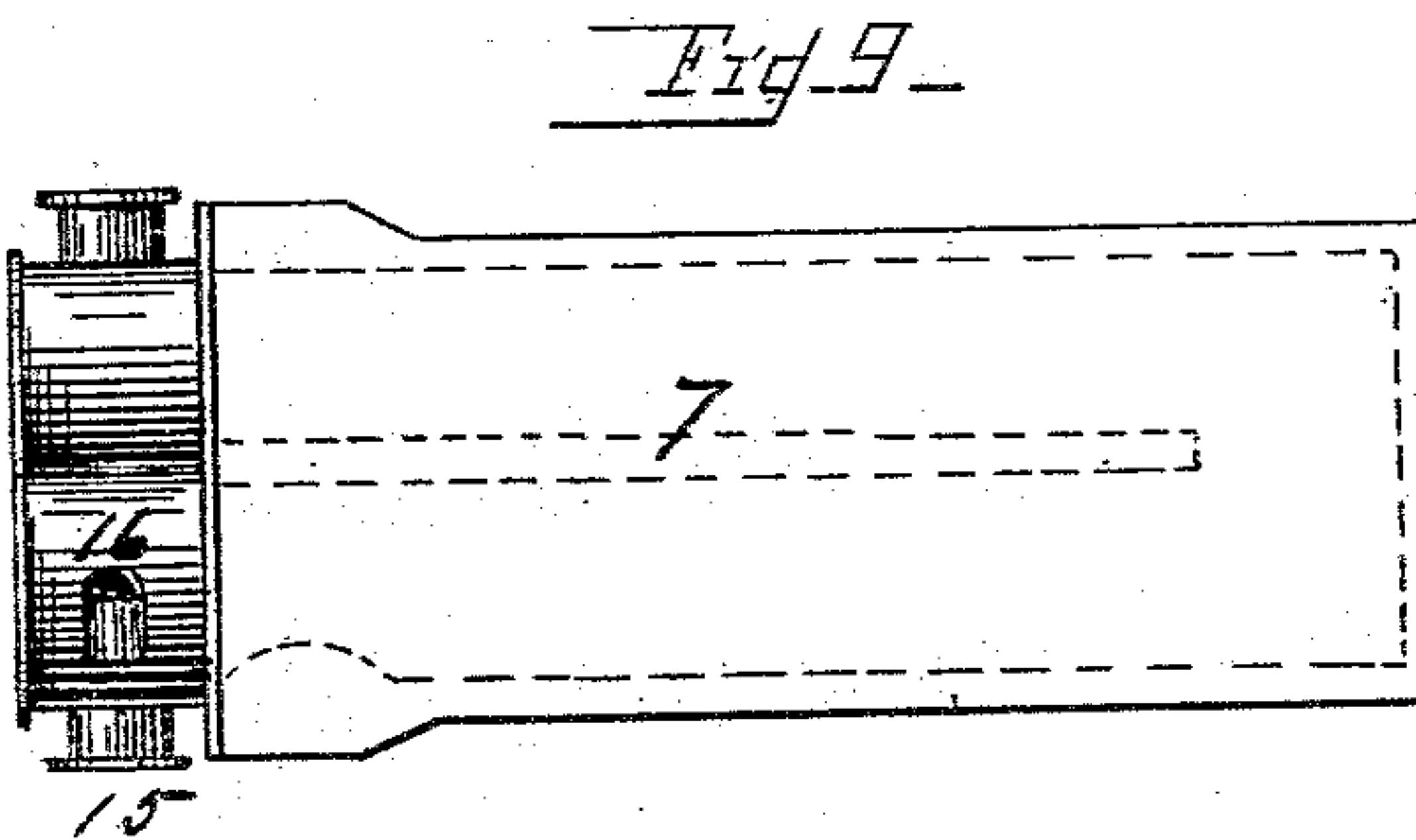
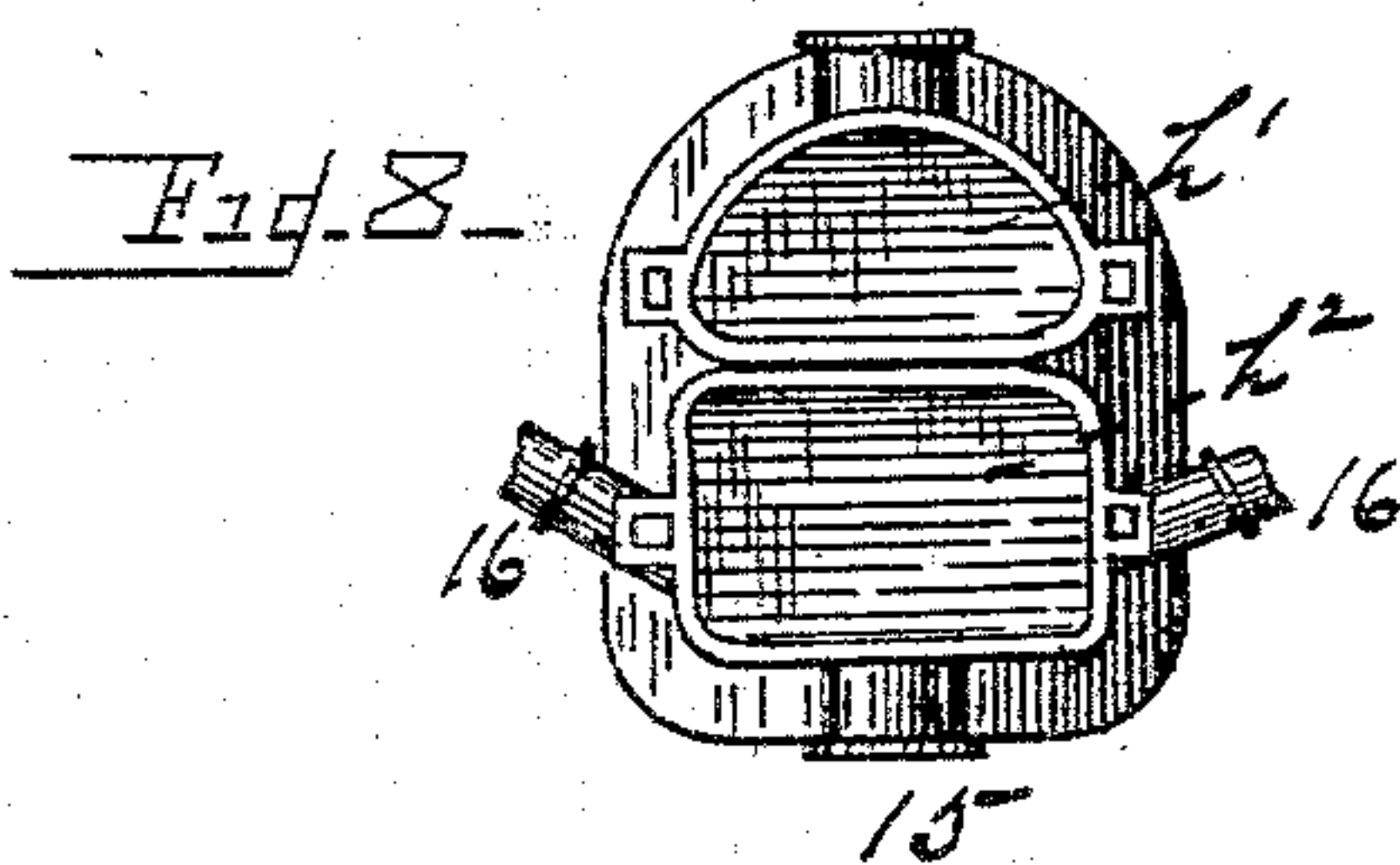
