B. F. Bee,

Steam-Boiler Indicator.

No. 15,324. Patented July 15, 1856.

Fig: 3.

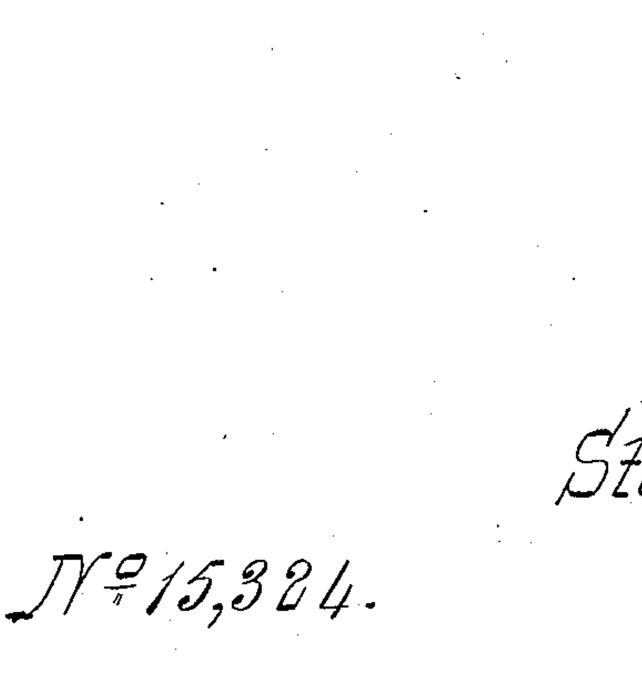
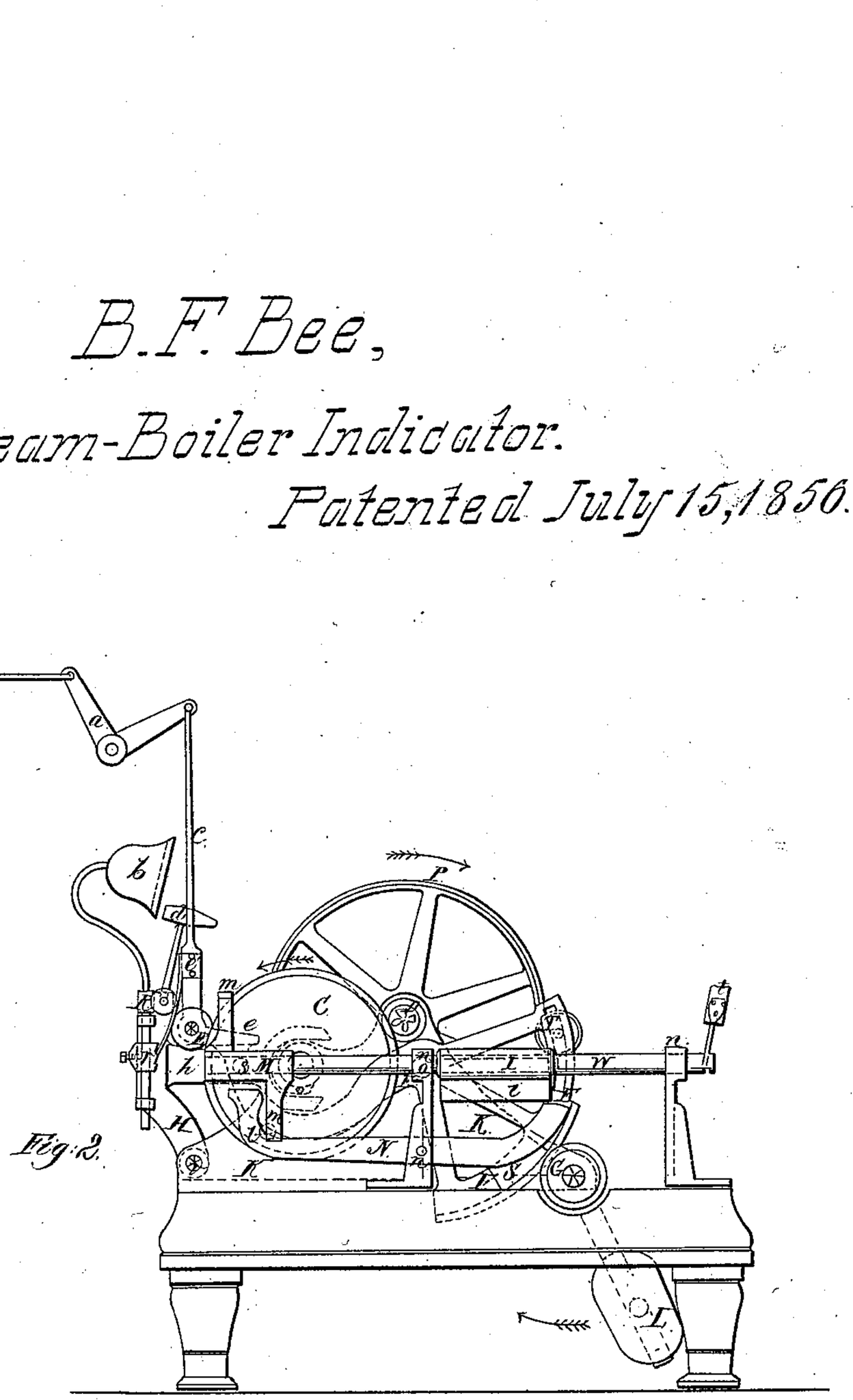


