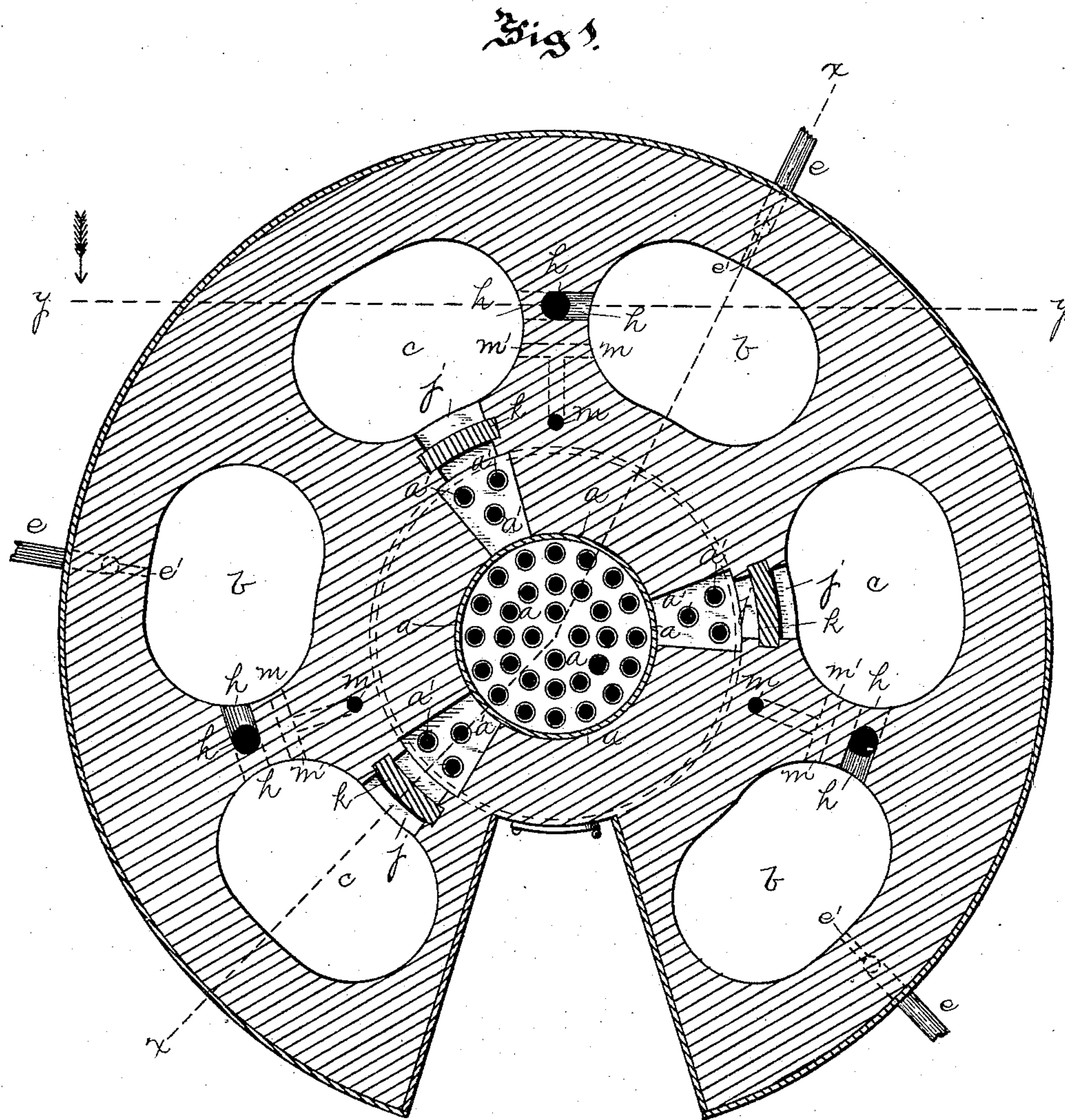


J. M. ROSE.

APPARATUS FOR THE MANUFACTURE OF WATER GAS.

No. 391,387.

Patented Oct. 16, 1888.



Witnesses:

J. M. Rose

Robt. D. Lotter

Inventor.

