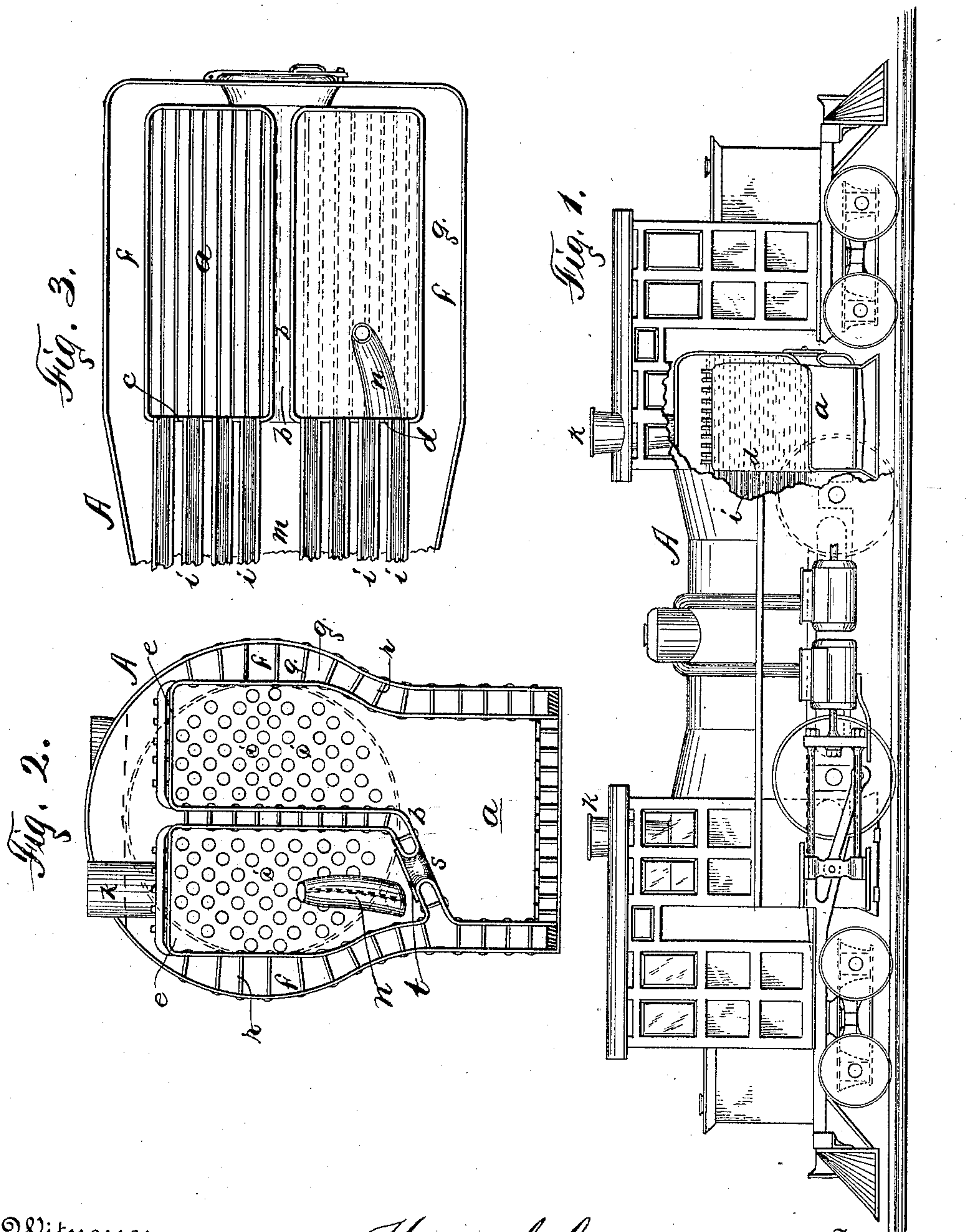


(No Model.)

H. C. GOULDING.
BOILER.

No. 466,933.

Patented Jan. 12, 1892.



Witnesses
H. A. Carhart
M. A. Andrews

Henry C. Goulding

Inventor

By his Attorneys
Smith & Denison

UNITED STATES PATENT OFFICE.

HENRY C. GOULDING, OF NASHOBA, MASSACHUSETTS.

BOILER.

SPECIFICATION forming part of Letters Patent No. 466,933, dated January 12, 1892.

Application filed February 12, 1891. Serial No. 381,154. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. GOULDING, of Nashoba, in the county of Middlesex, in the State of Massachusetts, have invented new and useful Improvements in Boilers, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

My invention relates to boilers constructed with a single shell and having a fire-box at both ends, a smoke-box at both ends, a smoke-stack at both ends, (one for each fire-box,) and independent fires at both ends, at the same time preserving full grate-surface for each fire.

My object is to produce a locomotive capable of high speed and of the maximum traction power, possessing great steam-producing properties without materially increasing the weight, and in which independent fires in independent fire-boxes are maintained each upon a full-sized grate-surface, each fire having a separate smoke-arch and a separate smoke-stack at the opposite end of the boiler from the fire, all of the smoke-flues being contained in a single boiler-shell, the flues on one side leading to one stack and those on the other side to the other stack, and all being surrounded or passing through a single water-chamber, and both smoke-arches being submerged, and each end of the water-chamber being extended over the smoke-arches, and at each end being vertically separated from the fire-box by a water-leg connected to a water-leg upon that side of the fire-pot, a water-leg on the opposite side of the fire-box being also connected to the water-chamber above the smoke-arch of each fire-box, and also providing means for collecting the cinders from each fire and discharging them into the fire-box adjacent to the point where they are collected, thus producing a boiler having a fire at each end, each upon a full-sized grate, with one side of the boiler-flues for each fire, a single water-chamber exposed to the heat of two full-sized fires, the boiler and its frame being relieved of all extra weight upon its center, although having virtually two boilers in one.