Fig: 2.



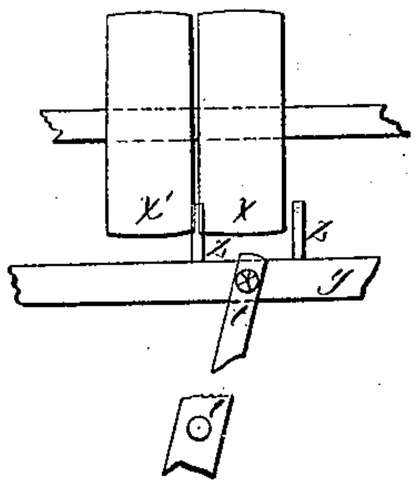


Fig: 4.

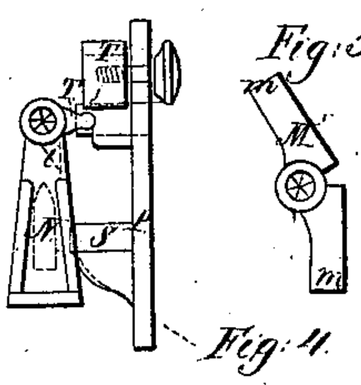


Fig: 5.

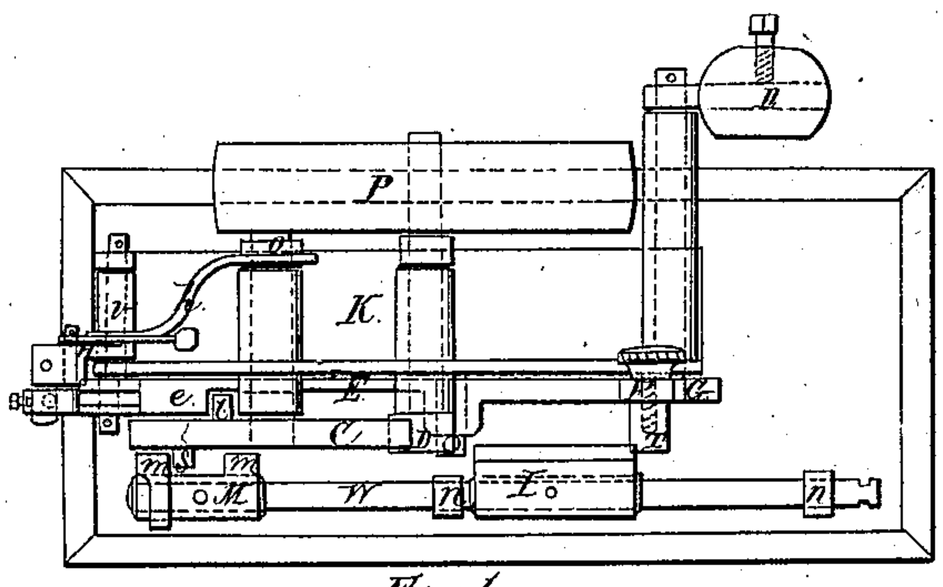


Fig: 1.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

BENJAMIN F. BEE, OF WAREHAM, MASSACHUSETTS.

MEANS FOR CONTROLLING FEED-WATER APPARATUS OF STEAM-BOILERS.

Specification of Letters Patent No. 15,324, dated July 15, 1856.

To all whom it may concern:

Be it known that I, BENJAMIN F. BEE, of Wareham, in the county of Plymouth and State of Massachusetts, have invented a new and improved method of regulating the supply of water to steam-boilers and also announcing the sufficiency and consequent safety thereof; and I do hereby declare that the following is a full and exact description of the same, reference being had to the annexed drawings, making a part of this specification in which—

Figure 1 is a plan view of the principal machine; Fig. 2, a longitudinal elevation of the same with its connections; Figs. 3, 4 and 5, details of parts which will be described hereafter.

The nature of this invention consists first in controlling the feed water apparatus of steam boilers by the operation of a float within the boiler, which being lifted from the surface of the water and let fall again, determines the height of water in the boiler—; this process being repeated at short intervals by suitable machinery, becomes the means of starting the pump or feeder when the boiler needs replenishing, and stopping the same, whenever the water attains its proper height.

Secondly, theory as well as practice will show that the force accumulated in the float by falling will cause it to sink deeper into the water than it would naturally float—and it will immediately rebound. This rebound of the float is taken advantage of, to give a signal which is an unerring indication not only of a sufficiency of water in the boiler, but also of the perfect condition of the machine itself—the force pump or feeder—the source of water, and indeed every part of the water arrangement.