No. 724,763. PATENTED APR. 7, 1903.

H. F. WALLMANN.

MEANS FOR VAPORIZING WATER.

APPLICATION FILED JAN. 3, 1899.

NO MODEL. 3 SHEETS—SHEET 1.

FIG. 2.

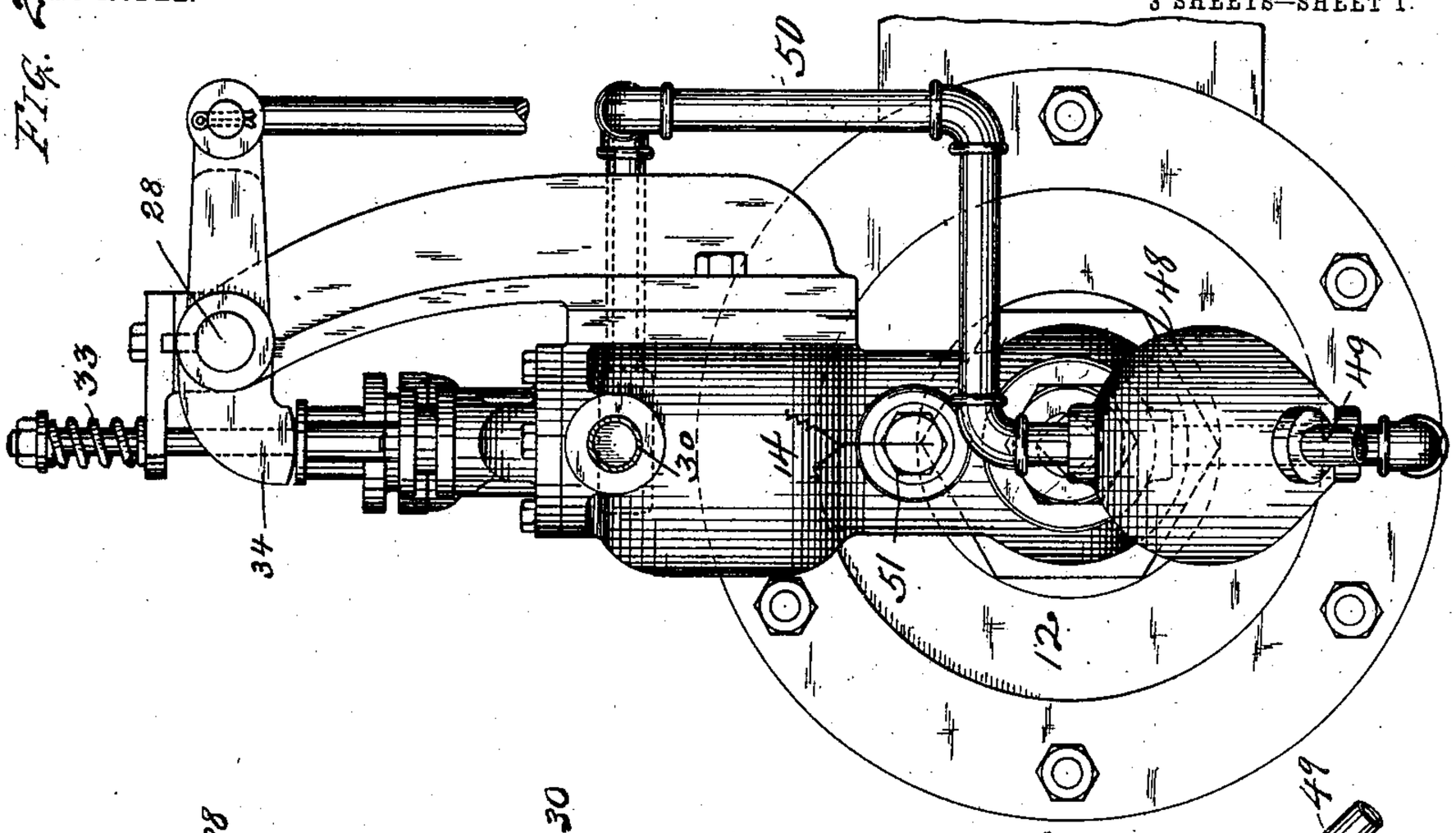
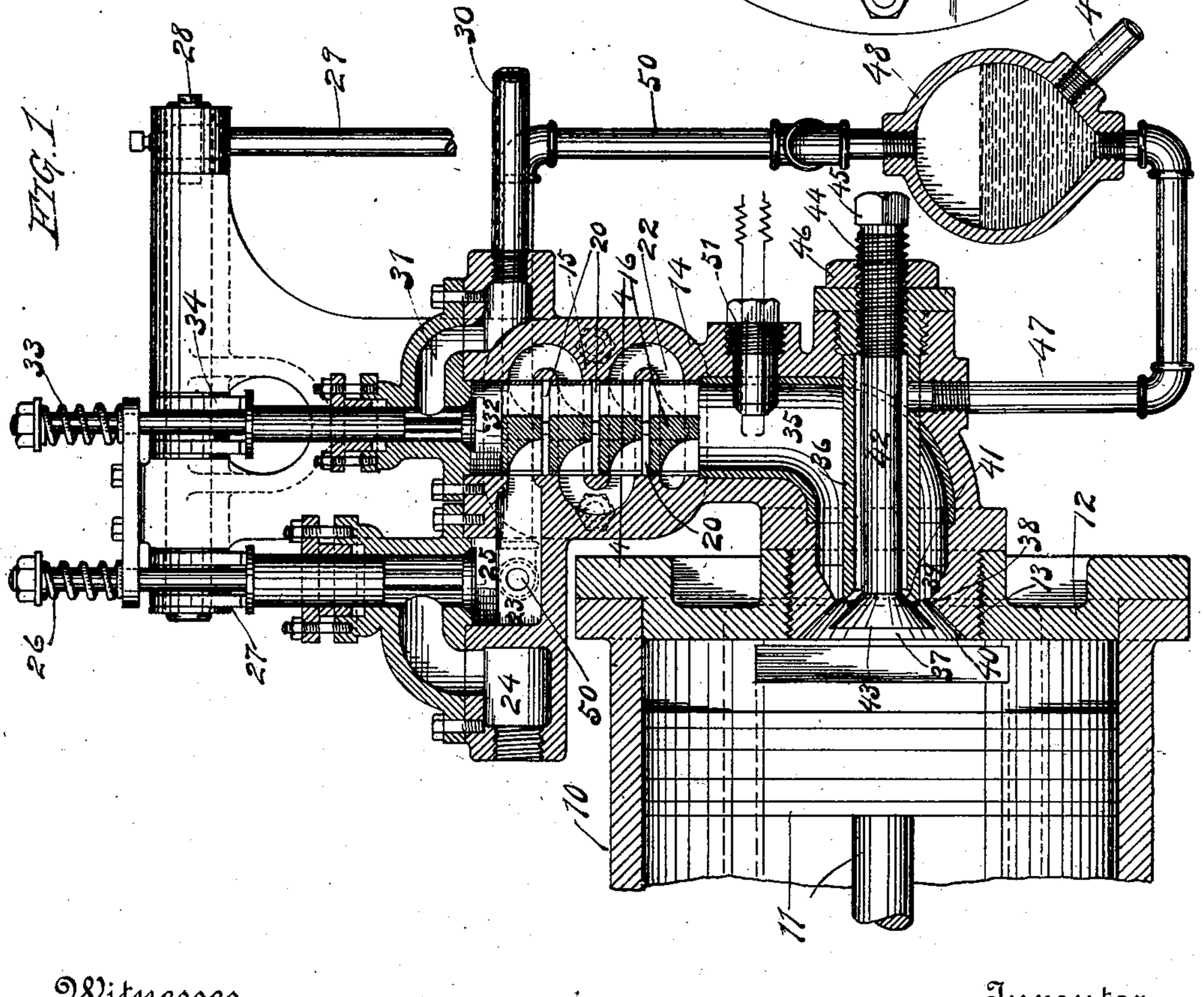


FIG. 1.



