

(No Model.)

2 Sheets—Sheet 1.

E. LUND, Jr.
PULSOMETER.

No. 443,532.

Patented Dec. 30, 1890.

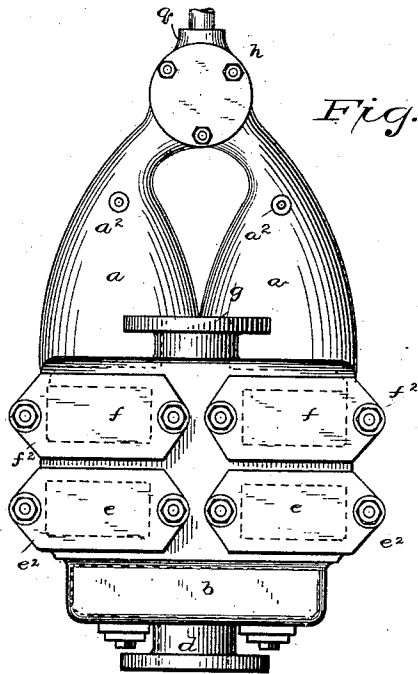


Fig. 1.

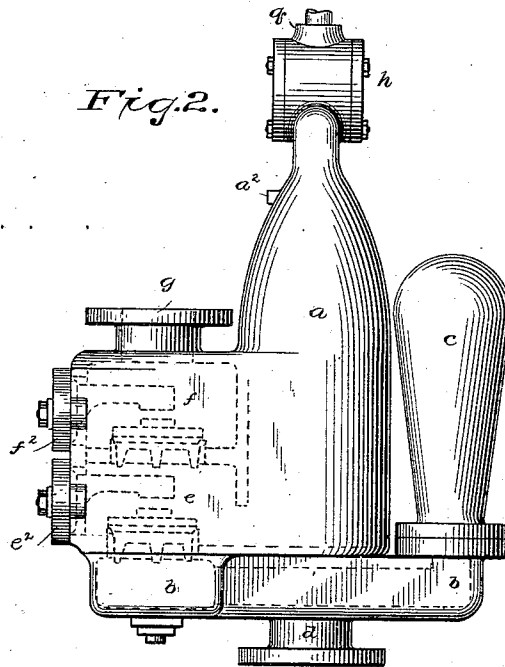


Fig. 2.

Fig. 3.

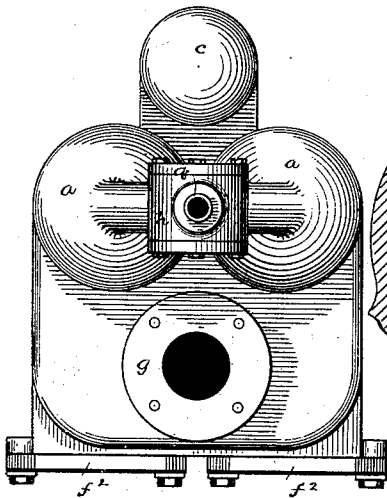


Fig. 4.

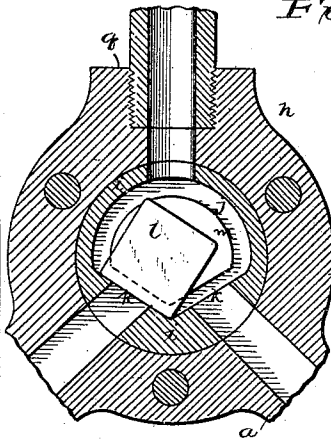


Fig. 5.

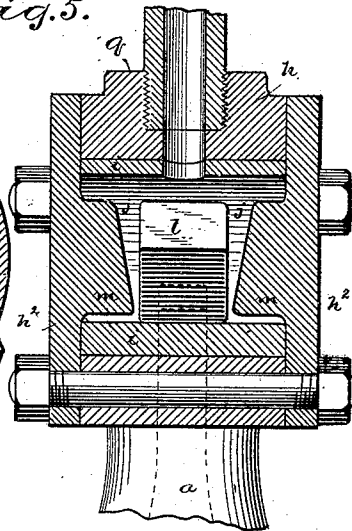
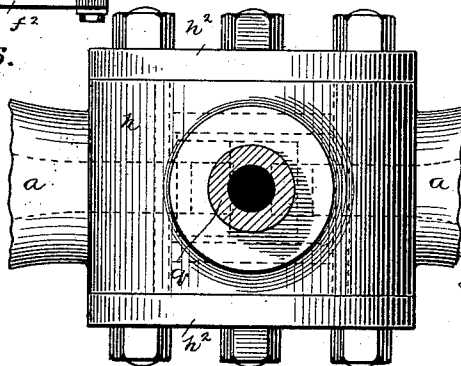


Fig. 6.



