

No. 692,771.

Patented Feb. 4, 1902.

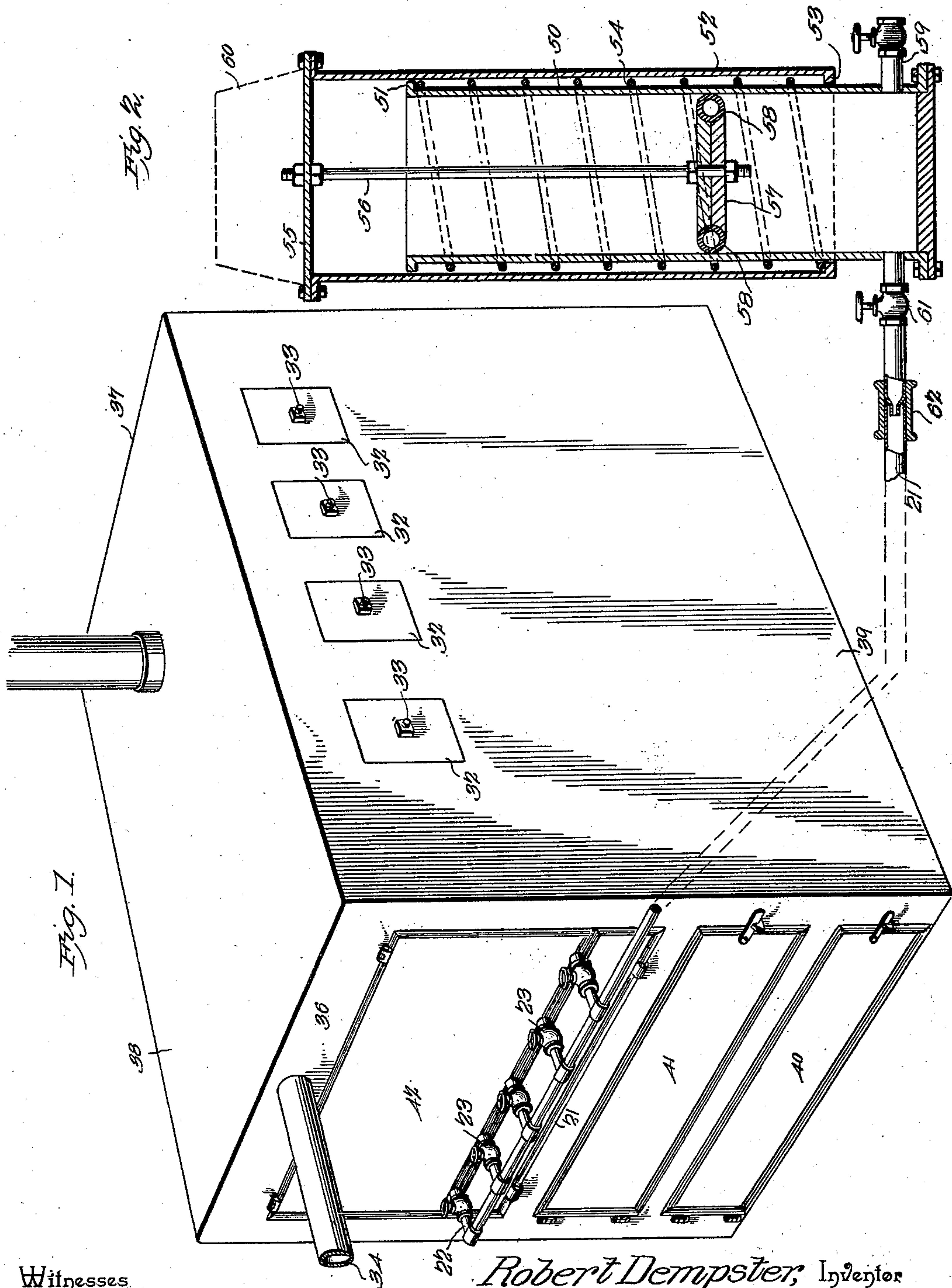
R. DEMPSTER.

