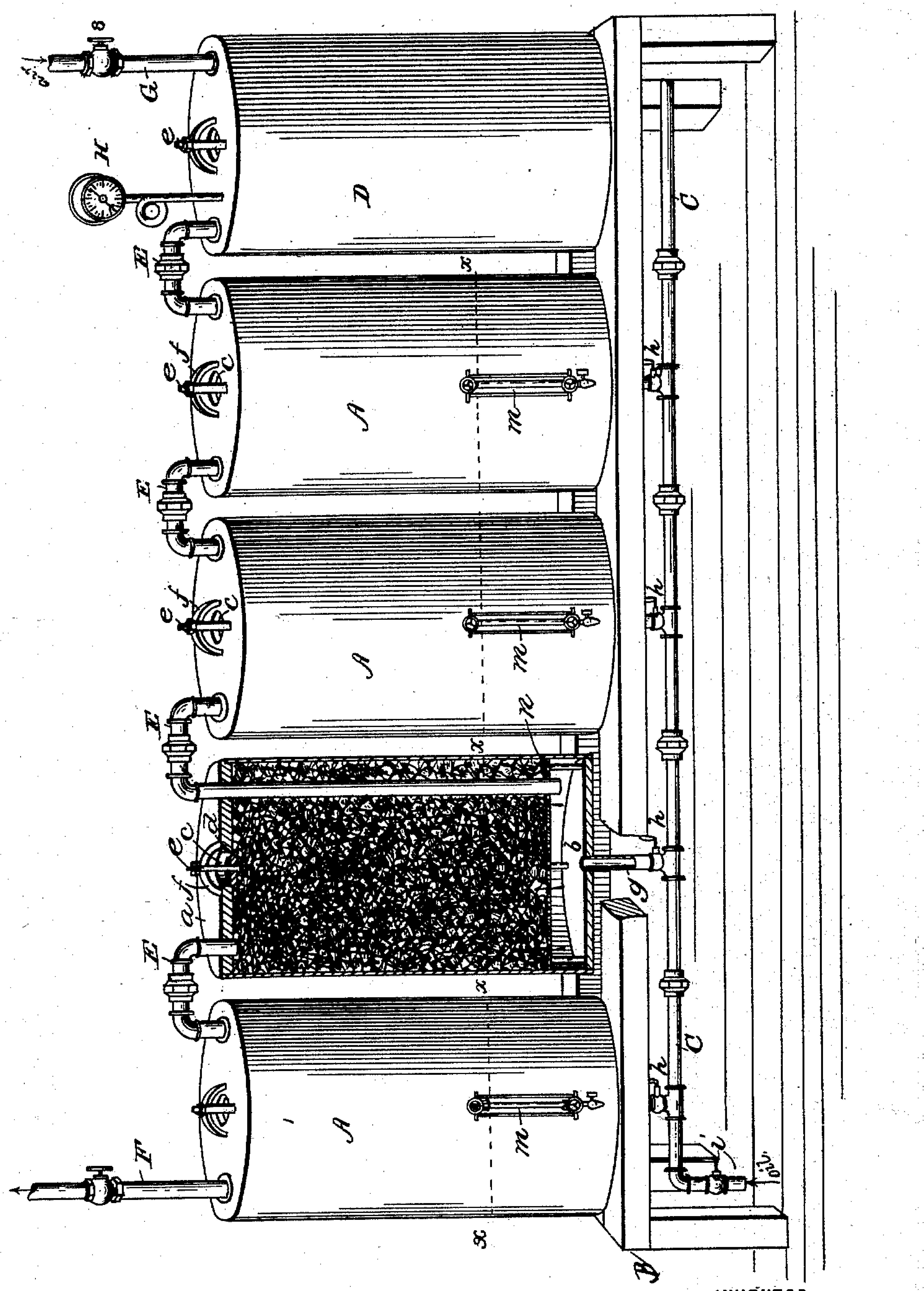
(No Model.)

R. M. BIDELMAN.

MANUFACTURE OF GAS.

No. 483,489. Patented Sept. 27, 1892.



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MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 483,489, dated September 27, 1892.

Application filed May 26, 1891. Serial No. 394,203. (No specimens.)