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A, Fig. 2, is a float consisting of a thin metallic vessel entirely open at the bottom, and divided into a number of hermetically tight compartments as shown at A′, Fig. 3—that it may float steadily upon the water.

V is a weight attached to the float to cause it to fall with the requisite force.

c, *c*, *c*, and *a*, *a*, are a combination of leading wires and levers connecting the float with the lifting lever E, the wire passing through the shell of the boiler, being made steam tight by a stuffing box, in the usual manner.

E, is the lifting lever to which is attached the segment F turning upon the fulcrum *o*, and gearing into the spur wheel G. The shaft of this wheel extends through its sleeves to the other side of the frame, where is attached the counterbalance L.

C, is the main wheel driven by the pinion D. Upon the back of this wheel is placed the lifting stud *l*, which as the wheel revolves takes upon the lifting lever at *e*, thus causing E to descend and by its connections lifting the float from the surface of the water—at the same time winding up the counterbalance in the direction of the arrow. When the stud *l*, has passed its position as shown in the drawings, it leaves *e*. The float now descends taking with it the lever E. The counter-balance L also descends and in falling acquires a sufficient force to carry it past the line of gravity and is ready in its return to assist the rebound of the float without detracting from its falling force. I would here state that the object of the counterbalance is not to produce the rebound but should be so adjusted as to compensate for the friction and inertia of the moving parts of the connection between the float and lifting lever thus preserving the rebound which produces the signal unimpaired. The devices which I have adopted for giving the signal is as follows.

