C. ROGERS.

Steam Vacuum-Pumps.

No. 212,267. Patented Feb. 11, 1879.

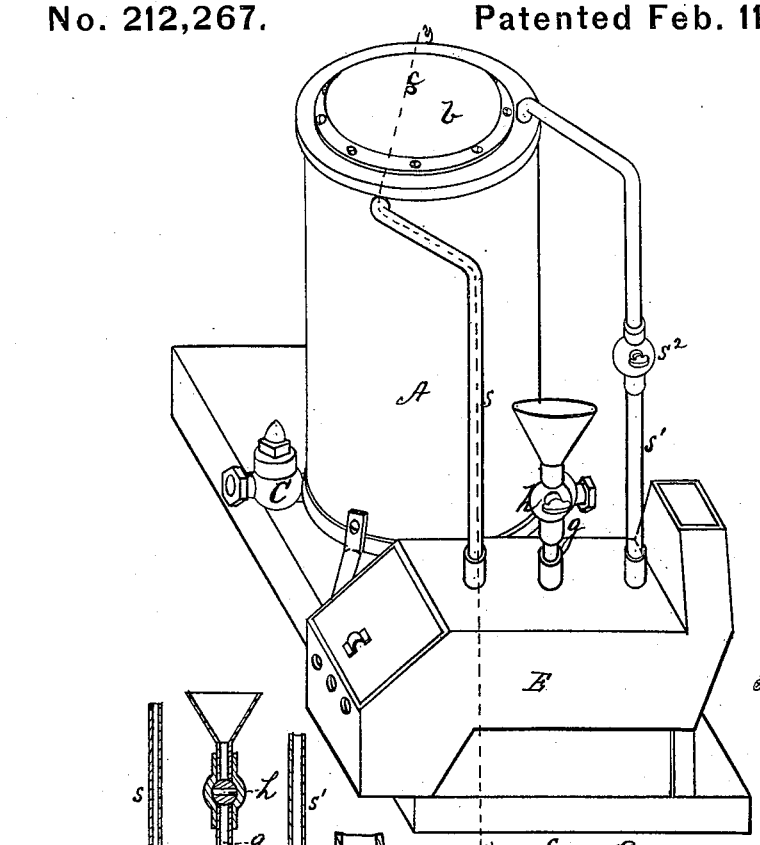

Fig. 1.

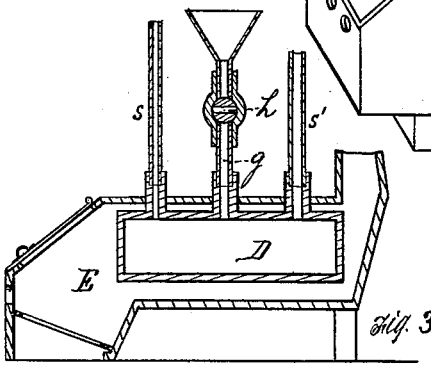

Fig. 3

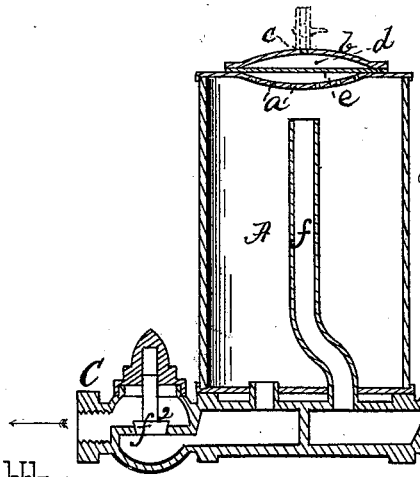

Fig. 2.

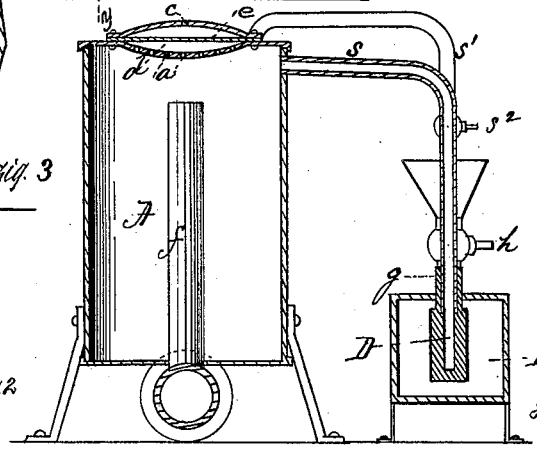

Fig. 4

Witnesses.

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UNITED STATES PATENT OFFICE.

CHARLES ROGERS, OF ALLEGHENY, PENNSYLVANIA.

IMPROVEMENT IN STEAM-VACUUM PUMPS.

Specification forming part of Letters Patent No. **212,267**, dated February 11, 1879; application filed December 9, 1878.

To all whom it may concern:

Be it known that I, CHARLES ROGERS, of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Steam-Vacuum Water-Elevators or Pulsometers; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a perspective view of devices embodying my invention. Fig. 2 is a vertical section of the vacuum-chamber and its connections. Fig. 3 is a vertical longitudinal section of the boiler and its connections; and Fig. 4 is a vertical section of the vacuum-chamber, boiler, and connecting pipe on the line *y y* of Fig. 1.

Like letters refer to like parts wherever they occur.

My invention relates to the construction and operation of pulsometers or steam-vacuum water-elevators; and consists, primarily, in supplying the boiler or steam-generator with water from the vacuum-chamber in such quantity and only at the instant the supply is required for generating the steam; secondarily, in the means therefor—viz., one or more non-valved or unobstructed pipes or passages connecting the upper part of the vacuum-chamber and the boiler or steam-generator, which conduit or conduits serve alternately for the passage of water-supply from and steam to the condenser or vacuum-chamber; and, finally, in specific constructions and arrangement of the devices hereinafter more fully set forth.

