(No Model.) 2 Sheets—Sheet 1.

A. T. POWELL.

STEAM ENGINE.

No. 265,138. Patented Sept. 26, 1882.

Fig 1.

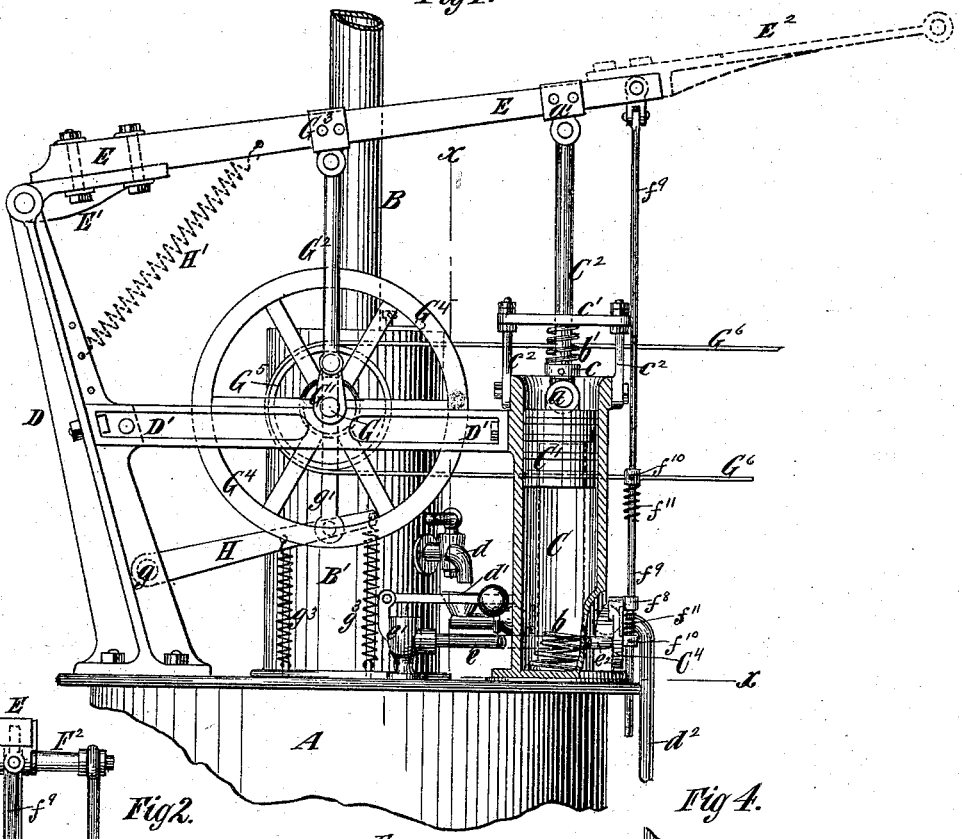


Fig 2.

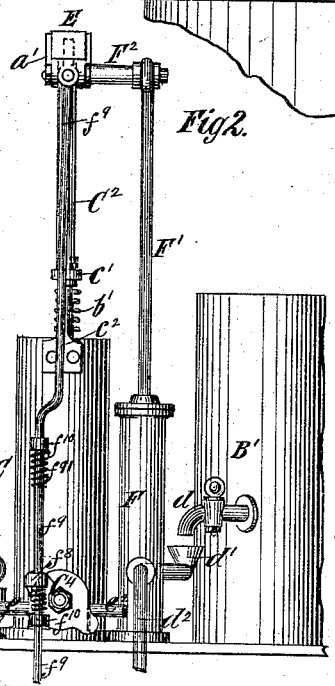


Fig 3.