To all whom it may concern:

Be it known that I, ROBERT M. BIDELMAN, a citizen of the United States, residing at Adrian, in the county of Lenawee and State of Michigan, have invented certain new and useful Improvements in the Manufacture of Gas; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to certain new and useful improvements in the manufacture of gas, and is based upon the discovery that a fixed gas can be obtained by forcing an aeriform fluid under pressure through a liquid hydrocarbon from which the constituent parts furnishing condensible vapors have been first removed, the air current on its passage through the said hydrocarbon being broken up both below and above the level of the liquid into minute streams by the agency of closely-packed absorbent solid material.

In the accompanying drawings I have illustrated a front view, partly in section, of a form of apparatus adapted to the practice of my invention.

Referring to the drawings, A indicates a series of generating-receptacles suitably supported upon a convenient basal support, as B. Each of these receptacles consists of a cylindrical metallic shell, securely riveted to metallic head-pieces *a b*, so as to constitute a vessel capable of resisting, with safety, an internal pressure of several atmospheres. The heads *a* are provided with hand-holes *c*, constituting filling-openings and adapted to be closed during the gas-making operation by means of closing-plugs *d*. The internal arrangement of all of the receptacles A is indicated by the one shown in section. The screw-threaded stems *e* of each of the closing-plugs *d* passes through the corresponding internally-screw-threaded boss of the bridge *f*, so as to be capable of being drawn tightly against the inner edges of the filling-openings to make a hermetic joint, through which the gas cannot escape.

Beneath the series of receptacles A extends a supply-pipe C, whereby the liquid hydrocarbon employed in the operation may be admitted through branches *g* into the receptacles. Each branch is provided with a shut-off valve *h*, and the supply-pipe with a shut-off valve *i*. A glass gage *m* for each of the receptacles indicates at all times the level of the oil therein.

A few inches above the bottom of each receptacle A is located a perforated false bottom *n*, adapted to support a superincumbent densely-packed body of absorptive solid porous material—such as wood, charcoal, or its equivalent. The various receptacles A are connected in series with each other by pipes E, extending from the top of one receptacle to below the perforated false bottom of its neighbor in the series. An exit-pipe F leads directly to the gas-holder from the last member of the series of receptacles. A vessel D, similar in construction to the receptacles A, except that it is devoid of perforated false bottom, oil-supply pipe, or filling of porous material, is provided with an inlet-pipe G for air under pressure supplied from a suitable source of compressed air. The function of the vessel D is to serve as an equalizing-chamber between the receptacles A and the compressor, thereby compensating for the pulsatory action or throbbing of the latter and furnishing a uniform current of compressed air to the receptacles. It is provided with a pressure-gage H.

The aeriform fluid, preferably compressed air, is supplied from the compressing-pump to the equalizing chamber or vessel D through the inlet-pipe G, provided with a shut-off valve *s*.

The operation of the invention is as follows: The liquid hydrocarbon employed is forced from a suitable supply-reservoir (preferably underground and outside the building wherein the gas is being generated) through the supply-pipe C and its branches *g* into the receptacles A until said hydrocarbon fills the space below the perforated diaphragms *n* and rises above said diaphragms well up into the body of the filling of charcoal to a point indicated by the dotted lines *x x* in the drawings. The liquid hydrocarbon employed is a distillate of Lima oil of a specific gravity of substantially 0.698. This distillate contains substantially none of the light-gravity gasoline and other kindred

constituents which in ordinary carbureting operations furnish vapors condensible under ordinary temperatures and conditions of pressure, said light-gravity products having been removed or driven off during the first stages of the process of producing the said distillate. I have found by experiment that such distillate contains in solution hydrocarbons, which may be taken up and removed as fixed gases by passing through the distillate a current of air under pressure, so as to constitute, with said air, a mixture furnishing a heating-gas, which may be stored for use in holders and conducted through supply-mains to great distances without appreciable condensation under ordinary conditions, and indeed without as much condensation as ordinary coal-gas under like circumstances. When the liquid hydrocarbon attains the height referred to, the cocks *h* in the branch pipes *g* are closed and the cocks in the inlet-pipe G and outlet-pipe F are opened. Compressed air from the compressor thereupon flows into the vessel D and is supplied therefrom under an equalized pressure to the receptacles A, passing successively from one receptacle A to the next in series by means of the pipes E, and finally through the exit-pipe F to the point of storage or use.

