2 Sheets—Sheet 1.

W. BAXTER.

Portable Steam-Engine.

No. 207,237. **Patented Aug. 20, 1878.**

Fig. 2.

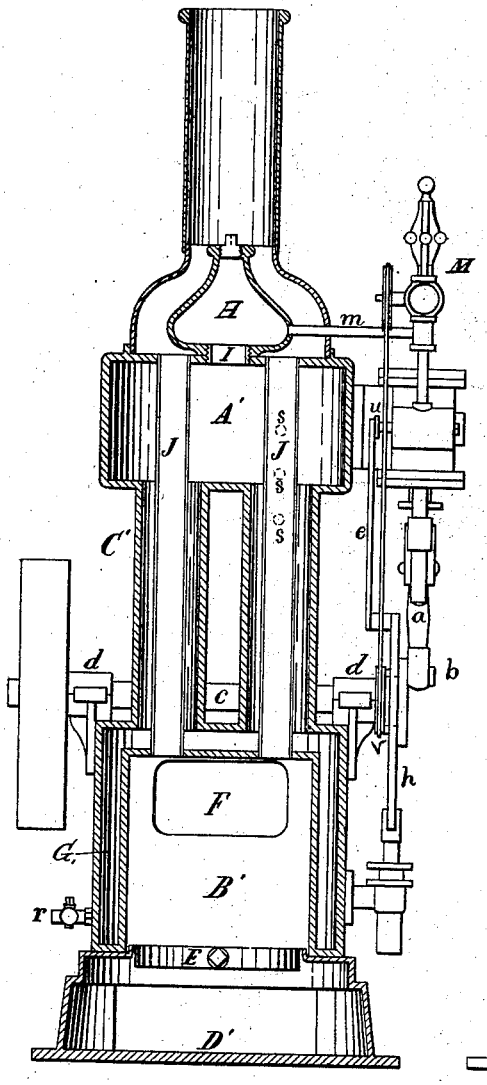
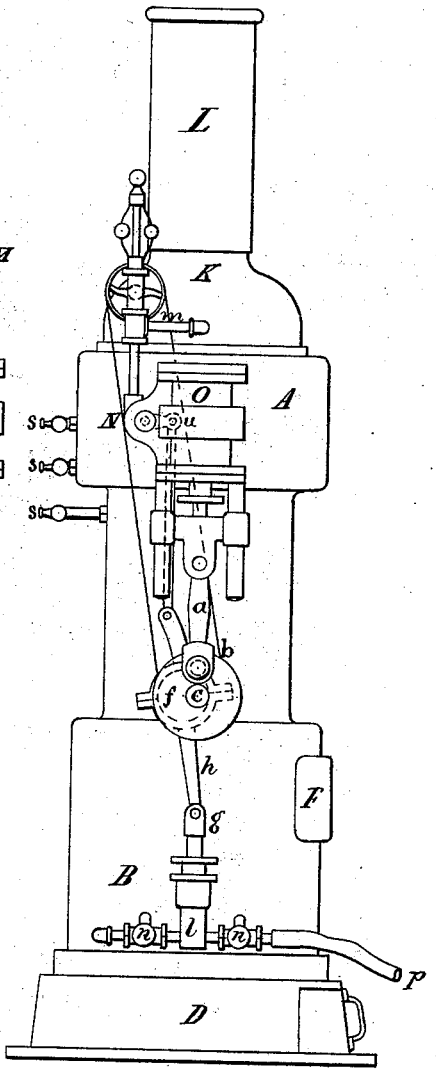


Fig. 1.



Attest:

C. C. Herrick

Geo. H. Bodemuehl

Inventor.

William Baxter, Jr.

Thos. S. Crane, Atty.

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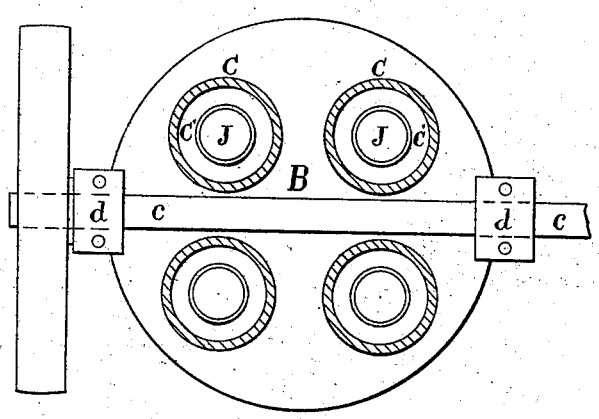
Fig. 3.



