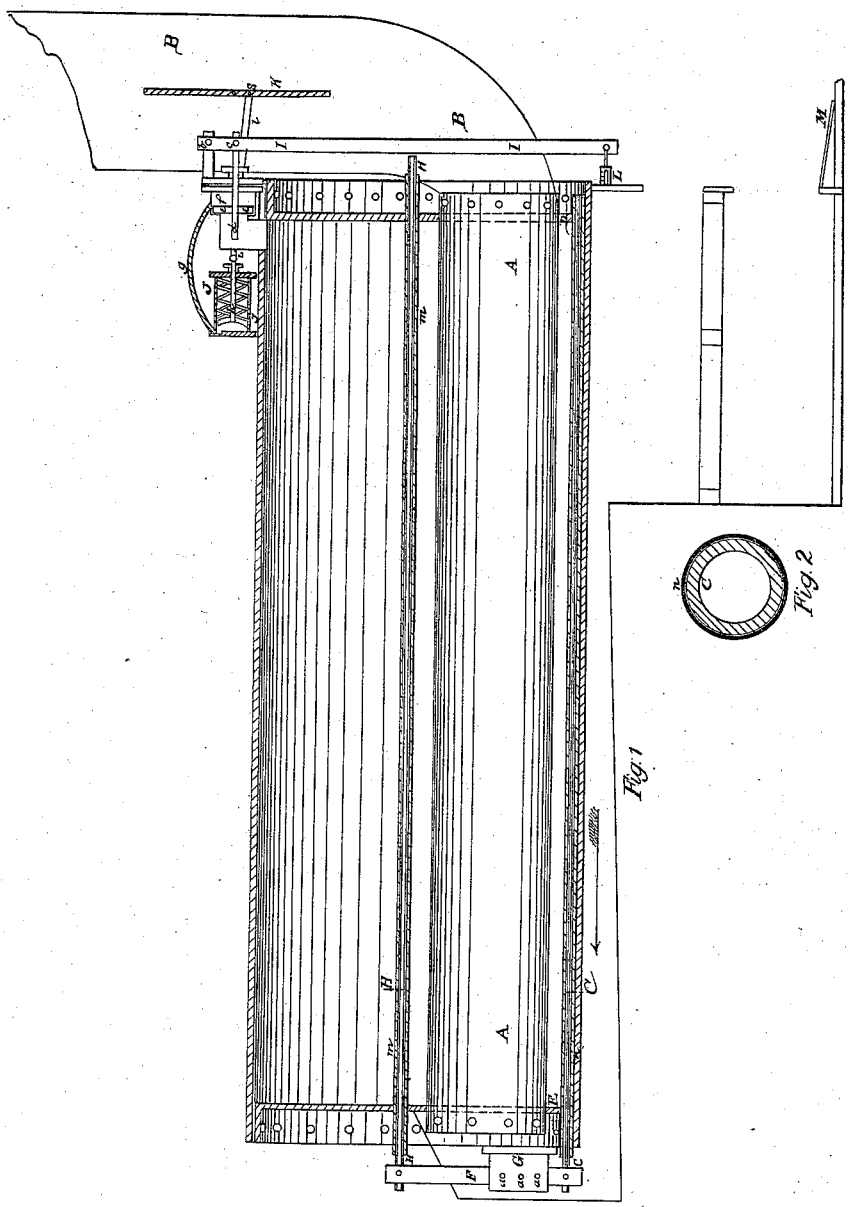
J. Montgomery,

Steam Safety Valve.

No. 4,178. Patented Sep. 2, 1845.



UNITED STATES PATENT OFFICE.

JAMES MONTGOMERY, OF MEMPHIS, TENNESSEE.

SAFETY APPARATUS FOR STEAM-BOILERS.

Specification of Letters Patent No. 4,178, dated September 2, 1845.

To all whom it may concern:

Be it known that I, JAMES MONTGOMERY, of Memphis, in the county of Shelby and State of Tennessee, have invented a new and useful improvement in the manner of applying expanding bars or rods to steam-engine boilers for the purpose of preventing explosions and of economizing fuel; and I do hereby declare that the following is a full and exact description thereof.

It is well known that bars, or rods, of metal, have been passed through steam boilers in such manner as to cause them by their expansion, when highly heated, to open a safety valve, and to allow of the escape of steam. In constructing my improved apparatus for the preventing of explosions and for the economizing of fuel I employ such expansion bars for the purpose of closing a damper in the flue of a steam engine, and thereby I arrest the draft and prevent the combustion of fuel, the further generation of steam of the same apparatus may also be made to close the ash pit door at the same time with the closing of the damper, if desired. For effecting this object I have arranged the expansion bars and combined them with each other, and with the boiler, in a manner that renders them more efficient and useful than in the modes of employing them heretofore adopted.

