2 Sheets—Sheet 1.

E. HUBER, J. C. TITUS, E. DURFEE & J. F. SWINNERTON.

Portable-Engine.

No. 205,867. Patented July 9, 1878.

Fig. 1.

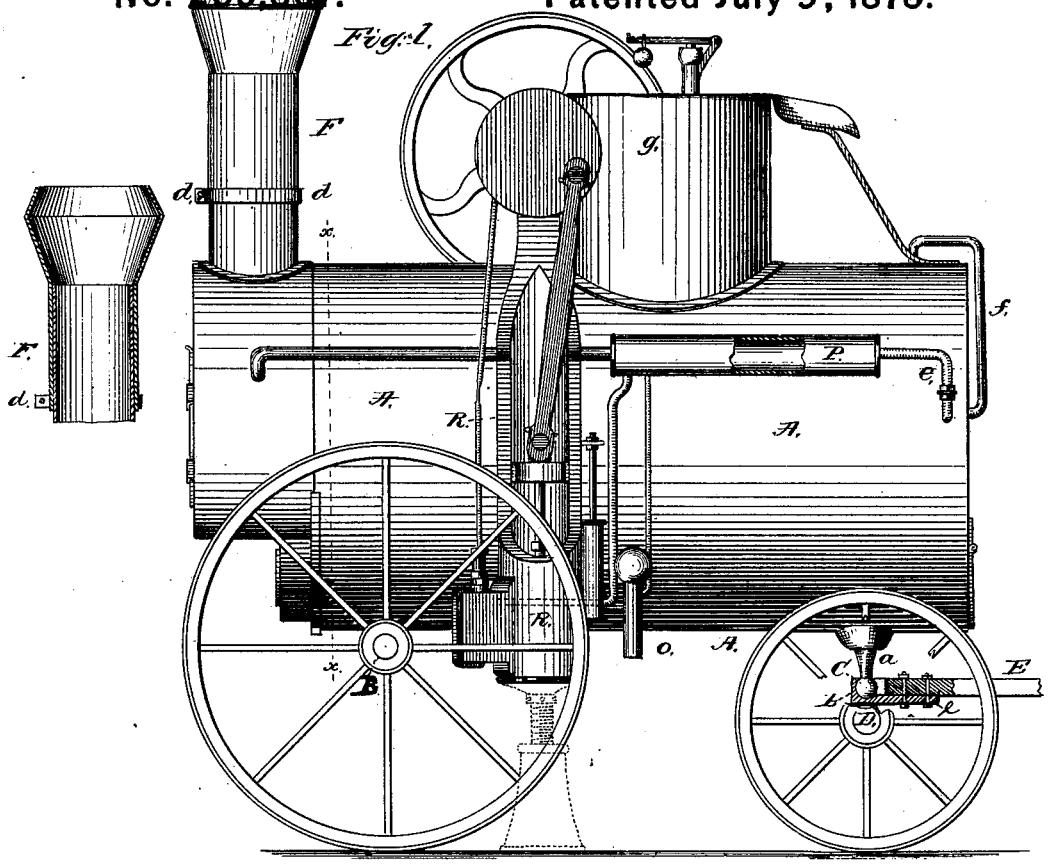
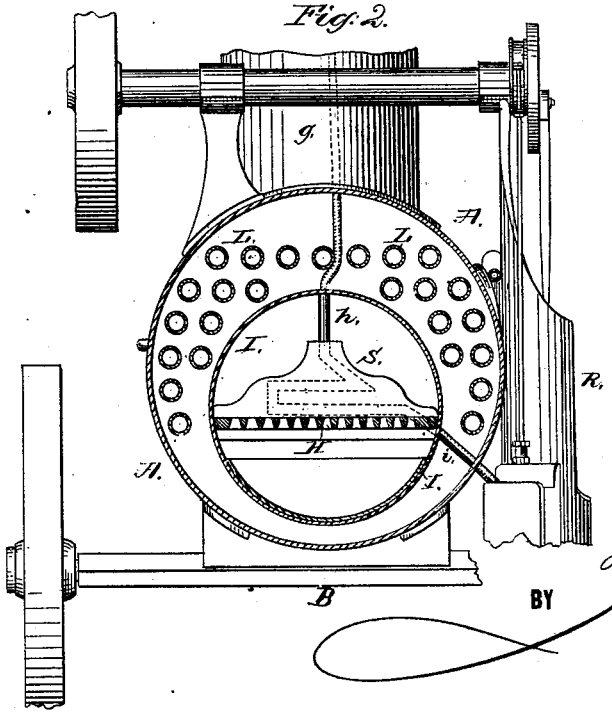


Fig. 2.



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2 Sheets—Sheet 2.

E. HUBER, J. C. TITUS, E. DURFEE & J. F. SWINNERTON.

Portable-Engine.

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Fig. 3.

