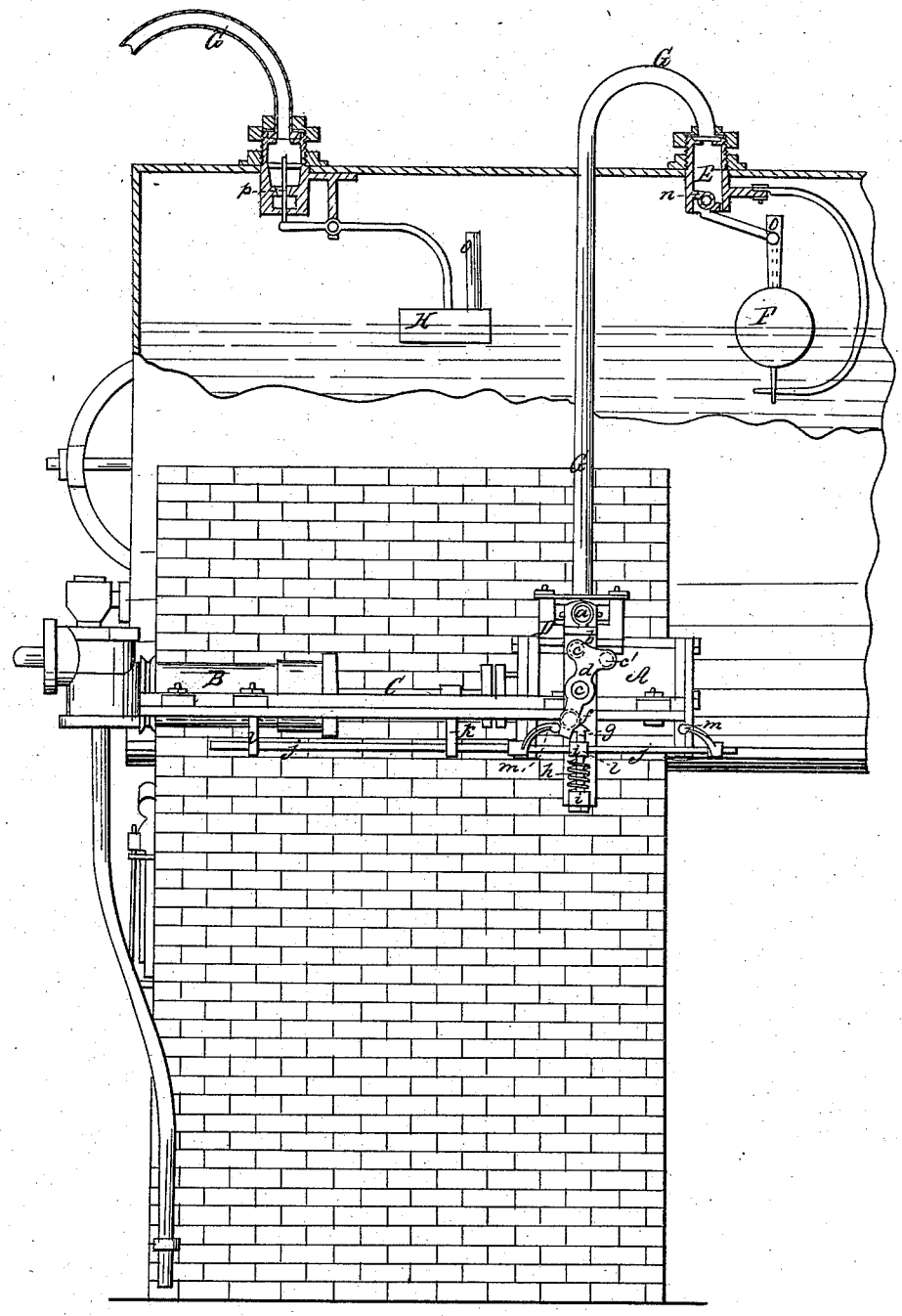
H. R. Worthington,

Steam-Boiler Water-Feeder,

No. 3,677, Patented July 24, 1844



UNITED STATES PATENT OFFICE.

HENRY R. WORTHINGTON, OF NEW YORK, N. Y.

MANNER OF CONSTRUCTING AND GOVERNING AUXILIARY STEAM-ENGINES FOR THE PURPOSE OF SUPPLYING STEAM-BOILERS WITH WATER.

Specification of Letters Patent No. 3,677, dated July 24, 1844.

To all whom it may concern:

Be it known that I, HENRY R. WORTHINGTON, of the city of New York, in the State of New York, have made certain new and useful improvements in the manner of constructing and governing auxiliary steam-engines for the purpose of supplying steam-boilers with water; and I do hereby declare that the following is a full and exact description thereof.

In the accompanying drawing, I have represented my auxiliary engine, and a force-pump connected therewith. I have also shown a part of a steam boiler which has a portion of its cylindrical shell removed, for the purpose of exhibiting the manner in which I construct and arrange a float and valve for the supplying of steam to work the auxiliary engine. In the general arrangement of my auxiliary engine and pump there is not anything new, such engines and pumps having been in use prior to the invention by me of the improvements therein which I am about to describe.

A, is the steam cylinder of the auxiliary engine, and B, the cylinder of the force-pump. The steam cylinder is furnished with a slide valve, steam ports, or openings, a piston, piston rod, and other appendages ordinarily used.

C, is the piston rod, the extension of which into the force-pump constitutes the plunger of that part of the apparatus.

