2 Sheets—Sheet 1

F. WEDGE.

Steam-Engine.

No. 109,783. Patented Nov. 29, 1870.

Fig. 1

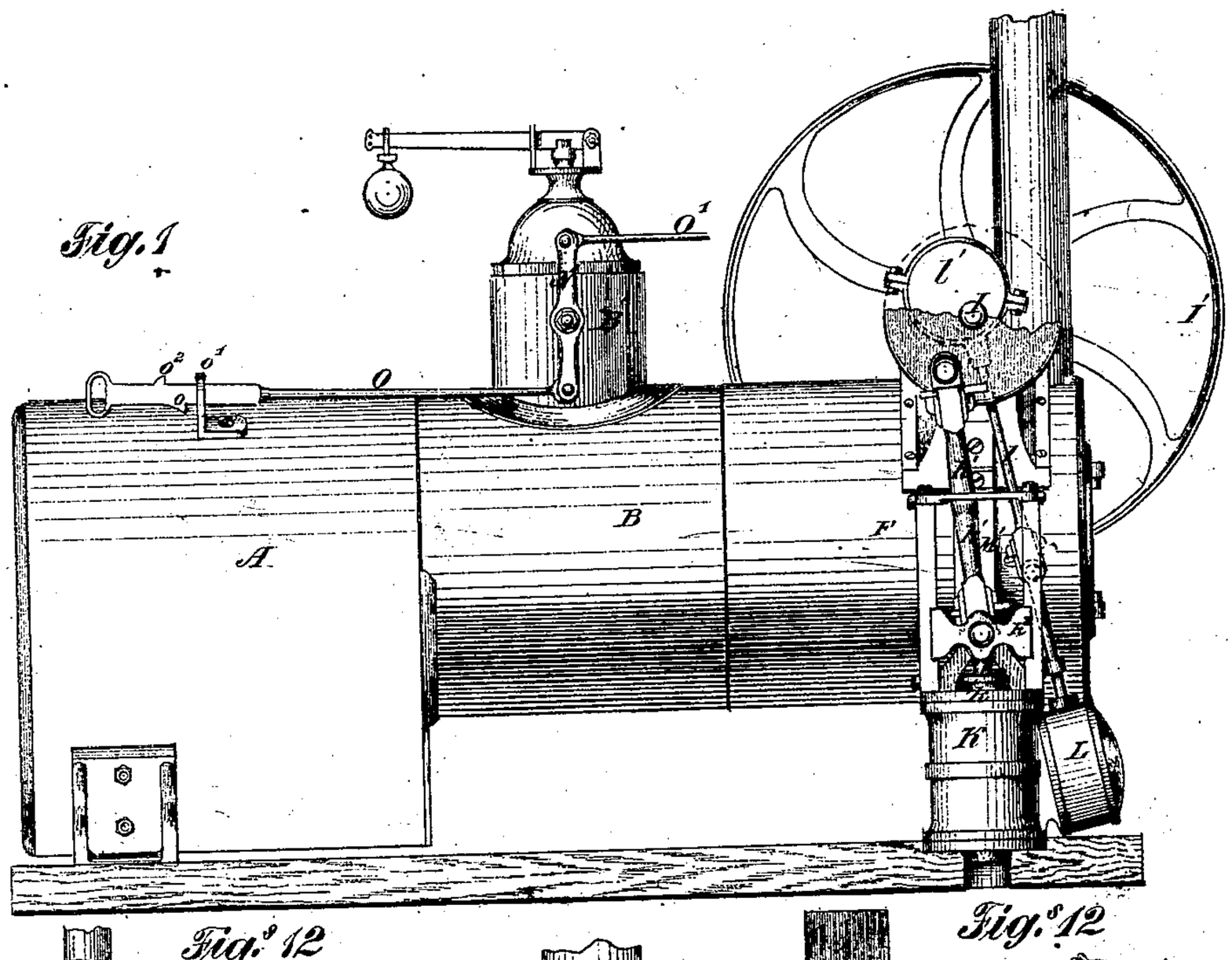


Fig.s 12

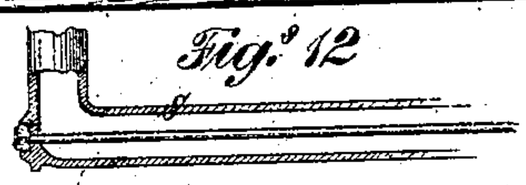


Fig. 3

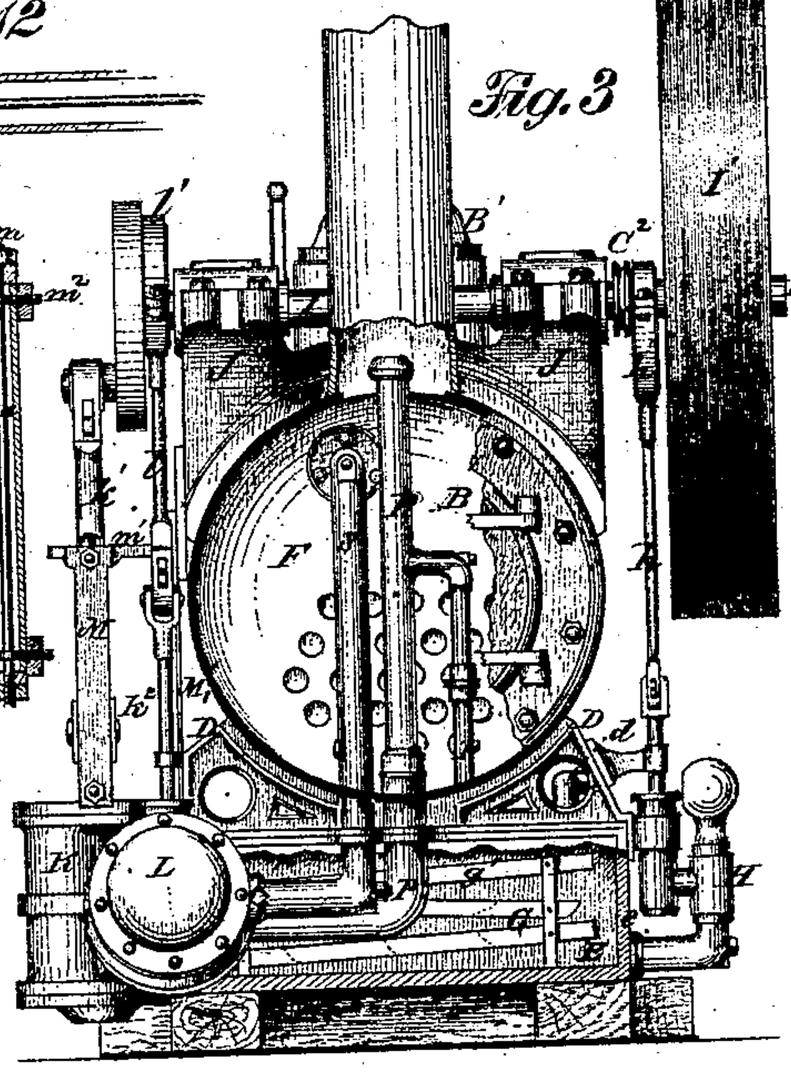


Fig.s 12

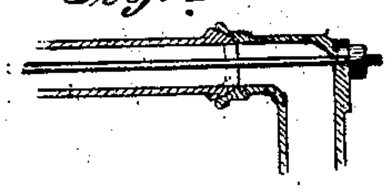


Fig. 9