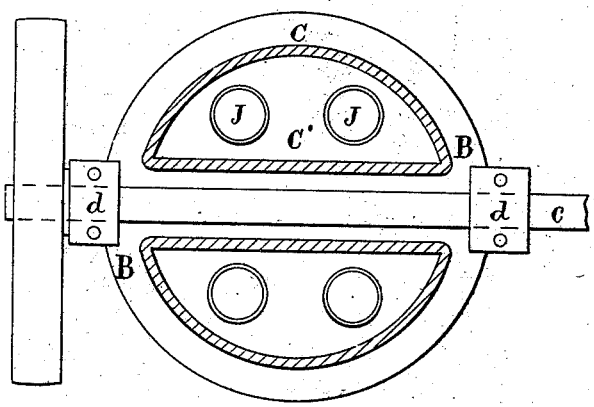


Fig. 4.

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UNITED STATES PATENT OFFICE.

WILLIAM BAXTER, OF NEWARK, NEW JERSEY, ASSIGNOR OF ONE-HALF HIS RIGHT TO ABRAHAM VAN WINKLE, OF SAME PLACE.

IMPROVEMENT IN PORTABLE STEAM-ENGINES.

Specification forming part of Letters Patent No. **207,237**, dated August 20, 1878; application filed November 22, 1877.

To all whom it may concern:

Be it known that I, WILLIAM BAXTER, of Newark, Essex county, New Jersey, have invented an Improvement in Portable Engines, of which the following is a specification:

My invention relates to that class of portable engines in which the cylinder and crank-shaft of the engine are attached directly to the boiler without framing of any kind; and my improvements consist in constructing the boiler in such a manner that the fly-wheel shaft may be secured to the boiler across its middle and very low down, thereby securing symmetry of design with the utmost stability under rapid motion.

In my specification I give a full, clear, and exact description of the same, referring to the annexed drawings, in which—

Figure 1 is a front view of an engine and boiler; Fig. 2, a side view of the engine and a vertical section of my columnar boiler. Figs. 3 and 4 are horizontal sections of the columns used to unite the sections of my columnar boiler.

This boiler consists of upper and lower sections, cylindrical in plan, and united by two or more pipes or hollow columns, secured between the sections. Figs. 1 and 2 show a cast-iron boiler thus made, the upper section, A, being cast with flat heads, into the lower of which the columns C open, forming a connection between the two sections A and B. The lower section, B, is also hollow, and is cast with a water-space between two metal surfaces, at its top, and around its whole circumference, the interior of the water-space forming a furnace-chamber, in one side of which is an aperture for a door, and provided at the bottom with a dumping-grate of any desired pattern, and pan to withdraw ashes.

The grate and boiler both rest on an ash-box base, constructed to support the boiler and the pivots of the grate, and open at one side to remove the ashes.

In the figures, the parts are lettered as follows: A, top section; A′, steam-chamber; B, bottom section; B′, furnace-chamber; C, columns; C′, space inside columns; D, base; D′, ash-pit in base; E, grate; F, furnace-door; G, water-space about furnace or flues.

In each of the columns a flue is inserted, and secured to the top of section A and to the crown of the furnace, perforating each in the manner usual to flue-boilers, and providing an outlet from the furnace for the gases generated in it.

The water is carried in the boiler so as to fill the spaces about the furnace, the space between each of the flues and its surrounding column, and to stand part of the way up in section A. The steam is taken from this section by a central opening, I, on top, into a bell-shaped superheater, H, the base of which is expanded enough to extend over the upper ends of the flues J and receive the heat in its passage to the chimney.

The superheater is tapered upward at the top, conforming nearly to the shape of a dome-casting, K, fitted upon the top of the boiler, and confining the gases in contact with the superheater until they pass out of the top into the chimney L.

Steam for the engine is taken from the superheater by pipe *m*, and, after passing through the governor M, enters the steam-chest N on the side of the engine-cylinder O which is bolted to section A. This cylinder is inverted, the piston-rod passing out of the bottom, and being connected by a link, *a*, to the crank *b* and wheel-shaft *c*, which is carried by bearings *d d*, secured upon the top of section B. Whatever number of columns C is employed, the shaft passes through the space between them, and has its fly-wheel or driving-pulley keyed, preferably, upon the opposite end.

In the engines, in operation, no inconvenience has resulted from the heat passing from the water inside the section B to the bearings *d d*, and the extreme rigidity of the cylindrical section makes them quite true and firm in position. This location of the crank-shaft renders the whole structure very steady, as the weight of the shaft and fly-wheel is brought as low as it can be placed without penetrating the furnace, thus enabling the engine to be run quietly at a great speed, being perfectly balanced on all sides.

