D. Barnum,

Steam-Boiler Water-Feeder,

No. 3,676. Patented July 24, 1844.

Fig. 1

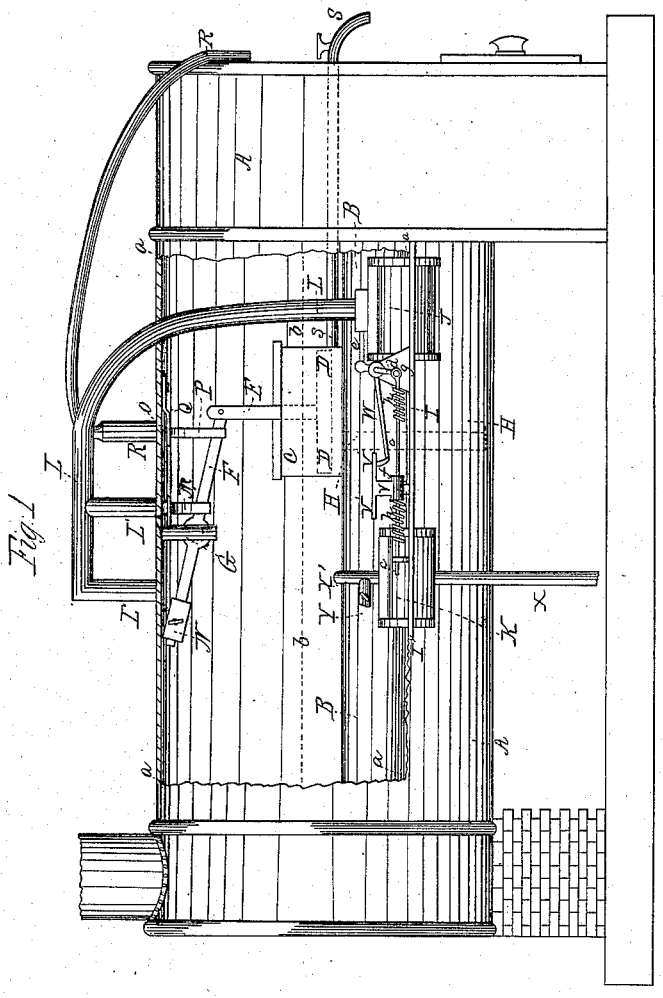

Fig. 5

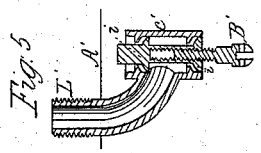

Fig. 3

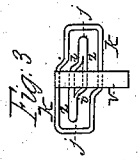

Fig. 2

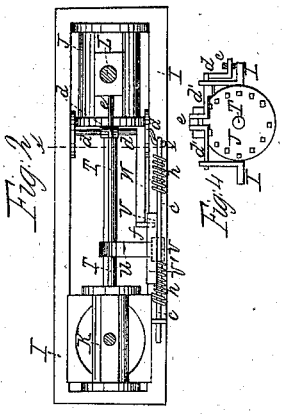

Fig. 4

UNITED STATES PATENT OFFICE.

DANIEL BARNUM, OF BRIDGEPORT, CONNECTICUT.

MANNER OF REGULATING THE SUPPLY OF WATER TO STEAM-ENGINE BOILERS.

Specification of Letters Patent No. 3,676, dated July 24, 1844.

To all whom it may concern:

Be it known that I, DANIEL BARNUM, of Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Steam-Engines, the first of which improvements consists in the manner of insuring a supply of water to the boiler of a steam-engine by means of a self-acting apparatus, and the second of a new and improved manner of constructing and arranging a cut-off in engines to be worked expansively; and I do hereby declare that the following is a full and exact description thereof.

In the accompanying drawing, Figure 1, represents a cylindrical boiler, a portion of the shell of which is removed for the purpose of showing the manner in which I arrange a float and lever, so as to open a valve, or valves, as the water descends in the boiler, and giving also a side view of a small auxiliary steam engine which is attached to the side of the boiler, or affixed in any other convenient manner, for the purpose of working a supply pump by the action of the steam contained within the boiler. Fig. 2, is a top view of the said small, auxiliary engine. Fig 3, a side view of the guide piece of the improved cut-off apparatus; and Fig. 4, is an end view of the cylinder J, and its appendages, in the line *x x* of Fig. 2.

A, A, is the boiler, and *a*, *a*, *a*, the place from which a portion of its shell is removed for the purpose of showing the interior.