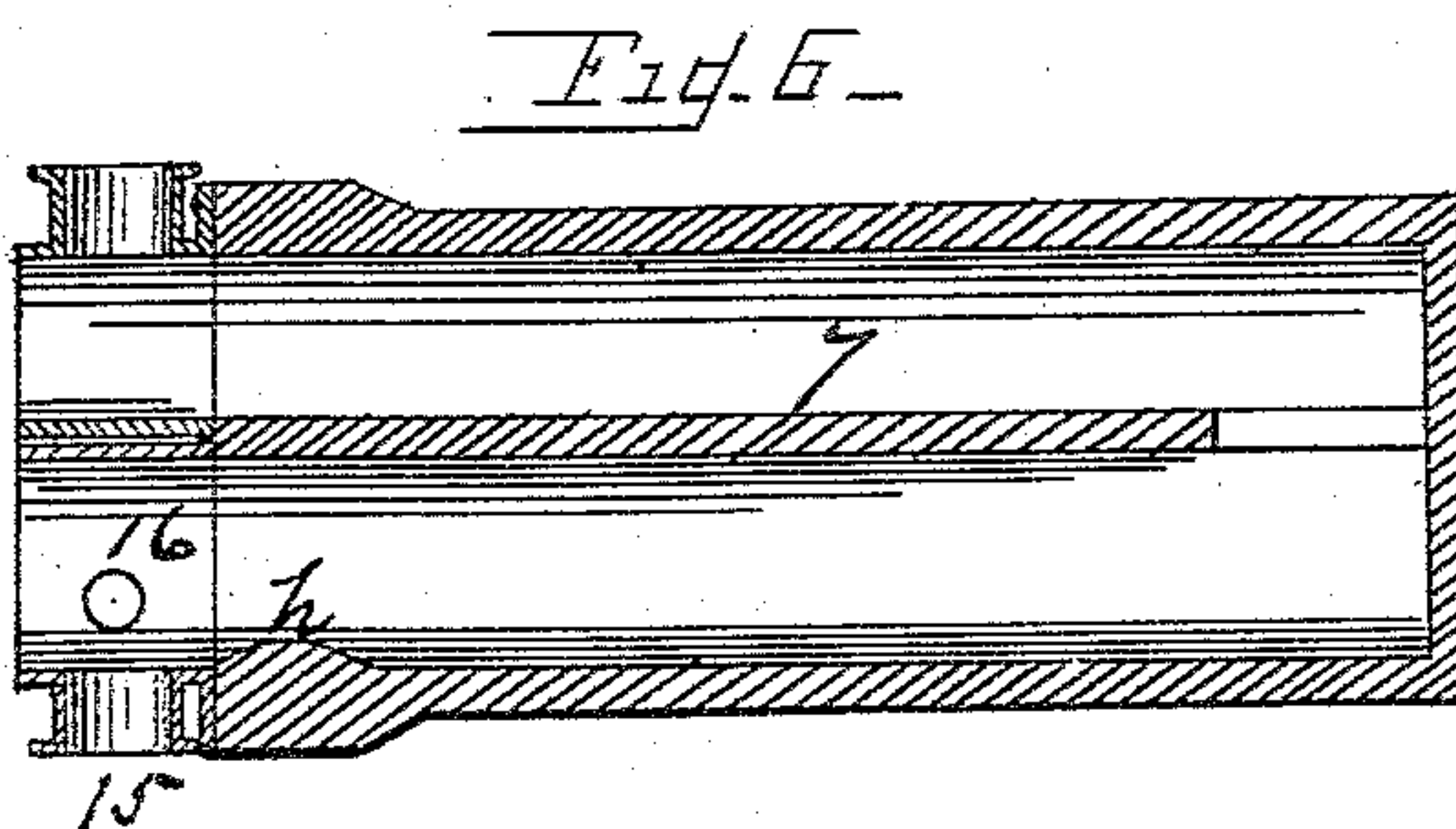
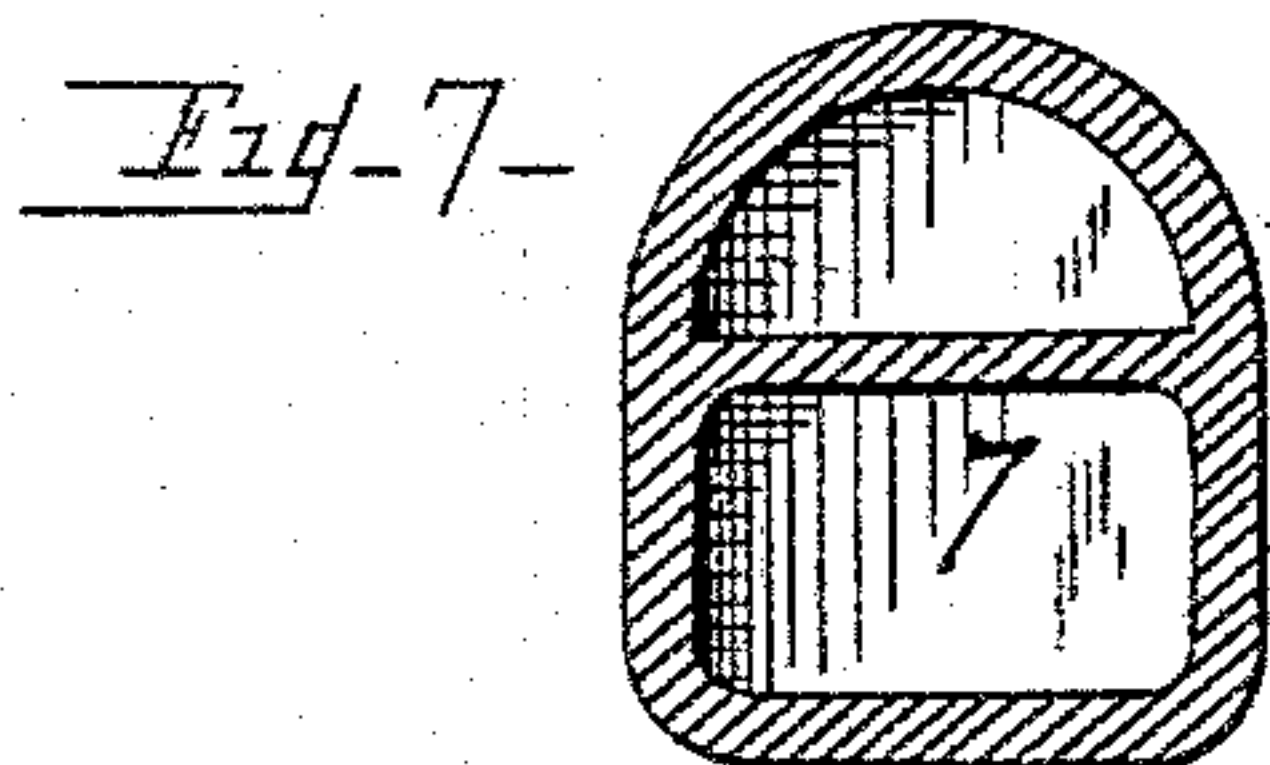