James M. Rose

By James D. Ray

Attorney

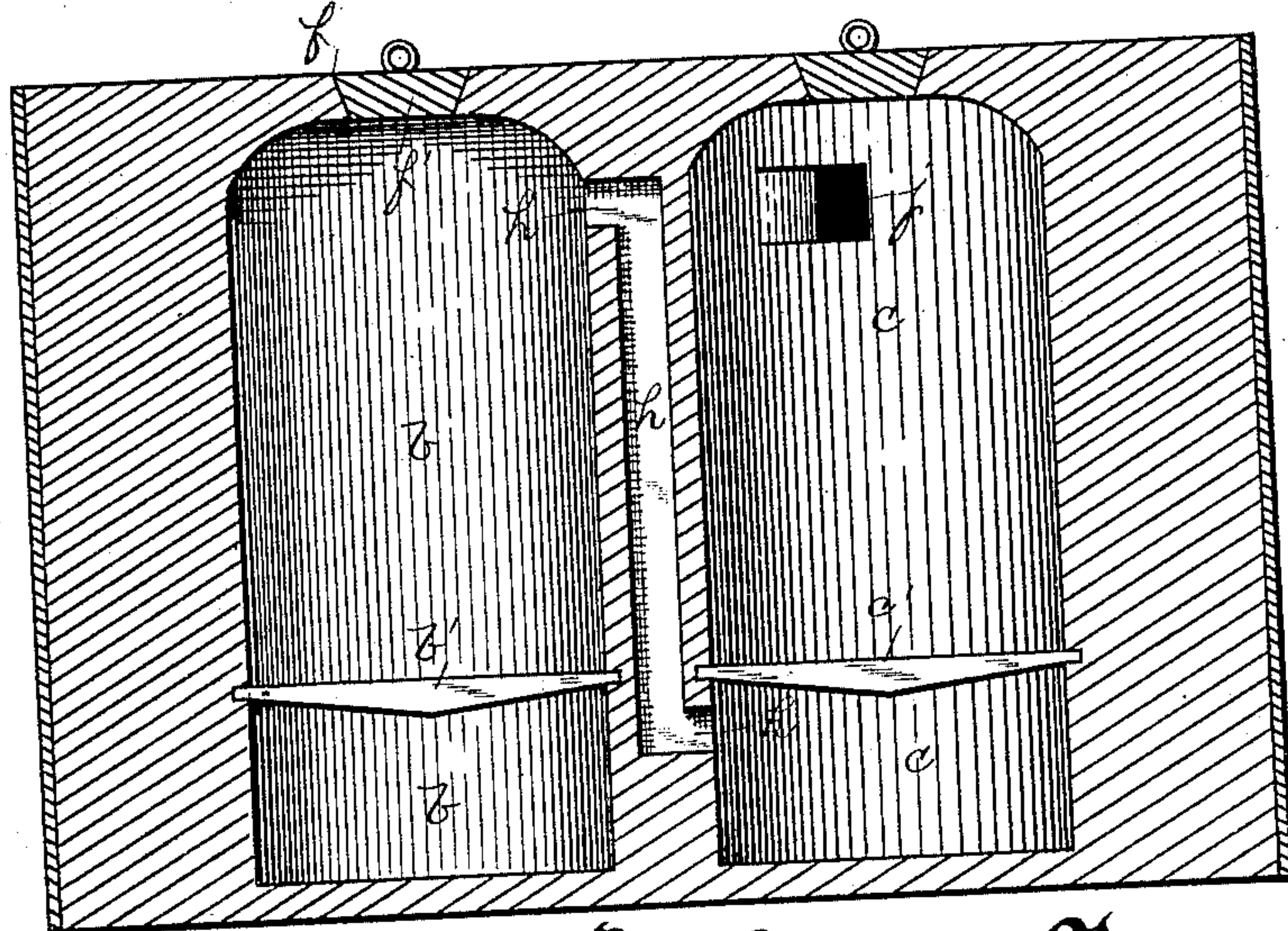
