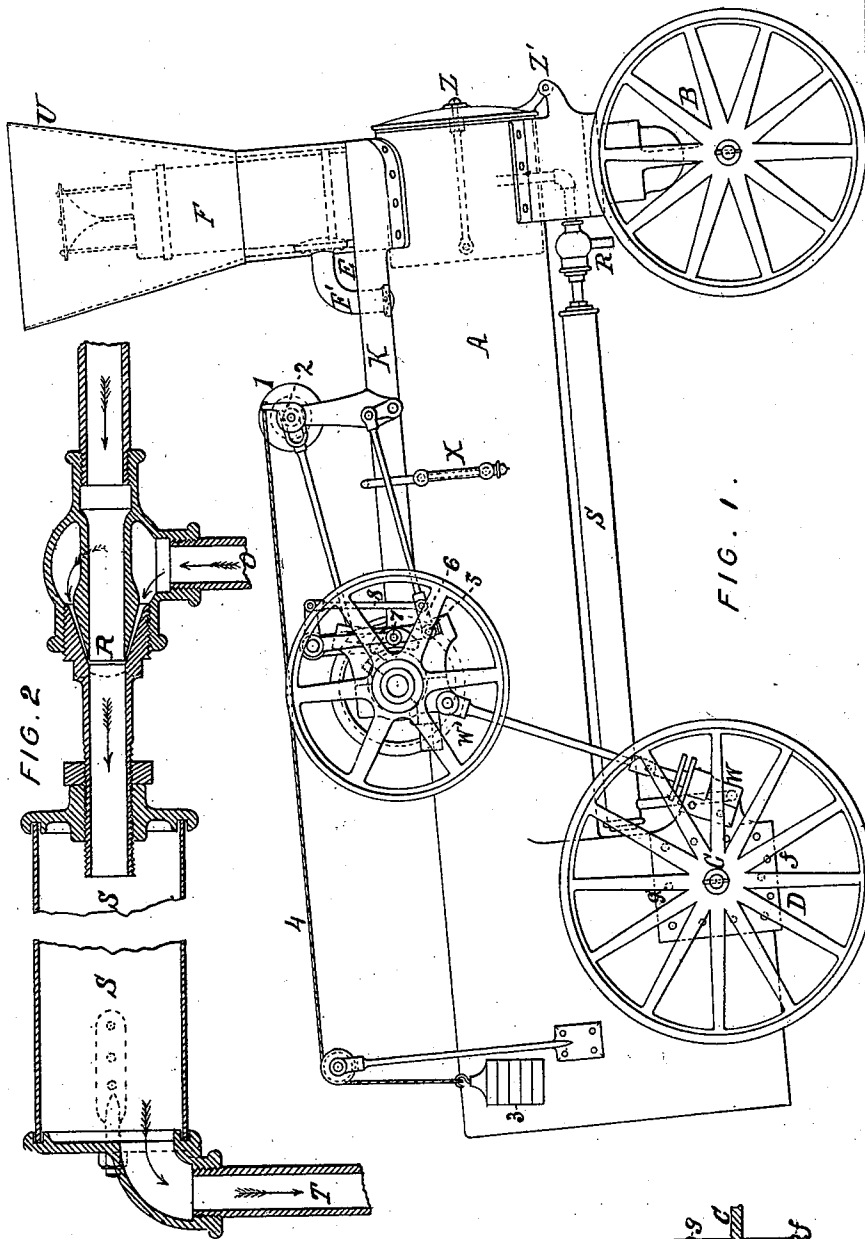


E. W. MILLS.
Portable Engines.

No. 227,566.

Patented May 11, 1880.



WITNESSES.

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FIG. 3.