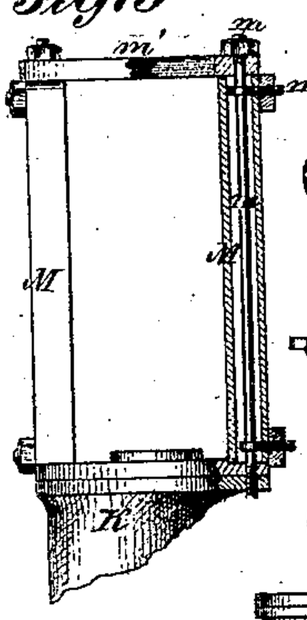


Fig. 10

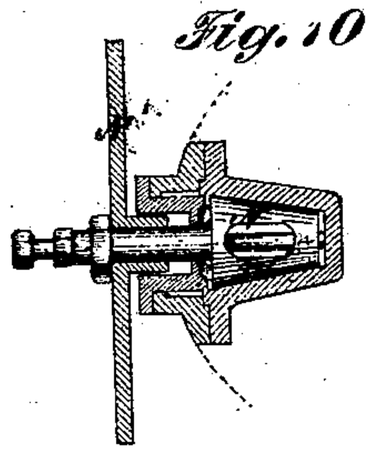
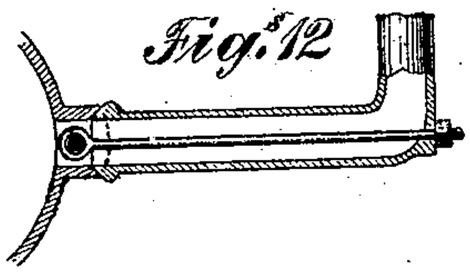


Fig.s 12



Witnesses:-
Wm. H. Rome
Joe. Peyton.

Francis. Wedge
by his Atty
Wm. D. Baldwin

2 Sheets—Sheet 2.

F. WEDGE.

Steam-Engine.

No. 109,783. Patented Nov. 29, 1870.