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NO MODEL. 3 SHEETS—SHEET 2.

FIG. 4

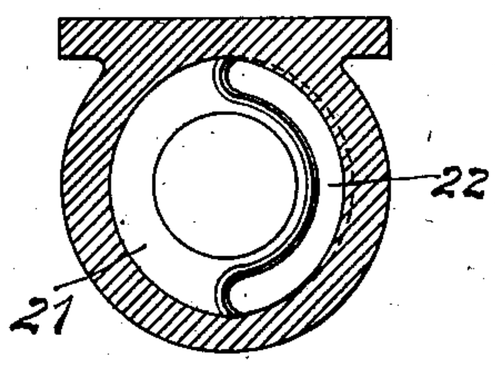


FIG. 5.

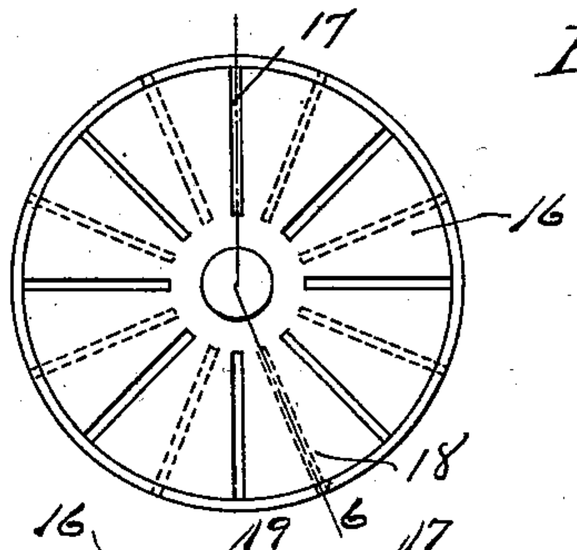


FIG. 6.