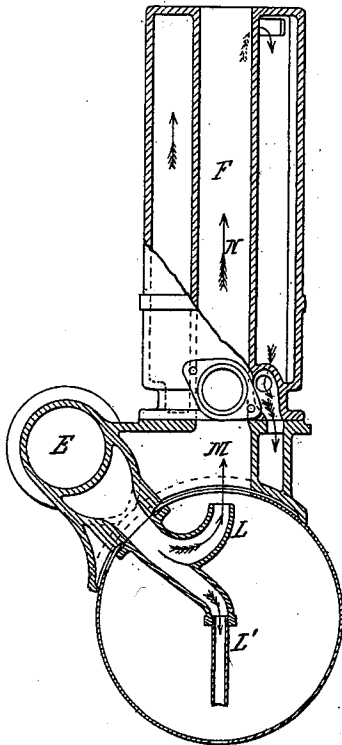


FIG. 4.

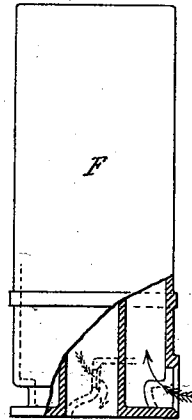


FIG. 5.

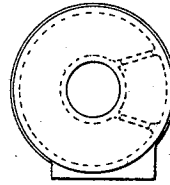


FIG. 6.

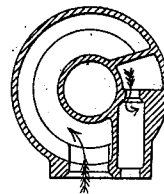


FIG. 7.

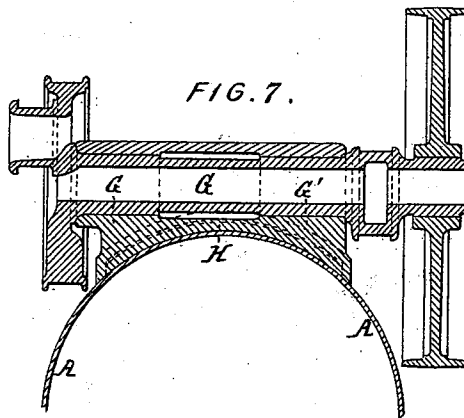


FIG. 8.

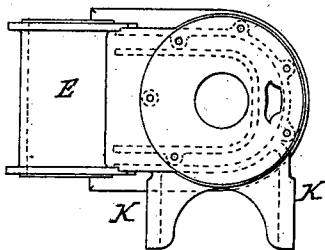
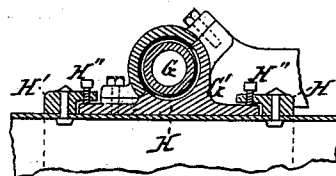


FIG. 9.



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UNITED STATES PATENT OFFICE.

EMORY W. MILLS, OF FISHKILL-ON-THE-HUDSON, ASSIGNOR OF ONE-HALF OF HIS RIGHT TO THE FISHKILL LANDING MACHINE COMPANY, OF FISHKILL LANDING, NEW YORK.

PORTABLE ENGINE.

SPECIFICATION forming part of Letters Patent No. 227,566, dated May 11, 1880.

Application filed January 27, 1879.

To all whom it may concern:

Be it known that I, EMORY W. MILLS, of Fishkill-on-the-Hudson, Dutchess county, State of New York, have invented a new and useful Improvement in Portable Engines, which is fully set forth in the following specification and accompanying drawings, in which—

Figure 1 is a side elevation of the engine. Fig. 2 is a longitudinal section of the condensing-heater. Fig. 3 is a vertical section of the steam-dome and a transverse section of the cylinder, taken through one of its ports and exhaust-passages. Figs. 4, 5, and 6 are detached views of the passages connected with the steam-dome. Fig. 7 is a longitudinal section of the crank-shaft, crank-pin, and saddle-plate. Fig. 8 is a plan of the cylinder, and shows its relation to the steam-dome. Fig. 9 is a transverse section of the crank-shaft, and shows one of its bearings in section.

These improvements pertain to that class of machines known as "portable engines;" and the invention consists, first, in combining the bearings of the crank-shafts with the cylinder, and both with the boiler, that full and free compensation for expansion and contraction is provided without injury to the boiler or change of valve motions; second, the invention also consists in combining the cylinder and smoke-box and steam-dome with their passages, as shown, in such a manner that waste products of combustion are utilized to prevent loss of power from radiation; third, the invention also consists in forming the crank shaft, crank-pin, and valve-eccentric all in one piece and making them hollow, so that a constant circulation of air may be formed through them when in motion, as will hereinafter appear; fourth, the invention also consists in mounting the end of the boiler which supports the steam-cylinder dome and the exhaust-passages in such a manner that a steam-space will always be left above the water-line under the steam-pipe or opening leading to the dome, as will hereinafter appear.