Fig. 2

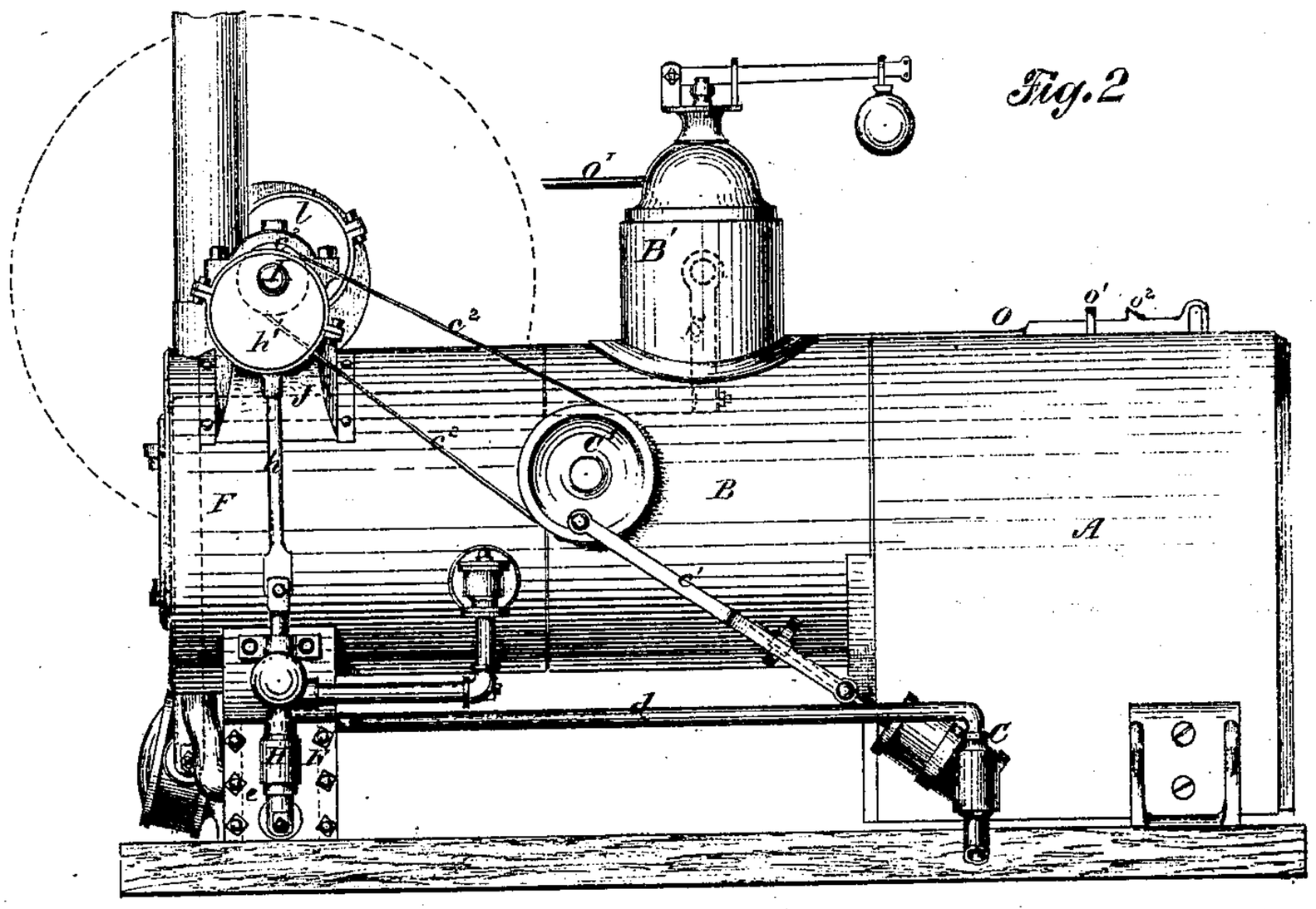


Fig. 4

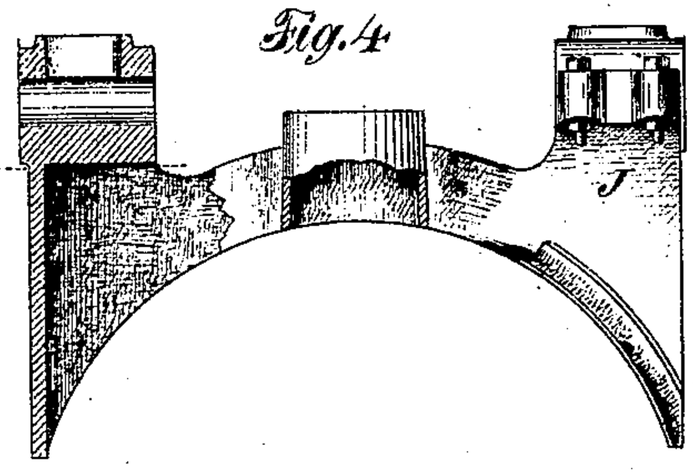


Fig. 7

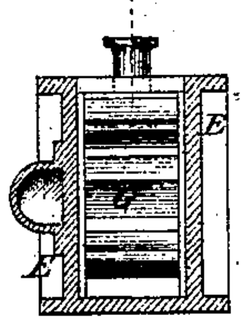


Fig. 6

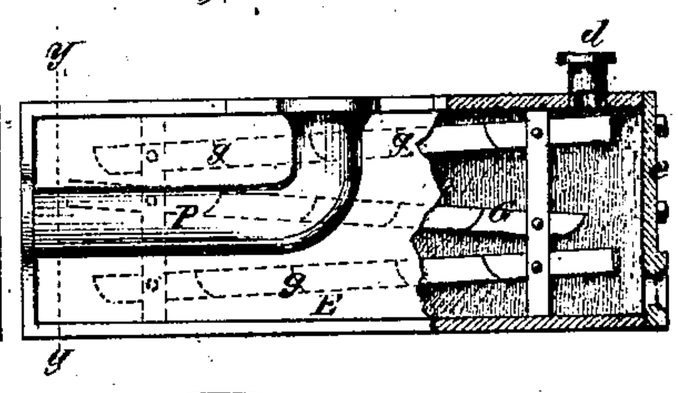


Fig. 5

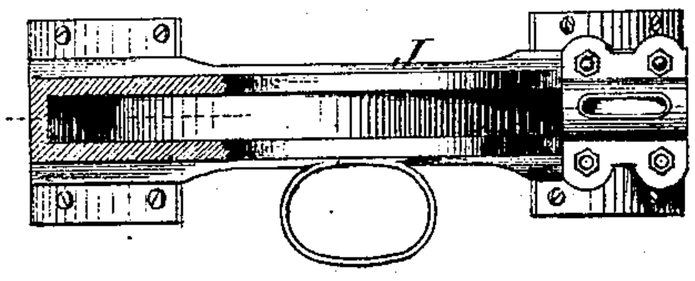


Fig. 8

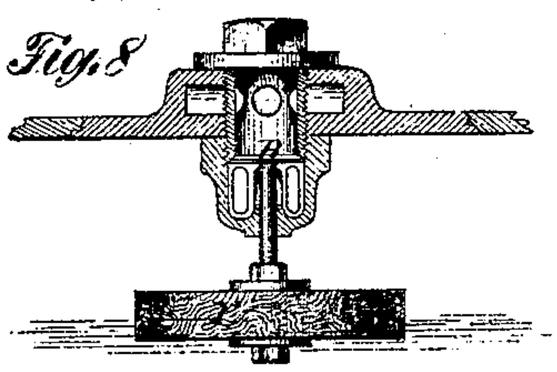
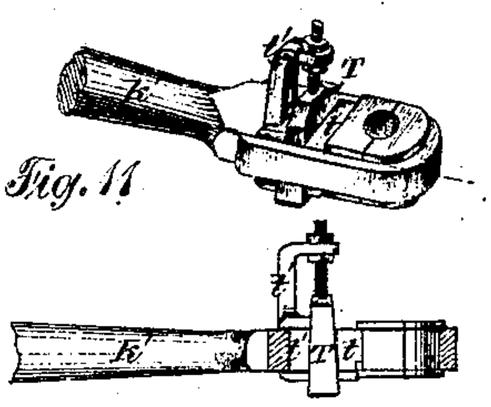


Fig. 11



Witnesses:-
Wm. H. Rome -
Joe. D. Peyton,

Francis Wedge
by his Atty
Wm. D. Baldwin

UNITED STATES PATENT OFFICE.

FRANCIS WEDGE, OF ZANESVILLE, OHIO, ASSIGNOR TO HIMSELF AND THOMAS GRIFFITH, OF SAME PLACE.

IMPROVEMENT IN STEAM-ENGINES.

Specification forming part of Letters Patent No. **109,783**, dated November 29, 1870.

To all whom it may concern:

Be it known that I, FRANCIS WEDGE, of Zanesville, in the county of Muskingum and State of Ohio, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification:

The object of my invention is to produce a cheap, simple, effective, and durable portable steam-engine; and to this end my improvements consist in certain novel combinations and constructions of the various parts of the engine, as hereinafter more fully set forth.

