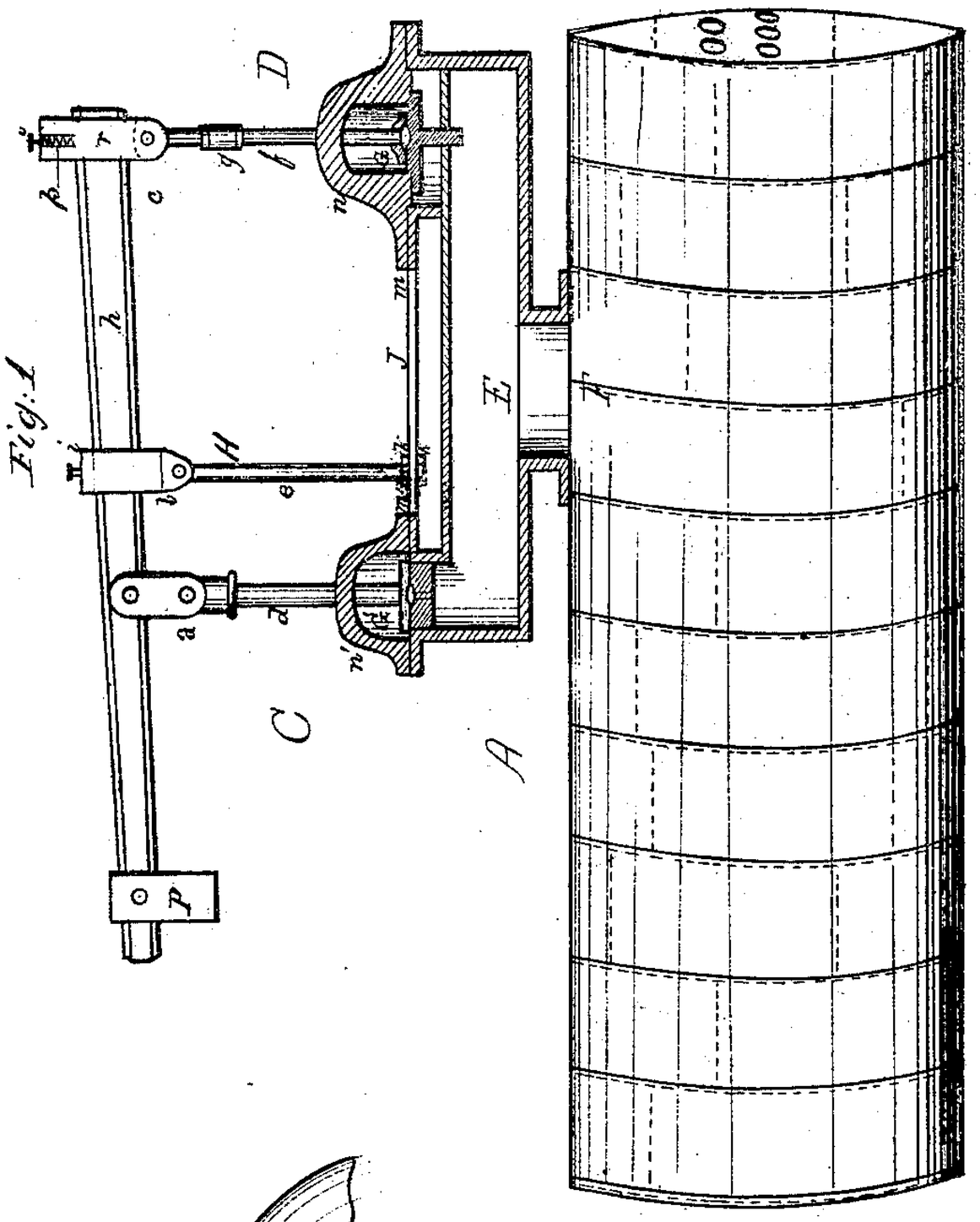
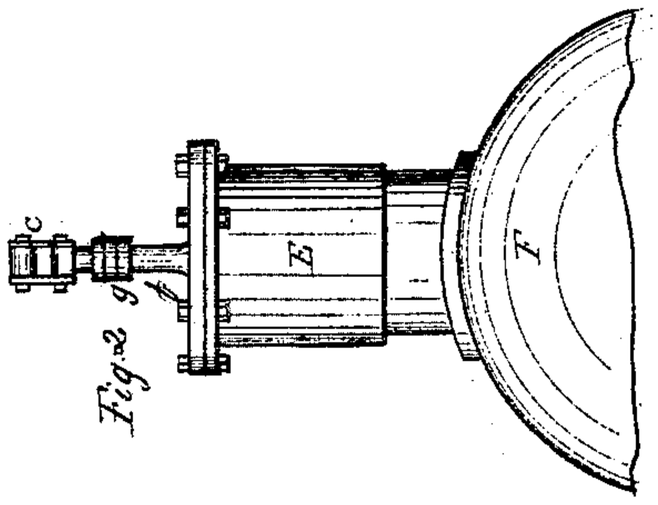
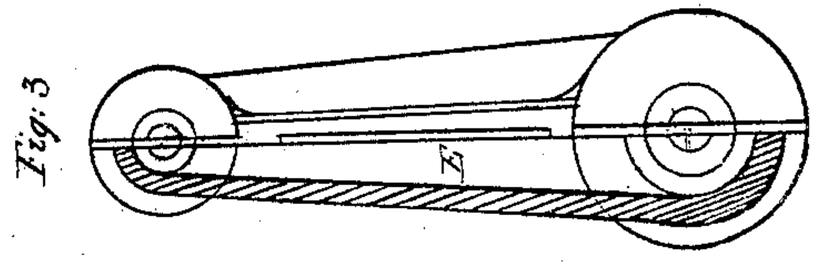
S. Boden,