There are several other improvements, which will form the subject of special claims, as will hereinafter appear, and which need not, therefore, be set forth in the recital of invention.

At A is represented the boiler of the porta-

ble machine, which is mounted on wheels. The front axle, with its wheels B, serves to support the smoke-box end of the boiler upon a pivotal bearing, to allow the axle to be turned in any position to guide the engine over the ground in transit, while the rear wheels, C, are mounted on spindles extending from the sides of the fire-box D, the base of said spindle being bolted or riveted to the fire-box. This arrangement allows the front end of the boiler or machine to be moved about as desired, while the rear wheels permit the change of position required.

The steam-cylinder E is cast in one piece with the base of the smoke stack, and the steam-dome is shown at F, so that when the several parts are united they will be in such proximity to each other as to prevent the loss of heat from radiation or from the condensation of the steam through long conducting-passages from one to the other, and they also serve as a base for the permanent mounting of the parts upon the end of the boiler, so that the cylinder and the steam-dome are firmly united together and to the boiler.

The crank-shaft is shown at G, and is mounted upon suitable bearings G', which rest upon the saddle H as a base-plate, which rests upon the top of the boiler or upon a base-plate fastened upon the top of the boiler. This saddle H is held in position upon the boiler by guides H', which control its motion in the direction of the length of the boiler, and by binding-screws H'', extending through flanges of the guides H', as seen at Fig. 9.

From the said saddle to the cylinder are bars of metal K, Fig. 1, which serve to connect the two (that is, the bearings of the shaft) with the cylinder, so that all expansion and contraction of the boiler between the cylinder and the crank-shaft are properly compensated for, as the saddle may be permitted to slide upon its seat on the boiler.

By such an arrangement the engine or cylinder and crank-shaft are mounted upon the boiler relatively to each other, and thereby form substantially one frame, as if cast in one piece.

The cylinder, as above stated, is formed with a projecting flange upon its side to sup-

port the steam-dome F, which receives the steam from the boiler through a pipe, F', in Fig. 1; and there are also formed upon the side of the cylinder next to the smoke-box exhaust-passages L L', for the outlet of the exhaust-steam from the cylinder.

The outlet-passage L leads to a point under the vertical opening through the steam-dome M, and the steam, in its passage from the cylinder, is thereby caused to go up or escape through the smoke-stack, as indicated by the arrow N. The other portion of the steam from the cylinder escapes down through the branch pipe L', and is thence conducted to its condensing-point R, Fig. 2, where an injecting-nozzle is combined with the cold-water supply, as at O. This injecting-nozzle is the same, or substantially the same, as used in the Giffard injector, and operates on the same principle to lift the water from a cistern or tank up through the tube O, and then is combined with the steam at the nozzle R, and is thence driven forward into the reservoir of hot water S, which is connected with the feed-pump at T.

By such an arrangement the exhaust-steam used for heating the feed-water is utilized as water, or is condensed instead of escaping, as is usually the case in such engines, after its heat has been used in the feed-water heater.

The passage for the outlet of the exhaust-steam through the said forked ends may be fitted with a valve to throw the exhaust-steam more to one than the other point, as desired.

The steam-dome F is a double-cylinder, as shown in section at Fig. 3, and the inner cylinder forms the smoke-flue, so that any heat escaping through it is to some extent utilized in keeping the steam in the dome dry before it escapes at the upper end.

There is outside of the said dome a smoke-funnel, U, which serves to shield the dome from the external air, and which may be carried to any height or in any form for increasing the draft as desired, or carrying off the waste products of combustion.

It will be observed that by placing the steam-cylinder and the steam-dome in close relation to each other, and the steam-dome within the smoke-stack, this end of the boiler may be raised to a sufficient height to prevent the steam in the dome from becoming charged with water from any cause whatever, while at the same time, whatever water is in the boiler may be kept in contact with the fire-box. This is exceedingly essential in the operation of such engines, as they carry but a very small supply of water as compared with their steam-generating requirements.

