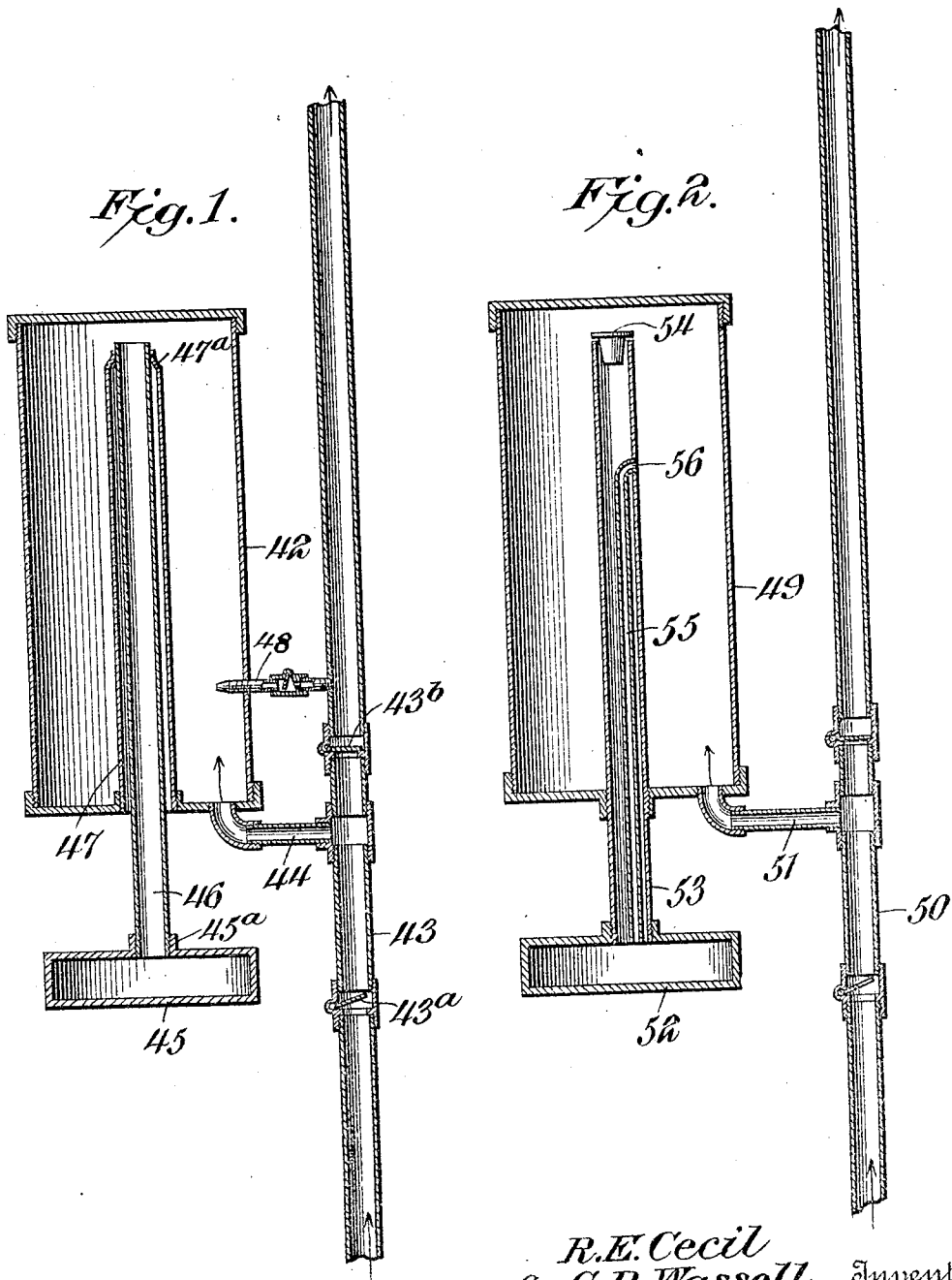


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STEAM AND VACUUM PUMP.
APPLICATION FILED NOV. 4, 1908.