APPARATUS FOR THE MANUFACTURE OF ILLUMINATING GAS.

(Application filed Sept. 16, 1901.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses  
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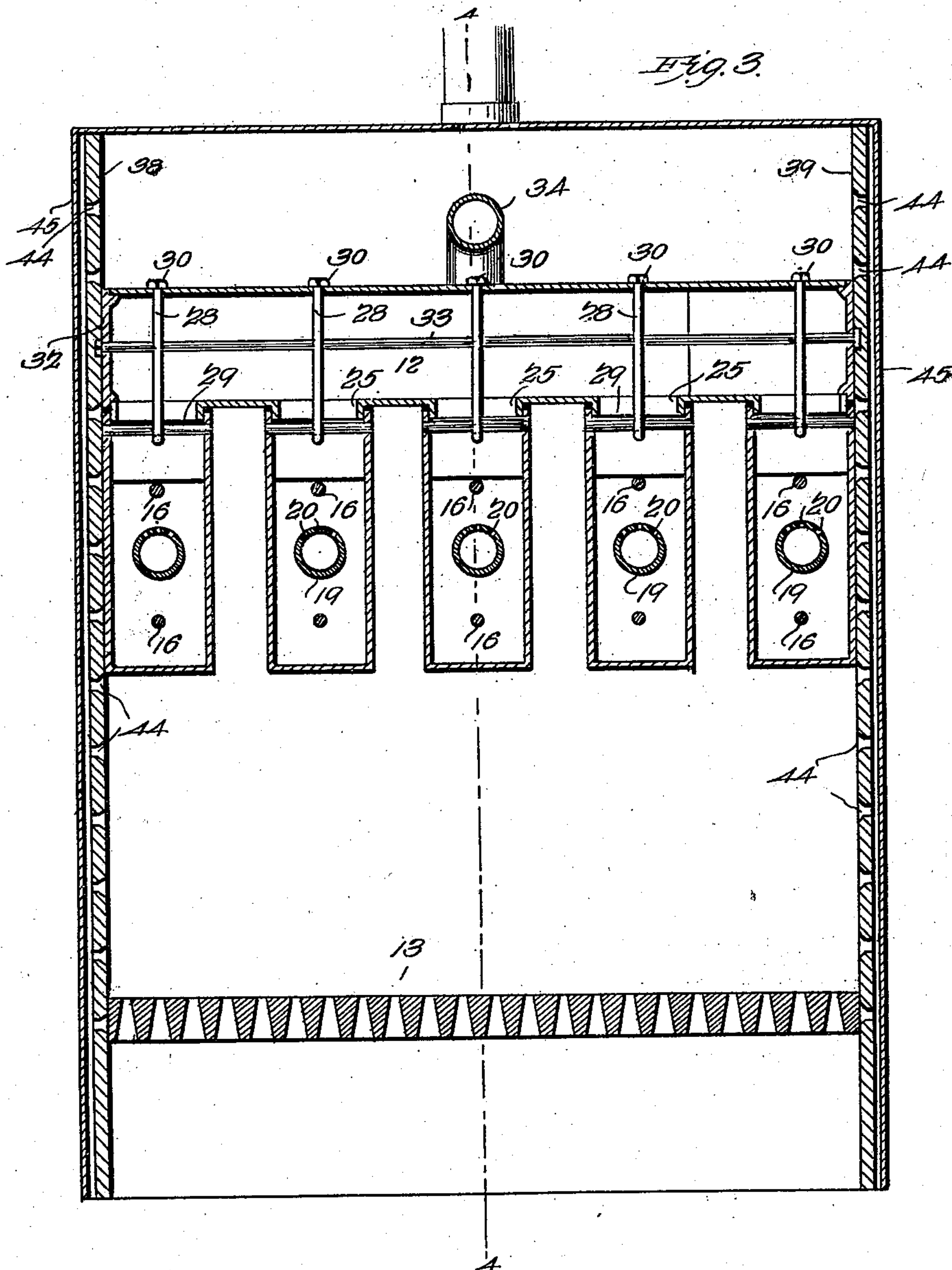
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(Application filed Sept. 18, 1901.)

