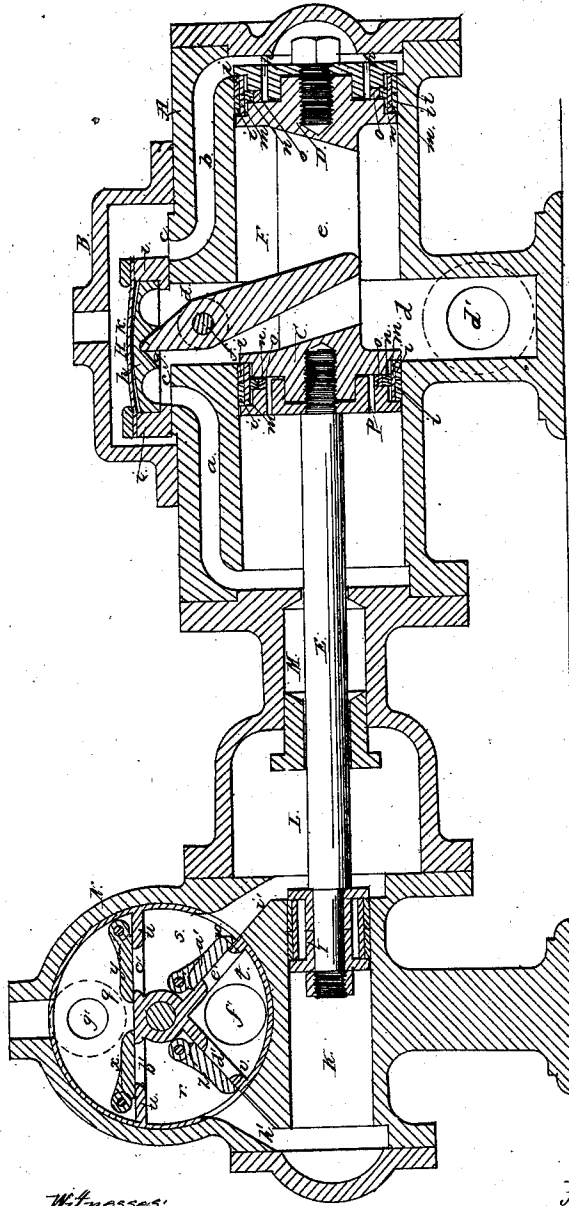


J. S. Barden,

Steam Pump.

N^o 61,910.

Patented Feb. 12, 1867.



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JOHN S. BARDEN, OF PROVIDENCE, RHODE ISLAND.

Letters Patent No. 61,916, dated February 12, 1867.

IMPROVEMENT IN STEAM ENGINES.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL PERSONS TO WHOM THESE PRESENTS SHALL COME:

Be it known that I, JOHN S. BARDEN, of the city and county of Providence, and State of Rhode Island, have invented a new and useful or improved Steam Engine; and I do hereby declare the same to be fully described in the following specification, and represented in the accompanying drawing, which denotes a longitudinal section applied to a double-acting force-pump.

In this engine there are two heads to the piston, the exhaust steam in escaping being caused to pass laterally through the cylinder, and between the said two connected heads applied to the piston-head.