H is a frame supported by, and swinging upon the fulcrum *v*. This frame carries the rack and pinion R; and upon the opposite end of the pinion arbor is attached the hammer *d*.

v is a piece made adjustable upon the shank of the rack with ratchet teeth upon its face. A spring catch *e′*, is so attached to the lifting lever as when the float descends to pass in contact with the ratchet teeth; but as float and lever rebound, this spring engages those teeth causing the rack to descend—the same causing the pinion to revolve, and the hammer to give its blow upon the bell *b*. It will be seen on examination that this catch and ratchet must be disengaged previous to the contact of the lifting stud *e*, with the lever at *e*, as that would result in the destruction of some of the parts. This is effected by the part of the bell-frame *h*, extending to, and embracing the cam *o* upon the main wheel shaft. This cam is of such form and so placed upon the shaft as to cause the frame H, to approach the lifting lever just previous to the falling

of the float and to recede just previous to the contact of the lifting stud *l*, with *e*.

The manner in which this machine starts and stops the pump or feeder is this—W is a shaft working in bearings, *n*, *n*, placed at an appropriate distance from the main wheel, &c., and carrying the shifting dogs M and the changing or reversing cam I.

s is the shifting stud placed on the front of the main wheel which as it revolves may come in contact with the dogs M.

S and T are studs or blocks placed upon the segment F, S being stationary and T adjustable by means of a set screw. Now when the lever E is depressed in raising the float, S comes in contact with I and restores the shaft and its fixtures to the position as shown in the drawings. Now if the water is sufficiently high in the boiler so that the float in its fall does not cause the stud T to disturb I, the shaft will remain in that position and as the shifting stud *s* revolves it will engage the lower dog of M, thus causthe shaft W to slide through its bearings, taking with it the shifting lever *t*, which acting upon the shifting bar *y*, will cause the belt to run upon the loose pully *x'* and the pump or feeder will stop. If however when the float fell, there was a deficiency of water, according to the adjustment of T, then I will be depressed and the stud *s*, will engage only with the upper dog of M and the pump, &c., if stopped will be started by a counter process—and if it be already in operation will continue so. It will be seen that by varying the position of the stud T, the height of water in the boiler will be varied; the lower the situation of the stud upon F, the higher the water will be carried in the boiler and vice versa. The object of the lever N is to render the changes of I prompt and decisive as in the event of T not falling sufficiently far to produce the whole change. Immediately after the float has fallen the stud *s* strikes the lever N causing its knife edge to rise and engage the knife edge projection of *i* upon I and as it takes upon either side, decides which of the dogs of M shall be presented to the stud *s*.

In case of the application of this invention to marine boilers the motion of the vessels might cause an unsteadiness in the operation of the float. To obviate this a vessel U, Fig. 2, is placed centrally in the boiler, said vessel being provided with holes to allow the passage of water to and fro, of such a size as to restrain the water within, from following the undulations without, thus causing the water in the vessel U to stand at an average height. Into this vessel the float is allowed to fall by which means a steady feed is obtained. The vessel U is not necessary in stationary or locomotive boilers. To put this invention in operation place the principal machine in any part of the establishment convenient to the pump or feeder, and the motive power and also where the signal may be heard by the engine and as many other persons about the establishment as possible, who thus become monitors of their own safety and that of all concerned. Connect the float A with the lifting lever E by wires and levers varying according to the distance and the angles to be turned. The wires should be so adjusted in length as to lift the float about 8 inches from the surface of the water where the boiler will admit of it. Apply the belt to the pulley P from some constant mover of such a speed as to cause the main wheel C to make about two revolutions per minute and in the direction of the arrow. The other parts of the operation are readily inferred from the foregoing description.

I do not claim the employment of a float in any of the ordinary methods for regulating the height of water in steam boilers, but

What I do claim and wish to secure by Letters Patent is—

Controlling the feed water apparatus of steam boilers by the float A and the intermediate means or their equivalents between it and the feed apparatus and connected with the counterbalance L, or not the parts being arranged and operated substantially as herein set forth.

BENJAMIN F. BEE.

Witnesses:

ALONSO WARREN,

ELIJAH DAMON, Jr.