Patented Dec. 21, 1909.
2 SHEETS—SHEET 1.

943,912.



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and C. R. Wassell, Inventors,

By *E. J. Siggers*
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Witnesses
Howard D. Orr.

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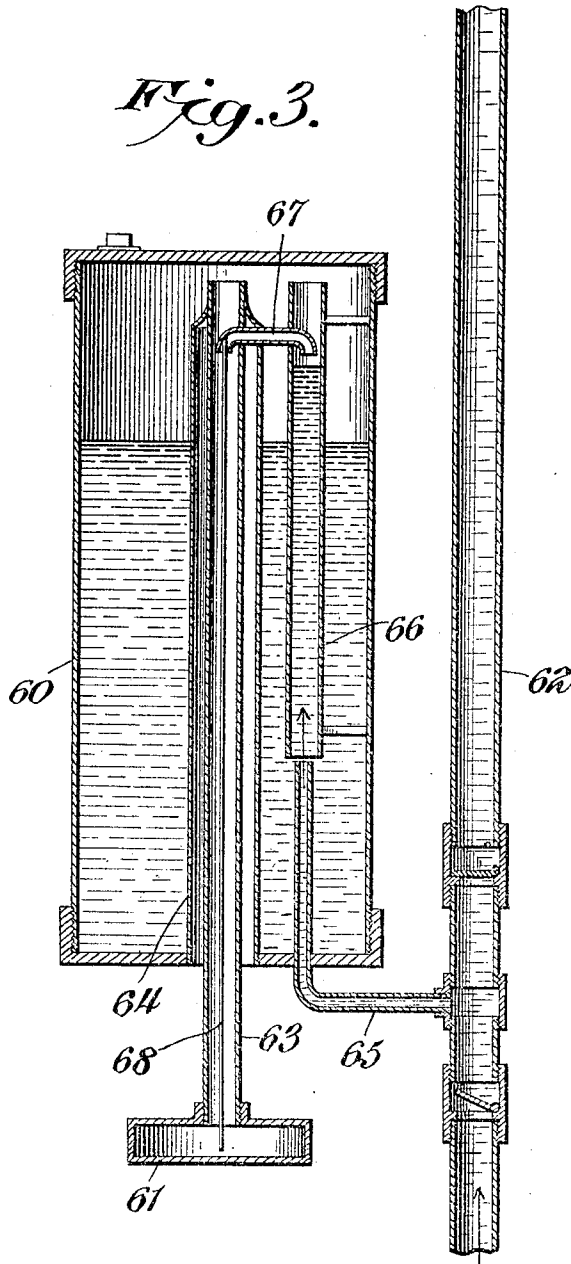
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Fig. 3.



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UNITED STATES PATENT OFFICE.

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STEAM AND VACUUM PUMP.

943,912.

Specification of Letters Patent.

Patented Dec. 21, 1909.

Application filed November 4, 1908. Serial No. 461,015.

To all whom it may concern:

Be it known that we, ROBERT E. CECIL and CLIFFORD R. WASSELL, citizens of the United States, residing at Ambridge and Sewickley, respectively, in the counties of Beaver and Allegheny and State of Pennsylvania, have invented a new and useful Steam and Vacuum Pump, of which the following is a specification.

Our invention relates to apparatus for raising water, and particularly to steam and vacuum pumps of the type wherein a pump chamber is connected to intake and discharge pipes and a steam generator is used, whereby steam may be forced into the pump chamber, force up the water contained within the chamber by means of its pressure, the steam being then condensed to form a vacuum, causing the water in the intake pipe to flow upward into the chamber, and steam to be again generated to force the water from the chamber into the discharge pipe.

The primary objects of our invention are to provide a novel, simple and effective structure of this character which will be automatic and require practically no attention, and which shall provide an apparatus that is particularly adapted for domestic purposes for use in country or suburban places where local water systems are necessary.