(No Model.)

4 Sheets—Sheet 2.



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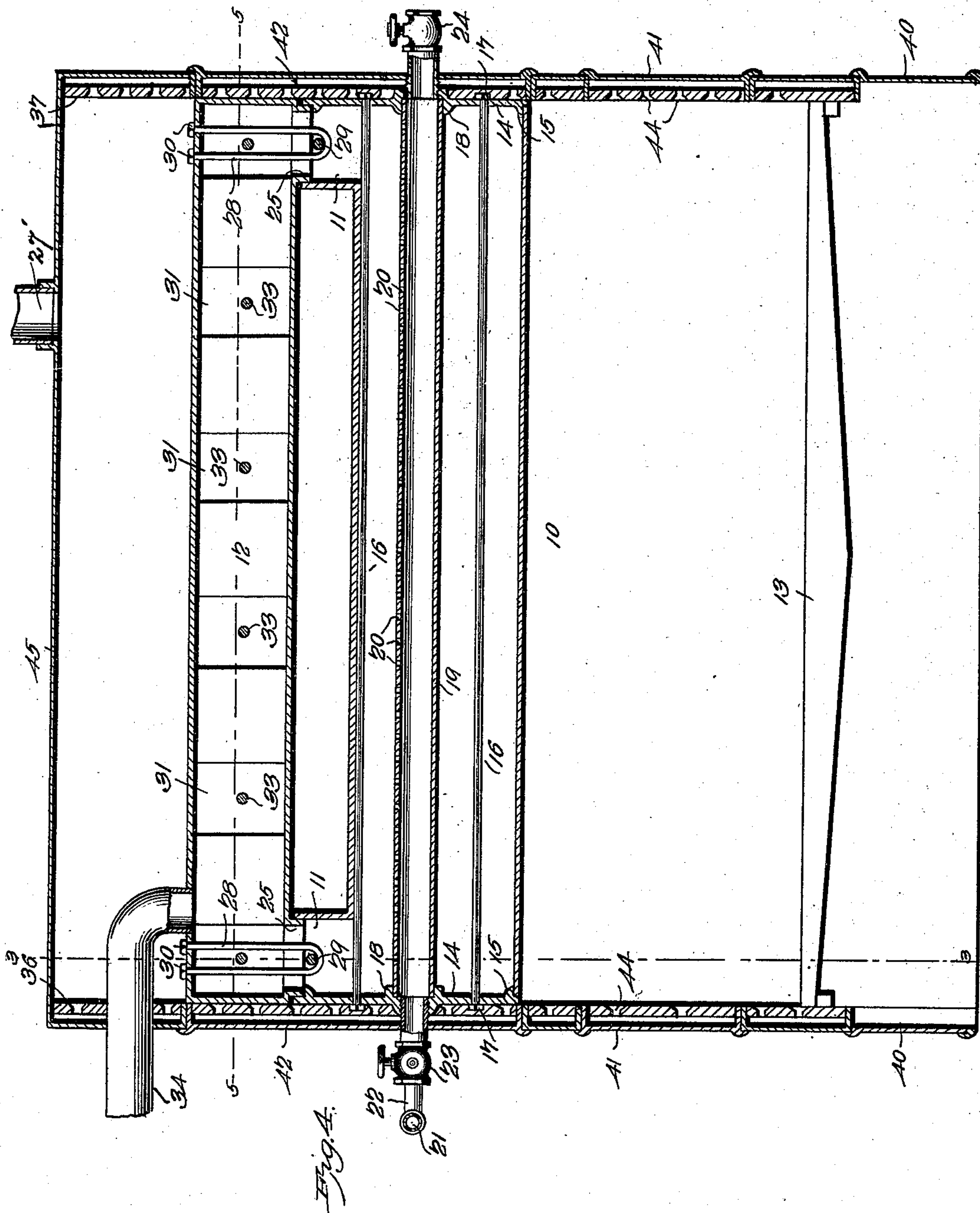
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4 Sheets—Sheet 3.



