(No Model.)

D. BOWEN.

STEAM ENGINE.

No. 383,614. Patented May 29, 1888.

Fig 1.

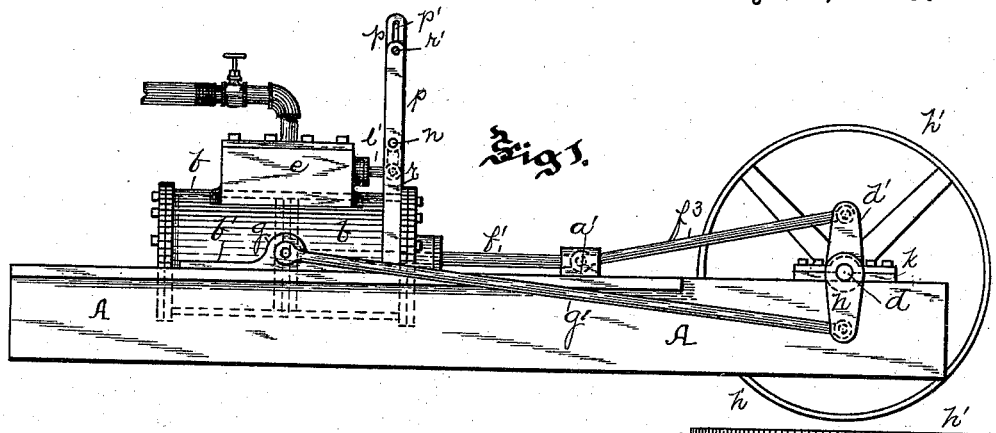


Fig 2.

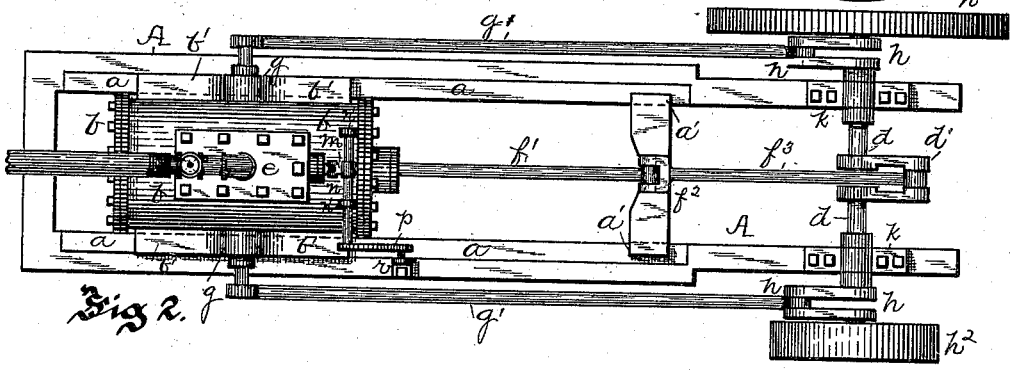


Fig 3.

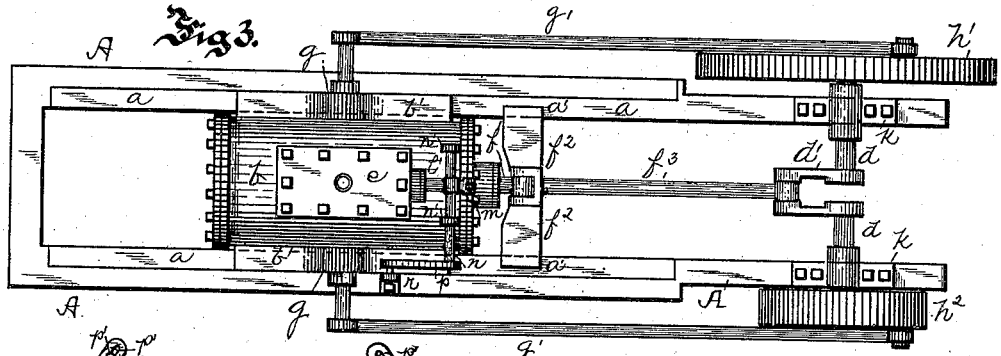


Fig 4.

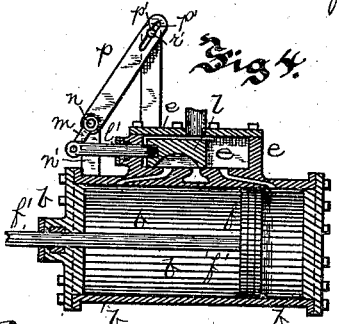
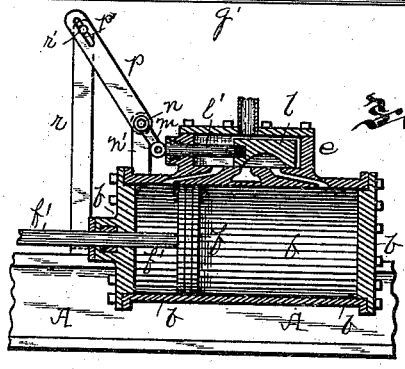


Fig 5.



Witnesses:
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By James S. Ray
Attorney

UNITED STATES PATENT OFFICE.

DAVID BOWEN, OF SHANNOPIN, PENNSYLVANIA.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 383,614, dated May 29, 1888.

Application filed July 1, 1887. Serial No. 243,108. (No model.)