Minor objects are to provide a steam generator of a very simple character, to provide for insulating the pipe connecting the steam generator with the pump chamber so that the steam may be properly conserved to provide means for condensing the steam, and particularly to provide an apparatus wherein the supply of water to the generator shall be intermittently opened and closed before the water has risen to the full height of the generator, thus accelerating the operation of the pump.

Other minor details consist in the better adjustment of the several parts and the simple manner in which they are arranged with relation to each other.

In the drawings:—Figure 1 is a longitudinal sectional view of an extremely simple form of our apparatus. Figs 2 and 3 are similar forms of other embodiments of our invention.

Similar reference numerals designate corresponding parts in all the figures of the drawings.

In Fig. 1, a very simple embodiment of

the invention is illustrated. The pump chamber, designated by the numeral 42 is connected at its lower end by the pipe 44 to a stand pipe 43 whose lower portion forms an intake pipe and whose upper portion forms the discharge pipe. Check valves 43^a and 43^b are provided below and above the lateral connection 44 operating to hold the water either in the discharge portion of the pipe after it has been forced up therein or to hold the water in the upper portion of the intake pipe and the pump chamber. The steam generator is designated by the numeral 45. As shown, it is composed of a circular closed chamber the lower face of which is adapted to be supported above any suitable burner or heating means. The top of the chamber is provided with a central hub 45^a into which is threaded a pipe 46 which passes through the bottom of the chamber 42 and extends to its upper end. This pipe 46 forms at once the steam-conducting pipe by which steam is taken from the generator into the chamber and also forms the water-conducting pipe whereby water is supplied to the generator. The portion of the steam-conducting pipe that is within the chamber, is surrounded by an insulator tube 47 connected at its upper end to the upper end of the pipe as shown at 47^a, the lower end of the tube being secured to the bottom of the chamber and opening on the exterior thereof, the space between the tube and pipe thus being open to the outer air and forming an insulating space whereby the heat of the pipe 46 is not communicated to the water contained within the chamber. A condenser jet nozzle 48 opening from the discharge portion of the stand pipe 43, communicates with the lower portion of the chamber 42. The operation of this form of our invention is obvious. Assuming that the chamber 42 is filled with water and there is a certain amount of water within the generator 45, it will be seen that as steam is generated in 45, it will rise through the pipe 46, filling the upper portion of the chamber 42. The pressure of the steam will now force the water within the chamber 42 out through pipe 44, closing the valve 43^a, lifting the valve 43^b, and passing into the upper or discharge portion of the stand pipe. As the level of the water gets below the pipe 48, and the pressure in 42 becomes less than the pressure in the dis-

charge pipe, a jet of water will be discharged into the chamber 42, the steam therein being rapidly condensed not only by this jet, but by contact with the cold walls 47 of the insulating pipe. Immediately upon a condensation of the steam to a pressure less than the pressure of the water in the upper portion of the stand pipe, the valve 43^b will be closed. The vacuum now being present within the chamber, the water in the lower portion of the stand pipe will be drawn up and enter through pipe 44 into the pump chamber, and the operation before described will be repeated.

In Fig. 2 is shown a slightly modified construction from that shown in Fig. 1. In this figure 49 designates the pump chamber which is precisely the same as the pump chamber 42, and also is connected by the lateral connection 51 with a stand pipe 50, having the before described check valves. The difference between the construction shown in Fig. 2 and that shown in Fig. 1 consists in the steam and water-conducting pipe 53, being provided at its upper open end with a gravity valve 54 which will close when the valve sinks below the level of the top of the pipe 53, and more particularly in providing a water conductor 55 preferably in the form of a pipe which passes down through the center of the pipe 53 into the steam generator 52 and opens at 56 on the exterior wall of the pipe 53 at a point about two-thirds the height of the chamber 49. The operation of this form of our invention is practically the same as that shown in Fig. 1, save for the fact that water is supplied to the generator before the water has risen to the top of the pipe so that steam is generating while the water is rising within the chamber 49, and does not have to wait for its initial generation until the chamber is entirely filled.