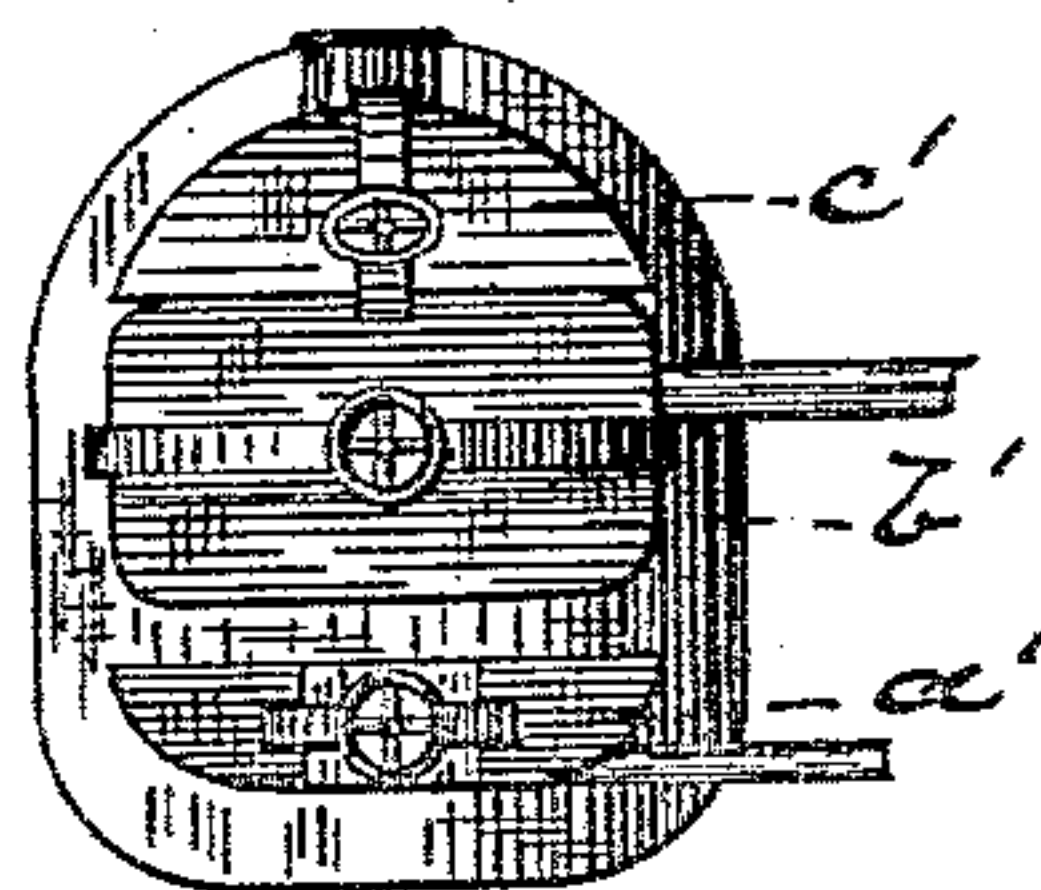