Safety Valve.

No. 90,226. Patented May 18. 1869.







Witnesses

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SAMUEL BODEN, OF LOUISVILLE, KENTUCKY.

Letters Patent No. 90,226, *dated May* 18, 1869.

IMPROVEMENT IN SAFETY-VALVE.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, SAMUEL BODEN, of the city of Louisville, in the county of Jefferson, in the State of Kentucky, have invented certain new and valuable Improvements in Steam-Boilers, to prevent the bursting and collapsing thereof; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The nature of my invention consists in providing a steam-boiler with one or more valves, for the escape of steam, in addition to the ordinary safety-valve, and in constructing the additional valve to open downward or within the boiler, or steam-drum, and of much larger area than the other, and ordinary safety-valve, and in so arranging both valves that both may open at once, for the escape of steam, or that the additional valve may be opened independent of the other, by being forced down by atmospheric pressure, in the event of the creation of a partial vacuum in the steam-drum, or boiler, by any cause, and thus preventing a collapse, in the first place, and a bursting, by the resulting reaction, in the second place.

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

Figure 1 represents a vertical sectional view of the steam-drum, or receiver, fixed upon the boiler F, and a side view of the valve-rods C and D, the adjustable fulcrum H, lever *h*, weight P, and other parts.

Figure 2 represents an end view.

Figure 3, a top view.

The steam-drum E has the form shown in the drawings, with a port, or opening at the end, marked G′, and another end, about twice as large, marked G.

This larger valve is located in the inside of the drum, or boiler, and is seated up against the top of the drum, while the smaller valve is located upon the outside, and has its seat upon its opening.

The valve-rods C and D are held in their positions perpendicular to their respective openings, by the caps *n′* and *n″*, through the tops of which they extend. From one cap to the other extends the horizontal bar J, which is formed with a vertical slot in it, through which the foot of the fulcrum H may be made to move back and forth, from M to M′.

The valve-rod C is connected with the plain lever *h* by a link, *a*, so as to make a loose joint with it.

The valve-rod D has additional and important features.

The stem *f* is in two parts. The upper end of the lower part, and the lower end of the upper part are within the nut *g*, and each has upon it a convex screw-thread, one a left, and the other a right-hand thread, and the nut *g* is formed with corresponding concave threads, so that, by turning the nut to the right or left, the stem may be lengthened or shortened, as may be desired.