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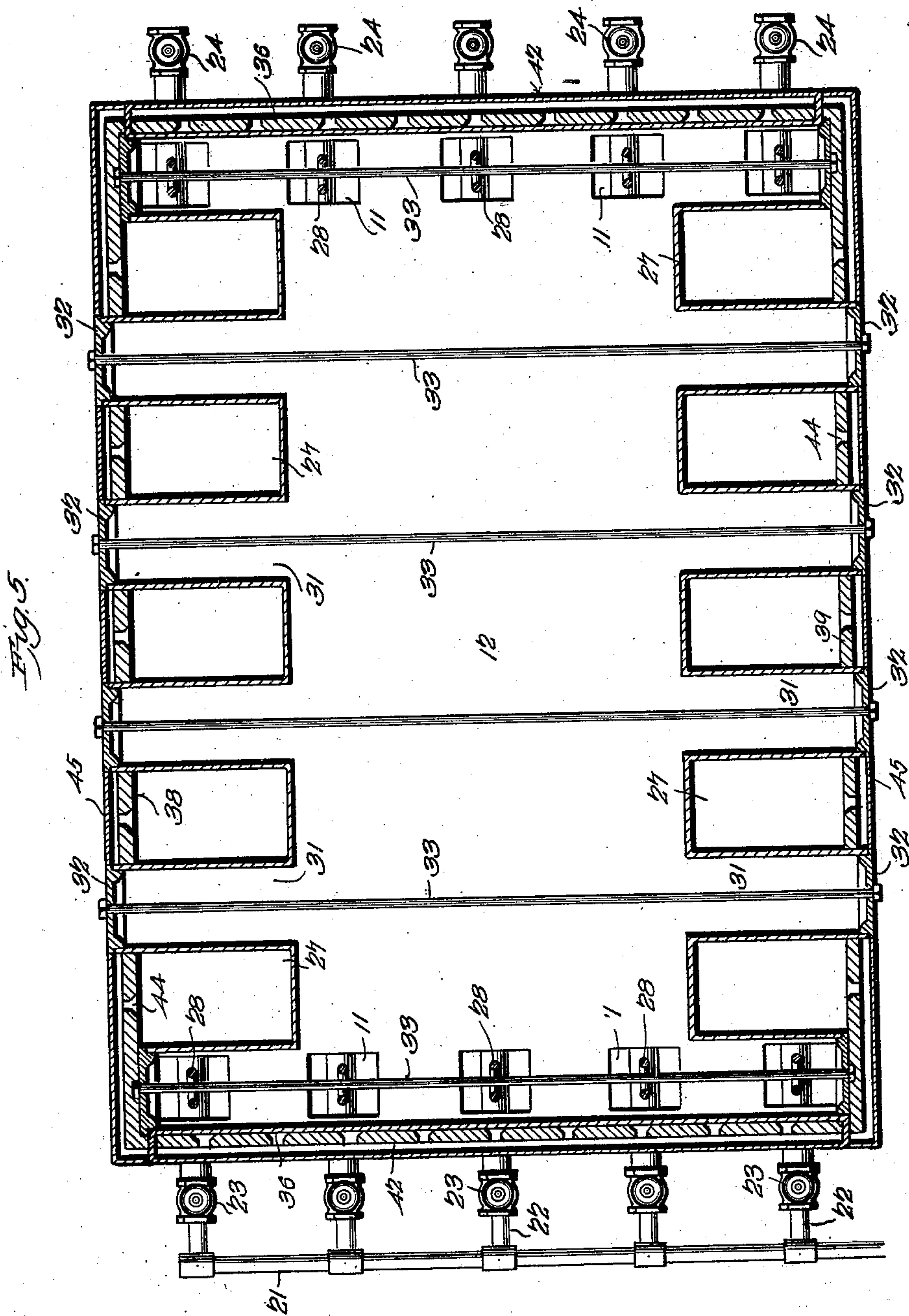
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(Application filed Sept. 16, 1901.)