Another great advantage of this arrangement is that as the end of the boiler from the fire-box forward is so raised its tubes are on an incline upward to the steam-dome. The steam-space being thereby formed between the tubes is increased as the water-space is diminished, so that the steam more easily escapes from the water and from saturation, and prevents the boiler from "priming" as

it is termed, or carrying the water up with the steam, as has been again and again clearly proven in practice. This tilted position of the several parts also tends to convey off the silt or earthy matter to the lowest points, where cocks are fixed to remove such impurities, and thereby prevents to a great extent the formation of scale.

Another feature of such an arrangement is that the feed-pump may be placed below the cylinder and the heater or condenser, as shown at W, so that all the water of condensation easily runs to the pump, whence it is again returned to the boiler. In this arrangement of the parts the injector does not act in any manner to feed the water to the boiler. Consequently the pump may be placed below all the sources of supply to it, and the water may be as hot as water can be made below the steam-point, and yet the boiler will be supplied by the pump. The pump in this case is of the well-known plunger kind, and its piston is driven by a connecting-rod, W', directly attached to the eccentric-strap that operates the valves.

The crank-shaft G and crank-pin and eccentric are all cast in one piece and with a hole or air-space through them, so that when they are in motion a current of air is drawn through the working parts, and thereby tends very greatly to keep them cool.

The feed-pump is fastened upon one of the brackets that support the wheels at the fire-box end of the boiler. Said brackets are on each side of the fire-box or legs of the boiler, and are formed with flanges f, which project under the bottom of the legs and have screw-bolts with hooked or T-heads extending through them to catch on the inside, so that the said brackets and hook-bolts support that end of the boiler, instead of allowing the weight to rest upon the screw-bolts above, which hold the brackets laterally upon the side of the boiler, as at g.

The water-gage is shown at X on the side of the boiler and toward the smoke-box end, and this is its proper location, for the reason, as above stated, concerning the escape of the steam from the water in an inclined tube, and where priming cannot take place. Consequently the true position of the water will be indicated by a gage placed nearer to the smoke-box than the fire-box of a tubular boiler when inclined, as already described.

Another improvement consists in the manner of fastening the door of the smoke-box by a center bolt, as shown at Z, so that it may be quickly opened and let down on its hinges at Z', which are attached to the lower edge, as shown in Fig. 1.

The governor is shown in outline at 1 in Fig. 1, and is of the turbine variety, and its shaft is connected to an arm, 2, by means of a friction-clutch, so that when the speed is sufficiently great to cause the clutch to act it forces the arm 2 back, and thereby raises the weight 3, attached to the cord 4, and at the

same time changes the eccentric 5 to operate upon the link 6, and thereby shift the valve-rod 7 in its slide or link 8, so that the throw of the valve will thereby be controlled and adapted to the proper speed, and the weight at the fire-box will also serve as an index to the fireman to control the fire.

Having thus described my invention, I claim—

10 1. The combination of the steam-cylinder, the steam-dome, the movable saddle carrying the crank-shaft, and the eccentric, all constructed and arranged substantially as described.

15 2. The combination of the steam-cylinder, steam-dome, and smoke-box, all constructed and arranged relatively to each other as shown, and for the purposes set forth.

20 3. In a portable engine, the crank-shaft, crank-pin, and eccentric cast in one piece and having an air space or opening through them,

as shown, and for the purpose of forming an air circulation through them, as specified.

4. In a portable engine, the combination of the feed-pump piston with the crank-shaft by attachment to the eccentric-strap that operates the steam-valves, all constructed and arranged as and for the purpose specified.

5. The combination of the annular steam-dome E with the exhaust-pipe of the cylinder, the smoke-box, and smoke-stack, all constructed substantially as shown and described.

6. The combination of the smoke-stack and saddle H, movable between guides H', with the crank-shaft C and steam-cylinder E, all arranged substantially as shown, and for the purpose specified.

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Witnesses:

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G. W. NICHOLS.