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Fig. 7.

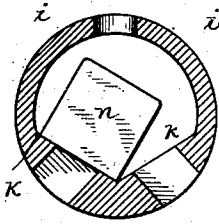


Fig. 8.

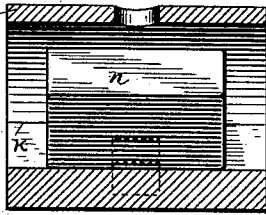


Fig. 9.

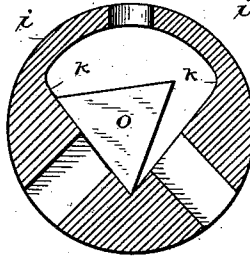


Fig. 10.

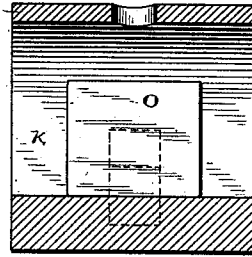


Fig. 11.

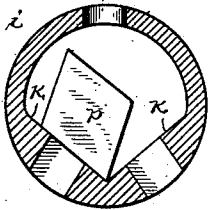


Fig. 12.

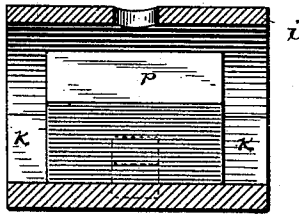


Fig. 13.

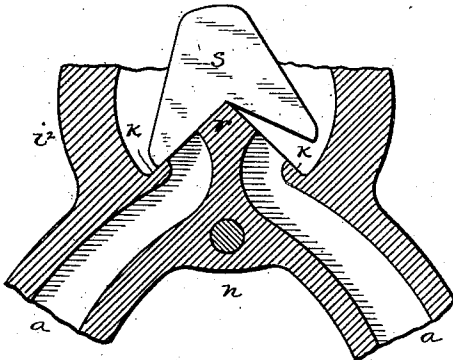


Fig. 14.

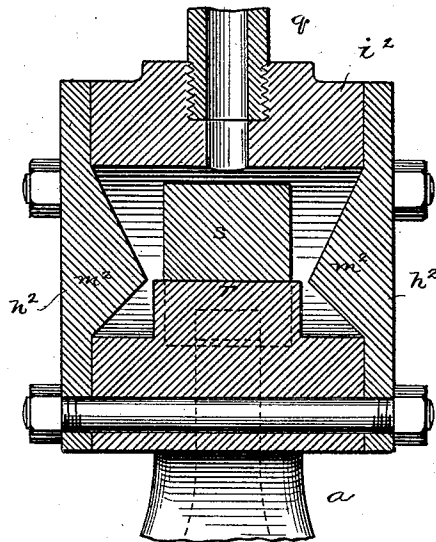


Fig. 15.

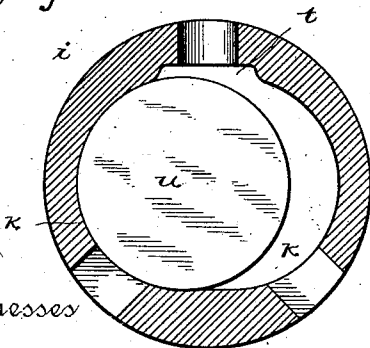
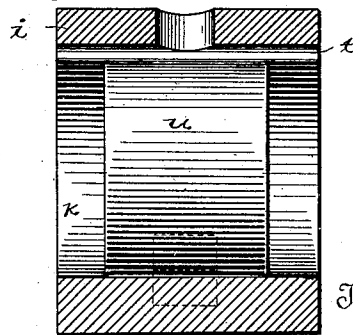


Fig. 16.



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UNITED STATES PATENT OFFICE.

EDWARD LUND, JR., OF STRETFORD, ENGLAND.

