

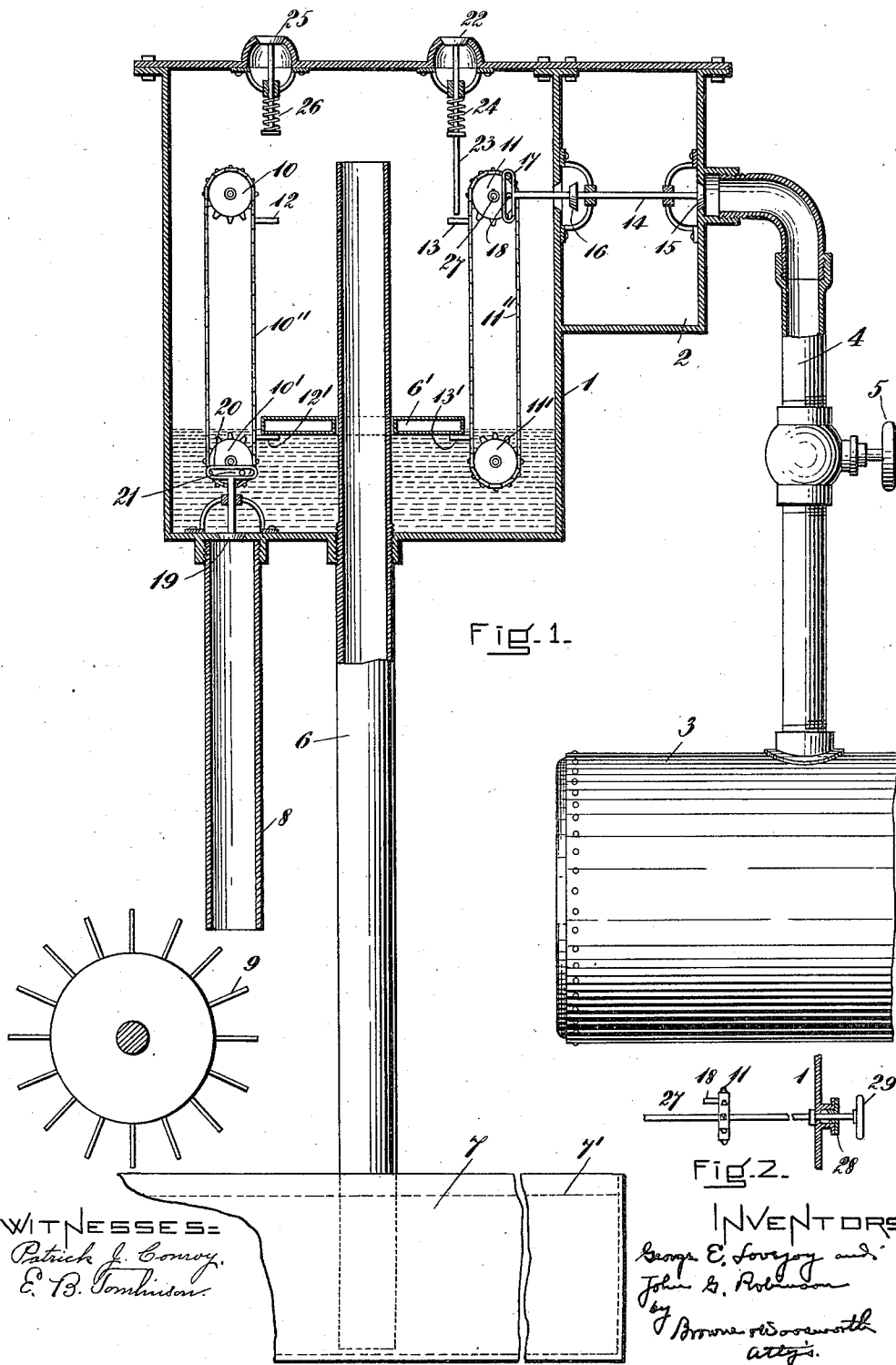
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STEAM VACUUM PUMP.

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UNITED STATES PATENT OFFICE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, GEORGE E. LOVEJOY and JOHN G. ROBINSON, citizens of the United States, and residents, respectively, of Boston, in the county of Suffolk, and of Melrose, in the county of Middlesex, State of Massachusetts, have invented a new and useful Improvement in Steam Vacuum-Pumps, of which the following is a specification.