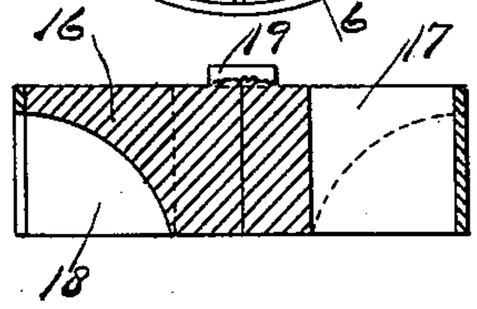
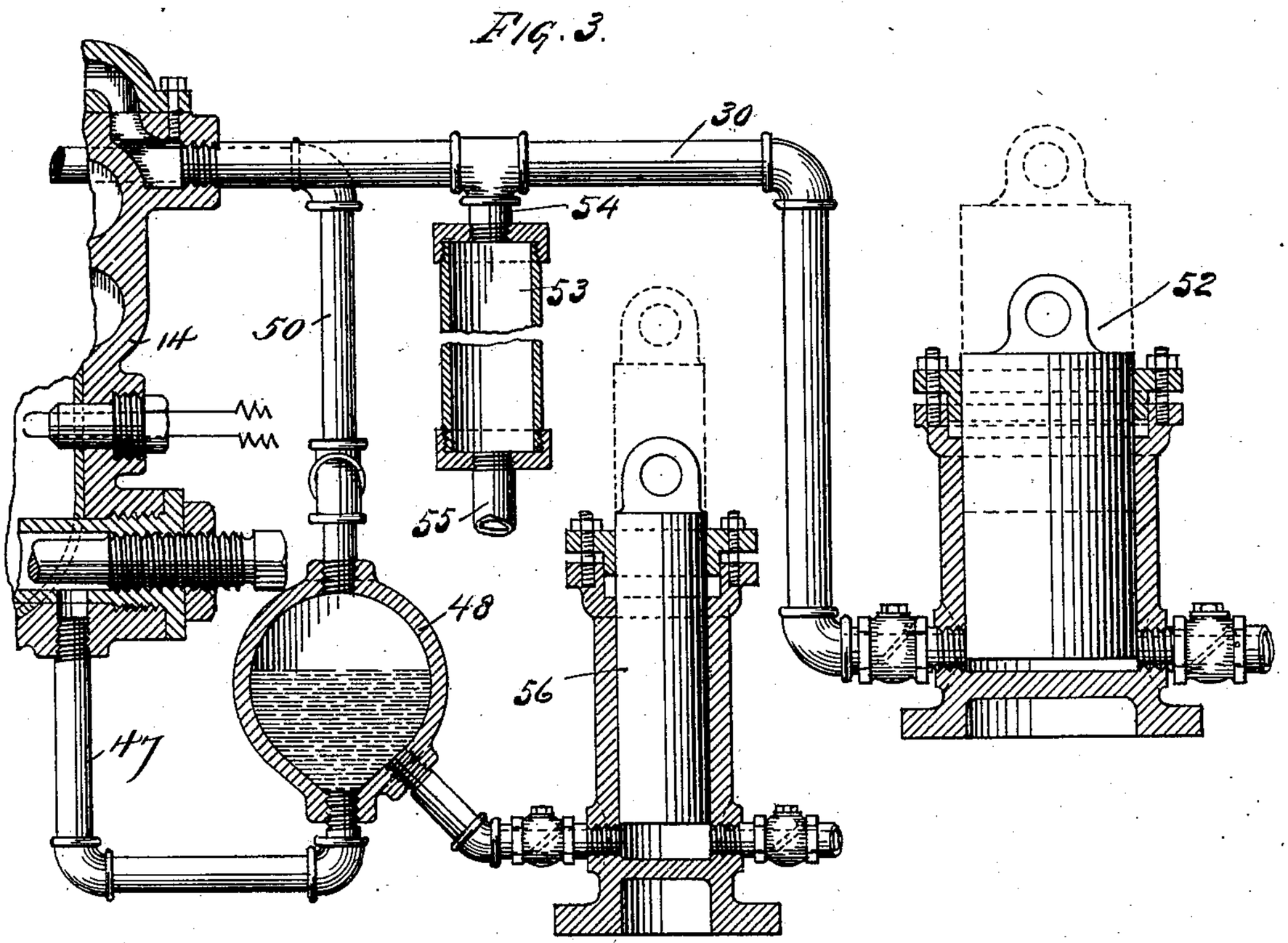


FIG. 3.