The upper end of the valve-rod D is connected with the link *r*, by a loose joint at *c*.

The stem *e*, of the fulcrum H, is constructed to form a loose joint with the clevis *b*.

The lever *h*, before being bolted to the link *a*, may be passed through the clevis *b*, and then through the link *r*.

The clevis *b* may be fastened at any point of the lever *h*, by turning the set-screw *i*, and the lower end of the fulcrum H may be fastened, at any point on the slotted bar J, by turning the nuts *k k*.

The openings in the link *r* are made considerably longer than the lever *h* is wide, in order that the end of the lever may have room to play up and down therein, but, in order to regulate that play, the top of the link is made with a circular opening in it, and in that opening is placed a spiral spring, *p*, and that spring is held in its place by a set-screw, *o*.

On the other end of the lever may be placed a common pea-weight, P, which may be fastened, at any point desired, by a set-screw through the top or side of the weight.

The movable fulcrum H, by its convenient form and structure, enables the engineer to place the fulcrum under the lever, at any desired point, with quickness and facility.

In case of any sudden and undue increase of steam, the valve G′ would be raised, and the raising of that end of the lever would, of course, depress the other, which rests upon the solid bottom of the link *r*, and thus would force downwards the larger valve G, and would afford instant relief to the boiler, by allowing the steam to escape by its port also, and this movement would be greatly aided by the atmospheric pressure upon the upper surface of that valve.

On the other hand, in case of any sudden creation of a vacuum, or a partial vacuum, within the boiler, by any cause, while the atmospheric pressure would hold the smaller valve G′ firmly in its seat, and closed, it would force the larger valve downwards, and open its port for the admission of the air. The spring in the top of the link *r* would close the valve G, so soon as the vacuum was destroyed, and then, in case of a sudden and undue increase of steam, at the instant of the closing of that valve, the valve G′ would open, and, by the action of the lever, would open the larger valve also, so that the steam would escape at the same time through both.

It is obvious, from the foregoing description, that the fulcrum H may be so adjusted that the steam, at a given degree of pressure, will be just sufficient, or more or less than sufficient, to raise the small valve, and depress and open the large one, notwithstanding

the pressure of steam upon the under side tending to hold it closed up against the seat.

With my construction and operation of these two valves, the collapse, or bursting of the boiler is rendered almost impossible. But, if deemed necessary, two, or even more additional valves may be used, for the same purpose and in the same manner.

The supply of steam in a boiler may become either excessive, or deficient from various causes, and in either case it is injurious to property. We know from experience that the shells of boilers do collapse, and in many instances of collapse we are unable to afford any rational explanation of the cause, or causes which produce this result. Steam-generators of only ordinary strength will withstand a pressure of steam from within of, say, one hundred and fifty pounds to the square inch, with safety, and we would naturally suppose that if a perfect vacuum were created within the boiler, the weight of the atmosphere, of about fifteen pounds to the square inch, would not injure, or collapse it, yet, as before stated, boilers are collapsed by the weight, or pressure of the atmosphere. This is generally when a vacuum, or partial vacuum is suddenly created, by any cause, such as the condensation of the steam within it, or the blowing off, and condensation at the same time. The suddenness of the pressure seems to produce this effect—the effect of a blow struck.

In case of the introduction of an excess of cold water, the portion of the boiler coming in immediate contact with the water would be reduced in temperature much below the remaining part, and this inequality would itself increase the tendency to collapse.

But, as before intimated, I may not be able to explain the reasons of collapse. I do, however, by my additional valve, afford an unfailing remedy.

What I claim as new, and desire to secure by Letters Patent, is—

1. The valve-rod D, with its slotted link *r*, adjustable connecting-nut *g*, spring *p*, set-screw *o*, loose joint *c*, and valve G, constructed, combined, and arranged substantially as herein set forth.

2. The arrangement of the foregoing-stated elements with the lever *h*, adjustable bearing *b*, and fulcrum-standard H, connecting-link *a* and stem *d*, valve G′, and weight P, substantially as herein set forth.

SAMUEL BODEN.

Witnesses:

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