PULSOMETER.

SPECIFICATION forming part of Letters Patent No. 443,532, dated December 30, 1890.

Application filed October 22, 1888. Serial No. 288,777. (No model.) Patented in England March 9, 1888, No. 3,656.

To all whom it may concern:

Be it known that I, EDWARD LUND, Jr., a subject of the Queen of Great Britain and Ireland, and a resident of Stretford, in the county of Lancaster, England, have invented a new and useful Improvement in Pulsometers, (patented in Great Britain and Ireland by Letters Patent No. 3,656, dated March 9, 1888,) of which the following is a specification.

This invention relates to improvements in that class of double-chambered apparatus employed for pumping liquids known as "pulsometers."

My invention consists in certain novel features of construction, hereinafter set forth and claimed, whereby a tilting steam-inlet valve is pivoted and kept in place on its seats, so as to be free from friction, without the aid of delicate parts. The valve-seats may be adjusted or readjusted with reference to the center of gravity of the valve in its respective positions, so as to keep the valve sensitive, and at the same time the valve is more solidly supported in its respective positions than heretofore, and in a preferred form it is provided with two or more sets of valve-faces which can be used successively.

Two sheets of drawings accompany this specification as part thereof.

Figure 1 of the drawings is a front view, Fig. 2 a side view, and Fig. 3 a top view, of a pulsometer constructed in accordance with this invention. Fig. 4 is a front sectional view, Fig. 5 a side sectional view, and Fig. 6 a top view, on a larger scale, of the upper part of the same pulsometer, comprising the improved steam-inlet chamber, valve, and valve-casing. Figs. 7 and 8 are front and side sectional views of a modified valve and valve-casing. Figs. 9 and 10 are like views of another modified valve and valve-casing. Figs. 11 and 12 are like views of another modified valve and valve-casing. Figs. 13 and 14 are front and side sectional views of the upper part of another pulsometer, illustrating additional modifications; and Figs. 15 and 16 are like views of another modified valve and valve-casing.

Like letters of reference indicate corresponding parts in the several figures.

The complete pulsometer (represented by

Figs. 1, 2, and 3) comprises the customary pair of hollow bottle-shaped bodies *a a*, containing the main chambers of the apparatus. These parts are united by and with a hollow base *b*, which communicates at the back with the air-chamber *c*, at bottom with the water-inlet neck *d*, and at the front with inlet-valve chambers *e*. The outlet-valve chambers *f* are located immediately above the inlet-valve chambers at the front of the apparatus, and communicate at top with the water-outlet neck *g*. The valve-chambers *e f* are conveniently located for obtaining access to the valves therein and are provided in front with separate bonnets *e² f²*, so that any one of the valves may be readily exposed. These water-valves may be of any of the usual descriptions and form no part of the present invention.

The upper or neck ends of the bodies *a a* are provided in front with air-vents *a² a²* of any approved make, and above these they converge to the outer shell *h* of my improved steam-valve casing *i*. Said shell *h* is preferably in the form of a small horizontal cylinder integral with the main casting, having a vertical steam-inlet neck *g* at top and closed at both ends, together with the casing *i*, by removable end plates *h² h²*, which are held in place by through-bolts. Said casing *i* is conveniently a true cylinder externally, so as to be fitted to the shell *h* by lathe-turning and boring operations, and so as to be turned on its axis to adjust the valve-seats with reference to the center of gravity of the valve in its respective positions, as aforesaid. Ports are formed therein, so as to coincide with the upper ends of the main chambers and with the steam-inlet, as shown. Its chamber *j* is open from end to end, and is provided at bottom with a pair of valve-seats *k k*, pierced by said ports, which communicate with the respective main chambers. These valve-seats *k* and my improved steam-valve *l* common thereto are so formed that the valve tilts freely from one to the other as the vacuum is formed in the corresponding main chamber. This is preferably affected by making the valve-seats flat and at an obtuse angle with reference to each other, and by making the valve rectangular, as shown in Fig. 4, the lower angle of the valve occupying the concave angle of seat-in-

tersection as a fulcrum. The rectangular shape of the valve adapts it to be turned, so as to occupy different positions as its respective angles become worn, and by making it cubical, as represented in Figs. 4 and 5, the possible changes are increased in number to eight.