My invention consists in the several novel features of construction and operation hereinafter described, and which are specifically set forth in the claims hereunto annexed. It

is constructed as follows, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of my boiler applied to and creating a double-ender locomotive, and having one end in vertical longitudinal section to show such a view of the fire-box, water-leg partition therein, and the flue connections at one end. Fig. 2 is a vertical transverse section across one of the fire-boxes, showing the water-legs on the sides and the longitudinal water-leg partition or division-wall. Fig. 3 is a longitudinal transverse section of one of the fire-boxes and adjacent flues, showing that the water-legs on the sides and the water-leg partition or division-wall only extend the length of the fire-box and open into the single water-chamber in the boiler.

Inasmuch as my present invention relates to the boiler only, and as the frame is substantially the same as was patented by me by Letters Patent No. 422,075, dated February 25, 1890, for improvements in locomotives, I shall limit this specification entirely to the description of the boiler and its operation.

A is the boiler, having a fire-box *a* upon each end, and this intermediate shell is of any ordinary construction. Each fire-box is divided as to its upper part by a water-leg partition or division-wall *b*, extending from the front of the fire-box back to and having the inner edges of its walls secured to the flue-sheet sections *c* and *d*, creating a vertical slot or opening into the single water-chamber in the boiler-shell. This partition water-leg opens on top through the crown-sheet or smoke-arch *e*, and its lower side is curved over to and opens into the water-leg *f* on one side of the fire-box at one end of the boiler and at the other end into the water-leg *g* on the opposite side of the fire-box. This construction leaves me full-sized grate-surface *h* at both ends of the boiler without any curtailment, though I reduce the size of the top of the combustion-chamber and smoke-arch.

As the flues *i* are all smoke-flues, it follows that the products of the combustion in one fire-box are carried through the one-half of the flues on that side to and are discharged through the stack *k* on that side, each fire-box having a separate stack upon the boiler at the end opposite to the fire-box. This divis-

ion of the flues by the water-legs in the fire-boxes gives me a separate crown-sheet or smoke-arch at each end for each fire-box and a separate set of flues for each fire-box divided by a vertical water column *m* of substantially the width of the water-leg, in which there are no flues, and having a water-leg at each end thereof.

At *n* I show the exhaust-pipe connected to the cylinders *p* in the ordinary manner, and the steam-chests of the cylinders are connected to the dome or single chamber in the boiler in the usual manner.

It will be seen that my boiler is provided with a single water-chamber heated by two independent fires, that all of the steam is connected in a single dome or steam-chamber, that the side walls and part, at least, of the top of each fire-box are water-legs, and that the crown-sheets and smoke-arches in both ends are submerged, thus both protecting them and also utilizing their heating-surface. The water-legs are carried around the front of each fire-box and around the door and connected with the partition water-legs. It will also be seen that by having a single water-chamber and fires at both ends thereof, though such fires are independent, yet they act jointly and co-operate in heating the water and producing steam and in securing and maintaining an equal and high temperature the whole length of the boiler, thereby producing a greater quantity of steam and easier and quicker and with very little, if any, more fuel than is now required in a single fire at a single end of the ordinary type of boiler. It will further be seen that the fire-box, smoke-arches, and water-legs are all alike in both ends and of the same size, and that the grate-surface of each fire-box is the same and is of full size and substantially the same as in the ordinary type of boiler. It will also be seen that by my construction I can use stay-bars *r* of only about one-half of the length required in an ordinary fire-box.

At 5, Fig. 2, I show an opening forming the smoke-arch adjacent to the exhaust *n* and through the water-leg into the fire-box, provided with a cover *t*, which may be opened from time to time, as desired, to permit theinders there collected to be emptied direct into the fire and utilized as fuel.

What I claim as my invention, and desire secure by Letters Patent, is—

1. A double-ended boiler consisting of a single shell, independent fire-boxes at each end, an independent set of flues for each fire-box, a partly-vertical and partly-transverse water-leg partition in each fire-box separating each fire-box from the smoke-flue of the other and connected to the water-chamber in the boiler and to a side water-leg, and an independent smoke-stack for each fire-box.

2. A double-ended boiler consisting of a single shell, independent fire-boxes at each end, an independent set of flues for each fire-box, mounted in vertically-separated flue-sheets, a partly-vertical and partly-transverse water-leg partition separating the flue-sheets sections and secured to the adjacent edges thereof and connected to the water-chamber in the boiler and to a side water-leg, and an independent smoke-stack for each fire-box.

3. A boiler comprising a shell, a single water-chamber therein, independent fire-boxes at each end of the shell, two sets of flues in the water-chamber, one for each fire-box, and each set connected to a smoke-stack, and a vertical water-leg partition in each fire-box connected to the water-chamber in the shell and to the water-leg on each side of each fire-box.

4. The combination, with the fire-box having water-leg sides, of a vertical and partly-transverse water-leg having its lower end connected to one of the side water-legs and reducing the combustion-chamber, but not the surface of the grate.

5. The combination, with the independent fire-boxes upon the ends of the intermediate boiler-shell, of a single shell having a single water-chamber therein, a set of smoke-flues for each fire-box, and a vertical and partly-transverse water-leg partition in each fire-box and connected to the water-chamber in the shell.

6. Independent fire-boxes upon the ends of a single shell, a set of smoke-flues for each fire-box in the shell, and a water-leg partition dividing the fire-box vertically and rendering the sets of flues independent of each other, in combination, as set forth.

In witness whereof I have hereunto set my hand this 9th day of February, 1891.

HENRY C. GOULDING.

In presence of—

HOWARD P. DENISON,
C. W. SMITH.