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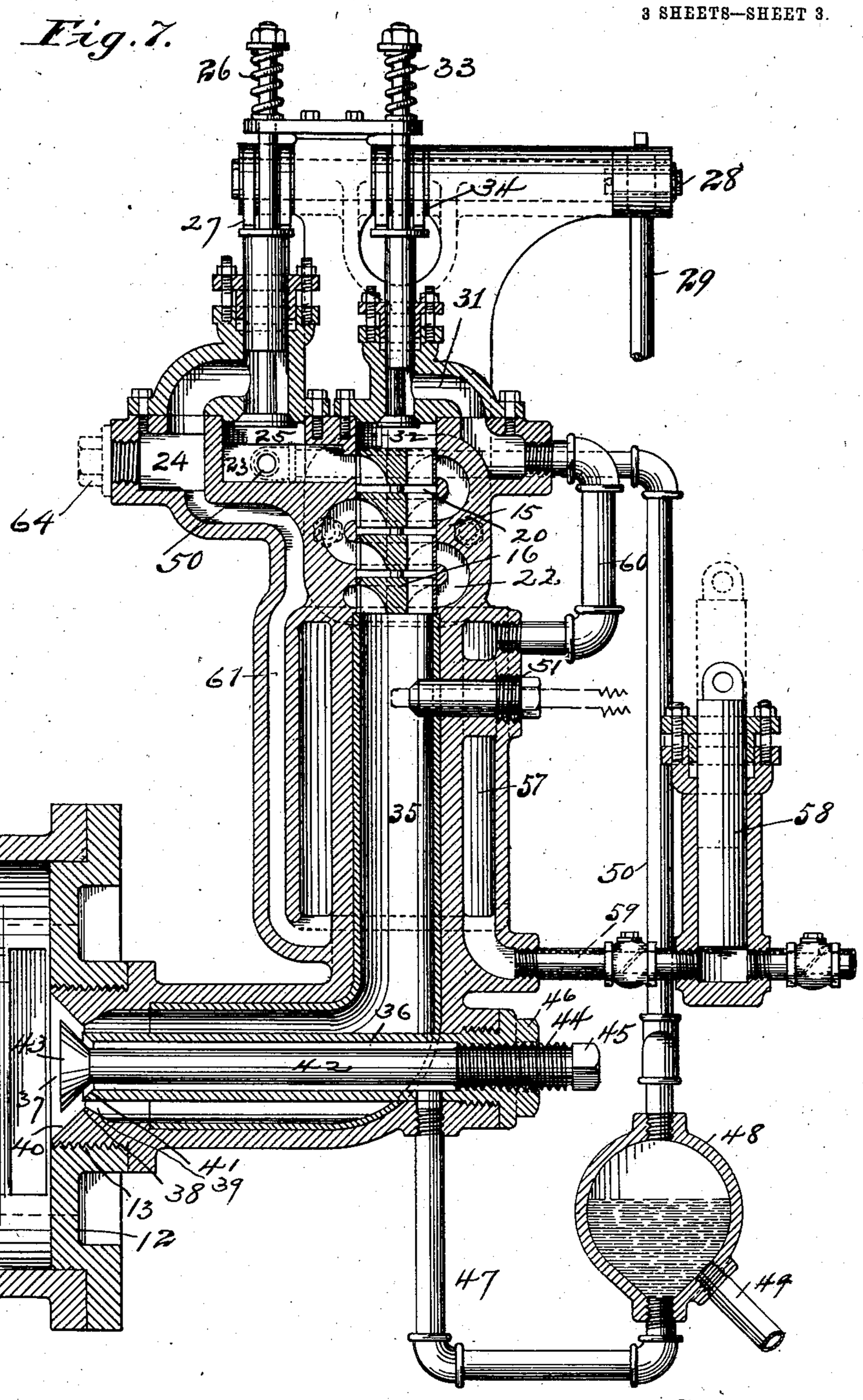
NO MODEL. 3 SHEETS—SHEET 3.

Fig. 7.



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UNITED STATES PATENT OFFICE.

HENNING FRIEDRICH WALLMANN, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WALLMANN ENGINE COMPANY, A CORPORATION OF ILLINOIS.

MEANS FOR VAPORIZING WATER.

SPECIFICATION forming part of Letters Patent No. 724,763, dated April 7, 1903.

Application filed January 3, 1899. Serial No. 701,018. (No model.)

To all whom it may concern:

Be it known that I, HENNING FRIEDRICH WALLMANN, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Means for Vaporizing Water, of which the following is a specification.

This invention relates to means for vaporizing water and other liquids, being adapted more particularly for use in connection with engines of the type in which steam, gas, and air are used, and more specifically with engines of the type known as "boilerless" engines, in which the water is vaporized in small quantities as required without the employment of a separate boiler or steam-generator.

To these ends the invention consists in certain novel features, which I will now proceed to describe and will then particularly point out in the claims.