In describing my apparatus I will suppose a cylindrical boiler of the ordinary kind, and made of sheet iron, to be used, and the expansion rods to be of brass; other metals, however, besides brass and iron, may be used, provided they are such as by their difference in expansibility will produce a like result. I use two expansion rods of brass within tubes of iron, one of which I place in contact, or nearly so, with the bottom of the boiler, at its lowest point, where the heat is most intense and direct, and where incrustation first takes place; the second I usually apply near one side of the boiler, just above the level of the tops of the flues. Both of these tubes, as above stated, are inclosed in tubes of iron, which tubes are attached at each of their ends to the boiler heads in such manner as that the expansion rods that are contained within them may operate through said heads. The boiler and the tubes being of the same metal their expansion will be equal, and the tubes will remain undisturbed. Under this arrangement the rods are kept from contact with the water in the boiler, and the galvanic action which would otherwise be induced by the saline matter contained in it is altogether prevented. The lowermost rod is firmly attached by one end to the fore head of the boiler, or to the tube within which it is contained at a point near to the fore head, its other end passing through the tube above named, and out from the rear head, is attached to one end of a lever of the first kind, the other end of which lever is attached to the rear end of the second, or upper, expansion rod. This second rod passes entirely through the iron tube intended to receive it, and out through the front boiler head where it acts by its expansion upon a lever that will open a valve connected with the boiler and thereby admit steam into a small cylinder containing a piston, within which it operates, and closes the damper in the chimney whenever the temperature is such as to render it desirable to arrest combustion.

In the accompanying drawing Figure 1, is a vertical section of a boiler from end to end, through its axis, A, A, is one of the flues passing through it, and B, B, the chimney. *c*, *c*, is a brass expansion rod passing through an iron tube *n*, *n*, at, or near to, the bottom of the boiler, which rod and tube are made fast to the head D, and passes out through the rear head E, where it is attached by a joint pin to the lower end of the lever F. This lever has its fulcrum in the projecting piece, or standard, G, attached to the boiler head; *a*, *a*, *a* are holes for changing the place of the fulcrum. H, H, is the upper expansion rod, which is attached to the upper end of the lever F, by a joint pin, and passing through its appropriate iron tube extends out in front of the boiler head D, so as to be in contact with a lever I, I; this lever has its fulcrum at *b*, and at *c*, it is attached by a joint pin to a valve stem *d*, carrying the valve *e*, *e*, which when open admits steam to pass from the boiler into J, J, a small steam cylinder placed on the top of said boiler; *f* is the valve box communicating with the cylinder J, by means of a steam pipe *g*; *h*, is the piston rod of said cylinder, which by means of a shackle-bar *i*, *i*, is connected by a joint pin to the damper K, within the chimney in such manner as that it will close or open said damper by the passing back and forth of the shackle-bar. Within

the cylinder J, there may be a spiral spring *j*, *j*, which when the pressure of the steam diminishes will carry the piston back to the head of the cylinder and will thereby completely reopen the damper.

The lever I, may be extended down and be attached at its lower end to a spring balance at L, which will operate as an indicator, pointing out accurately the tension of the steam. The operation of the rod H, against the lever I, being proportioned to the temperature within the boiler. The force with which this rod will act will be such that no adhesion of the valve *e*, *e*, however great, can resist it.

M, is the ash pit door which may, if desired, be closed and opened by the same action that closes and opens the damper K; a connecting rod attached to an arm, or crank, on the axis of the damper extending down to the door M, for that purpose, so that the damper and door shall have a simultaneous action.

Fig. 2, is a cross section through one of the iron tubes and its inclosed brass expansion rod, which I also intend to make tubular; they are shown in this figure of the size that I contemplate making them.

It will be seen from the foregoing description of the manner in which my apparatus operates that it is not intended by me to use it for the purpose of opening a safety valve of the ordinary kind, my object not being to diminish tension by the escape of steam; a practice which has, in numerous instances, been found to invite the danger which it was intended to obviate, and which when not followed by any disaster, is necessarily accompanied by great waste of fuel. At the point of pressure at which I close the damper the boiler must be of sufficient strength to bear the tension of the steam; and the draft through the fire being arrested this tension will not be increased, but will, on the contrary, be gradually diminished, and all danger thereby effectually avoided, while the steam and water, so necessary to the operation of the engine, are retained undiminished in the boiler.

The placing of one of the expansion rods close to the bottom of the boiler is a matter of great practical importance, as, on our western waters, or wherever saline or earthy incrustations are likely to take place, the bottom of the boiler may, and frequently does, become highly heated, and is burnt out, while there is not an undue temperature elsewhere. The increased expansion of the rod, so situated, would, under such circumstances, operate on the damper apparatus, and insure the desired reduction of temperature. It is believed also, by many intelligent engineers, and appears to be a fact established by careful observation and experiment, that the water is not infrequently repelled from the bottom when the fire is intense, and that it is burnt out, although there is not at the time any actual deficiency of water. An accident of this kind could not possibly occur under my arrangement of the expansion bars in combination with the damper.

The upper expansion bar I have represented in the drawing as being placed near to the side of the boiler, but it may, if preferred, be placed along the top of one of the interior flues.

Having thus fully described the nature of my improvements in the manner of employing expanding bars, or rods, for preventing explosions and economizing fuel, what I claim as new therein, and desire to secure by Letters Patent, is—

The combining with a steam boiler of two such bars of brass, or other suitable metal, arranged as herein described; said bars being also combined with each other, and with the apparatus by which the damper in the chimney is to be closed, and the draft through the furnace arrested, the same being effected substantially in the manner herein set forth. I do not intend, however, by this claim, to limit myself to the precise arrangement of the respective parts of my apparatus, as herein described, but to vary these as I may think proper while I attain the same end by means substantially the same.

I do not claim the exclusive right to use expansion rods or bars to open or close valves, or dampers, by variations of temperature, this principle of obtaining motion for such a purpose being well known; but I limit my claim to the foregoing improved arrangement and combination of parts for effecting this object.

JAS. MONTGOMERY

Witnesses:

THOS. P. JONES,

EDWIN L. BRUNDAGE.