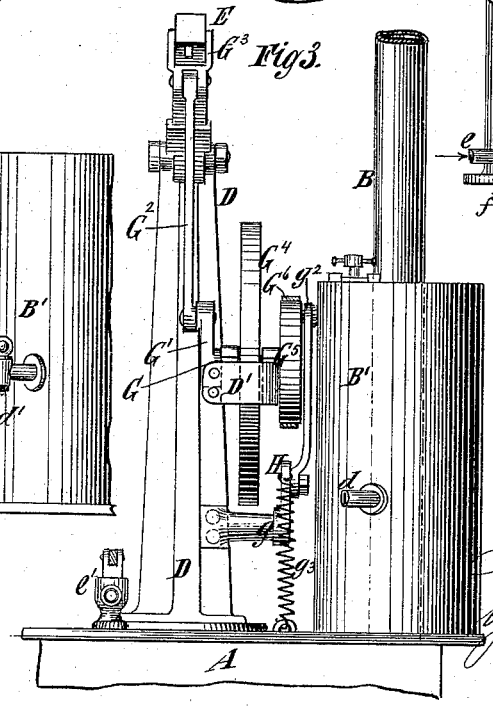


Fig 4.

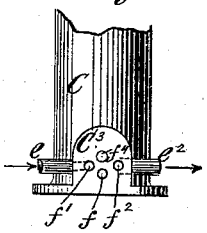
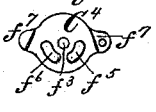


Fig 5.



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(No Model.) 2 Sheets—Sheet 2

A. T. POWELL.

STEAM ENGINE.

No. 265,138. Patented Sept. 26, 1882.

Fig 6.

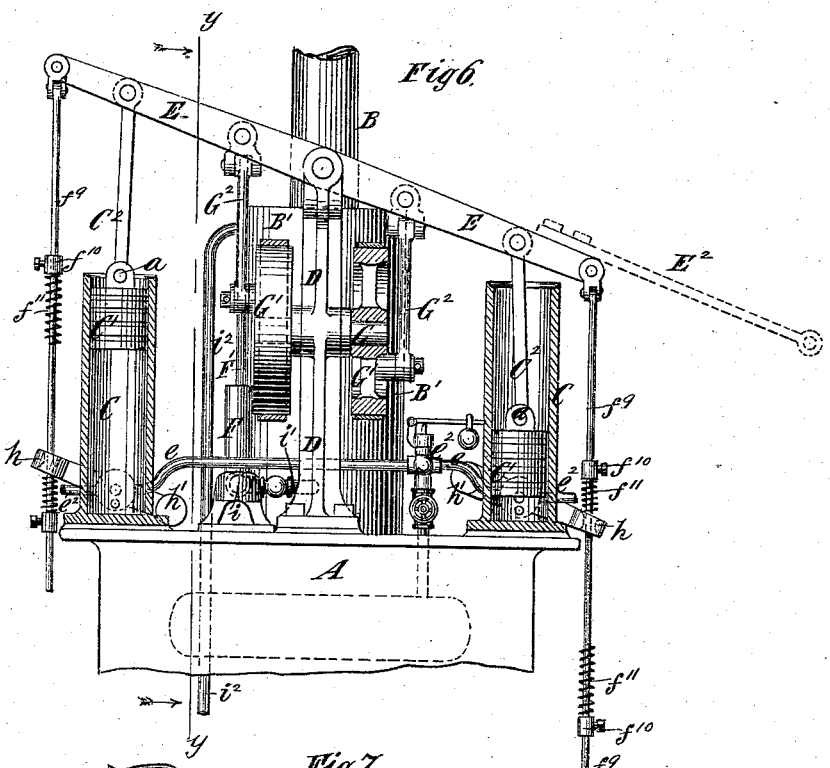
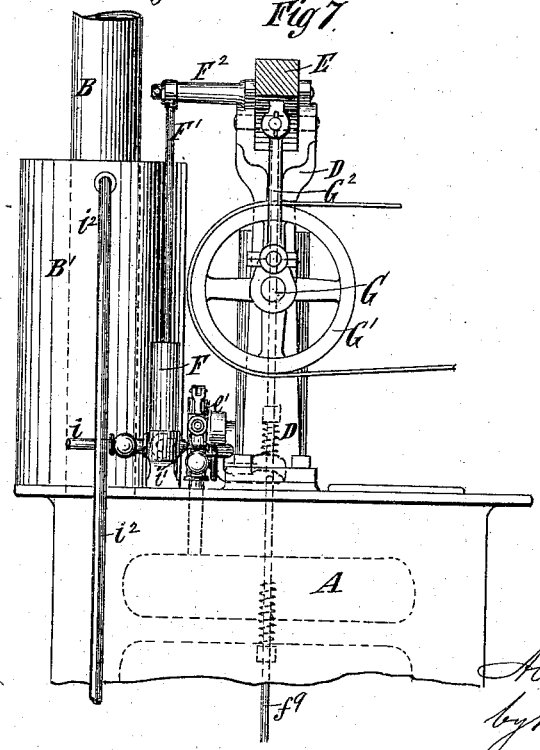