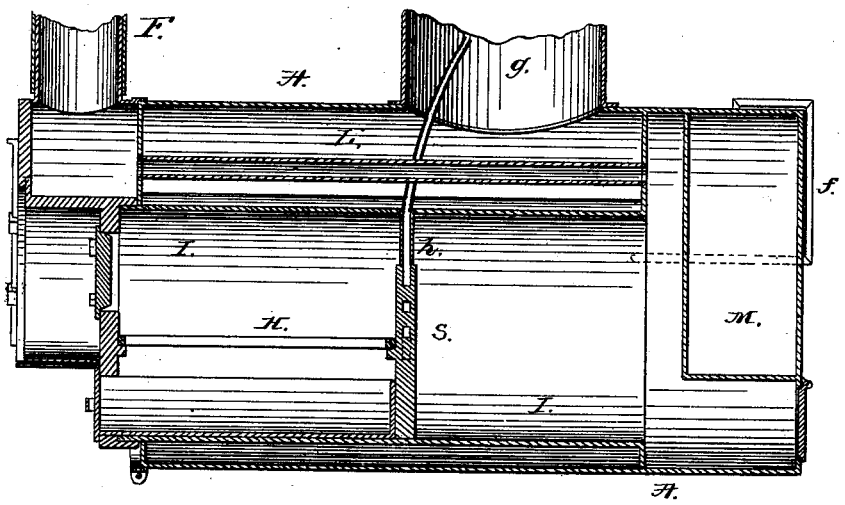
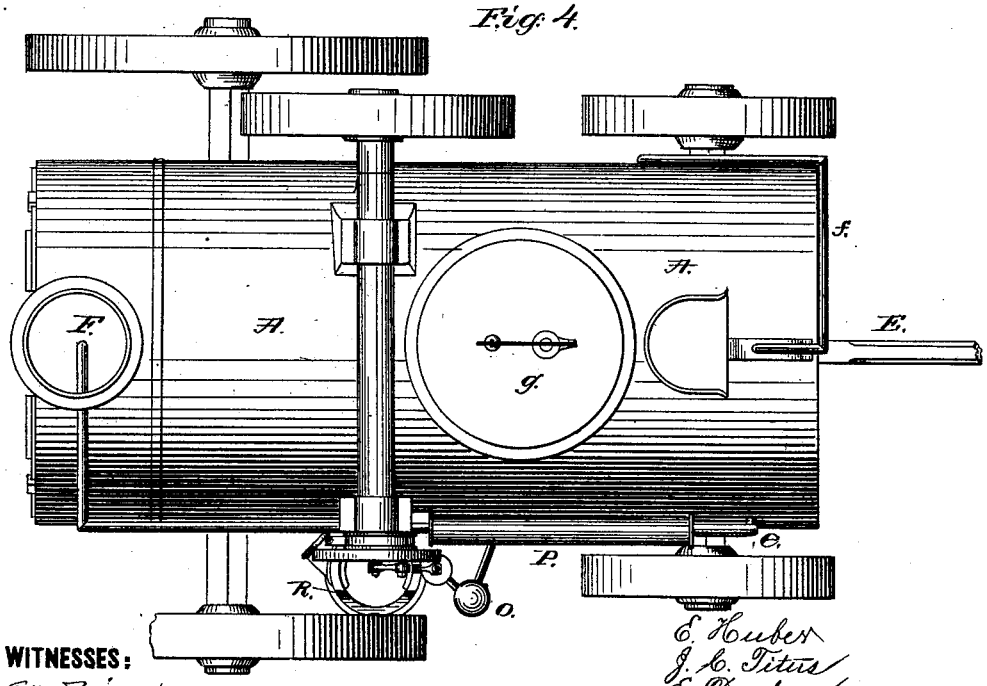


Fig. 4.



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UNITED STATES PATENT OFFICE.

EDWARD HUBER, JOHN C. TITUS, EDWARD DURFEE, AND JAMES F. SWINNERTON, OF MARION, OHIO, ASSIGNORS TO HUBER MANUFACTURING COMPANY, OF SAME PLACE.

IMPROVEMENT IN PORTABLE ENGINES.

Specification forming part of Letters Patent No. **205,867**, dated July 9, 1878; application filed April 30, 1878.

To all whom it may concern:

Be it known that we, EDWARD HUBER, JOHN C. TITUS, EDWARD DURFEE, and JAMES F. SWINNERTON, of the city and county of Marion, and State of Ohio, have invented a new and Improved Portable Engine; and we do hereby declare that the following is a full, clear, and exact description of the same.

The invention consists in an exhaust-steam feed-water heater and a mud or sediment extractor so connected and arranged with the boiler proper and the pump that the water is forced in hot at the side of the extractor, and escapes from the top thereof in a still hotter condition, and mostly free of sediment or solid foreign matter.

The invention further consists in dispensing with a considerable number of fire-tubes and substituting a single large tube or flue therefor, and placing in the latter a hollow bridge, through which steam is conducted for superheating it before reaching the steam-chest.

