(No Model.)

S. W. HEMPSTED.

OSCILLATING STEAM ENGINE.

No. 346,996. Patented Aug. 10, 1886.

Fig. 1.

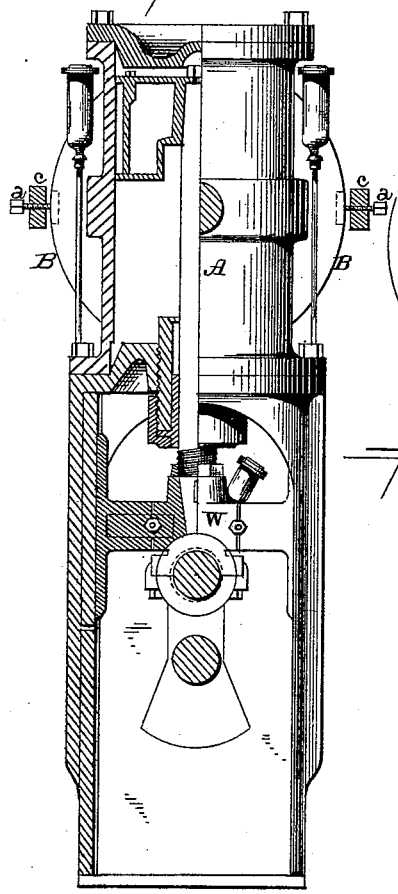


Fig. 2.

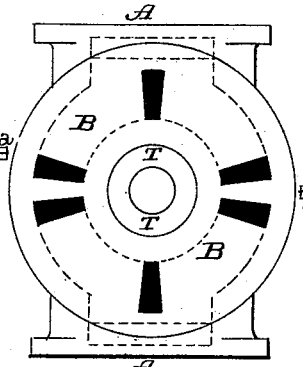


Fig. 3.

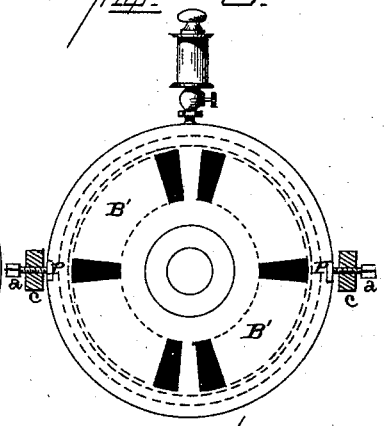


Fig. 4.

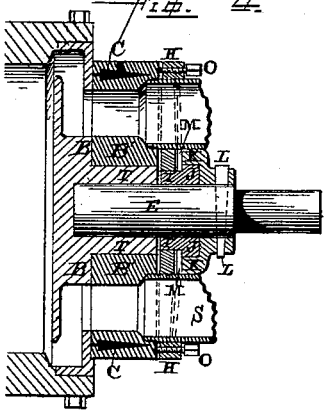


Fig. 5.

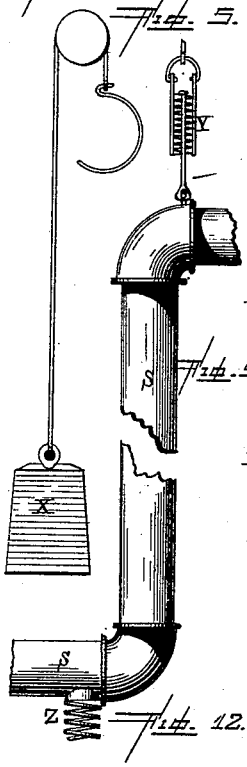


Fig. 6.

Fig. 7.

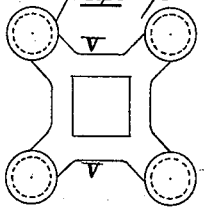


Fig. X.

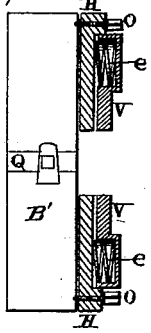


Fig. 9.

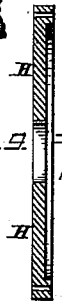


Fig. 10.