Sloping projections $m m$ on the respective end plates h^2 keep the cubical valve in place on the valve-seats without appreciable friction, their contracted points of contact with the valve being located adjacent to its said fulcrum, and thus adjacent to the valve's center of motion.

In the modification represented by Figs. 7 and 8 an oblong rectangular valve n is employed, which may dispense with said projections m , and provides for endwise adjustment in connection with four angular changes of position.

In the modification represented by Figs. 9 and 10 a valve o is employed in the form of an equilateral triangle, which provides for three angular changes and renders the valve somewhat more sensitive.

In the modification illustrated by Figs. 11 and 12 a still more sensitive valve p is constructed of rhomb shape in cross-section, with two pairs of faces and two acute angles for successive use.

In the modifications illustrated by Figs. 13 and 14 the valve-seats $k k$ are formed on an angular projection r , and the valve s , having a single re-entrant angle, straddles the projection and oscillates upon its apex. These figures also represent a valve-casing i^2 , made integral with the bodies $a a$, instead of in the shape of a lining or bush, also conical projections $m^2 m^2$ on the end plate h^2 in place of sloping projections, to keep the valve in place without appreciable friction. In common with said sloping projections these conical projections are so beveled as to locate a contracted point of contact near the fulcrum at each end of the tilting valve.

In the modification illustrated by Figs. 15 and 16 the valve-casing is constructed with a chamber t , forming concave curvilinear seats $k k$, and the valve u , fitted to said seats, is cylindrical in shape, with the same tilting or oscillating motion, however, and capable of being adjusted when worn by turning it on its axis, and also adjustable lengthwise, if desired.

It will be understood that in all the several modifications, as well as in the arrangement first described, the set or inclination of the valve-seats must be so formed or adjusted at such an angle that the valve will tilt or oscillate freely from one seat to the other, leaving the steam-port in the vacant seat fully opened for the admission of steam to the corresponding main chamber, and that the valve shall be so shifted automatically by the alternate pulsating action in the respective main chambers. Access is had to said valve and valve-seats by removing either or both of the end

plates $d^2 d^2$ and the valve may then be readily cleaned, turned, or adjusted and the seats cleaned or fitted by filing them, with very little interruption of the work of the apparatus; or the valve-casing in the preferred species may be removed bodily from its shell, if required, and another inserted in its place without much loss of time; or said valve-casing, being cylindrical, may be turned on its axis so as to adjust or readjust the valve-seats with reference to the center of gravity of the valve in its respective positions, in order that the tilting valve shall be evenly and exactly self-balanced when midway between its seats.

Having thus described my said improvements in pulsometers and several modifications thereof, I claim as my invention and desire to patent under this specification—

1. A pulsometer having its steam-inlet chamber provided at bottom with valve-seats at a more or less obtuse angle and a fulcrum between them, a removable tilting valve superposed upon said fulcrum, and removable end plates having beveled projections forming contracted contact-points at the respective ends of the valve adjacent to said fulcrum, substantially as hereinbefore specified.

2. In a pulsometer, the combination, with a tilting steam-inlet valve, of a movable valve-casing in the form of a hollow horizontal cylinder provided internally at bottom with longitudinal valve-seats and a fulcrum between them upon which said valve is superposed, a relatively-fixed shell surrounding said casing, and removable end plates closing the ends of said shell, substantially as hereinbefore specified, whereby said valve-seats may be adjusted relatively to the center of gravity of the valve in its respective positions by turning said casing on its axis.

3. The combination, in the steam-inlet chamber, of a pair of flat oppositely-inclined valve-seats adjoining each other at a re-entrant angle, and a superposed tilting valve which is angular in cross-section and forms at two or more of its angles pivotal edges having valve-faces on the respective sides thereof, substantially as hereinbefore specified, whereby the valve is adapted to be used successively in different angular positions to utilize such pivotal edges respectively.

4. A cubical tilting valve forming pivotal edges by all of its angles with valve-faces on the respective sides of each pivotal edge, in combination with a pair of oppositely-inclined valve-seats adjoining each other at an obtuse re-entrant angle which constitutes the fulcrum of the valve, substantially as hereinbefore specified, for the purpose set forth.

In testimony whereof I affix my signature to the foregoing specification.

EDWARD LUND, JR.

Witnesses:

JOHN G. WILSON,
WALTER GUNN.