Our invention relates to steam vacuum pumps whereby liquid is raised from a lower to a higher level by atmospheric pressure acting against a vacuum created by the condensation of steam, and our object is to improve the construction and increase the efficiency of such pumps in the manner hereinafter set forth.

The principle of our invention will be explained by the drawings which accompany and form a part of this application.

In the drawings, Figure 1 is an elevation partly in section of one embodiment of our invention and Fig. 2 is an elevation showing a detail of construction.

In the particular drawings selected for more fully disclosing our invention, 1 is a tank provided with a steam chamber 2 and the latter is suitably connected with a boiler 3 by means of the pipe 4 which in the present instance is provided with a valve 5. The tank 1 is located at a suitable height above the tank 7 and is connected with the latter by a vertical pipe 6, which as shown, projects upwardly into the tank 1 and terminates at or near the bottom of the lower tank 7. An outlet pipe 8 is suitably secured to the upper tank and when the device is employed for generating power, the lower end of said outlet pipe is so located as to direct a stream of water against a suitable energy-translating device herein shown as a water-wheel or turbine 9. A float 6', preferably of considerable weight, and in such case made hollow to have the requisite buoyancy, surrounds the upwardly extending end of the pipe 6, the hole in the center of the float being sufficiently large to permit the float to travel along said pipe as the water level in the tank is varied without undue friction.

10, 10' are sprocket wheels located within the upper tank and arranged to turn about horizontal axles. The sprockets are connected by a chain 10'' provided with lugs or strikers 12 12'. A similarly constructed

wheel 11 is keyed to the horizontal shaft 27 and is connected by the chain 11'' with the lower sprocket 11'. The chain 11'' is provided with lugs 13, 13'. The horizontal valve stem 14 is provided with two oppositely directed valves 15, 16 and terminates in the cross-head 17, which coöperates with the pin 18 on the sprocket 11. Communication between the upper tank and the pipe 8 normally is closed by the valve 19, the stem of which is connected with the sprocket 10' by the crosshead 20 and pin 21. It will be understood, however, that any suitable means may be employed for operatively connecting the valve stem 14 and the stem of the valve 19 with the sprockets 11 and 10' respectively, so that by the rotation of said sprockets the position of said valves may be controlled.

22 is a valve located preferably on the top of the tank and normally closed by the spring 24 surrounding the valve stem 23, the lower end of which is arranged in the path of the striker 13. As shown, another valve 25 normally closed by the spring 26 is secured to the tank. The horizontal axle 27 to which the sprocket 11 is keyed is shown as extending through a stuffing box placed in one wall of the upper tank and terminating in the hand-grip 29, so that by the manipulation of the latter the sprocket 11 may be rotated and the valves 15, 16 opened and closed at will.

The operation is as follows: The valve 5 is opened and the sprocket 11 rotated manually thereby closing valve 16 and opening valve 17 and bringing the striker 13 in contact with the lower end of the valve stem 23. The chamber 2 is now in communication with the boiler or source of steam supply and by turning the grip 29 in the opposite direction so as to move the valve stem 14 to the right, the valve 15 is closed, the valve 16 opened and the pin 18 placed in line with the center of the axle 27 and the horizontal axis of the rod 14, in other words, on a "dead center," so that the pressure of the steam from the boiler on the valve 15 will have no effect in changing the position of the valves 15, 16. The charge of steam in the chamber 2 being now admitted to the tank 1 expands and opens the valve 22, or the valve 25, if the latter be employed, drives the air out of the tank and eventually condenses, thereby forming a vacuum. The

atmospheric pressure acting on the water in the tank 7, said tank being open and the water level indicated by the dotted line 7', drives the water from the lower tank through the pipe 6 into the upper tank, whereupon the float begins to rise until it comes in contact with the strikers 12 and 13. The impact of the float against the striker 12 causes the sprocket 10' to rotate in a counter clockwise direction and open the valve 19 through the pin and cross-head connection 20, 21. The impact of the float against the striker 13 causes the sprocket 11 to rotate in a clockwise direction thereby closing the valve 16 and opening the valve 15, and practically simultaneously with the movement of said valves, the striker raises the stem 23 and opens the valve 22. When the valve 22 is opened the vacuum in the tank 1 is destroyed and the water contents thereof flow out through the pipe 8 for whatsoever purpose may be desired, such for example, as the operation of the water turbine 9. The valve 16 being now closed and the valve 15 open, the pressure of the steam from the boiler 3 against the valve 16 maintains the latter in its closed position and this serves to maintain the striker 13 in contact with the valve stem 23 for the purpose of keeping the valve 22 open against the tension of the spring 24.