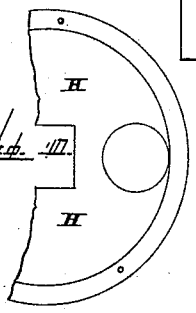


Fig. 11.

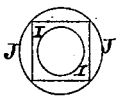


Fig. 13.

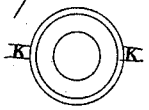


Fig. 14.

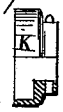


Fig. 12.

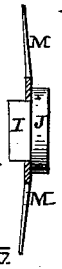
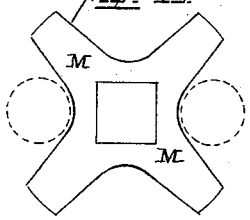


Fig. 15.



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A. S. Pattison

Inventor.
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per
F. A. Lehmann,
Atty.

UNITED STATES PATENT OFFICE.

SAMUEL W. HEMPSTED, OF COLUMBUS, OHIO.

OSCILLATING STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 346,996, dated August 10, 1886.

Application filed December 15, 1885. Serial No. 185,710. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL W. HEMPSTED, of Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Oscillating Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to an improvement in oscillating steam-engines; and it consists in, first, a variable self-adjusting steam-chest of an oscillating engine, having an oil-chamber inside it and provided with perforations connected with this chamber, so as to distribute the oil directly to the parts to be lubricated; second, the combination, with a valve and steam-chest of an oscillating engine, of a self-adjusting automatic spring-balance, for the purpose of keeping the valve and chest on their seat, and thus allow them to accommodate themselves to the variable pressure of the steam and load; third, the combination, with the valve and steam-chest of an oscillating engine, of slots or ways provided with slides working in the slots or ways and held in position by set-screws, for the purpose of allowing the steam-chest and valve a free movement in any direction except to oscillate with cylinder; fourth, the combination, with a steam-chest and valve of an oscillating engine, of counter-weights or springs for the purpose of relieving the valve of the weight and rigidity of the inlet and exhaust pipes attached thereto.

Figure 1 is a side elevation of an oscillating engine embodying my invention, and partly in section. Figs. 2, 3, and 4 are detail views of the bearing-surface of the cylinder valve-seat, steam-chest, and valve. Figs. 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, and 15 are detail views of different parts.

A represents the steam-cylinder, which has the valve-seat B, in the usual manner. This valve-seat is made circular, as shown in Fig. 2, and through it, into the cylinder, are made two or more steam-inlets and two or more exhaust-ports, in contradistinction to a single inlet and a single outlet, as heretofore used. These ports or openings of the cylinder are independent openings, which are auxiliary to the single inlet and outlet ports heretofore used, and thus afford additional inlet and outlet capacity for the steam. By this construction the greatest initial force and effectiveness is given to the steam in performing its work and discharging itself in engines of the oscillating type.

Oscillating engines receive their valve motion from the swing of the cylinder, and, having neither lap nor lead, it has been found impossible to secure with a single inlet and a single exhaust, operating alternately with each other, an opening in sufficient practical proportion to the piston-area. The consequence has always been that the steam would be cramped both in entering and leaving the cylinder, instead of entering and discharging freely, as is the case where more than one inlet and outlet ports are used.

The combined valve and steam-chest B′ is centered or pivoted on the boss T, which forms the seat of the trunnion E. In this combined steam-chest and valve are openings or ports corresponding in number and area to those in the valve-seat of cylinder. This combined steam-chest and valve is applied to and rests on the valve-seat of the cylinder, as shown in Fig. 4. In this steam-chest valve is formed an internal circular oil-chamber, C, and which chamber has a series of small openings or ducts connected with it, to conduct and deliver the oil from this chamber C through the small openings direct to such points and places between valve and valve-seat as require lubrication, and also to points that are inaccessible to throttle or steam oiling. This oil-chamber C is entirely independent of the steam-oiling lubrications generally used. Into this combined chest and valve are made openings to receive the steam and exhaust pipes, as shown in Fig. 4.

Directly behind the steam-chest B′ is a circular plate, H, which has a square opening through its center, and which plate is preferably of the same diameter as the steam-chest. Through this square opening, which is made in the center of this plate H, is passed a square sleeve, I, upon which is formed a shoulder, J, which fits in the socket K, which socket is fastened to the trunnion E by means of a pin, L.