In the accompanying drawings, Figure 1 is an elevation, partly in vertical central section, of an apparatus embodying my invention in one form. Fig. 2 is an end elevation of the same. Fig. 3 is a view similar to Fig. 1, illustrating certain adjunctive mechanism which I prefer to employ as a part of my apparatus. Fig. 4 is a detail plan section taken on the line 4 4 of Fig. 1 with the mixing-disks removed. Fig. 5 is a plan view of one of the mixing-disks. Fig. 6 is a sectional view of the same, taken on the line 6 6 of Fig. 5; and Fig. 7 is a view similar to Fig. 1, illustrating a modified form of apparatus adapted for use in connection with a liquid fuel, such as a liquid hydrocarbon, instead of gas.

Referring first to the construction shown in Figs. 1 to 6 of the drawings, I have shown in said figures an apparatus adapted for use in connection with an engine the piston of which is actuated by a mixture of air, gas, and steam or water-vapor. In said construction, 10 indicates the cylinder of such an engine, and 11 the piston-rod thereof. The cylinder 10 has in its head 12 an opening 13, by means of which the actuating mixture is introduced into the interior of said cylinder. In the preferred construction the opening 13 is threaded to receive a correspondingly-threaded portion of a casting 14, which contains the mixing and combustion chambers and vaporizing devices. The mixer proper, which is constructed in the manner set forth in an application filed by me December 17, 1898, Serial No. 699,577, is located in the upper portion of the casting 14 and comprises a longitudinally-extending mixing-chamber 15, in which are located a series of disks 16, each having formed therethrough a plurality of passages 17, extending from top to bottom of the said disk, and a corresponding plurality of passages 18, extending from the periphery of each disk inward and downward to its under face, being closed at the top by the body of the disk, as clearly shown in Figs. 1 and 6 of the drawings. These passages are preferably in the form of alternately-arranged radial slots, and the passages 17 are successively larger or increasing in size or number as the discharge end of the mixing-chamber is approached. The disks 16 are spaced apart by projections 19 or in any other suitable manner, so as to form commingling-spaces 20 between each pair of disks. Adjacent to each disk 16 there is provided in the wall of the mixing-chamber an annular passage 21, and these annular passages are connected with each other by connecting-passages 22, the uppermost annular passage being in connection with an air-inlet chamber 23, as shown in Fig. 1 of the drawings.

24 indicates an air-supply passage which is connected with a source of supply of air under pressure in any suitable manner, and the passage of the air from said air-supply passage to the air-inlet chamber 23 is controlled by a valve 25, which is preferably a balanced valve, as shown, and which is normally closed by a spring 26 and adapted to be opened by a tappet 27 on a rock-shaft 28, which is operated from any suitable moving part of the engine by a connecting-rod 29.

30 indicates a gas-supply pipe which is connected with a source of supply of gas under pressure and which opens into a gas-inlet passage 31, communicating with the upper end of the mixing-chamber 15, said communication being controlled by a valve 32, held normally closed by a spring 33 and operated by a tappet 34 on the shaft 28.

The combustion-chamber, which is indi-

cated at 35, is formed with the casting 14 between the mixing-chamber and the connection with the cylinder 10 and is preferably L-shaped, as shown in Fig. 1 of the drawings, having a vertical portion which connects with and forms an extension of the mixing-chamber and a horizontal portion which connects the vertical portion with the engine-cylinder. Within this combustion-chamber and mainly within the horizontal portion thereof, being preferably arranged axially thereof, is located the vaporizer proper, which comprises a sleeve or hollow cylinder 36, closed at its outer end and open at its inner end, which is located at the opening or mouth 37 of the combustion-chamber at the point where this latter communicates with the interior of the cylinder 10. The mouth 37 of the combustion-chamber 35 is contracted in the manner shown by means of an annular rib 38, V-shaped in section, so as to provide a passage at the mouth 37, which is first contracted, as shown at 38, and then expanded, as shown at 40. The surfaces producing this contraction and expansion of the passage are beveled or conical, as shown, and the outer extremity of the sleeve 36 is beveled or conical, as shown at 41, to correspond to the bevel of the outer or flaring portion 40 of the passage and terminates in a plane coincident with the plane of junction of the contracted and expanded portions 39 and 40 of the passage.

