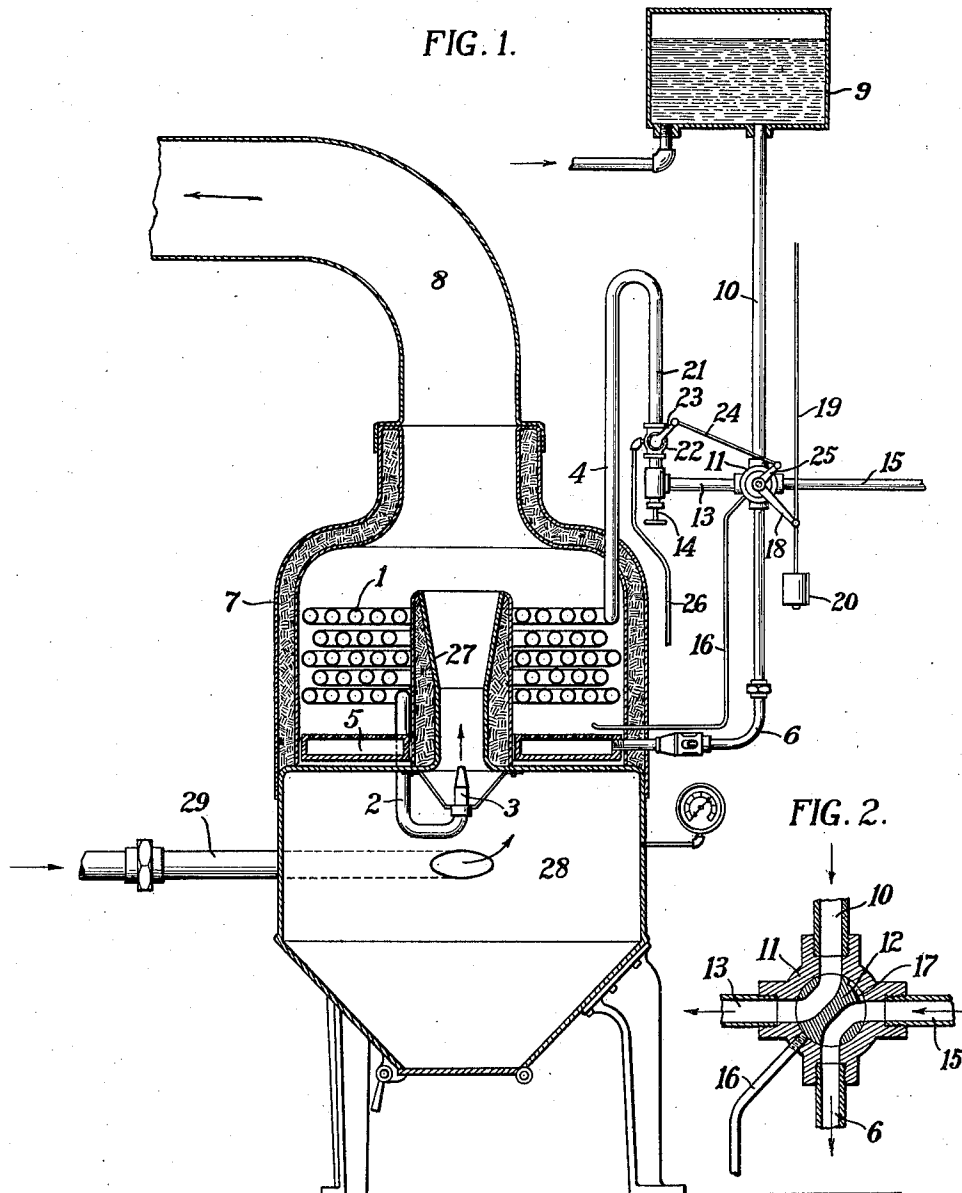


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VACUUM APPARATUS.
APPLICATION FILED MAY 4, 1910.

1,029,746.

Patented June 18, 1912.



WITNESSES:

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VACUUM APPARATUS.

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To all whom it may concern:

Be it known that I, LOUIS W. G. FLYNT, a subject of the King of Great Britain, and resident of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Vacuum Apparatus, of which the following is a specification.

This invention relates to apparatus in which air is exhausted from a pipe or main by means of an ejector operated through the agency of steam, and the invention is particularly designed for use in connection with vacuum-cleaning systems, although it is applicable to various other uses.

One object of the invention is to produce a simple and self-contained apparatus of the kind above referred to, which may be supplied with water and fuel from the ordinary sources of supply of water and gas, respectively, which may be easily and quickly thrown into and out of operation, and which, when in operation, will require no attention, but will act automatically and continuously to maintain a substantially-constant degree of vacuum in the vacuum-main.