B, B, is a flue through the boiler, of which there may be one, or more, as preferred.

C, is a box which is to contain a float, which float is represented by the dotted lines D, D, and is suspended by a rod E, from the lever F, which has its fulcrum at G. The box C, is to be inclosed on all sides, its top being perforated to admit of the working of the rod E, through it, and which has a tube, or tubes, represented by the dotted lines H, H, entering its bottom, and extending down nearly to the bottom of the boiler, to admit water into the box C.

I, I, Figs. 1, and 2, is a bench, or frame, that supports the small engine, and force pump, to supply the boiler. J, is the cylinder, and K, the force pump of said engine. L, L, is a steam tube which conducts the steam from the boiler to the steam chest of the cylinder J. I usually allow the steam tube L, L, to communicate with the boiler through two apertures, as at L′, and L″, each of which is furnished with a valve, or stop cock, by which it may be left open, or closed, at pleasure. M, is a valve that is represented as open, but which would be closed should the float, D, be raised by the admission of water so as to reach to the proper water line, say at *b*, *b*; which water line is considerably below the top of the box C; and it will be seen that said box may extend up to a height considerably greater than that shown in the drawing, should this be found desirable.

When the water sinks as low in the boiler as it is ever intended to be, the float, of course, sinks with it, and the valve M, will be opened by the action of the lever F, which may be accurately balanced by means of the weight N. The opening through the tube L″, is supposed to be kept closed, by means of its valve, or stop cock, and that through L′, open, under the usual arrangement of the apparatus. The valve M, being open, as represented, steam will be supplied to the cylinder J, and the engine and supply pump will be put in operation; and when the water has risen to the proper height, the valve M, will be closed, and the operation of the small engine will cease. In the practical application of this apparatus, the operation of the small engine has been uniformly found to be gentle and frequent, keeping up a constant and equal supply from the hot, or cold, water well.

To obviate all danger from any accidental derangement of the auxiliary engine and supply pump, I employ an alarm-tube, through which steam will escape should the water sink in the boiler a trifle below the level at which the valve M, opens.

O, is a valve on the upper end of a stem P, through a slot in which stem the lever F, passes. The valve O, is generally kept closed by means of a spring Q; but should the float descend a little lower than ordinary, the lever F, will bear against the bottom of the slot in the stem P, and the valve O, will be opened. This valve when it is in ordinary situation closes a tube R, R, but when depressed will allow steam to pass through said tube, and convert it into a tell-tale. A whistle may be attached to the tube R.

When a boat is not under way, or at any time when it may be desired to pump water into the boiler so as to rise above the ordi-

nary water line *b*, *b*, this may be effected by means of the opening of the tube L″, that in L′, being closed by the valve M, or otherwise. Steam will then pass through the tube L″, L, L, and the engine be set in action.

When the water with which the boiler is to be supplied contains much sedimentary matter, as in some of our western rivers, the inclosing of the float in the box C, in the manner described, will tend greatly to prevent the accumulation of sediment upon the float, and thereby to interfere with its intended action; and the more completely to prevent this accumulation of sediment in the box C, I have devised and mean to apply when necessary, a method of discharging any sediment therefrom, by means of a tube through which the water contained in the box C, may be blown off independently of the blowing off of that contained in the boiler.

S, S, is a tube which enters the box C, near its bottom, and is as distant as may be from the tube H, through which the box obtains its supply from the boiler; these tubes should, in fact, be at opposite ends of the box. When the cock is opened which ordinarily closes the tube S, the water in C, will be forcibly blown off, and with it the sediment contained therein; a fresh portion of water being supplied through the tube H, and that as long as may be thought necessary.

T, T, is the piston rod of the cylinder J, and of the supply pump; and to this rod is attached an arm U, which, at its outer end, V, is perforated, and slides upon a guiding rod, *c*, *c;* one end of this guide rod is connected to a crank, *d*, that works the stem, *e*, of the slide valve.

V′, V′, Figs. 1, and 2, is a flat plate, seen edgewise in Fig. 1, and W, is an arm made fast to the shaft *d′*, of the crank, *d;* the end *f* of the arm, W, passes alternately over and under the plate V′, V′, said arm being raised and lowered by the vibration of the crank, *d;* the spiral springs *h*, *h*, which surround the guide rod *c*, *c*, ease off the action of the slide, V. The situation of the piece *f*, above, or below, the plate V′, determines the admission of steam on one or the other side of the piston, throughout the stroke. Instead of the guide plate V′, V′, I intend, in general, to substitute the apparatus shown in Fig. 3, which is to operate both as a guide and a cut-off, to be presently described.