The accompanying drawing represents so much of my improved engine as is necessary to illustrate the invention herein claimed.

It is, however, obvious that some of my improvements may be used without the others, and that they may be adapted to other engines differing somewhat in construction from the one herein shown.

Figure 1 represents an elevation of the engine as seen from the side on which the working-cylinder is located; Fig. 2, an elevation of the side opposite to that shown in Fig. 1; Fig. 3, a front elevation with the end of the smoke-box broken away; Fig. 4, a front elevation, partly in section, of the front saddle and the base of the smoke-stack; Fig. 5, a plan view of the same; Fig. 6, a front elevation, partly in section, through the feed-water heater; Fig. 7, a vertical section through the same on the line *y y* of Fig. 6; Fig. 8, a section through the feed-water-heater valve; Fig. 9, a view, partly in section, of the guide-frame and cylinder; Fig. 10, a section through the throttle-valve; Fig. 11, views of the strap-joint of the cross-head end of the driving-pitman; Fig. 12, a section through the steam-pipes, showing the mode in which they are connected.

In this instance a fire-box, A, and horizontal tubular boiler B, of the usual construction, are shown as mounted on a foundation or frame of suitable construction. A cold-water pump, C, Fig. 2, is secured upon the side of the fire-box. The piston-rod of this pump works in a guide on the boiler-shell, and is reciprocated by a pitman, c^1, pivoted to a pulley, C^1, driven by an endless belt, c^2, encircling a pulley, C^2, on the main shaft I. I am thus enabled to get a long stroke by using a large pulley, and to diminish the length and weight of the pitman.

The front end of the boiler rests upon saddles D, which form caps or covers for the feed-water reservoir E, arranged beneath the smoke-box F. These saddles may either be bolted upon the box or cast in one piece with it, as preferred. A pipe, *d*, leading from the cold-water pump C, passes through one of these saddles and enters the reservoir. (See Figs. 2, 3, and 6.)