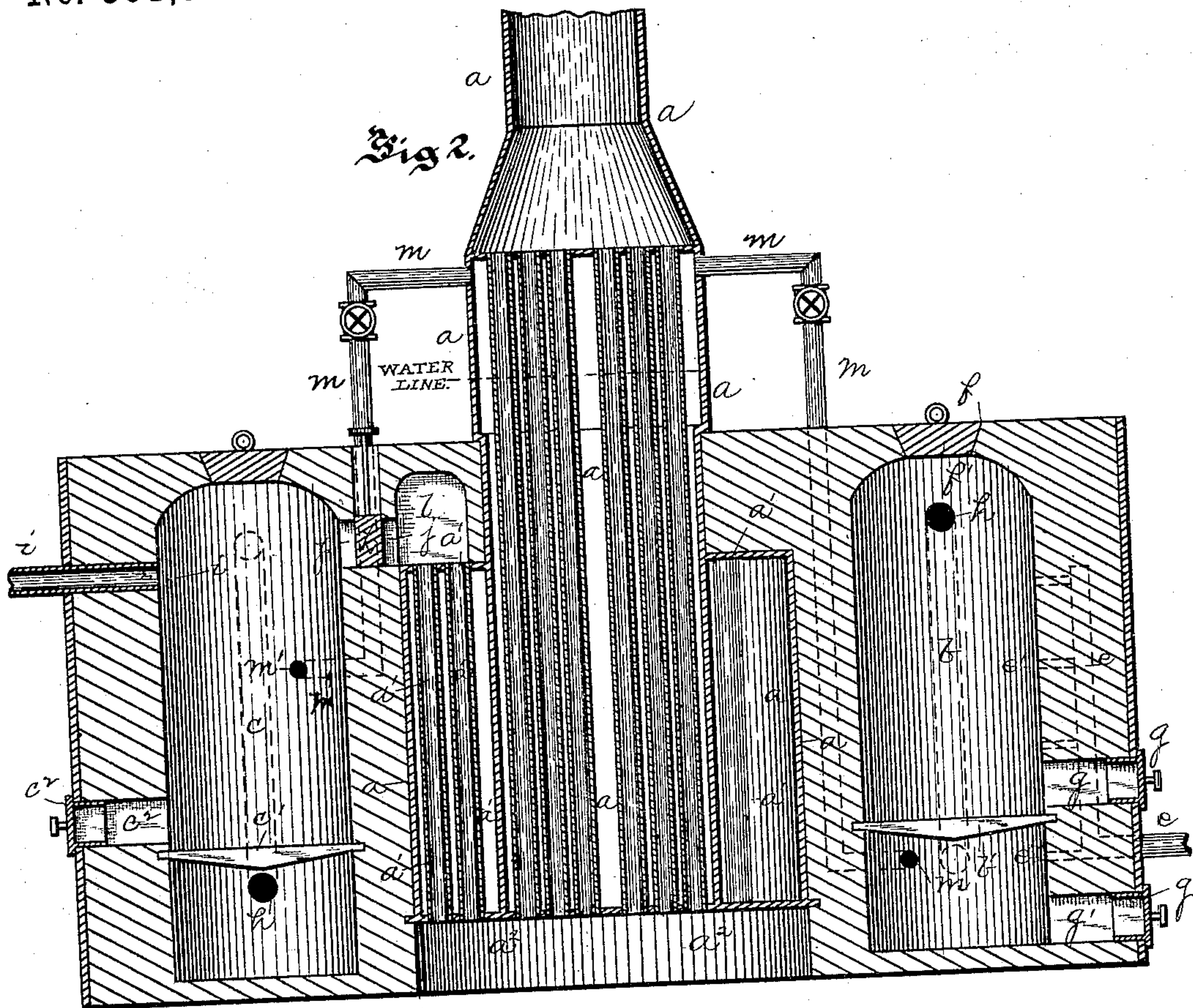
(No Model.)