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4 Sheets—Sheet 4.



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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR THE MANUFACTURE OF ILLUMINATING-GAS.

SPECIFICATION forming part of Letters Patent No. 692,771, dated February 4, 1902.

Application filed September 16, 1901. Serial No. 75,530. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT DEMPSTER, a citizen of the United States, residing at Marietta, in the county of Washington and State of Ohio, have invented a new and useful Apparatus for Vaporizing Liquids, of which the following is a specification.

My invention relates to certain improvements in apparatus for the formation of vapor from liquids, and while applicable for use as a steam-boiler is particularly intended for use for the formation of gas from liquid hydrocarbons of any character.

The principal object of my invention is to construct a retort-vaporizer of portable nature, which may be employed for the manufacture of a fixed gas of high illuminating power and which, owing to its low cost, may be used for heating purposes or for the running of explosive-engines.

A further object of the invention is to so construct the device as to facilitate any necessary cleaning when tar or other deposits are to be removed and to render the device portable by constructing it of a number of sections which may be readily assembled or disassembled.

A still further object of the invention is to provide in connection with the vaporizer a feeding device which will act to force a predetermined quantity of hydrocarbon into the retort.

With these and other objects in view the invention consists in the novel construction and arrangement of parts hereinafter more particularly described, shown in the accompanying drawings, and pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a perspective view of a vaporizing apparatus constructed in accordance with my invention. Fig. 2 is a sectional elevation of the oil-feeding device employed in connection therewith, the discharge-pipe of the oil-feeder being shown as connected, by dotted lines, to the feed-pipe of the vaporizer shown in Fig. 1. Fig. 3 is a transverse sectional elevation of the vaporizing apparatus on the line 3 3, Fig. 4. Fig. 4 is a longitudinal sectional elevation of the same on the lines 4 4 of Fig. 3. Fig. 5 is a sectional plan view

through the superheater at the upper portion of the device on the line 5 5 of Fig. 4.

Similar numerals of reference indicate corresponding parts throughout the various figures of the drawings.

10 designates a cast-iron retort of rectangular form in cross-section and provided at each of the ends with upwardly-extending gas-outlets 11, through which the gas passes to an upper superheating-chamber 12. The number of retorts 10 employed depends entirely on the capacity of the apparatus. In the present instance I have shown five retorts extending parallel with each other, a space being left between each of the retorts for the passage of the products of combustion arising from a mass of fuel to be supported by a lower grate 13. The ends of the retort are provided with removable covers 14, having inner flanges 15, acting partly as guides and partly to hold the covers in position. The covers are firmly clamped in place by longitudinal bolts 16, extending entirely through the retort and having nuts 17 at one or both ends to bind the doors firmly in place. The covers or doors may be provided with packing at their edges or may be luted in the usual manner. On the inner side of each cover 14 is an annular rib 18, forming a socket for the reception of the end of a pipe 19, said pipe being of such length as to be firmly clamped when the bolts 16 are tightened. The pipe 19 is provided on its upper side with a series of perforations 20, extending throughout the entire length of said pipe. An oil-supply pipe 21 is arranged at the front of the vaporizer, and to said pipe is connected a series of smaller pipes 22, each being tapped into a recess or opening in a retort-cover immediately in line with the pipe 19, the oil being fed through said pipe 22 into the pipe 19. Each pipe 22 is provided with a separate governing-valve 23, by which the flow of oil may be adjusted, or in case of the clogging of the pipe 19 from an accumulation of the heavier hydrocarbons the supply-valve leading to said pipe may be closed temporarily without interfering with the manufacture of gas in the remaining retorts. At the rear cover of each retort is a valved pipe 24 in alinement with the pipe 19 and permitting the withdrawal



of the greater quantity of tar and other accumulations as may from time to time become necessary.