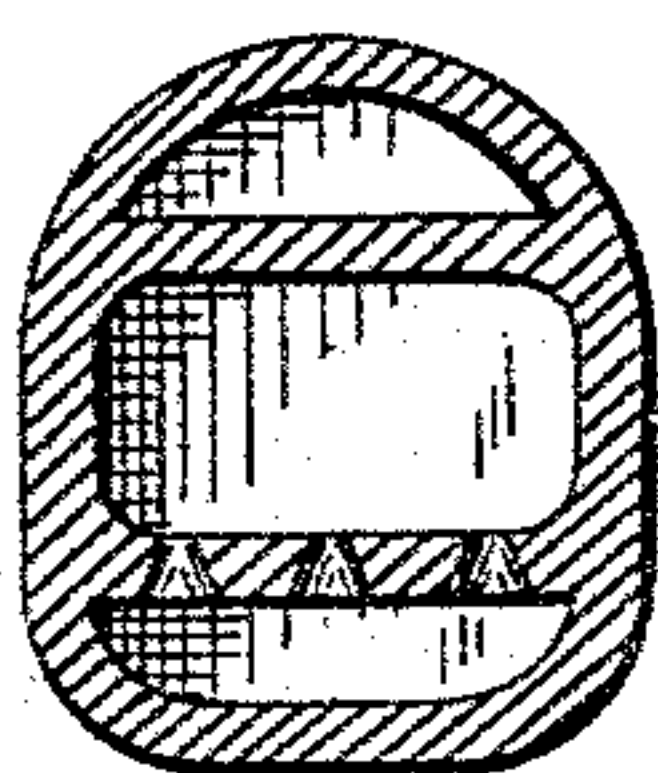
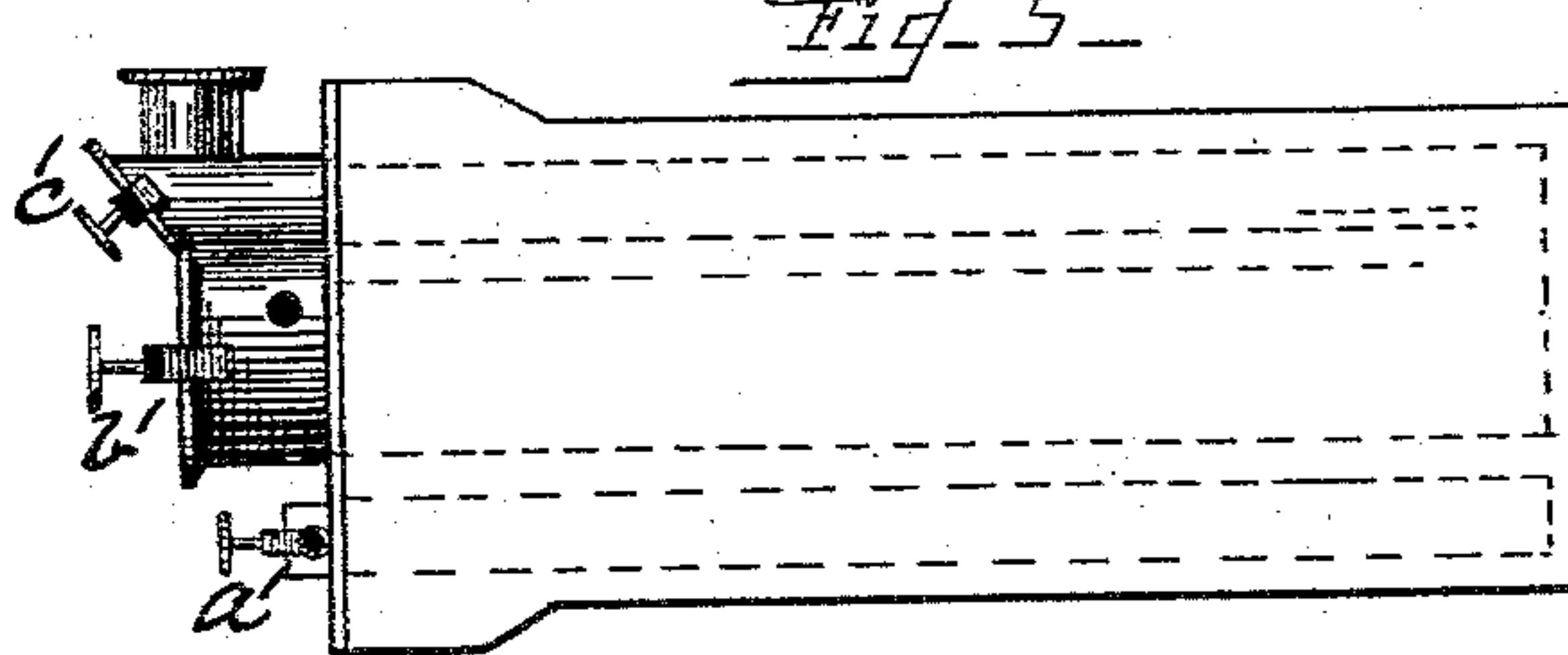
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UNITED STATES PATENT OFFICE.