In between the shoulder J of the sleeve I and the plate H is placed the spring M, which has a square opening through its center for the square sleeve I to pass through, and is provided with a suitable number of prongs or bearing-points, the extreme ends of which rest on the outer face of the plate H.

In large engines, where a great pressure of steam is to be overcome, a spider, V, will be used, and which has a socket in the end of each of its prongs, and in which sockets short stiff coiled springs *e* will be placed, so as to bear against the outer face of the plate H.

The pressure of the spring M or the springs in the spider V is regulated by means of the set-screws O, which pass through the outer edges of the plate H and bear against the outer face of the steam-chest. As the steam reacts against the piston, the spring M receives the pressure of the steam-chest, and thus forms a spring-balance, which is self-regulating, for the valve and steam-chest. After the screws O are once adjusted to the maximum boiler pressure or load no further attention is necessary, as any wear between the valve and its seat is automatically taken up by the spring M or spider V. There may be any number of these set-screws O; but three, which are placed equidistant apart, will answer every purpose.

In order to prevent the steam-chest and valve from partaking of the rocking motion of the cylinder, and yet at the same time to be able to accommodate itself to any lateral or perpendicular variations of the valve-seat and cylinder, there are formed on each side of the steam-chest B′ slots Q, in which are placed movable slides P, having centers, in which rest the points of the set-screws *a*, which pass through and are held by the lugs *c*, which are fastened to the bed-plate. These screws and slots prevent any revolving movement of the chest, and yet allow the valve to take up all its wear and the chest and valve-face to maintain a perfect and reliable steam-joint with the valve-seat under any variations of the cylinder from a perfect line.

In order to prevent the weight and rigidness of the inlet and exhaust pipes S, which are connected to the steam-chest, from disturbing or deranging the automatic operation of the valve, I use a counterbalance-spring, Y, or a counter-weight, X, as shown in Figs. 5 and 6, and which spring or counter-weights may be applied in any suitable manner so as to exert a tension upon the pipes just equal to their weights. If the supply and exhaust are respectively received from and discharged below, a coil-spring, Z, is placed directly under the pipe, as shown. For large engines, where the connections are very close and with a heavy main, I prefer to use a weight, which is passed over a pulley, and which weight serves to get the elasticity of a portion of the main. The springs Y or weights X serve to balance the pipes, so that the even action of the spring M or the spider V against the valve is not disturbed, as would be the case if the inlet and exhaust pipes bore down perfectly rigid.

In order to relieve the piston-rod and stuffing-box of the wear occasioned by the oscillating of the cylinder, I connect to the outer end of the piston-rod, at or near its connecting-point with the crank-pin, a cross-head, W, which moves freely back and forth in suitable guides which are prepared to receive it, and which guides or ways are securely fastened to the cylinder-head, as shown in Fig. 1. This cross-head keeps the piston-rod always in line with the stuffing-box, and prevents any unequal wear or derangement of the packing.

Having thus described my invention, I claim—

1. The combination, in an oscillating engine, of the steam-chest B, provided with an internal oil-chamber, C, located wholly within the steam-chest, and small openings connected thereto, for the discharge of the oil direct between the bearing-surface of cylinder, valve-seat, and valve, substantially as described.

2. The combination, in an oscillating engine, of the valve-seat, the steam-chest, a plate which is applied to the inlet side of the steam-chest, regulating-screws and spring or springs, and a suitable bearing or other device for holding the spring in position, substantially as set forth.

3. The combination of an oscillating engine, the steam-chest and valve B, the plate H, provided with set-screws O, the sleeve I, provided with the shoulder J, the spring M or spider V, and the socket K, which is fastened to the trunnion, substantially as specified.

4. The combination of the steam-chest provided with slots, the slides placed therein, and the set-screws that pass through and are held by stationary lugs and made to bear against the slides, substantially as shown.

5. In an oscillating engine, the combination of a self-adjusting steam-chest and valve, having the inlet and outlet pipes connected thereto, with suitable counter-balances or springs, which are applied to the pipes, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

SAMUEL W. HEMPSTED.

Witnesses:

CHAS. S. CHERINGTON,

J. S. GOLD.