In the form shown in Fig. 3, the construction of the pump chamber 60, the generator 61 and stand pipe 62 with its valves is precisely the same as before described for the construction shown in Fig. 1, the steam-conducting pipe 63 passing upward through an insulating pipe 64, which is open at the lower end to the atmosphere and closed at its upper end. The essential features of difference from that shown in Fig. 1 consists in the intake pipe 65 which instead of merely entering the lower end of the chamber as in Figs. 1 and 2, passes upward within the chamber for a certain distance, as for instance one-third of its height. Above this intake pipe is an open ended pipe 66 preferably of larger diameter than the pipe 65 and suitably supported from the walls of the chamber in any desired manner. The upper termination of this pipe may coincide with the upper termination of the pipe 63 and below these upper terminations, these

two pipes are connected by a lateral or connecting pipe 67 which passes into these pipes and has downwardly turned ends. In order to economize space so that the space occupied by the pipe 63 need not be too great we provide a conductor 68 of wire which passes downward centrally through the pipe 63 and connected at its upper end to the pipe 67 whereby all water passing through the pipe 67, will be conducted down the wire conductor into the steam generator. This wire conductor has exactly the same purpose as the conductor 55 shown in Fig. 2. I find in practice that it works quite as well as the tubular conductor, does not obstruct the upward flow of the steam and indeed acts to permit the down coming water to be properly vaporized even before it has reached the generator. The lower end of the pipe 66 is open as before stated, and the space between the upper end of the pipe 65 and the interior diameter of the pipe 66 is relatively small compared with the opening of the pipe 65 so that as the water in the intake portion of the stand pipe rushes into the chamber 60 upon the formation of a vacuum therein, the water will be forced up in the pipe 66, and will always be at a somewhat higher level within said pipe than within the surrounding chamber, thus the water will reach the connecting pipe 67 and will pass over to the conductor 68 where it will generate steam before the water within the chamber has risen to the level of the pipe 67. In other words, as soon as the water in the pipe 66 reaches the entrance to the pipe 67, a small portion enters into the heater and forms steam, the vacuum within the chamber 60 is thus immediately relieved and water ceases to come in through the pipe 65 and the water level in the pipe 66 drops to the same level as the water in the chamber, thus first preventing more water from flowing into the chamber and consequently providing that the water which has already passed into the heater shall continue to vaporize, producing a pressure which effectually forces the water out. The advantages of this over the construction shown in Fig. 2 is as follows. In the form shown in Fig. 2, the main body of water has to rise above the opening 56 before it is discharged into the heater and it continues to so discharge until steam enough is generated to force the water below the level of the opening 56. Now when water is discharged into the generator enough steam is formed almost instantly to relieve the vacuum within the chamber and to prevent therefore the inflow of water before it takes an increasingly longer time to force the water out against a head. In the arrangement shown in Fig. 3, the supply of water to the heater is automatically cut off and the supply is therefore intermittent.

It will be seen from the description above

given that our devices are extremely simple and may be made of ordinary pipe fittings at a very low cost. Because of the simplicity of the construction and the lack of any complicated parts, there is no danger of our devices getting out of order a most important provision in the case of apparatus designed for country houses and districts wherein the aid of skilled workmen is not easily procurable. The peculiar construction of our heater, the insulation of the steam conducting pipe, and the small size of the generator in comparison with the pump chamber all combine to allow a minimum of the heating surface to be used with a maximum of water supply.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art, without further description and it will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is:—

1. In a steam and vacuum pump, the combination with a pump chamber and intake and discharge pipes connected thereto and provided with upwardly opening check valves, of a steam generator located below the bottom of the pump chamber, a steam conducting pipe extending from the top of the steam generator through the bottom of the chamber and into the upper portion thereof and having its upper and lower ends communicating with the chamber and generator, respectively, and means located in the steam-conducting pipe for conducting water from the upper portion of the chamber into the generator.

