W. P. McConnel,

Steam Safety Valve.

No. 3,098. Patented May 19, 1843.

Fig. 1

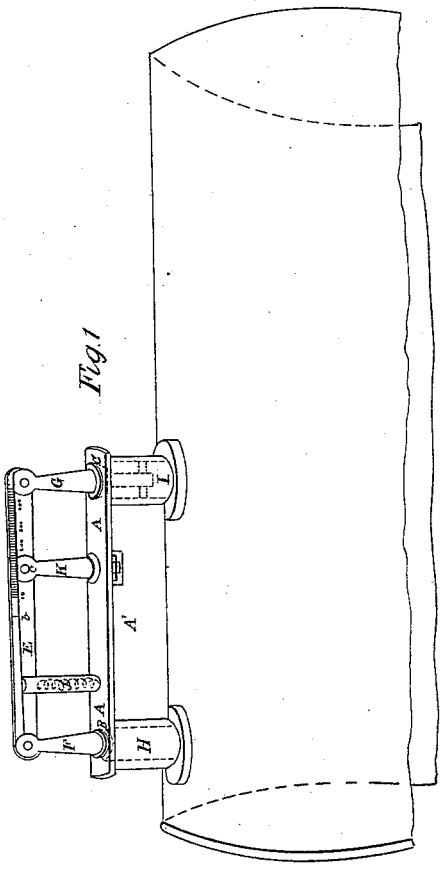
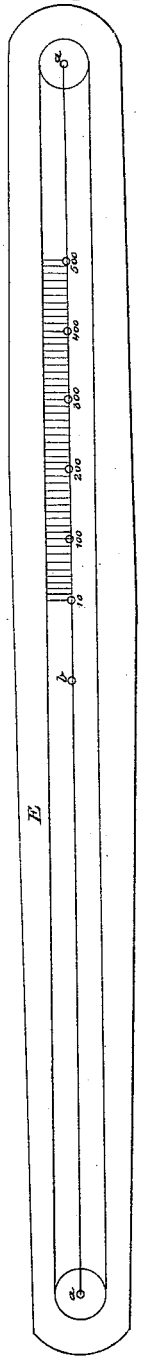


Fig. 2



UNITED STATES PATENT OFFICE.

WM. P. McCONNELL, OF WASHINGTON, DISTRICT OF COLUMBIA.

SAFETY-VALVE OF STEAM-BOILERS.

Specification of Letters Patent No. 3,098, dated May 19, 1843.

To all whom it may concern:

Be it known that I, WILLIAM P. McCONNELL, of the city of Washington, in the District of Columbia, have invented a new and useful improvement in the manner of combining and arranging the safety-valves of steam-engines for the purpose of preventing explosion or collapse in the boilers thereof; and I do hereby declare that the following is a full and exact description of my said improvement.

By my manner of combining and arranging the safety valves of steam engines, I am enabled to dispense with the use of weights as ordinarily employed upon a lever; and also with the action of floats, and of rods passing through stuffing boxes, which have been rendered necessary under some former arrangements intended for a like purpose; said valves being, under my arrangement, dependent for their action solely upon the pressure of the steam in the boiler, which they are intended to indicate by their opening as soon as such pressure transcends, in the slightest degree, the prescribed amount; the valves so arranged, I have denominated the differential valves.

In the accompanying drawing, Figure 1, represents a portion of a cylindrical boiler with my differential safety valves placed thereon, and Fig. 2, represents a graduated lever of such size as might serve for actual use.

A, A, A′, Fig. 1, is a metallic casting which is firmly riveted to the top of the boiler, and the upper part A, A, of which constitutes the seats of two valves, B, and C, which depend from the lever E; said valves being connected therewith by means of joint pins *a*, *a*, at the upper ends of the stems F, and G, which rise from said valves. The valve B, opens downwards, and has under its seat a hollow cylinder H, which opens into the boiler, and is somewhat larger in diameter than the valve in order to admit of the passage of steam when said valve is depressed. The valve C, opens upward, and the hollow cylinder I, admits the steam in the boiler to act on its lower side; the dotted lines on I, represent a stem and guide pieces to cause the valve C, to descend accurately to its seat.

K, is a pillar, or standard, bearing a joint pin *c*, which forms the fulcrum of the lever E; this fulcrum is to be placed at such distance from the center of the lever as is rendered necessary by the degree of steam pressure at which it is intended that the valves shall open.

The manner in which I graduate my valves and lever is as follows; the lever E, as shown in Fig. 2, is fifteen inches long between the points of suspension *a*, *a*, of the two valves, B, and C; the valve B, I have, under the supposed arrangement, made one inch and seven eighths in diameter on its lower face, and the valve C, two inches; then if *b*, be the center of the lever E, and the fulcrum, or point of suspension, of the lever be at the point marked 10, on the scale, the valve C, will open with a pressure of ten pounds on the square inch of its lower face; and when this is intended to be the maximum pressure, the fulcrum is to be so placed. If the fulcrum be removed to the next division on the scale, it will open at a pressure of twenty pounds, and so of every other division in the advancing series.

It will be manifest that if the valves are changed in their diameters so that their relative proportions are altered, the scale of pressures will also be changed; but that which is above given is an exemplification of the principle, and is correct when the lever is of the length, and the valves of the diameters, above indicated. Such scale may be found for all lengths and diameters either by trial, or by calculations from the given data. The valves may, if preferred, be of equal diameters, and their differential action be made dependent upon the situation of the fulcrum of the lever alone; and in whatever way this be managed, while the principles above laid down be adhered to in the arrangement, the action of the valves will be dependent solely upon the pressure of the steam within the boiler, and the use of shifting, or other, weights will be entirely dispensed with.

As it would be necessary to increase the weight of the short arm of the lever were its gravity depended upon to close the valves B, and C; and as it is desirable to avoid this increase of weight, I place a spiral, or other, spring, J, under its long arm, the tension of which shall suffice to close the two valves, when this is not prevented by the action of the steam.

When the valves are combined, as above set forth, steam will escape through the openings to which each of them is adapted, as soon as its pressure reaches the intended

limit; the principal escape will, however, be at the valve C; and as soon as the pressure is reduced to the prescribed amount, the valves will close; and to enable them to do so unobstructedly the cylinder H, is, as before mentioned, made somewhat greater in its interior diameter than that of the valve B, which descends within it.

Having thus fully described the manner in which I arrange and combine my differential valves, I do hereby declare that I do not claim the arranging of two valves upon a steam boiler in such manner as that one of them shall open inwards and the other outwards by the action of the same lever, this having been previously done for the purpose of indicating a deficiency of water, by their combination with a float, but what I do claim as new in the above described invention, and desire to secure by Letters Patent, is—

The manner of combining and arranging two such valves, as above set forth, so that they shall be operated upon solely by the pressure of the steam within the boiler, and be opened and closed according to the amount of said pressure, the whole construction and arrangement being substantially the same with that herein made known.

WM. P. McCONNELL.

Witnesses:
THOS. P. JONES,
JOHN HITT.