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Witnesses:

J. H. Cooke

Robt. D. Lotter

Fig. 3.

Inventor.
James M. Rose
By James D. May
Attorney

UNITED STATES PATENT OFFICE.

JAMES M. ROSE, OF ALLEGHENY, PENNSYLVANIA, ASSIGNOR TO THE ROSE
GAS GENERATOR COMPANY, OF NEW JERSEY.

APPARATUS FOR THE MANUFACTURE OF WATER-GAS.

SPECIFICATION forming part of Letters Patent No. 391,387, dated October 16, 1888.

Original application filed March 2, 1887, Serial No. 229,435. Divided and this application filed November 1, 1887. Serial No. 253,968. (No model.)

To all whom it may concern:

Be it known that I, JAMES M. ROSE, of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Apparatus for the Manufacture of Water-Gas; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to the manufacture of gas, its object being to provide apparatus for practicing by a continued process the manufacture of gas from incandescent fuel, the apparatus being particularly, though not exclusively, adapted for employment in the manufacture of gas by the process set forth in application for patent filed by me March 2, 1887, Serial No. 229,435, of which this application is a division. In that application is described a process for making gas, consisting, generally stated, in heating a mass of coke or coal to incandescence, and passing the products of combustion therefrom through a mass of limestone or other porous refractory material impregnated with a heavy hydrocarbon, and then passing a current or currents of steam into the incandescent fuel and the heated impregnated limestone, the gas obtained by this process being found to be rich enough in light hydrocarbons, principally marsh-gas, to be well adapted for fuel purposes.

My invention will be described in connection with this process of making gas.

It consists, generally, in gas-making apparatus having a central steam-boiler and a series of sets of limestone-chambers and generator-chambers arranged around the boiler, the limestone-chamber of each set communicating with the flues of the boiler, and the generator-chamber being placed at the side of the limestone-chamber and communicating therewith, this construction of the gas-making apparatus giving easy access to all the lime-chambers and generator-chambers through the outer wall for cleansing, refilling, or repair, and rendering the apparatus compact and well adapted to small plants.

To enable others skilled in the art to make and use my invention, I will describe the same, referring to the accompanying drawings, in which—

Figure 1 is a horizontal section of the apparatus. Fig. 2 is a vertical section of the same on the line *x x*, Fig. 1; and Fig. 3 is a vertical section of the same on the line *y y*, Fig. 1.

Like letters refer to like parts in each of the figures of the drawings.

Arranged around a central boiler, *a*, are a number of gas-generator chambers, *b*, between each one of which and alternating therewith, are limestone-chambers *c*, which communicate with the gas-generator chambers and with the boiler, in the manner hereinafter set forth. Each gas-generator chamber *b* is provided with grate-bars *b'*, and in the outer wall with a flue or passage, *e*, having lateral offshoots *e'* leading into the chamber to raise the mass of fuel to incandescence. The roof of the generator-chamber has therein a charging-port, *f*, closed by a block, *f'*, and the lower part of the chamber is provided with a stoking-hole, *g*, and ash-pit door *g'*, and leading from the upper part of the chamber into the limestone-chamber, just below or into the mass of limestone or refractory materials, is a flue, *h*, Fig. 3, through which the products of combustion from the gas-generator chamber pass. Each limestone-chamber *c* is provided with grate-bars *c'* to support the limestone or other material, and in the upper part of the chamber with a gas-flue, *i*, leading to the gas-storage tanks or to the purifying-box, and a flue, *j*, closed by a damper, *k*, leading into the chamber *l*, which communicates by the flues *a'* to the chamber *a''* at the bottom of the flue-boiler *a*, through which the products of combustion pass, after heating the mass of limestone or other material in the limestone-chamber, into the boiler and generate steam in the same.

For the purpose of withdrawing the material which is charged into the limestone-chamber, the latter is provided with a stoke-hole, *c''*, opposite the grate-bars. Steam-pipes *m* convey steam from the boiler *a* to the generator-chamber *b* just below the grate-bars and pipes *m'* to the limestone-chambers just above or below the grate-bars and into the upper part of the same.

In employing my improved apparatus with the process of making gas described in the said application of March 2, 1887, a quantity

of limestone, dolomite, slag, or some porous refractory material is thoroughly impregnated with a heavy hydrocarbon—such as asphaltum, coal-tar, &c.—and the material thus produced
 5 charged into the limestone-chamber *c* through a port in the roof thereof until the chamber is about half filled, and the said chamber is then sealed by suitable means to prevent access of air thereto. At the same time the gas-gener-
 10 ator chambers are filled with coke or coal, and when the charging is completed the fuel is ignited and the blast turned on in the passage *e*, which rapidly causes the fuel to become incandescent, the products of combustion there-
 15 from passing over through the flue *h* into and through the mass of impregnated limestone, heating the same, the limestone-chamber being closed, so that no air is admitted to support combustion and thus burn the hydrocarbon
 20 with which the limestone or other material is impregnated. These products of combustion, after passing through the mass of material in the limestone-chamber, pass through the flue *j* into the chamber *l*, and thence into the
 25 boiler *a* to generate steam. When the fuel in the generator-chamber has reached the proper degree of incandescence, the air-blast is turned off and the damper *k* lowered to close the flue leading into the boiler from the limestone-
 30 chamber, after which steam is turned on in the pipes *m m'*. The steam from the former, coming in contact with the incandescent carbon, is decomposed and hydrogen and carbonic oxide formed, which gases pass over into the
 35 limestone-chamber *c* through the mass of material therein, the carbonic oxide uniting with the oxygen released by the decomposition of the steam, which enters the limestone-chamber below the mass of lime, to form carbonic acid,
 40 and the hot gases thus formed passing through the heavy hydrocarbon causes the latter to form with the nascent hydrogen hydrocarbons, principally of the ethylene and paraffine series, which mingle with the carbonic hydro-
 45 gen and other gases in the upper part of the lime-chamber.