The object of my invention is, first, to dispense with the objectionable valve system, and, secondly, to simplify the devices.

I will now proceed to describe my invention, so that others skilled in the art to which it appertains may apply the same.

In the drawings, A indicates the vacuum-chamber, perforated above, as at *a*, and closed by a cap, *b*, having one or more small perforations, *c*. The chamber *d*, formed between the perforated top of the vacuum-chamber and the cap, is divided by a rubber or equivalent septum or diaphragm, *e*, thus forming a cushion to counteract the surging of the water as it rushes into the vacuum-chamber A. B indicates an induction or supply pipe, which extends up into the vacuum-chamber, as at *f*, and is provided with a suitable valve, f^1, which opens toward the vacuum-chamber; and C indicates the discharge or eduction pipe, which leads to the point of delivery, and is provided with a valve, f^2, opening from the vacuum-chamber.

D represents a boiler or steam-generator, set in a suitable hot chamber or furnace, E, and connected directly with the vacuum-chamber at or near the top by a steam-pipe, *s*, said pipe being devoid of valve. This single connection between the boiler and vacuum-chamber is all that is absolutely required to make the devices operative and effective; but in order to be able to increase the steam-pressure in the vacuum-chamber at will, or when it may be desirable, I connect the boiler and vacuum-chamber by a second pipe, s^1, providing the same with a stop-cock, s^2, whereby the latter pipe may be partially or entirely closed at will. *g* indicates a priming-tube, arranged at any suitable point on the boiler or steam-generator D, and provided with a stop-cock, *h*, said tube being employed to fill the boiler D when the devices are to be started.

The operation of my devices is as follows: Fire having been started in the furnace E, and the steam-generator or boiler D properly heated, the generator is filled with water through the priming-tube *g* and the cock *h* turned to close the tube. The entire amount of water in the boiler D being converted or flashed into steam will pass by pipe *s* (or s^1, or both) to the vacuum-chamber A, driving out the air therein, when the steam will condense, producing a vacuum, which causes the chamber A to at once fill with water, which enters through induction or supply pipe B *f*, filling said chamber, and overflowing by pipe *s* into the boiler D. The water thus overflowing into boiler D is converted into steam, and rushing back through pipe *s* exerts pressure on the water in the vacuum-chamber A, forcing it therefrom through the eduction-pipe C, when the condensation of the steam in chamber A takes place and the operations specified are repeated. If at any time more steam is desired than will be flashed in the boiler and pass by pipe *s* to the vacuum-chamber, then the cock s^2 in pipe s^1 may be partially or en-

tirely opened, and the generator D allowed to receive its charge of water and discharge its steam into the chamber A through both pipes. In this latter case, however, I prefer to manipulate the cock s^2 so as to reduce the orifice of pipe s^1 as soon as steam is discovered escaping from the vacuum-chamber.

Whenever a vacuum is formed in the vacuum-chamber the air entering through perforation *c* in the cap acts on the diaphragm, depressing the same and permitting the chamber *d* to fill with air, so that when the water rushes in to fill the vacuum-chamber A the air will escape slowly from *d* through perforation *e*, forming an effective cushion to resist and counteract the shock. If desired, a tube and cock (indicated in dotted line, Fig. 2) may be used, and the size of port *c* regulated.

I have found that excellent results may be attained if the following proportions between the parts exist: vacuum-chamber, ten gallons; boiler having about two hundred and fifty square inches of heating-surface; and I have employed a boiler two (2) feet long, eight (8) inches deep, and two (2) inches thick; cavity one-half ($\frac{1}{2}$) inch wide, shell three-fourths ($\frac{3}{4}$) of an inch thick, the whole boiler being cast-iron. The boiler may be "cast-steel casting;" but I do not intend or expect to limit myself thereto, nor to any specific size or relative proportion of the several parts, nor to any specific construction of the vacuum-chamber or boiler, the details herein given being simply used to illustrate and explain the principle involved.

In case very great pressure is required in the vacuum-chamber, the number of boilers and connecting-pipes may be increased.

Having thus described the nature and advantages of my invention, what I claim, and desire to secure by Letters Patent, is—

1. The method herein described for operating pulsometers, the same consisting in supplying the boiler with water from the vacuum-chamber in the required quantity and at the instant the steam is to be generated, substantially as specified.

2. The combination, in a pulsometer, of a vacuum-chamber and a steam-generator or boiler, connected by one or more unobstructed passages or pipes, which are adapted to act alternately as feed-water and steam passages, substantially as and for the purpose specified.

3. The combination, in a pulsometer, of a vacuum-chamber and a boiler or steam-generator, connected by one or more unobstructed and one or more valved pipes, substantially as and for the purpose specified.

4. The combination of a vacuum-chamber, a boiler or steam-generator, one or more unobstructed passages or pipes connecting the same, and a priming-tube for preliminarily charging the boiler, substantially as and for the purpose specified.

5. An air-cushion for the vacuum-chamber of a pulsometer, consisting of a chamber divided into two distinct compartments by a flexible diaphragm, one of said compartments communicating with the vacuum-chamber and the other communicating with the external air by a port or ports, substantially as specified.

In testimony whereof I, the said CHARLES ROGERS, have hereunto set my hand.

CHAS. ROGERS.

Witnesses:
R. H. WHITTLESEY,
F. W. RITTER, Jr.