The pipe X, is that which leads from the force-pump to the hot, or the cold, water well; X′, that part of the supply tube which enters the boiler. Y, is a tube attached to the latter, and which is furnished with a stop-cock; this is intended to act in case of fire, which it will do most efficiently, both from the operation of the supply pump, and the pressure of the steam. The supply tube may, of course, be made to enter the boiler at its lower part, should this be preferred.

I will now proceed to describe the manner in which I construct my cut-off, which may be applied to this engine, or to others. An apparatus similar to that shown in Fig. 3, is substituted for the sliding piece V, and the flat plate V′, V′, above described, and the end *f*, of the arm W, or of any fixture performing a like office, passes into the space, Z, Z, formed by the piece *i*, *i*, *j*, *j*, and the frame *k*, *k;* and is thereby guided in its ascent and descent, by the inclined planes *i*, *i*, and in its horizontal, or its vertical motion, according to the position of the engine, by the straight portions, *j*, *j;* it will be seen that the situation of the inclined planes, *i*, *i*, and the relative lengths of the straight parts *j*, *j*, will determine the point at which the steam shall be cut off.

The valve M, which I have described as opened by the descent of the float, has been found to work well in low pressure engines, but in those of high pressure the float would be borne up by the force of the steam, unless it were made so small as to interfere with its utility, or some better means were devised of obviating this objection; this I have effected by means of the double valve, represented in Fig. 5; where it is drawn on a larger scale than the other figures. In this figure A′, represents the line of the top of the boiler, and L′, the tube through which the steam is to pass to the auxiliary engine. B′, is the valve stem on which the float lever F, Fig. 1, is to operate. C′ is a valve box, within which there are two valves, *i*, *i′*, with their seats, said valves opening downward; these valves are to be nearly equal in size, but the lower valve *i*, should be a trifle larger than the uppermost, *i′*, in order that it may be in some degree supported by the steam. As the valve box C′, is open at both its ends, and is entirely within the steam chamber, the exposed surfaces of the valves will be pressed with the same force on the square inch, and they may be made to open readily by the action of the float, whatever may be the elastic force of the steam.

Having thus fully described all the parts of the engine, or apparatus, which are necessary to an understanding of my improvements, what I claim therein as new, and desire to secure by Letters Patent, is—

1. The within described arrangement for blowing off the contents of the box, C, by means of the pipe S, S, independently of the blowing off of the general contents of the boiler.

2. I claim the manner in which I have combined and arranged the small auxiliary steam engine, the fire engine and the supply pump, with the supply pump, by which the action of the slide valve is regulated, and the water supplied to the boiler.

3. I claim the particular manner of regulating the cut-off of a steam cylinder, herein described, and represented in Fig. 3, whether applied to the small, auxiliary engine for filling the boiler, or to any other steam cylinder to which it may be adapted.

4. I claim the manner in which I have combined the double valve *i*, *i'*, with the float and the auxiliary engine, for the purpose of insuring its ready action in the boilers of high pressure engines.

I do not claim to be the first to have used two valves upon one stem, this having been done in what is called the balance valve; but I do claim the special arrangement of the double valve, in the combination, and for the purpose, above described. And I do hereby declare that I do not claim to be the first inventor of the application of an auxiliary engine made to operate by the agency of a float, so as to set in motion a supply pump for the supplying of a boiler; a method of doing this having been described by Isaac N. Coffin, and patented by him on the 13th day of September 1839; but I limit my claims, as above specified, to the arrangement and combination of the respective parts of the apparatus, as herein made known; nor do I claim the using of a box to inclose the float, excepting when this is done both at top and bottom, and in combination with a tube, such as is represented at H, H; by means of which arrangement the float is guarded against the effects of foaming. And I do hereby further declare that I do not intend to limit myself to the precise form and arrangement of the apparatus as herein described and represented, but design to vary the same as I may find expedient, while I attain the same ends by means substantially the same. I have, for example, now in operation, on board the steam boat Croton, on Long Island Sound, an apparatus constructed by me, and substantially the same with that herein described, but, instead of the single steam cylinder of the auxiliary engine, I have used two cylinders the piston rods of which are attached to a three throw crank shaft; two of the cranks having the two steam piston rods attached to them, and the third working the supply pump; an arrangement that will, probably, be preferred, as operating more steadily than the single cylinder engine.

DANIEL BARNUM.

Witnesses:
THOS. P. JONES,
EDWIN L. BRUNDAGE.