Any carbon disulphide which may have been formed in the fuel-generator chamber is broken up by the high temperature of the
 50 limestone-chamber and sulphureted hydrogen formed, which may be subsequently removed by passing the gas through a purifying-box.

During the heating of the limestone-cham-
 55 ber and the impregnated material therein by the products of combustion passing there-through the heat causes some of the hydrocarbon to be distilled, which, as the upper walls of the limestone-chamber are at a com-
 60 paratively low temperature, deposits thereon more or less carbon, as do the products of combustion passing through the chamber to a slight extent. To take up this deposited carbon and still further enrich the gas in hydro-
 65 gen and reduce the bulk of the carbonic acid formed in the lower part of the limestone-

chamber to carbonic oxide, a supply of steam is admitted into the upper part of the lime-
 stone-chamber, which, as the free carbon and the gases in the upper part of the chamber
 70 are now at a high heat, the steam is decomposed and the oxygen released united with the hot carbon and this carbonic acid to form carbonic oxide, the hydrogen mingling and
 75 passing off with the other gases formed in the lime-chamber through the outlet *i* to the purifying-box or storage-tanks. The flow of steam into the fuel or generator chamber and into the limestone-chamber is continued as long as the fuel and material in the limestone-chamber
 80 remain heated to a sufficient degree to effect the decomposition of the steam; but as soon as the heat of these substances falls too low the steam is turned off, the damper *k* raised, and the air-blast turned on in the passage *e*,
 85 which soon raises the temperature of the fuel and the material in the limestone-chamber to the proper temperature to commence the gas-making step again. When the hydrocarbon with which the material in the limestone-
 90 chamber is impregnated is exhausted, the limestone is withdrawn from the chamber and a new charge of impregnated material is inserted. As a series of these sets of gas-making chambers is arranged around the boiler,
 95 and as they do not act simultaneously, some one set of chambers is always discharging its products of combustion into the boiler while another set is always discharging a supply of gas into the storage tanks or reservoir, so that
 100 the action of the apparatus is continuous.

The gas which is obtained by this process contains more or less hydrogen and is rich enough in light hydrocarbons—principally
 105 marsh gas—to insure that a long heating flame will be obtained in burning it, and hence the gas is well adapted for fuel purposes. As the asphaltum or coal-tar forms with the hydrogen a large percentage of light hydrocarbons, a very large volume of gas is made very quickly
 110 at a comparatively low cost.

This particular arrangement of gas-generators and lime-chambers has the advantage over that described in my patent, No. 370,971, dated
 115 October 4, 1887, in that the limestone-chambers are next to the outer walls of the apparatus and thus easier to get at and repair. The arrangement is also more compact and better adapted to small plants where space is a con-
 120 sideration.

My improved gas apparatus may be employed in other gas-making processes, such as where the limestone or second chambers con-
 125 tain lime or fire-brick or other suitable material for either purifying the gas formed in the generator-chambers *b*, or other material for generating a further quantity of gas.

I do not claim herein the particular process of making gas heretofore described, as that
 130 forms the subject-matter of the said application, filed March 2, 1887, Serial No. 229,435, of which this application is a division.

Having now described my invention, what I claim is—

5 In gas-making apparatus, the combination, with a central steam-boiler, of a series of sets of limestone-chambers and generator-chambers arranged around the boiler, the limestone-chamber of each set communicating with the flues of the boiler, and the generator-chamber being placed at the side of the limestone-cham-

ber and communicating therewith, substantially as and for the purposes set forth.

In testimony whereof I, the said JAMES M. ROSE, have hereunto set my hand.

JAMES M. ROSE.

Witnesses:

JAMES I. KAY,
J. N. COOKE.