To all whom it may concern:

Be it known that I, DAVID BOWEN, of Shannopin, in the county of Beaver and State of Pennsylvania, have invented a new and useful Improvement in Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to steam engines, its object being to provide a steam-engine in which a high speed can be obtained, and in which the entire pressure or expansive force of the steam is utilized at each stroke and this pressure regulated so as to transfer to the engine-shaft the necessary power for rotating the same, not only from the piston and its piston-rod, but from the body of the cylinder, so that a high-speed engine can be constructed, while at the same time a long cylinder may be employed and strain is removed from the engine-bed.

To these ends my invention consists, generally stated, in the combination of a longitudinally-moving cylinder with a longitudinally-moving piston, connections both from said cylinder and said piston to the engine-shaft, a slide-valve and connections between said slide-valve and the frame of the engine, whereby the steam admitted within the cylinder and on either side of the piston operates by its expansion against the end of the cylinder and the piston-head, and both can move to impart the desired motion to the engine-shaft, by so doing enabling the engine to utilize the entire expansive force of the steam and transfer it to the engine-shaft, either from the piston or the cylinder, to operate the engine at a much higher speed than can be obtained in the ordinary single-cylinder engines having the same piston-stroke, and to relieve the engine-bed from heavy strain.

It also consists in certain details of construction hereinafter more specifically set forth.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a side view of my improved engine. Figs. 2 and 3 are top views thereof, the position of the piston within the cylinder being illustrated in Fig. 1 by dotted lines; and Figs. 4 and 5 are views illustrating the means of operating the slide-valves or operating-valves of the engines.

The bed A of the engine is of the ordinary construction, except that instead of having the cylinder secured firmly thereto slides *a* are provided at the rear end of the bed, on which said cylinder *b* moves, the bed also having the cross-head slides *a'* between the cylinder and the engine-shaft *d*. The cylinder *b* is provided with slides or anti-friction bearings *b'* along the side faces thereof, which move on the slides *a* of the bed, the cylinder having the ordinary steam-chest, *e*, at the upper side and having the piston *f* sliding therein, said piston being connected to the rod *f'*, which extends out to the cross-head f^2 and is connected by the pitman f^3 with the crank *d'* of the crank-shaft *d*.

Extending out on each side of the cylinder *b* are the stud-bearings *g*, these bearings extending beyond the slides *a* of the engine and being connected by means of the pitmen *g'* with cranks *h h* on said engine-shaft *d*, or, as preferred by me, with the fly-wheel *h'* and band-wheel h^2, which are mounted on said engine-shaft *d* beyond the bed of the engine, said fly-wheel and band-wheel each having stud-bearings *k*, which are connected by the pitmen *g'* with the stud-bearings *g* of the cylinder. This, generally described, constitutes my improved engine, both the piston and the cylinder being connected with the engine or crank shaft, so that when steam is admitted on either side of the piston within the cylinder the pressure of the steam not only forces the piston from one end to the other of the cylinder, but, as the cylinder is movable and can slide within the bed, causing the longitudinal movement of the cylinder, and thus transmitting the power from the cylinder through the pitmen *g'* to the cranks *h h* or to the band-wheel and fly-wheel, which practically form parts of said cranks, and as the engine is operated the steam entering the cylinder presses against the two movable bodies and forces them in opposite directions. At the same time, as both the cylinder and the piston are connected to the engine-shaft, and as they both move strain on the engine-bed is reduced to a minimum, and as there is from the single cylinder a drawing strain in both directions on the engine-shaft, part from the cylinder and part from the piston, the strain thereon is equalized, while as the cylinder is forced in opposite directions to the piston and moves for half its stroke, a crank

of one-half the length generally used with the same length of cylinder may be employed and the necessity of the piston traveling for so great a distance is overcome, so that even with a long-stroke engine a rapid stroke may be obtained and a high speed generated thereby. As, however, the cylinder is movable, it is necessary, of course, to arrange some means for the operation of the valves. A valve gear suitable for the purpose is illustrated in the drawings, this valve gear having a slide-valve, *l*, within the valve-box *e*, the stem *l'* of which is connected to the lever *m*, extending down from a rock-shaft, *n*, mounted in suitable bearings, *n'*, on the movable cylinder, and this shaft *n* is provided at its outer end with a lever, *p*, which extends upwardly, having a slot, *p'*, fitting around a pin, *r'*, on a standard, *r*, extending up from the bed of the engine, a sliding joint or connection being thus formed between the lever *p* and standard *r*. By this construction, as the cylinder *b* reciprocates it draws the lever *p* into different positions or angles, as illustrated in the drawings, on one or the other side of its pivotal point, thus rocking the shaft *n* through its sliding connection with the standard *r*, and the shaft *n*, through its lever *m*, imparts a longitudinal movement to the slide-valve *l* through its rod *l'*, the valve apparatus thus acting, as the cylinder passes from one end of its stroke to the other, to operate the slide or engine valve and control the feed and exhaust of steam. Suitable connections—such as steam-hose or flexible jointed pipes—may be made with the steam supply and exhaust ports of the steam-chest *e*.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In steam-engines, the combination of an engine-bed, the cylinder sliding longitudinally thereon, the steam-chest and the slide-valve mounted therein, and lever-connections between the slide-valve and engine-bed, said lever being fulcrumed on the cylinder and connected at one end with the slide-valve and at the other to a fixed pivot, substantially as and for the purpose set forth.

2. In steam-engines, the combination of the engine-bed, the cylinder sliding longitudinally thereon and having a steam-chest, a slide-valve within the steam-chest, the shaft *n*, carrying the lever *m*, lever *p*, and standard *r*, substantially as and for the purpose set forth.

In testimony whereof I, the said DAVID BOWEN, have hereunto set my hand.

DAVID BOWEN.

Witnesses:
J. N. LANGFIRT,
JAMES I. KAY.