In the drawings, A denotes the cylinder, provided with steam passages or ports, *a b*, leading from the two ends of its bore to and through a valve-seat, *c*, of a valve chest, B, applied to one side of the cylinder. Between the two ports *a b* is an exhaust port or passage, *d*, which leads out of the valve-seat and laterally through opposite sides of the cylinder, in manner as represented in the drawing, and to an escape hole, *d'*. Within the cylinder is a double-headed piston, that is, one provided with two heads to its rod, such two heads being shown at C D, and the rod at E. The heads are arranged within the cylinder in manner as exhibited, and are connected by a rod, F, provided with a long slot, *e*, made vertically through and longitudinally in it. The longer arm of the lever G, which is arranged within the cylinder and the exhaust passage *d*, and has its fulcrum at *f*, as shown in the drawing, extends into the slot *e*. The shorter arm of the said lever enters an angular recess, *g*, made in a movable plate, *h*, which constitutes part of a slide valve H, placed on the seat *c*, and within the steam chest B. The plate *h* is rectangular, and slides vertically within a rectangular frame, *i*, and up against an elastic plate, *k*, composed of vulcanized India rubber, or of a thin plate of spring steel, the said plate *k* serving as a cover to the valve-frame *i*, as well as a spring to advance the valve immediately after its operative lever, G, may have been forced into a vertical position by either end of the slot *e*. Each piston-head may be provided with a series of expansive metallic packing-rings, arranged on it as represented at *l m n* and *o*; and, with respect to the steam entrance passages P P, disposed in the head in manner as shown in the drawing. An auxiliary, or pump-piston head, I, is fixed to the piston-rod E, and works in a pump-barrel, K, whose axis is in the same straight line with those of the two connected piston-heads C D. The bore of the barrel K opens at one end into a mouth-piece, L, extending from the stuffing-box M of the cylinder A, and being arranged with the said barrel in manner as shown in the drawing. The said barrel is surmounted by a valve chest, N, which is divided into three valve chambers, *q r s*, and an induction chamber, *t*, by valve-seat partitions, *u v w*, arranged in it, and provided with valves and valve passages, as shown at *x y z*, *a'*, and *b' c' d' e'*. There is an induction opening, *f'*, to the chamber *t*, and there is also an eduction opening, *g'*, to the chamber *q*; and furthermore, there are ports and passages, *h' i'*, leading from the valve chest N into the bore of the pump-barrel at or near its two ends, as represented. If we suppose the slide valve H of the steam engine to be off the port *b*, so as to allow steam to flow from the chest B and act against the head D, the connected piston-heads C D, and the piston-rod E, will be simultaneously moved rectilinearly in the cylinder A. During this movement the lever G will be moved on its fulcrum by one end of the slot *e*, the plate *h* rising in the mean time under the pressure of the lever G. This movement of the lever will cause the plate *h* to rise, and the valve H to be moved a little more than half its length of movement, the remaining portion of its movement being produced by the pressure of the steam in the valve chest, that is, by the pressure of the steam on the flexible or elastic part or cap *k*. So soon as the valve may have been thus moved so as to cover the entrance of the port *b*, and uncover that of the port *a*, the steam will act on the head C, and drive the piston in the opposite direction, the valve H in the mean time being thrown back to its first position. On either port *a* or *b* being covered by the valve, the exhaust steam will flow into the valve, and from thence into and through the exhaust passage *d*, and the cylinder or the space thereof between the two connected piston-heads C D.

From the above it will be seen that the slide valve H and its operative mechanism are entirely enclosed within the cylinder and valve chest; also that the mouth-piece L not only serves to connect the steam engine with the pump, and as a condenser for waste steam escaping through the stuffing-box M, but it also serves as a means of rendering unnecessary a stuffing-box at that end of the pump-barrel which receives the piston-rod. By constructing the slide-valve H in manner as described, the steam, by the operation of the valve, will be caused to act expansively in propelling the piston of the engine. The valve may be constructed and applied to the lever G in such manner that each rectilinear movement of the valve may be produced by the lever and

the slot *e* during the movement of the piston, in which case the steam would not be cut off so as to afterward act expansively in moving the piston. Furthermore, I would remark that by the combination of the two sets of metallic packings or packing-rings with the two connected piston-heads *C D*, and by the arrangement of the steam passages *p p* of the two sets of packings, in manner as described, one of the packings, while the piston is being moved in either direction, will be expanded, and the other will be collapsed, that is to say, the impelling steam will expand the packing of the head against which it may be in operation, and the packing of the other head, or that which may be in the act of passing the exhaust steam from the cylinder, will be collapsed, on account of the pressure being equal on it in all directions, for as the exhaust steam will be on both sides of the head. Under these circumstances the cylinder and piston will be relieved from friction of the packing of the advance head, or that in which the collapse of the packing may take place. Thus it will be seen that, during each stroke of the piston, it will be subjected to the friction of only one of the two sets of packing, but this result would not follow with any other than an expansive packing to be expanded by the pressure of the steam.

I do not claim the application of a metallic expansive packing to a piston-head, as this is a very old invention; but the employment of the sets of packings with the two connected heads, and with the steam passages arranged in the two heads, as set forth, is new, and productive of a new effect, as set forth.

I claim the improved steam engine, constructed not only with the two connected heads *C D* to its piston, and with the exhaust passage *d*, extending from the steam chest laterally into the space between the said two heads and out the side of the cylinder, but as provided with the lever *G* to extend between the two heads and into the slide valve *H*, such lever being for operating with such slide valve, in manner substantially as explained.

I also claim the combination of the mouth-piece *L* with the force-pump and the steam engine, arranged and so as to operate substantially as specified.

JOHN S. BARDEN.

Witnesses.

R. H. EDDY,

F. P. HALE, Jr.