Within the sleeve 36 and arranged axially therein is located a spindle 42 of less diameter than the internal diameter of said sleeve and provided at its inner end with a conical enlargement 43, the bevel or slope of which corresponds with those of the surfaces 40 and 41. The spindle 42 is adjustable longitudinally with the sleeve 36, so as to permit the adjustment of the enlargement 43 toward or from the surfaces 40 and 41, and in order that this adjustment may be readily effected the spindle 42 is preferably provided with a threaded outer portion 44, which fits within the correspondingly-threaded outer end of the sleeve 36, and thereby closes said end. For convenience in adjustment the outer end of the spindle 42 is provided with a wrench-grasp 45, and a lock-nut 46 is employed to secure the said spindle in position after adjustment.

47 indicates a water-supply pipe communicating with the interior of the sleeve 36 at one end, while its other end is in communication with the lower portion of a water-chamber 48. A water-supply pipe 49, also communicating with the water-chamber 48, is employed to introduce a supply of water into said water-chamber, being connected for this purpose with a suitable source of supply, preferably of the character hereinafter pointed out. An air-supply pipe 50 opens into the upper portion of the water-chamber 48, its other end being connected to a source of supply of air under pressure and preferably in the manner shown by connecting said pipe 50 with the air-inlet chamber 23 or with any portion of the air-supply so located that the valve 25 lies between said connection and the source of pressure.

A suitable igniting device is provided, and I prefer to employ for this purpose an electrical igniting device 51 of any approved character, extending into the combustion-chamber, as indicated in Fig. 1.

In the preferred form of construction (shown in Fig. 3 of the drawings) I employ a pump 52 for delivering gas under pressure through the supply-pipe 30, and for the purpose of equalizing the pressure I provide an equalizing-chamber 53, connected at one end with the gas-supply pipe 30 by means of a coupling 54 and having at its other end a pipe 55, which is connected with the air-pressure at some suitable point. As a preferred means for supplying water to the chamber 48 I employ a pump 56. The pumps 52 and 56 are connected with and driven from the engine in any suitable manner and are so regulated and constructed as to deliver a definite quantity at each stroke.

The apparatus thus organized operates in the following manner: At each stroke of the engine a predetermined quantity of water is delivered by the pump 56 into the chamber 48 and at the same time a definite quantity of gas is forced through the pipe 30 to the mixing-chamber. The valves 32 and 25 being opened, the air and gas enter the mixing-chamber and passing through the same become thoroughly commingled. The gas passes downward through the passages 17, and air is admitted thereto successively at intervals through the passages 18, the air and gas intermingling in the commingling-spaces 20 after each admixture. The mixture of gas and air is ignited and burns in the combustion-chamber 35, thereby heating the sleeve or cylinder 36. When the valve 25 is opened, air under pressure is admitted through the pipe 50 to the water-chamber 48 and forces the water in said chamber through the pipe 47 into the sleeve or cylinder 36, where it is heated and may be partially vaporized. The burning mixture of air and gas issues out through the opening 37 and by reason of the contraction of said opening and of the enlargement 43 of the spindle 42 acts as an atomizer to thoroughly comminute and subdivide the fluid which issues from the sleeve or cylinder 36. The water is thus intimately commingled and associated with the burning mixture of gas and air and is not only vaporized by heat, but also mechanically comminuted, so as to facilitate the complete vaporization of the water in a practically instantaneous manner. The mixture of steam, gas, and air is thus introduced into the cylinder 10 and operates expansively therein to actuate the piston 11.

The apparatus thus constructed is adapted for use where it is desired to employ an engine without a boiler, the requisite amount of water for each stroke of the piston being

supplied periodically and vaporized at the time when the effective stroke is to be made. A comparatively small quantity of water is required, the chamber 48 being small and being supplied with the requisite amount of water at each stroke and entirely emptied thereof by the air-pressure when the valve 25 is opened and again supplied with water when said valve is closed.