Another object of the invention is to produce a device of the kind referred to which shall be perfectly safe to operate, the steam-generator being so constructed that an explosion is impossible under any conditions which may arise in the use or the misuse of the apparatus.

To accomplish the foregoing objects I employ a steam-generator operating on the continuous-flow principle and having a constantly-open outlet which constitutes a steam-nozzle comprising a part of an air-ejector, and in place of controlling the flow of steam from the generator by means of a throttle-valve in the ordinary manner I control the operation of the generator by regulating the influx of water at the inlet end of the generator. In connection with this control of the water I control also the flow of the gas which is employed as a fuel for heating the generator, in such a manner that the fuel is suitably proportioned to the water, and in the preferred embodiment of the invention the water and the gas are controlled simultaneously by unitary means, and their flow is started and stopped by the

same means, so that, by a single operation on the part of the user, the generator and ejector are thrown into or out of operation. In combination with the means for starting and stopping the flow of water and gas I employ also a device by which the delivery of water to the generator is delayed for a predetermined time after the gas-burner is thrown into operation in order to afford time for the generator to become heated before the water is introduced into it.

Other objects and features of the invention not hereinbefore specifically referred to will be set forth in connection with the following description of the illustrated embodiment of the invention.

In the drawings:—Figure 1 is a side elevation of an apparatus embodying the present invention, the parts, including the generator and the ejector, being shown in section; and Fig. 2 is a vertical section through the main-valve.

In the illustrated embodiment of my invention the steam-generator 1 comprises a plurality of superposed flat coils of tubing connected together, in any well known manner, in order to constitute a continuous-flow generator. The outlet-end 2 of the generator-tube extends downwardly from the bottom of the generator, and is then turned upwardly and terminates in a restricted steam-nozzle 3, which is directed upwardly and constitutes a part of the air-ejector. This outlet-nozzle is constantly open, and thus affords always an outlet for steam which may be generated in the generator-coils.

The inlet-extremity 4 of the generator extends upwardly from the uppermost coil, and is connected with the water supply.

The generator is heated by a gas-burner 5, of ordinary form, located at a suitable distance below the generator. This burner is supplied with gas through a gas-pipe 6.

The generator and the burner are inclosed within a casing 7 which is provided with a lagging of nonconducting material, as shown in Fig. 1. From the upper end of the casing extends a flue 8, which constitutes an outlet for the products of combustion from the burner.

The uniform operation of the generator and the ejector depends primarily upon the

connection of the generator with a source of supply of water at substantially-constant pressure, the apparatus being, in fact, intended particularly for use where such a source of supply is available, as, for example, where the generator may be supplied from the pipes of an ordinary city water-supply. In Fig. 1 the water-supply is indicated by an elevated water-tank 9, which is adapted to furnish, or may be understood to indicate, a supply of water at substantially-constant pressure. The water from such supply is admitted to the apparatus through a pipe 10, and the flow of water into the generator is controlled primarily by a four-way valve 11, hereinafter designated as the "main control-valve." This valve is provided with a rotatable plug 12, and is connected with the generator through a water-supply pipe 13, the valve-plug 12 controlling the inlet and the outlet from the pipe 10 to the pipe 13, respectively. In Fig. 2 the valve is shown open so as to admit water to the generator.

The flow of water to the generator is adjusted, according to the pressure in the water-supply pipe, by means of a regulating-valve 14, which may be a needle-valve of ordinary form, and this valve, having once been set according to the conditions of use, does not ordinarily require readjustment.

The main control-valve 11 is used to control the flow of gas to the burner as well as, and simultaneously with, the flow of water to the generator. To this end it is connected, through a pipe 15, with a source of supply of gas, which may be the pipes of the ordinary city gas-supply. Where the gas from such a source is supplied at substantially-constant pressure no independent regulation of the gas is necessary. The gas issues from the main control-valve through the pipe 6 to the burner, the valve-plug 12 having a passage registering with and controlling the inlet from the pipe 15 and the outlet to the pipe 6, respectively.

In order that the apparatus may be thrown into operation immediately upon the manipulation of the main control-valve the burner is provided with a pilot-light which is constantly burning, and which is supplied with gas through a pipe 16 leading from the main supply-valve. When the main supply-valve is closed gas for the pilot-light flows from the gas-pipe 15, through a by-pass passage 17 in the valve-plug 12, to the pipe 16. The pipe 16 terminates just above the upper surface of the gas-burner, so as to maintain constantly a small flame in position to light the burner when the main control-valve is opened.