AUGUSTUS L. ALLEN, OF POUGHKEEPSIE, NEW YORK.

APPARATUS FOR THE MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 356,863, dated February 1, 1887.

Application filed April 16, 1886. Serial No. 199,124. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTUS L. ALLEN, a citizen of the United States, residing at Poughkeepsie, in the county of Dutchess and State of New York, have invented certain new and useful Improvements in Apparatus for the Manufacture of Gas; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, wherein—

Figure 1 is a front elevation of a bench of five retorts embodying my invention. Fig. 2 is a longitudinal central section of one of the lower four retorts. Fig. 3 is a transverse section of the retort on the line *x x*, Fig. 2. Fig. 4 is a front elevation showing the mouth-piece. Fig. 5 is a side elevation, also showing the mouth-piece of the four lower retorts. Fig. 6 is a longitudinal vertical section of the upper carbureting-retort. Fig. 7 is a transverse section thereof. Fig. 8 is a front, and Fig. 9 a side, elevation of the carbureting-retort, showing a bell on the under side of the mouth-piece for connecting the lower retorts.

Like figures refer to like parts wherever they occur.

My present invention relates to certain improvements in the combination, setting, and fitting of horizontal retorts for the manufacture of gas for either heating or illuminating purposes, as the circumstances may require, and has for its object such an arrangement and combination of the parts that without change or reorganization the works shall be adapted to use anthracite coal or coke, bituminous coal, oil and its products, or other carbonaceous matter, either separately or conjointly, in the manufacture of an illuminant, or anthracite coal or coke in the manufacture of water-gas or a simple fuel-gas, producing either alternately, as desired.

The apparatus is particularly designed to be employed in conjunction with the Allen-Harris or American hydrocarbon process, and as far as possible to perfect the apparatus by which the same and other similar processes are carried out.

It is also especially adapted for use in connection with the system of vertical retorts described in Patent No. 302,909, August 5, 1884, granted to G. W. Harris and A. L. Allen, and in Patent No. 310,487, January 6, 1885, granted

to A. L. Allen, which, or equivalent apparatus, may be employed where it is desired to confine the work of the present apparatus to carbureting in manufacturing an illuminant.

As the invention lies, broadly, in the combination of bituminous-coal retorts with a carbureting-retort, and in the adaptation of the fittings and settings to the purposes of the combinations, it is evident that any retorts which allow of working bituminous coals, oils, &c., and which can be utilized as carbureting-retorts, when combined as herein specified, will fall within the scope of this invention, and inasmuch as the particular construction of the retorts themselves is not material, I have chosen, for purposes of illustration, those shown in former patents of Allen and Harris, as the best devices known to me. For instance, for the upper carbureting-retorts I prefer the retort shown in patents to G. W. Harris, No. 112,593, March 14, 1871, and G. W. Harris and A. L. Allen, No. 209,563, November 5, 1878, while for the lower or bituminous-coal retorts I prefer the retort shown in the patent of A. L. Allen and G. W. Harris, No. 309,916, December 30, 1884; but I wish it distinctly understood that I do not herein claim the construction of either said retorts, nor do I limit myself to such constructions because I see fit to use them for the purposes of illustration.

I will proceed to more specifically describe the invention, so as to enable others skilled in the art to which it appertains to apply the same.

In the drawings, I indicate the brick-work of the furnace, within which the horizontal retorts are set, said furnace having the spy-holes 2, the grate 3, and ash-pit 4.

Within the furnace, preferably on each side of the grate or fire-chamber 3, I place steam-driers 5, the pipes of which may connect with the water-gas pipes, which lead to the retorts, or may have independent branches leading to the retorts. These driers are brought into use when water-gas or fuel-gas is to be made in the apparatus.

6 6 6 6 represent a series of horizontal retorts adapted for the employment of either the bituminous or anthracite coal, coke, or other matter (carbonaceous) which is used in the production of either fuel or illuminating

gas, and are to be used alternately for either purpose. Said retorts 6 are combined with an upper retort, 7, which is a carbureting-retort, or especially adapted for the use of bituminous coals, oils, or its products, for the purposes of carbureting the water-gas, fuel-gas, or any other gas generated in the lower retorts, when, as is well understood, the latter, from its nature, or from some cause, is low in illuminating quality.

For purposes of illustration, the retorts in the series are shown as five (5) in number; but it is apparent that the combination is complete when the number is three (3)—that is, two of the lower or bituminous-coal retorts 6, with one carbureting-retort 7.

8 8 and 10 10 indicate the stand-pipes of the lower series of retorts, which, by means of connections 9 and 11 11, deliver into the lower chamber of the carbureting-retort, while the single stand-pipe 12, having a valve, 13, connects the upper chamber of the carbureting-retort 7 with the main 14.

Before proceeding to describe the fittings, &c., of the retorts more specifically, I will give the reason for combining the lower retorts, 6, with the carbureting-retort 7, instead of using a stand-pipe leading from each retort to the main, as now commonly practiced.

Where each retort has an independent stand-pipe, it is impossible, even with an extra upper chamber in the retort, to prevent a great portion of the most volatile and best portions of the hydrocarbons in bituminous coal from passing off without being utilized, and the object of combining the retorts and arranging them as specified is not only to insure the immediate and perfect saturation of the rapidly-volatilizing hydrocarbons during the destructive distillation of bituminous coals or other carbonaceous substance, but to more perfectly prevent the carbons from being carried off in the form of smoke, soot, and tar by subjecting them to longer contact with the permanent gases through increasing heats, thereby securing a more perfect chemical combination with all the gases.