The form of apparatus hereinbefore described is adapted for use with gas and air; but my invention also contemplates the employment of a liquid fuel, such as a liquid hydrocarbon capable of being readily vaporized, and in Fig. 7 of the drawings I have shown a form of apparatus adapted for use with such a fuel. In this construction the combustion-chamber 35 is surrounded by a vaporizing-chamber 57, and the liquid fuel is introduced into said vaporizing-chamber by means of a pump 58 and supply-pipe 59, which latter opens, preferably, into the base or lower portion of the vaporizing-chamber 57. The oil or other liquid fuel is vaporized by heat from the combustion-chamber 35 and passes through a pipe 60, which leads from the upper end of the vaporizing-chamber to the gas-inlet passage 31. A conduit or passage 61 extends from the air-inlet 24 to the lower end of the vaporizing-chamber 57, and a portion of the air-supply is diverted through this passage 61 and becomes heated and mingled with the vaporized liquid fuel in the vaporizing-chamber 57 and passes along with the same through the pipe 60 to the gas-inlet. The heated current or blast thus supplied is preferably provided in the manner set forth and comprises a mixture of air and gas or of air and a liquid fuel, such as a liquid hydrocarbon, which is capable of being converted into gas; but I wish it to be understood that my invention contemplates the employment of any combustible fuel, whether mixed or unmixed, whereby a current or blast of the character described may be produced.

I claim—

1. In an apparatus of the character described, the combination of a power-cylinder, a piston therein, a fuel-combustion chamber having a contracted convergent discharge end in open communication with one end of said power-cylinder, means for supplying combustible fuel to said combustion-chamber, a tubular vaporizer located within and heated by said combustion-chamber and having its outlet coincident with the outlet of the latter, means for supplying water to said vaporizer, and a water-dispersing deflector located in the path of the discharge-outlet of said vaporizer and adapted to direct the discharge from the vaporizer across the path of the discharge from the combustion-chamber, substantially as described.

2. In an apparatus of the character described, the combination of a power-cylinder, a piston therein, a fuel-combustion chamber having a contracted convergent discharge end in open communication with one end of said power-cylinder, means for supplying combustible fuel to said combustion-chamber and igniting the same therein, a tubular vaporizer located within and heated by said combustion-chamber and having a flaring or divergent outlet coincident with the convergent outlet of the combustion-chamber, means for supplying water to the closed end of said vaporizer, and a water-dispersing deflector located adjacent to the discharge-outlet of said vaporizer and adapted to coöperate with the convergent discharge end of the combustion-chamber to direct the discharges from the combustion-chamber and vaporizer across each other's path, substantially as described.

3. In an apparatus of the character described, the combination of a power-cylinder, a piston therein, a fuel-combustion chamber having its discharge end in open communication with one end of said power-cylinder, a mixer communicating with the opposite end of said combustion-chamber, a vaporizer located within said combustion-chamber and having its outlet coincident with the outlet of the latter, a water-chamber, a pipe connecting the latter with said vaporizer, means for maintaining a supply of water in said water-chamber, an air-supply pipe communicating with the top of said water-chamber through which compressed air may be admitted to the latter to force the water therefrom to and through the vaporizer, and means for supplying air and fuel in regulated quantities to said mixer, substantially as and for the purpose described.

4. In an apparatus of the character described, the combination, with a cylinder and a piston therein, of a combustion-chamber having an outlet into said cylinder, a mixing-chamber communicating with said combustion-chamber, a source of air under pressure, a valve controlling the admission of air from said source, a gas-pump connected with the mixing-chamber, and a pressure-equalizing chamber connected with the air-supply and with the connection between the gas-pump and mixing-chamber, substantially as described.

HENNING FRIEDRICH WALLMANN.

Witnesses:
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