2. In a steam and vacuum pump, the combination with a pump chamber and intake and discharge pipes connected thereto and provided with upwardly opening check valves, of a steam generator located below the same, an upstanding steam pipe connecting the chamber and generator and extending to the upper end of and communicating with the latter, and a water supply conductor for the generator extending longitudinally downward within the steam pipe and connected to the exterior thereof to conduct water in the chamber downward into the generator, the upper end of the conductor being arranged below the upper end of the steam pipe to receive water from the pump chamber before the latter reaches the top of the steam pipe.

3. In a steam and vacuum pump, the combination with a pump chamber and intake and discharge pipes connected therewith, of

a steam generator located below the same, a steam conducting pipe extending from the top of the generator through the bottom of the chamber and into the upper portion of the latter, a water conductor extending from the generator upwardly and centrally within said steam pipe, and an inlet tube extending through the wall of the steam pipe and having its inner end connected to said conductor for causing the water to flow down the conductor.

4. In a steam and vacuum pump, the combination with a pump chamber and intake and discharge pipes provided with check valves, said intake pipe being provided with a branch extending inwardly through the bottom of the chamber and then upwardly into the same, an upright tube supported within the chamber with its lower end contiguous to the upper end of the inlet pipe and immediately above and open to the same and to the chamber, the upper end of the tube being also open to the chamber, a steam generator located below the chamber, a steam conducting pipe extending from the generator through the bottom of the chamber and into the upper portion thereof, a transverse water conducting tube projecting from the interior of said steam pipe into the interior of the pipe supported above the water inlet pipe, and means for connecting the transverse tube to the generator.

5. In a steam and vacuum pump, the combination with a pump chamber and intake and discharge pipes provided with check valves, said intake pipe being provided with a branch extending inwardly through the bottom of the chamber and then upwardly into the same, of an open ended tube supported within the chamber with its lower end contiguous to the upper end of the inlet pipe and immediately above the same, a steam generator located below the chamber, a steam conducting pipe extending from the generator through the bottom of the chamber into the upper portion thereof, a transverse water conducting tube projecting from the interior of said steam pipe into the interior of the pipe supported above the water inlet pipe, and a water conducting wire disposed in the first-mentioned tube and extending from the last-mentioned tube to said generator.

6. In a steam and vacuum pump, the combination of a pump chamber, a generator for conducting steam thereto, an inlet pipe for supplying water to the chamber, an open-ended vertically-disposed tube in the generator arranged directly over the discharge end of the inlet pipe for causing the water to rise more rapidly in the said tube than in the chamber, and means for conducting water from the top of the column of water in the said tube to the generator.

7. In a steam and vacuum pump, the com-

5 bination with a pump chamber, a steam
generator, a pipe adapted to conduct the
steam from the generator to the chamber
intermittently, an inlet pipe leading into the
10 chamber, an open-ended tube in the chamber
arranged in such coöperative relation with
the inlet pipe that water is adapted to flow
both into the pump chamber and tube simul-
taneously and rises to a higher level in the
15 tube, and means for conducting water solely
from the tube to the generator when the wa-
ter reaches a certain level in the tube.

8. In a steam and vacuum pump, the com-
bination of a pump chamber, a steam gen-
15 erator connected therewith, a pipe through
which water is adapted to enter the cham-

ber, a feed tube in the chamber for segre-
gating a portion of the water in the cham-
ber from the main body of water and caus-
ing such segregated water to reach a higher 20
level in a given time than the water in the
chamber, and means for conducting water
from the said tube when the water therein
reaches a certain level.

In testimony, that we claim the forego- 25
ing as our own, we have hereto affixed our
signatures in the presence of two witnesses.

ROBERT E. CECIL.

CLIFFORD R. WASSELL.

Witnesses:

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H. J. SAMUELIAN.