I will now return to the description of the retorts and fittings. The retorts 6 are of the class having horizontal diaphragms, which divide the retorts into an ash-chamber, *a*, carbon-chambers *b*, and perfecting-chambers *c*, and are preferably of the construction described in patent to Allen and Harris (No. 309,916, hereinbefore referred to and disclaimed)—that is to say, the diaphragm *d* between the ash-chamber *a* and carbon-chamber *b* is perforated, as at *d'*, and the diaphragm *e* between the carbon-chamber *b* and the perfecting-chamber *c* is provided at its rear end with port *e'* and valve *f*, while the mouth-piece has three lids or covers, *a' b' c'*, so that access may be had to any chamber without disturbing the others. There are also water-gas pipes, one of which delivers into the ash-chamber *a* and the other into the carbon-chamber *b* at the front.

The carbureting-retort 7 is of the general character shown in former patent of Harris and Allen (No. 209,563, hereinbefore referred to and disclaimed)—that is to say, has a diaphragm which divides it into an upper and a lower chamber, which chambers communicate at the rear so as to form a return-passage in the retort. As in the present invention oil and its products are used in this retort, its construction is varied by forming at or near the mouth of the lower chamber a transverse rib, elevation, or dam, *h*, to prevent the escape of any fluid (oil, &c.) which may at times accumulate in the lower chamber of said retort 7.

The mouth-piece of the retort 7 has the two independent lids or covers *h' h''*, and in addition to the bell or the spigot for the stand-pipe 12 has a second bell or hollow spigot, 15, on its under side for the connections from the lower retorts. This will be sufficient if the combination is to be limited to three retorts; but where five (5) are employed, arranged as herein shown, the mouth-piece will require side bells or spigots, as shown at 16.

The several retorts 6 6 6 6 and 7 are set in series, as hereinbefore specified, and connected and combined by the pipes 8 9 10 11, so that all the lower retorts deliver into the front end of the chamber of the carbureting-retort 7.

17 indicates the main water-gas supply-pipe, which connects directly with any suitable source of apparatus for producing water-gas—as, for instance, a bench of vertical retorts (see patents to Harris and Allen, No. 302,909, and A. L. Allen, No. 310,487, hereinbefore referred to and disclaimed)—and from said pipe 17 four branch pipes, 18, each provided with an index-valve, 19, lead to the respective retorts 6 6. Each of these water-gas pipes 18 branches or divides before reaching the retort it is to supply, so that one branch delivers into the ash-chamber *a* and the other into the carbon-chamber *b*, as hereinbefore specified.

In addition to the branches 18, leading to the lower retorts, 6, are short branches 20, each with its index-valve 21, which lead from the main water-gas pipe 17 and deliver into the pipes 10 11, which lead to the carbureting-retort 7. 22 indicates oil-pipes which lead from any suitable source of supply and deliver into the water-gas pipes 20, so that the oil will be carried by the water-gas into the pipes 10 11, which lead to the carbureting-retort 7, and will reach the retort in a vapor form, ready to combine with the gases from the retorts 6 6, &c.

The retorts 6 6 have to be used sometimes as distillation-retorts only—as, for instance, when they are charged with bituminous coal in the manufacture of illuminating-gas—and at other times as converters only, as when they are charged with anthracite coal, coke, or equivalent material, as in the manufacture of water-gas, and it is essential, therefore, that what-

ever form of retorts is selected to occupy the position of the lower retorts, 6, in the combination, must be adapted for use alternately as distilling or converting retorts, as may be required of them.

The devices being of the general character hereinbefore specified, and combined and arranged to form an apparatus having the characteristics set forth, may be used to make either an illuminating or fuel gas at will from bituminous coal, oil and its products, or anthracite coal, coke, &c., in either of the following ways:

First. In case water-gas or fuel-gas only is desired, the carbon or middle chambers, *b*, of the several retorts 6 are filled with anthracite coal, coke, or other suitable substances, and both chambers of retort 7 filled with like material. Then steam, which has been previously superheated in the driers 5, is passed through the carbon-chambers *b* of the several retorts, and then through the return (both) chambers of the retort 7, and out through the single stand-pipe.

Secondly. If it is desired to change the fuel-gas manufactured as above into the illuminating-gas by the use of oil or its products, then the proper percentage of oil is fed from oil-pipes into branches 11, is vaporized, and passes through the return-chambers of retort 7, where it combines with the water or fuel gas and gives the desired illuminating properties.

Thirdly. The steps as recited above in the first method may be followed, and the chambers of the retort 7 supplied with a rich bituminous coal or like carbonaceous matter for carbonizing the fuel-gas.

Fourthly. The steps recited in the first and second methods may be followed, and the chambers of retort 7 supplied with bituminous coal or its equivalent; or, in other words, the superheated steam from driers 5 will be passed through anthracite coal, coke, or the equivalent thereof in the carbon-chambers of retorts 6, (to form water-gas,) then through a charge of bituminous coal or its equivalent in the chambers of retort 7, and with the fuel gas that enters retort 7 will be carried the oil vapors from oil-pipe, which will aid in the carburizing of the fuel-gas in retort 7, whereby said gas is converted into an illuminant.