A series of pans, G, is arranged in the reservoir, as shown in Figs. 3, 6, and 7, being inclined in alternately opposite directions, and provided with low transverse partitions *g*. (Shown in dotted lines in Figs. 3 and 6.) The feed-water flows over these partitions and down these troughs, being heated, as it descends, by the exhaust-steam, as hereinafter explained.

A feed-pump, H, is mounted or cast on a plate, *e*, which forms one end of the reservoir E, to which it is attached by screws or bolts, to permit of its ready removal and replacement to allow access to the heater-pans G. The core is removed through the opening covered by the plate *e* when the reservoir is cast in one piece with the saddles. This pump is driven by a pitman, *h*, and an eccentric, *h'*, from the main shaft I, which is mounted in proper bearings in a saddle, J, on the boiler.

A band-wheel, I', on the same side as the pump, drives the machinery, to which the power is to be applied by a belt or band in the usual way.

The cylinder K and valve-chest L are secured upon another plate, forming the end of the reservoir, opposite to the feed-pump H.

The valve-chest, it will be observed, is inclined relatively to the cylinder; but its face is radial to the main shaft I, from which it is worked by a pitman, *l*, and eccentric *l'* in the usual way. By this arrangement I secure the movement of the valve in a line radial with the main shaft, and thus secure uniform wear on its face.

The piston-rod *k* drives the pitman k^1 connected with the main shaft I. The cross-head k^2 of this pitman is, by preference, made of steel, and forged in one piece with the piston-rod. It may, however, if desired, be made separately therefrom. The cross-head moves be-

tween tubular guides M, resting in grooves on the cylinder-head.

Rods *m* pass down through a yoke, m^1, bolted to the brace M^1, which is secured in a socket on the saddle J. These rods also pass down through the cylinder-head, and through eyebolts m^2 projecting through the tubular guide-posts. Set-screws on these eyebolts serve to adjust the positions of the guide-posts relatively to the cross-head. The rods M thus serve as bolts for the cylinder-heads, as stays for the guide-posts, and as a means of adjusting the guide-posts.

A strong bar or brace, M^1, is inserted in a socket in the saddle J, connects it with the reservoir, and stiffens the guide-frame of the engine. The yoke m^1 is secured to this brace, as above stated.

A throttle-valve, N, which also acts as a regulator-valve, is arranged in the steam-dome B′ of the boiler, and is controlled by a double crank-arm, N′, which moves endwise on a feather set in the stem of the valve-plug *n*, thus causing the arm and plug to turn together, while leaving the crank free to be adjusted by its packing-nut. The hub of the arm thus acts as a gland for packing said stem. (See Fig. 10.)

A link, O, extends from the arm N′ to a point within reach of the fireman. A lug, *o*, on this link abuts against a stop, o^1, on the boiler (which stop may, if preferred, be rendered adjustable) when the link is shoved forward to slow the engine, without shutting off the steam entirely.

To stop the engine the link must be lifted until the lug *o* passes over the stop, and pushed forward until the lug o^2 on the link abuts against the stop, when the steam will be shut off.

Another link, O′, likewise connected with the crank-arm of the valve N, extends forward of the engine, so that it may be reached by the workman in charge of the driven machinery, and thus enable him to control the engine from that point independent of the fireman.

A steam-pipe, S, leads from the under side of the throttle-valve in the steam-dome down through the boiler and tube-sheet into the smoke-box, as shown in Fig. 2, and thence is conducted down to the valve-chest, as shown in Fig. 3.

Instead of the joint ordinarily used, I round the ends of the pipes so as to form a ball-joint, and connect the two parts by center-bolts through the pipe, as shown in Fig. 12. This mode of construction insures the accurate fitting of the joints, and compensates for the working of the parts.

The exhaust-pipe P, which leads from the cylinder K into the smoke-box F, is cast on the outer side of the reservoir E.

The feed-water is heated by conducting part of the exhaust-steam into the reservoir E by means of a pipe, *p*, leading from the exhaust-pipe P, the nozzle of which is contracted to furnish pressure sufficient to drive the steam through the pipe, as well as to increase the draft.

I propose, instead of the exhaust-pipe shown in Fig. 3, to use the device shown in Fig. 8, consisting of a valve, R, in the exhaust-pipe, provided with a float, *r*, in the reservoir. When the water is low in the reservoir the valve R would be open and the exhaust-steam would escape into the reservoir; but when the water rises the valve closes and prevents the feed-water from escaping into the exhaust-valve, while the steam continues to exhaust up the pipe.