The invention further consists in constructing the smoke-stack in sections, which slide telescopically one within another, and are secured in any adjustment by means of a friction-clamp.

The invention further relates to the construction whereby the front axle is connected with the boiler, as hereinafter described.

Figure 1 is a side elevation of the engine. Fig. 2 is a cross-section on line *x x*, Fig. 1. Fig. 3 is a longitudinal sectional elevation. Fig. 4 is a top-plan view.

The front or fire end of the boiler A is rigidly attached to axle B, and the other end has a swivel or ball-and-socket connection, C, with axle D, to which the pole E is attached. Said swivel connection is formed by a stem or standard, *a*, whose lower end is of spherical shape, and fits in a socket formed in a plate or bolster, *b*, bolted to the axle. The socket is open or cut away on its front side to permit the stem *a* to be easily and quickly inserted in or detached therefrom, and is held in the socket by the abutting rear end of the pole E, which is bolted to the hounds , as shown.

The smoke-stack F is made of two tubular joints or sections adapted to slide telescopically one within the other, so that the stack may be quickly extended to the required height when the engine is in use, or lowered when the engine is to be transported or placed under shelter.

The sliding joint or section has a friction-clamp, *d*, attached to its lower ends. Said clamp consists of a metal band and a screw which passes through its free projecting end, so that by rotating the screw in one direction or the other the movable joint will be clamped and held in any adjustment, or else released and allowed to slide downward on the fixed lower section of the stack.

We will now proceed to describe the boiler and engine proper.

We dispense with a fire-box of the usual form, and place the grate H within the large central cylindrical flue I, which extends the length of the boiler A. The small return-flues L are arranged over and around this large flue.

The chief advantages of this construction are the decreased weight of the engine as a whole, and the avoidance of direct firing against the ends of the flues and of the danger of cracked flue-sheets.

A small circular boiler, M, is located at the rear end of the main boiler to subserve the purpose of a feed-water heater and mud or sediment extractor, as hereinafter explained. Said small boiler M is set off from the end of the main boiler, so that the flame and products of combustion, which impinge on the former, and are by it diverted upward, will have unobstructed entrance into the flues L, through which they pass into the smoke-stack. The boiler M thus constitutes an end fire-wall for the furnace, and utilizes heat which would be otherwise wasted.

The water supplied to the main boiler, or boiler proper, is forced by pump O into the exhaust-steam heater P, attached to the side of the boiler, and passes thence through pipe *e* into heater M at the side thereof, from which it escapes through pipe *f* at the top of the

heater into the main boiler A. The mud and other sediment contained in the water has time to settle and deposit in the heater, from which it can be readily removed, so that the pure water is forced out at boiling heat from the top of the same, thus preventing incrustation of the main boiler and its attendant dangers.

The engine-cylinder, with Corliss bed-plate R, is bolted on the side of the boiler in a vertical position, and hence has no endwise motion as the piston reciprocates. This position of the cylinder also facilitates the application of a jack-screw when the engine is put in use. Said jack-screw is placed, as shown in dotted lines, Fig. 1, under the flat cylinder-head, and caused to raise it until all the weight of the engine proper and part of the boiler is supported by the jack, so that the engine will stand almost as firm as a stationary engine.

The steam to work the engine is taken from the top of the dome *g* by a pipe, which conducts it through the large fire-flue *h* to the vertical fire-bridge S, located at the rear end of the grate, and thence to the steam-chest through pipe *i*, passing through shell of boiler. The fire-bridge is constructed hollow, or of a series of pipes, or so as to allow steam-pipe to pass through it, so that the steam is superheated in passing through it, thereby insuring dry steam in the cylinder, and rendering it unnecessary to carry so high boiler-pressure (ten to thirty pounds) as is usually required in portable engines when kept ready for work, but not in actual operation, the ultimate result of which is an economy in consumption of fuel and water.

By the construction and combination of parts as above described we produce a portable engine which is superior in point of compactness, lightness, durability, and economy.

Having thus described our invention, what we claim as new is—

1. The combination, with the horizontal boiler A, of the feed-water heater and mud or sediment extractor M, the two being connected by a pipe, *f*, leading from the top of the latter, and the exhaust-steam heater P and pipe *e* connected thereto, for conducting water from the pump and introducing it at the side of the heater M, all arranged as shown and described, for the purpose specified.

2. The combination, substantially as described, of the hollow fire-bridge located in the large central fire-flue, the dome steam-pipe, and the exit steam-pipe leading to the steam-chest, for the purpose of superheating the steam, as specified.

3. The combination, with a portable engine, of the fixed and adjustable sections of the smoke-stack and the friction-clamp, consisting of a band and screw, applied and arranged as shown and described, for the purpose specified.

4. In combination with a portable engine, the boster *b*, having a socket open on the front side, the hounds *e*, the tongue E, standard *a*, and axle D, as shown and described.

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