Fig 7.



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UNITED STATES PATENT OFFICE.

ALBERT T. POWELL, OF STANFORDVILLE, NEW YORK, ASSIGNOR TO POWELL STEAM MOTOR COMPANY, (LIMITED,) OF SAME PLACE.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 265,138, dated September 26, 1882.

Application filed November 4, 1881. (No model.)

To all whom it may concern:

Be it known that I, ALBERT T. POWELL, of Stanfordville, in the county of Dutchess and State of New York, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

My invention relates more particularly to small engines which are adapted for use in grocery-stores for driving coffee-mills and like purposes, in dairies for working churns, and in many other situations where only a small power is required.

The object of my invention is to provide a simple and inexpensive engine which is adapted for giving rotary motion to any desired machine by a belt from its crank-shaft, and which is adapted for giving a reciprocating motion directly to a churn-dasher or to any machine requiring such motion.

The invention consists in the combination, with a steam-boiler, of a feed-water heater and a feed-pump erected thereon, a standard also erected thereon, a beam or lever fulcrumed in said standard, a steam cylinder or cylinders erected on the boiler, and a single-acting piston or pistons for operating the beam or lever, a crank-shaft, and a connecting rod or rods for operating said shaft from the beam or lever, whereby I produce a very simple and compact single or double cylinder engine, in which no stuffing-boxes are necessary, and which are cheaply made. The cylinder or cylinders are preferably arranged at a distance from the standard in which the beam is fulcrumed, and the rod or rods for operating the crank-shaft are connected to the beam between said cylinder or cylinders and the standard. I also combine with the beam or lever a detachable arm or extension-piece, which may be attached to the beam or lever when it is desired to impart or direct reciprocating motion by a rod from the beam or lever to a churn-dasher, and which may be removed when the power of the engine is to be transmitted through a belt from the crank-shaft.

The invention also consists in the combination, with the cylinder and piston, of a spring for cushioning the piston at the end of its upward stroke, arranged as hereinafter particularly described.

In the accompanying drawings, Figure 1 represents an elevation of the top portion of a boiler and a side view and partial section of a single-cylinder engine erected thereon. Fig. 2 represents an end view of a portion of the engine, showing the cylinder, the pump, and their connections, the valve-operating mechanism, and a portion of the feed-water heater. Fig. 3 represents a vertical section on the dotted line *x x*, Fig. 1, looking toward the crank-shaft. Fig. 4 represents a side view of the lower portion of the cylinder, showing the valve-seat. Fig. 5 represents a face view of the valve. Fig. 6 represents an elevation of the upper part of a boiler and a partially-sectional elevation of a double-cylinder engine erected thereon; and Fig. 7 represents a vertical section on the dotted line *y y*, Fig. 6, looking in the direction indicated by the arrows.

Similar letters of reference designate corresponding parts in all the figures.

Referring first to Figs. 1 to 5, inclusive, A designates the upper portion of a steam-boiler, which may be of any ordinary or suitable construction, as it in itself forms no part of the invention.

B designates the smoke-pipe leading from the boiler, and B′ designates a feed-water heater which surrounds the smoke-pipe, and is adapted to contain a sufficient supply of water for feeding the boiler a considerable time.