Fig. 11 represents an improved method of connecting the pitman with the cross-head.

The ordinary gib and key, passing through the strap at right angles to the pivot, could not be used in my engine conveniently on account of the guides M. I insert in the strap, above the brasses, a beveled backing-piece, *t*, with flanges on one end to prevent it from being drawn through the strap as the wedge is tightened. I also insert in the strap a flanged back gib, *t′*, having a bracket on it, through which the screwed spindle of the tightening-wedge T passes, and is held by jam-nuts on each side of the bracket. The parts are thus rendered easy of removal, replacement, and adjustment. That portion of the slot in which the wedge T is inserted is made much wider than that portion occupied by the body of the brasses. This mode of construction enables me to use flanged brasses, which can be inserted in the wide part of the slot, and then moved up into the narrow part, where they are securely held by the flanges from moving endwise.

My invention combines a horizontal tubular boiler with a vertical engine, which combination insures many practical advantages, as the horizontal boiler is the best for general use, while the vertical engine works with comparatively little wear and strain, as the main shaft of the engine comes directly over the tube-sheet, and the weight of the boiler steadies the engine.

I claim as my invention—

1. The combination of the cold-water pump, the feed-water reservoir, the saddle which supports the boiler and covers the reservoir, and the cold-water pipe passing through the saddle into the reservoir, all these parts being constructed and operating substantially as hereinbefore set forth.

2. The combination of the boiler, the feed-water reservoir, and the saddles which form the cover of the reservoir and the support of the boiler, all these parts being constructed substantially as hereinbefore set forth.

3. The combination of the boiler, the feed-water reservoir, the working-cylinder at one end of the reservoir and the feed-pump at the other, all these parts being constructed to operate substantially as hereinbefore set forth.

4. The combination of the feed-pump with the removable plate which forms the end of the feed-water heater, as set forth.

5. The feed-water reservoir, constructed as described, and supporting the forward end of the boiler.

6. The combination, with the feed-water reservoir, constructed as described, with a removable end plate, *e*, of the inclined transversely-divided feed-water pans, constructed independently of the reservoir, as set forth, so that they, as well as the reservoir, may be accessible for repairs.

7. The combination of the cold-water pump, the reservoir, the feed-water pans, and the feed-pump, all these parts being constructed and operating in combination, substantially as hereinbefore set forth.

8. The combined throttle and regulating check-valve in the steam-dome, constructed and operating as set forth.

9. The combination of the horizontal boiler, the main shaft mounted on top of the boiler, the working-cylinder and its valve having its face radial to said shaft, both cylinder and valve being mounted on the feed-water reservoir, below the boiler, as set forth.

10. The combination, construction, and arrangement of the feed-water reservoir, the saddle in which the main shaft is mounted, the bar connecting the saddle and reservoir, the working-cylinder, the guides of the cross-head, and the yoke supporting said guides, substantially as hereinbefore set forth.

11. The combination of the working-cylinder, the tubular guides between which the cross-head works, the yoke which connects the guides with the engine-frame, and the screw-rods connecting the yoke, the guides, and the cylinder-head, as set forth.

12. The combination and arrangement of the working-cylinder, the feed-water reservoir, the exhaust-pipe, and the feed-water steam-pipe leading from the exhaust-pipe to the reservoir, these parts being constructed to operate in combination, substantially as set forth.

13. The combination of the feed-water reservoir, the exhaust-pipe, and the automatically-closing overflow-valve, substantially as set forth.

14. The combination of the slotted strap, the flanged brasses, the flanged backing-piece, the flanged gib and its bracket, and the tightening-wedge, its screwed spindle, and jam-nuts, all these parts being constructed to operate in combination, as set forth.

15. The combination of the throttle-valve, the steam-chest, the steam-pipes, the ball-joints, and the through-bolts inclosed in the pipes, all these parts being constructed as described, for joint operation.

In testimony whereof I have hereunto subscribed my name.

FRANCIS WEDGE.

Witnesses:
JOE I. PEYTON,
BALTIS DE LONG.