In the practice of my invention I have obtained the most satisfactory results by employing in connection with the vessel D a series of generating-receptacles, eight in number, of the construction of receptacles A, the compressed air being forced in by a double-acting compressor at an initial pressure of two and a half pounds, the engine making ten strokes per minute and the cylinders being sixteen inches long by twelve inches in diameter, the depth of the oil in the generating-receptacles being about twelve inches and the perforated diaphragm being about three inches from the bottom of the receptacle. Upon the issuance of the air from the equalizing-vessel D below the diaphragm of the first generating-receptacle said air passes at once into the body of liquid hydrocarbon contained therein and thence upward through the perforations of the diaphragm and through the submerged portion of the charcoal filling, taking up in its passage the fixed gases contained in the distillate described. The submerging of the lower portion of the charcoal filling to a substantial depth within the oil and below its level has the function of breaking up and dividing the air-current while still below the oil-level and, in fact, during substantially its entire period of passage below the oil-level into minute streams, thereby presenting an obstacle to the passage of the air rapidly and in large bubbles through the oil-body. The small or minute streams of air on their passage from the submerged portion of the charcoal filling through the superjacent unsubmerged portion are screened of the globules of the distillate, which they would otherwise carry over with them into the next receptacle, and pass over into said next receptacle and through its contents, taking with them the fixed gases only. In like manner the air on its passage through the succeeding generating-receptacles of the series takes up a constantly-increasing volume of fixed gases, and finally issues under a low pressure through the outlet-pipe F and passes to the point of storage or use.

Analyses of the gas produced show that it contains, intermixed with the air, a percentage of about three parts of fixed hydrocarbon gases, of which marsh-gas is the principal constituent, the other constituents being olefiant gas and heavy hydrocarbon gases. Thus one analysis gave as the constituent parts of the gas the following percentages, to wit: marsh-gas, 1.94 per cent.; olefiant gas and other heavy hydrocarbons, 1.27 per cent.; nitrogen, 77.63 per cent.; oxygen, 19.16 per cent.

The gas is of high calorific power, heating wrought-iron rapidly to bright redness when inserted in the flame without the addition of any air-blast, and, when introduced into a muffle-furnace with the addition of an air-blast, being capable of producing an intense white heat sufficient to fuse fire-brick and of melting copper or other metal.

Another and important use to which the gas may be applied is to furnish the flame for heating the mantles of illuminating-burners. In this use of my invention I have during the winter season carried the gas continuously for months in a permanent street-main supplying Welsbach burners to a distance of over two thousand feet from the gas-holder with practically no condensation, and although the main makes a number of turns at right angles to each other along the line and at points dips a number of feet below grade.

While in the foregoing description I have referred to a Lima distillate of a specific gravity of substantially 0.698 as suitable for the practice of my invention, I do not desire to limit myself to such distillate nor to the particular specific gravity mentioned, but intend to cover, broadly, the employment of similar oils containing in solution fixed gases capable of being removed by the forcing of air through the oil-body, but substantially devoid of constituents furnishing condensible vapors.

Having thus described my invention, what I claim is—

1. The method of generating a fixed gas, which consists in first substantially removing from a liquid hydrocarbon the constituent parts which would furnish condensible vapors, and subsequently taking up and removing the fixed gases by passing through the residue an aeriform fluid under pressure, substantially as described.

2. The method of generating a fixed gas, which consists in first substantially removing from a liquid hydrocarbon the constituent parts which would furnish condensible va-

pors, submerging a body of absorbent porous solid material within the residue, and subsequently taking up and removing the fixed gases by passing through said porous material and residue an aeriform fluid under pressure, substantially as described.

3. The method of generating a fixed gas, which consists in forcing an aeriform fluid under pressure through a petroleum hydrocarbon which has been deprived of those vapors which condense at the ordinary temperatures of a gas-main, substantially as described.

4. The method of generating a fixed gas, which consists in forcing an aeriform fluid under pressure through a Lima-oil distillate of substantially 0.698 specific gravity, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT M. BIDELMAN.

Witnesses:
JOHN C. PENNIE,
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