The main control-valve is intended to be operated manually from any convenient point. To this end it is provided with an arm 18 connected with a wire or rod 19

which may be extended to any point from which the apparatus is to be thrown into and out of operation. A weight 20, at the lower end of the rod 19, acts normally to hold the main control-valve in closed position, as illustrated in Fig. 1.

Since the illustrated generator is adapted to act as a flash generator, that is, to turn the water into steam as fast as it enters, it is necessary that before the water is introduced into the generator the latter should be heated to working temperature. It is necessary, therefore, to postpone the delivery of the water to the generator after the main control-valve has been opened and until the burner has had time to heat the generator. To this end the connections between the main control-valve and the generator are so arranged as to provide a space to receive water flowing through the regulating-valve 14 and of a capacity such that the time required to fill this space is sufficient to delay the delivery of water to the generator until the generator has been sufficiently heated. This space may be produced in various ways which will be obvious, but in the illustrated embodiment of the invention it is provided by a short length of vertical tube 21 extending upwardly from the regulating-valve and continuous with, discharging at its upper end into, the downwardly-extending inlet-extremity 4 of the generator.

When the main control-valve is moved to closed position to interrupt the operation of the apparatus it is necessary to drain the water from the vertical tube 21, in order that it may be empty when the apparatus is again thrown into operation, and it is also necessary or desirable to drain the water from the generator coils without permitting it to escape through the steam nozzle. To this end a waste-valve 22 is inserted at the bottom of the tube 21, by which the water contained in the tube is drawn off through a waste-pipe 26. The waste-valve is provided with an arm 23 which is connected, by a link 24, with an arm 25 on the main control-valve, so that the waste-valve is operated simultaneously with the main control-valve. When the waste-valve is opened the steam pressure in the generator forces all water remaining in the coils back into the tube 21 and out through the waste-valve, and the boiler is thus left empty, and ready to be again thrown into operation in the manner hereinbefore described.

The steam-nozzle 3 discharges upwardly through a draft-tube 27 which, together with the steam-nozzle, constitutes the air-ejector. The lower end of the draft-pipe communicates with a casing 28 constituting a receptacle for air, and the casing is connected with the air-pipe or main 29. As the draft-pipe discharges into the upper part of the casing 7, the flue 8 constitutes an out-

let for the air and steam as well as for the products of combustion.

When the main control-valve is opened the gas-burner is thereby supplied with gas and is ignited by the pilot-light. The burner then at once begins to heat the generator. At the same time the water flows through the regulating-valve 14 and gradually fills the tube 21 until it overflows at the upper end thereof into the inlet of the generator. When this last event occurs the generator begins producing steam, and thereafter the operation of the apparatus is constant, the steam flowing from the outlet-nozzle and operating the ejector so as to exhaust air constantly, and with a substantially-constant degree of vacuum, from the air-chamber 28 and the air-main 29. This operation continues without attention until the main control-valve is closed again.

The apparatus is particularly adapted for use in vacuum-cleaning systems, for the reason that it may be installed in any dwelling-house or other building having the ordinary water and gas-supply, and that it may be thrown into and out of operation from a distant point, as, for example, from an upper story of the building, and that it operates without any attention, skilled or otherwise, so that it may be used by any one whether or not familiar with the care of machinery. In this connection it should be noted that the constantly-open outlet from the generator is an absolute safeguard against explosion, since the capacity of the generator is such that it never can generate more steam than can escape, under moderate pressure, through the steam-nozzle.

My invention is not limited to the embodiment herein-before described and illustrated in the accompanying drawings, but may be embodied in various forms within the na-

ture of the invention as it is defined in the following claims.

This application is filed as a division of my application Serial No. 512,095, filed August 9, 1909, and patented July 11, 1911, No. 997,548.

I claim.

1. The combination of a source of supply of water, a steam-generator, connections between said source and the generator including a portion having an outlet higher than its inlet and with a capacity between said outlet and inlet sufficient to substantially delay the introduction of water into the generator while the water is rising to said outlet, means for heating the generator, means for controlling simultaneously the flow of water and the operation of the heating-means, and means for draining water from said connections when the flow of water from the source of supply is interrupted.

2. The combination of a steam-generator, a feed-water valve, a gas-burner for heating the generator, a gas-valve for controlling the flow of gas to the burner, means for opening the feed-water valve and the gas-valve simultaneously to admit feed-water and start the heating of the generator, connections between the feed-water valve and the generator including a portion having its outlet to the generator higher than its inlet from the feed-water valve and having a capacity, between said inlet and outlet, sufficient to substantially delay the introduction of water to the generator, and means operating automatically to drain the water from said portion when the feed-water valve is closed.

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Witnesses:

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