C designates a steam-cylinder, erected on the boiler, and D designates a standard, also erected on the boiler. This standard, together with a brace or beam, D′, extending from it to the cylinder, forms the frame-work of the engine.

E designates a beam or lever, which is fulcrumed at one end to the standard D. This beam or lever may be of metal or it may be made of wood, as here represented, and have at the fulcrum end a bracket, E′, bolted to it and receiving the fulcrum-pin.

C′ designates the piston, which is fitted to the cylinders C, and may be of any suitable construction and provided with any desirable packing. The cylinder C receives steam only at the lower end below the piston, and the top of the cylinder is open.

C² designates the piston-rod, which is jointed or hinged to the piston at the lower end by a

pin, *a*, and is connected in a similar manner at the upper end to a strap or connection, *a'*, which may consist of a casting embracing the beam or lever E, and bolted thereto. This arrangement dispenses with any stuffing-box and with a cross-head and slides, which are necessary where a rigid piston is used. In order to cushion the piston C' on its upstroke I employ a spring, *b'*, surrounding the piston-rod C^2, and arranged between an adjustable collar, *c*, on the rod and a fixed cross-piece or abutment, *c'*, supported by uprights c^2 on the cylinder.

F designates a pump, arranged by the side of and parallel with the cylinder C^2, and F' designates its piston-rod, which is connected at the upper end to and is operated by an arm, F^2, projecting from the beam E.

The hot feed-water is discharged by a cock or faucet, *d*, from the heater B', and is delivered into a funnel, *d'*, from which a suction-pipe leads to the pump F, and by the pump the water is delivered through a discharge-pipe, d^2, into the boiler. This system of feeding is adapted for feeding a very small quantity of water at each stroke into the boiler, where it will be instantly converted or flashed into steam. The steam-cylinder is supplied with steam from the boiler through a supply-pipe, *e*, in which is arranged a safety-valve, *e'*, and the steam is exhausted from the cylinder through an exhaust-pipe, e^2.

On the exterior of the cylinder C, near the lower end, as seen best in Figs. 2 and 4, is a flat valve-seat, C^3, in which are three ports, $f f' f^2$. The port *f* leads directly to the cylinder, the port *f'* leads from the supply-pipe *e*, and the port f^2 leads to the exhaust-pipe e^2.

C^4 designates a valve, which is pivoted to the seat C^3 by a bolt passing through a hole, f^3, in the valve and entering a hole, f^4, in the seat. This valve is exposed—that is, it is not covered by or contained within a steam-chest—and by dispensing with a steam-chest the cost of the engine is reduced. In the face of the valve C^4 are two cavities or coves, f^5 f^6, of arc shape, and by oscillating the valve the port *f'* is first brought into communication with the port *f* by the cavity f^5 covering both said ports, to allow steam to enter the cylinder, and the port f^2 is afterward brought into communication with the port *f* by the cavity f^6 covering both ports to allow steam to exhaust from the cylinder. The exposed oscillating valve is not in itself new. The valve C^4 has upon its face two lugs, f^7, which limit the extent of its oscillation in both directions, and on its back is a lug or ear, f^8, through which works a valve-rod, f^9, connected at its upper end to the beam or lever E. The rod f^9 works loosely in the lug or ear f^8, and is provided above and below the said lug or ear with adjustable collars f^{10} and spiral springs f^{11}, as clearly seen in Figs. 1 and 2. The valve C^4 is oscillated in either direction until the lugs f^7 strike the sides of the valve-seat, and then the springs f^{11} yield, while the valve-rod f^9 moves still farther, thus insuring the valve always making a full movement and cushioning the rod in its action on the valve.