The superheater 12 acts as a crown-sheet for the furnace and at each of its ends is provided with downwardly-projecting neck portions 25, adapted to enter the vertical passages 11, extending from the various retorts and forming continuous gas-passages to permit the escape of gas from both ends of the retorts to the superheater. The opposite sides of the superheater are provided with a series of vertical passages 27, forming outlets for the products of combustion, the burning gases arising from the mass of fuel passing between and around all of the retorts and after striking the lower face of the superheater passing through the side passages 27 and finally escaping through an outlet-flue 27'.

The retorts are firmly secured at each end to the vaporizer by U-shaped bolts 28, the lower central portions of which pass under cross-bars 29 in the vertical passages of the retort, the upper portions of said bolts extending through the top of the superheater and being provided with suitable nuts 30.

The arrangement of the flues or passages 27 divides the sides of the superheater into a series of rectangular chambers 31, the outer ends of which are closed by removable cover-plates 32, held in position by bolts 33, extending transversely through the superheater and passing through cover-plates 32 at opposite sides of said superheater. The removal of these doors permits of the cleaning of the superheater when accumulations of carbonaceous matter are to be removed.

From the top of the superheater extends a gas-outlet pipe 34, which may be connected to a suitable gasometer or, if desired, to a purifier.

The various retorts and the superheater being bolted together form a rigid structure which is held in position within the furnace-casing, constructed of a number of independent sections which may be readily taken apart when the apparatus is to be shipped and which are of such character as to dispense with the employment of the usual fire-brick. The casing is made of four main sections comprising end walls 36 and 37 and side walls 38 and 39, shaped to conform to the general outline of the furnace and each end wall having an ash-pit door 40, the feed-door 41, and a door 42, which may be opened to gain access to the ends of the retort. This latter door is preferably made in sections, owing to the arrangement of the pipes 22 and 24. Each section of the casing is provided with a large number of openings 44, countersunk on the inner side to prevent ashes lodging in the hole, and over all of the casing extends a sheet-iron casing 45, separated from the sections 36, 37, 38, and 39 by a continuous air-space to prevent to a considerable extent the heating of such outer casing.

Referring now to Fig. 2, 50 represents a vertically-disposed cylindrical casing having at its upper end an outwardly-turned annular flange 51. Sliding telescopically on the casing 50 is a second casing 52, having at its lower end an inwardly-extended flange 53, and in the space formed between the two flanges is a helical spring 54, having a normal tendency to depress the casing 52. At the top of the casing 52 is a cross-bar or cover-plate 55, to the central portion of which is secured a piston-rod 56, having at its lower ends a two-part piston 57, provided with a pneumatic packing-ring 58, which fits snugly against the interior surface of the casing 50. The casing 50 is filled with oil, which is forced under pressure through a valved pipe 59, forcing the piston upwardly until the chamber is filled with the desired quantity of oil. The oil is maintained under pressure by means of the spring 54, if necessary, by the addition of a weight 60. (Shown by dotted lines in Fig. 2.) In some cases I prefer to employ the weight only and to entirely dispense with the spring, and owing to the fact that where a weight is used the pressure on the oil is at all times equal, while in the use of a spring the pressure would necessarily lessen as the quantity of oil in the chamber decreased. The oil is discharged from the lower portion of the chamber 50 through the pipe 21, a valve 61 being provided to govern the outflow, and in said pipe is also placed a reducing-nozzle 62, which will permit the passage of but a small quantity of oil and permit of a regular supply in small quantities to the vaporizing apparatus.