I am aware that portable engines have been made with the shaft located low down, but outside the shell of the boiler, and in other cases through the smoke-box on the top;

but I consider my arrangement preferable to the former in carrying the crank-shaft across the middle of the boiler, and to the latter in keeping the weight and momentum of the moving parts at the lowest possible point above the fire-box.

It is evident that another arrangement may be made to afford the same passage low down across the boiler for the crank-shaft of the engine. The boiler may be of the ordinary upright tubular kind, with a pipe inserted transversely through its body, just above the fire-box; or it may be of sections, like those just described, and united by two semi-cylindrical or segmental-shaped columns, as shown in plan in Fig. 4. Inside these columns flues J would pass, as before described, and, in fact, the same Fig. 4 would represent the upright tubular boiler described above, the space between the columns C C answering exactly to the pipe specified for such a boiler, if the same were shown in section.

The valve of the engine is constructed to oscillate in a steam-chest on the side of the cylinder, and rocked in its seat by a connection, *e*, to a lever hinged at its lower end, and constructed to embrace an eccentric, *f*, behind the main crank and disk *b*.

The hinged joint *g* is connected to the plunger of a force-pump, *l*, which serves as a guide for the lower end of lever *h*, and enables the eccentric to work the pump at the same time that it operates valve *i*.

From the above description it will be seen that the engine and boiler, as described, constitute an exceedingly cheap, simple, and durable generator of power.

The engine is attached to the boiler, so as to run steadily at any desired speed, the center of gravity being kept as low as can be secured when the shaft of the engine is attached solely to the boiler.

The continuous motion of the pump is usual on all engines when the pump is worked from the cross-head, the supply of water being controlled by a suitable feed-cock on the suction-pipe.

In Fig. 1, *l* is the pump; *n n*, the check-valves attached to it; *p*, the suction-pipe, and *r* the blow-off in the water-space G. S S S are gage-cocks to regulate the height of water in section A. A safety-valve and other appliances are also provided, and the whole arrangement is such that the combined engine and boiler takes the least possible space, exposing no highly-heated surfaces to radiation, and capable of being protected (below the dome) either with a felt cover or some non-conducting application.

The advantages claimed above can be secured by the employment of an upright tubular boiler, with transverse tube through the body for the shaft of the engine; but the cost of such a boiler is much greater than the columnar boiler described above, especially if the latter is cast all in one piece, as I have done when great cheapness was required.

Three columns, or any number, can be used, as their size can be so designed that the shaft will pass between them, and the desired advantages secured.

When made of wrought-iron, the columns can be screwed by right and left threads into the two sections, or flanged and riveted at the ends. Even if the driving-wheel is not placed at the side opposite the engine, it is a great advantage to locate the weight of the shaft, wheel, &c., at the middle of the boiler.

The driving of the pump by the same eccentric that works the valve is quite an economic point in construction, as is also the arrangement of the valve *i* with its smaller end toward the boiler, so that its lever *u* is inside the main link *a* and crank-disk *b*, and has its connection *e* behind the disk. If outside the disk *b*, a return-crank would have to be used to drive the valve *i*, or some indirect connection, thus preventing the casting together in one piece of the crank-disk *b*, eccentric *f*, and governor-pulley *v*, which is much the simplest construction possible.

The governor M is so adjusted on the chest N that the governor-belt *x* clears all the parts of the valve-motion, as well as the rib *w*, by which the cylinder is secured to the boiler.

I am aware that boilers of various kinds have been made in sections, and also of cast-iron, as well as boilers with steam-engines attached directly to them, and I do not therefore claim such modes of construction, broadly; but,

Having specified the various points I have improved, I hereby claim as follows:

1. The cast-iron boiler for portable steam-engines, constructed with sections A and B and two or more columns, C C, all in one piece, combined with the cylinder and crank-bearings of the engines, in the manner herein described.

2. The combination and arrangement, in an inverted-cylinder portable steam-engine, of the boiler, constructed with sections A and B and columns C C, secured thereto, and flues J J, passing through the columns, with the cylinder O and crank-bearings of the engine, secured thereto in the manner described.

3. The combination and arrangement, in an inverted-cylinder portable steam-engine, of the cylinder O, crank-shaft *c*, and upright boiler, with opening across its middle for the passage of the crank-shaft *c*, substantially in the manner and for the purpose set forth.

Dated November 16, 1877.

WM. BAXTER.

Witnesses:
GEO. H. BODENSCHATZ,
THOS. S. CRANE.