Fifthly. The carbon-chambers *b* of retorts 6 and both chambers of retort 7 may be charged with bituminous coal or like rich carbonaceous coal, where it is desired to use only that class of material in the manufacture of an illuminating gas.

Sixthly. When producing an illuminating-gas from the rich bituminous coals alone—as indicated in the preceding paragraph (fifth)—if the gas becomes poor in illuminating properties, as frequently happens toward the close of distillation, this can be readily corrected by admitting a small percentage of oil from oil-pipe into pipe 22, so that its vapor will enter retort 7 with the gases from retorts 6.

Seventhly. Where other means for produc-

ing the water or fuel gas are available, as in the case of a bench of vertical retorts, &c., as hereinbefore referred to, the retorts may be charged with bituminous coal or its equivalent and the water or fuel gas from main pipe may be delivered by branch pipes to the retorts 6, pass thence by the pipes 8, 9, 10, and 11 to retort 7, if necessary a percentage of oil being admitted to the gases in pipes 22, as before specified, and the finished illuminating-gas will pass through stand-pipe 12 to the main 14.

Finally, it will be evident to any person skilled in the art of manufacturing gas that the character of the devices, the combinations into which they are brought, and the character of the fittings and settings by which the combination and coaction of the several retorts is rendered possible result in a single apparatus or works which, without alteration or reorganization, can be employed to manufacture at will either a fuel or illuminating gas, and to utilize all or any of the wide range of gas-producing substances; and, so far as I am aware, there is no other gas apparatus or combination of retorts and fittings which will answer this purpose. It will also be noted that the desired quality or candle-power of the gas, when reduced by too much saturation of the materials with water-gas or other non-illuminant, can be restored so as to secure a more uniform quality of the gas made than can be obtained with one stand-pipe to each retort, or as retorts are commonly set and combined.

In case of small arches in existing works, or for other reasons, the two lower retorts can be omitted, and the bench may be set with only the upper three retorts.

As the Allen-Harris or the American hydrocarbon process and the kindred processes for the manufacture of heating and illuminating gases are well known in the art, it is unnecessary here to more fully describe the operation of the devices than has heretofore been done, as their capacity and utility will be perfectly apparent to all gas engineers and manufacturers.

I am aware that a decomposing or water-gas retort has been connected with a series of superheating-retorts, the last of which delivered into a coal or distilling retort, and that in such a bench an oil-pipe has been arranged to deliver into the connection between the water-gas or decomposing retort and the first of the series of superheating-retorts, and do not herein claim the same, for the reason that with such a bench it would be impossible to manufacture a gas from coal and regulate its quality by final additions of water-gas and oil.

I am also aware that a steam superheater has been combined with distilling-retorts so as to deliver thereinto, said distilling-retorts arranged to deliver into decomposing or water-gas retorts, which latter deliver into a small oil-retort for carbureting the final product, and do not herein claim the same, as in such a

bench or arrangement of devices it would be impossible to first form a water-gas, then add oil thereto, and finally retort it in the presence of coal.

5 Furthermore, with the first-recited and disclaimed combination of retorts there would occur loss in illuminants from the deposit of carbon in the superheating-retorts, and in the last-recited and disclaimed combination
10 the gases from the distilling-retorts would be stripped of illuminants in the decomposing or water-gas retorts.

Having thus described the nature, advantages, and operation of my invention, what I
15 claim, and desire to secure by Letters Patent, is—

1. In apparatus for the manufacture of gas, the combination, with a carbureting-retort adapted for solid carbons—such as coal—and
20 provided with a stand-pipe, of a plurality of generating retorts, each of which is connected directly with and delivers into the carbureting-retort, water-gas pipes which deliver into the passages which connect the last recited

retorts with the carbureting-retort, and oil- 25 pipes which deliver into the water-gas pipes, substantially as and for the purposes specified.

2. In apparatus for the manufacture of gas, the combination, with a single carbureting-retort, 7, adapted for solid carbons—such as 30 coal—and provided with a stand-pipe, 12, of a series of four generating-retorts, 6 6, which are connected directly with and deliver into said carbureting-retort, water-gas pipes 18, which deliver into the series of retorts 6 6, water-gas 35 pipes 20, which deliver into the passages which connect one set of retorts with the carbureting-retort, and oil-pipes 22, which deliver into the last-recited set of water-gas pipes 20, substantially as and for the purposes specified. 40

In testimony whereof I affix my signature, in presence of two witnesses, this 13th day of April, 1886.

AUGUSTUS L. ALLEN.

Witnesses:

CHAS. C. MILLS,
G. ADDISON TALMAGE.