In the operation of the device, the valves 61 and 23 being opened, oil is forced from the chamber 50 through pipe 21 and each of the pipes 22 to the perforated pipe 19 in the interior of the retort 10. Fuel having been applied to the grate-bars 15 and the retorts heated to a greater or less degree, generally to a cherry-red, the radiated heat will vaporize the oil contained within the pipes 19, forming a heavy vapor containing all of the lighter hydrocarbons and some of the heavy hydrocarbons, said vapor passing out into the retort and there subjected to intense heat. Under the influence of the heat in the retort the gas will deposit a portion of the heavy hydrocarbons, and on passing into the superheater a further proportion of the carbonaceous matter will be deposited and the proportion of permanent gases will be increased, and their levity also, in proportion to the heat. The quantity of gas formed depends altogether on the heat to which the hydrocarbon is subjected—the lower the heat the less the quantity of carbon deposited, and therefore the greater will be the quantity of carbon which combines with the hydrogen, and the greater the heat the greater the quantity of carbon deposited, the gas becoming poorer in illuminating qualities, but of a character especially adapted for the operation of explosive-engines where the deposit of carbon-



ceous matter in the cylinder of the engine is detrimental.

The device is of such character that it may be readily taken apart for cleaning, and the arrangement of the primary vaporizing-tube 19 is such that the larger quantity of the heavier hydrocarbon will remain in such tubes, from whence it may be withdrawn through the pipe 24.

The structure may be modified in a variety of ways and its proportions may be altered to increase or decrease the quantity of gas manufactured, and the minor details of construction may be altered to accommodate various requirements of use without departing from the spirit or sacrificing any of the advantages of my invention.

Having thus described my invention, what I claim is—

1. A gas-generator comprising in combination, a retort exposed to the action of heat and having removable end doors, a primary vaporizing-tube arranged centrally within the retort and protected by said retort from the direct action of flame or the products of combustion, said tube having top perforations and being supported at its opposite ends by the removable doors, and a feed-pipe connected to one of said doors in alinement with said tube, substantially as specified.

2. The combination in a gas-generator, of a retort exposed to the action of heat, removable doors arranged at the ends of said retort and having tube-receiving sockets, a tube arranged centrally within the retort and having its opposite ends supported in said sockets, an oil-feed pipe connected to one of said doors in alinement with the said tube, and a residuum-discharge pipe connected to the opposite feed-door in alinement with said tube.

3. In a device of the class specified, the combination of a series of spaced retorts each having a perforated primary vaporizing-chamber, a superheater to which all of said retorts are connected, flues or passages for the products of combustion arranged at the

sides of said superheater, and a combustion-chamber in which the retorts and superheater are arranged.

4. In a device of the class specified, a combustion-chamber having suitable side and end walls, and a fuel-grate, a series of retorts situated within said combustion-chamber and spaced for the passage of the products of combustion, a superheater forming the crown-sheet for the combustion-chamber and communicating with all of the retorts, there being in the sides of said superheater flues or passages for the products of combustion.

5. In a device of the class specified, the combination with a combustion-chamber, of a series of retorts, a superheater communicating with said retorts, there being in the opposite side of said superheater a series of flues or passages for the products of combustion, the intervening portions of the superheater between said flues or passages forming chambers having removable end covers or doors.

6. In a device of the class specified, the combination with a combustion-chamber, of a series of retorts, a superheater forming a crown-sheet for the combustion-chamber, a series of side passages arranged in the superheater, removable doors or covers closing said passages, and securing-bolts extending transversely of the superheater and through said covers or doors on opposite sides of the same.

7. In a device of the class specified, the combination with a retort, of a sectional casing comprising a series of perforated sheets, the perforations of each sheet being countersunk from the inner side, and a sheet-metal outer casing surrounding the perforated casing and separated therefrom by an air-space.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

ROBT. DEMPSTER.

Witnesses:

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W. S. HANCOCK.