G designates a crank-shaft mounted in suitable bearings on the cross-beam D', and provided with a crank, G', which is operated by a connecting-rod, G^2, connected to a strap or socket, G^3, secured on the beam E. Upon the crank-shaft G is a fly-wheel, G^4, and a pulley, G^5, from which power may be transmitted by a belt, G^6. As the cylinder C and piston C' are single-acting, the crank-shaft has no power transmitted to it on the downstroke. To assist the weight of the beam and connections in the downward stroke and impart a more uniform motion to the crank, I employ a lever, H, fulcrumed at *g* to the standard D, and connected by a rod, *g'*, to a crank-pin, g^2, in the pulley G^5, as seen in Fig. 3. To the lever H are connected one or more springs, g^3, (two being here shown,) which are extended when the engine makes its upstroke, and serve in contracting to assist the downstroke. In lieu of the lever H and its connections, a single spring, H', might be applied between the beam E and standard D, as shown dotted in Fig. 1, for the same purpose.

Where it is desired to impart a reciprocating motion directly to any machine—as to a churn-dasher—I employ an arm or extension-piece, E^2, which is detachably secured to the end of the beam E, so that when not wanted for use it may be removed. To the outer end of the arm or extension-piece the churn-dasher or other moving part may be connected.

I will now describe the double-cylinder engine shown in Figs. 6 and 7.

A designates the upper part of the boiler; B, the smoke-pipe, and B' the feed-water heater. In this engine the beam or lever E is fulcrumed at or about the middle of its length to the standard D, and the beam might have an extension-piece or arm, E^2, applied to either end of it, as shown in dotted outline in Fig. 6, or to both ends of it, for the purpose previously described. Two cylinders, C, are arranged at opposite ends of the beam E, and their pistons C' are connected with the beam by rods C^2, as previously described. The valves C^4 are of the kind previously described, except that each valve has an arm, *h*, extending from it, through which the valve-rods f^9 work, and is weighted at *h'* on the opposite side to balance said arm. The arrangement of the valve-rods f^9, their collars f^{10}, and springs f^{11} is the same as in the single-cylinder engine. The pump F is arranged as before described, and its rod F' is operated through an arm, F^2, projecting from the beam E; but in this instance the pump takes its suction through a pipe, *i*, from any suitable source of supply, and the water is discharged from the pump into the heater B' through a pipe, *i'*, and escapes from the heater to the boiler through a pipe, i^2. The crank-shaft G is arranged parallel with and under the beam, and has two disk-cranks, G', which serve

as driving-wheels. The cranks are operated by rods G^2 from the beam E. In this example of my invention no springs are necessary for cushioning the pistons or for assisting the downward stroke of the pistons, as steam is always acting upon one or the other of the pistons when the engine is in operation.

The arrangement of the crank-shaft relatively to the beam shown in Figs. 6 and 7 and other features of construction are not claimed in this application, and may be made the subject of a future application for a patent.

By my invention I produce an engine of simple construction, which may be sold at a low price, and which will serve admirably for many purposes where small power only is required.

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

1. The combination, with a steam-boiler, of a feed-water heater and a feed-pump erected thereon, a standard also erected thereon, a beam or lever fulcrumed in said standard, a cylinder or cylinders also erected on the boiler, and having a piston or pistons connected with said beam or lever, and a crank-shaft, and a connecting rod or rods for operating the shaft from said beam or lever, substantially as specified.

2. The combination, with a standard and a beam or lever fulcrumed therein, of a cylinder and piston and a crank-shaft, a rod connecting the piston with the beam or lever near its free end, and a connecting-rod for operating said crank-shaft, connected to the beam or lever between the cylinder and the standard, substantially as specified.

3. The combination, with a beam or lever, a cylinder and piston for operating the same, and a crank-shaft operated by said beam or lever, of a detachable arm or extension-piece fitted to the end of said beam or lever, substantially as specified.

4. The combination of the beam or lever E, the crank G', the connecting-rod G^2, the crank-pin g^2, the lever H, and rod g', and one or more springs, g^3, substantially as specified.

5. The combination, with a cylinder, C, and its piston C' and piston-rod C^2, of the collar c on said rod, the cross-piece or abutment c', and a spring, b', surrounding the rod and arranged between said collar and cross-piece or abutment, substantially as specified.

ALBERT T. POWELL.

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