My principal improvement in the auxiliary engine consists in the manner of rendering the action of the slide-valve certain, without its being necessary to depend upon the momentum of the engine therefor. The movement of this valve has, heretofore, been produced by attaching a projecting pin to the piston rod, or to a rod connected therewith, which pin was, at the proper time, made to strike a lever on the valve stem, and thereby to move the slide-valve in the proper direction for the alternate admission of steam on the opposite sides of the piston. When the engine is thus arranged, the momentum of the moving parts is depended on for continuing the motion of the valve beyond the steam ports, or openings; but it has been found, in practice, with all engines of this description that the momentum is frequently insufficient for this purpose; its motion is often extremely shown, as when the water is nearly at the required height in the boiler, the quantity of steam that passes to the auxiliary engine is very small, and the valve is, consequently, liable to stop in such a position as to cover both of the steam openings into the cylinder. When this happens, the aid of an assistant is requisite to start the engine anew, as without such aid it would remain forever at rest, whatever might be the elastic force of the steam admitted. By my improvement, the danger of the stopping of the valve in such a position is effectually obviated.

The principle upon which my improvement is dependent may be carried into effect in various ways, but I have, in the accompanying drawing, represented that which, after careful experiment, I have found to be one of the most simple, and know to be perfectly effective.

D, is the steam chest of my auxiliary engine, within which there is a slide-valve of the ordinary construction, the seat of which is curved, as is usual where the valve is moved by the vibration of its stem, this being so moved by the stem, *a*. To this stem I attach an arm, or lever, *b*, which extends down, and passes between two projecting pins, the places of which are shown by the dotted lines, *c*, *c'*, on the head of the T-formed piece, *d*, which piece vibrates on a center at *e*. Toward the lower end of this piece, as at *f*, there is a friction roller, against which a sliding piece, *g*, is born up by a spiral spring, *h*, the piece *g*, is guided up and down by passing through holes in the studs, *i*, *i*, or in any other convenient manner, its head is in the form represented in the drawing, where it is shown as forming two inclined planes, meeting in an angular point at its apex.

A sliding rod, *j*, *j*, which is attached to the piston rod by an arm, *k*, and passes through sockets at *i*, *l*, *l*, carries two tappets, *m*, *m*, which operate on the lower end of the vibrating piece *d*. The pins *c*, *c'*, which receive between them the lower end of the arm, or lever, *b*, are so far apart as to allow said lever to vibrate to a considerable distance out of contact with either of them.

Under this arrangement, it will be seen that when the engine is in motion the tappets, *m*, *m*, being alternately brought into contact with the vibrating piece, *d*, will move it back and forth, alternately depressing and relaxing the spiral spring, *h*;

but that this vibration will not, in consequence of the distance apart of the pins, c, c', communicate motion to the slide-valve until the friction roller, f, has passed over the apex of the sliding piece, g, when the spring, h, by its tension, will then force up said piece and give the required motion to the slide-valve, and it will thus be moved back and forth alternately, with unerring certainty; it being impossible for the valves to continue, for an instant, over both steam ports.

It will be perceived by any competent machinist that a like effect may be produced by substituting a tumbling weight for the spring and slide, h, and g, which weight may be placed on an arm rising vertically above the vibrating piece, d, and firmly attached thereto; the tappets will then operate so as alternately to throw the arm beyond the vertical position, when the weight, from its gravitation, will produce the desired effect.

In order to render the auxiliary engine self-acting without requiring any attention on the part of the engineer, I place a float within the boiler, which, as the water descends below its ordinary level, will, through the intervention of a lever, act upon a valve, and open it to such extent as is necessary to regulate the quantity of steam passing through it; which will be proportioned to the deficiency of water in the boiler. I have, in the accompanying drawing, shown two different modes of aranging the float and valve, either of which will answer the intended purpose.

E, is a tube, or chamber, containing a throttle-valve, n; F, is a float, from the stem, o, of which a lever extends, and is attached, at its opposite end, to the valve, n. It will be manifest, under this arrangement, that as the float, F, descends, the throttle valve will be opened, and that in exact proportion thereto.

G, G, is the tube by which the steam is conveyed to the auxiliary engine. The valve n, will act with equal ease whatever may be the pressure of steam within the boiler, its surface on each side of its center of motion being equal. I make my float of metal, and hollow; its stem, o, is tubular, as shown by the dotted lines, and extends up to a considerable height above the water line; the float may, therefore, be made as light as may be desired, without the possibility of its collapsing by the pressure of steam; and should any water be formed in it by condensation, it will be evaporated whenever the boiler is heated.

H, is a float for the same purpose as F, though differing from it in form; it is, however, similar to it in its construction and operation, being hollow, and having a tube, o, rising from it. This float is connected to a puppet valve, p, which is made to open outward, like the ordinary safety valve; it is kept closed only by the action of the float when the water is sufficiently high; but when it is too low, the pressure of the steam concurs with the descent of the float in opening the valve. This valve should be small, or the pressure of highly elastic steam might counteract the buoyancy of the float.

Having thus fully described the nature of my invention, and shown the manner in which the same may be carried into operation, what I claim therein as new, and desire to secure by Letters Patent, is—

The manner in which I govern the action of the slide valve of the auxiliary engine, by the aid of the tappets, the vibrating piece, d, the sliding piece, g, and their appendages, as set forth. I claim the so regulating of this action, whether the apparatus be constructed precisely in the form represented, or in any other in which a like effect is produced by means substantially the same.

HENRY R. WORTHINGTON.

Signed in the presence of–
A. WORTHINGTON,
R. HENRY ISHAM.