When the water in the tank 1 has reached its desired lower level, the float coöperates with the strikers 12' and 13', thereby closing the valve 19 by rotating the sprocket 10' in a clockwise direction and closes and opens the valves 15, 16, respectively, by rotating the sprocket 11 in a counter clockwise direction. A second charge of steam from the chamber 2 is now admitted to the tank 1 and the cycle is repeated automatically without further necessity for manipulating the handle 29.

It will be understood that while we have described in detail one arrangement of apparatus for effecting the object above set forth, various other apparatus may be devised by those skilled in the art that will accomplish the same result in substantially the same manner. Accordingly we do not limit ourselves to the apparatus which we have shown and described in detail for the purpose of more completely explaining the nature of our invention.

We claim:

1. In a steam vacuum pump, a tank, a steam chamber connected thereto, a source of steam supply connected to said steam chamber, and means for closing the connection between said steam chamber and tank and simultaneously opening the connection between said steam chamber and source, and vice versa.

2. In a steam vacuum pump, a tank, a steam chamber connected thereto, a source

of steam supply connected to said steam chamber, and automatic means for closing the connection between said steam chamber and tank and simultaneously opening the connection between said steam chamber and source, and vice versa.

3. In a steam vacuum pump, a tank arranged to hold liquid, a steam chamber connected thereto, a source of steam supply connected to said steam chamber, and means operated by the liquid in said tank for closing the connection between said steam chamber and tank and simultaneously opening the connection between said steam chamber and source, and vice versa.

4. In a steam vacuum pump, a tank, a steam chamber connected thereto, a source of steam supply connected to said steam chamber, automatic means for closing the connection between said steam chamber and tank and simultaneously opening the connection between said steam chamber and source, and vice versa, and manually operated means for initially operating said automatic means.

5. In a steam vacuum pump, a tank arranged to hold liquid, a steam chamber connected thereto, a source of steam supply connected to said steam chamber, means operated by the liquid in said tank for closing the connection between said steam chamber and tank and simultaneously opening the connection between said steam chamber and source, and vice versa, and manually-operated means for initially operating the liquid-operated means.

6. In a steam vacuum pump, an upper tank, a lower tank, a pipe connecting said tanks and projecting upwardly into the upper tank, a steam chamber connected to said upper tank, a source of steam supply connected to said steam chamber, and means for closing the connection between said steam chamber and tank and simultaneously opening the connection between said steam chamber and source, and vice versa.

7. In a steam vacuum pump, an upper tank, a lower tank, a pipe connecting said tanks and projecting upwardly into the upper tank, a steam chamber connected to said upper tank, and automatic means for closing the connection between said steam chamber and tank and simultaneously opening the connection between said steam chamber and source, and vice versa.

8. In a steam vacuum pump, an upper tank and a lower tank, both arranged to hold liquid, a pipe connecting said tanks and projecting upwardly into the upper tank, a steam chamber connected to said upper tank, a source of steam supply connected to said steam chamber, and means operated by the liquid in said upper tank for closing the connection between the steam chamber and the upper tank and simultaneously opening the

connection between said steam chamber and source of steam supply, and vice versa.

9. In a steam vacuum pump, an upper tank, a lower tank, means for creating a vacuum in said upper tank whereby a liquid may be raised from said lower tank to said upper tank and means controlled by the liquid in said upper tank for emptying said tank of its liquid contents.

10. In a steam vacuum pump, an upper tank, a lower tank, means for creating a vacuum in said upper tank whereby a liquid may be raised from said lower tank to said upper tank, and two valves controlled by the heights of the liquid in said upper tank, one of said valves being arranged to destroy the vacuum and the other to permit the said tank to be emptied of its liquid contents.

11. In a steam vacuum pump, a tank, a source of steam supply, a steam chamber in-

terposed between said tank and supply and automatic means for intermittently putting said steam chamber into communication alternately with said source and said tank.

12. In a steam vacuum pump, a tank arranged to hold liquid, a steam chamber connected thereto, a source of steam supply connected to said steam chamber, means for intermittently connecting said steam chamber alternately with said source and said tank, said means being controlled by the liquid in said tank.

In testimony whereof, we have hereunto subscribed our names this 15th day of Feb., 1912.

GEORGE E. LOVEJOY.
JOHN G. ROBINSON.

Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."