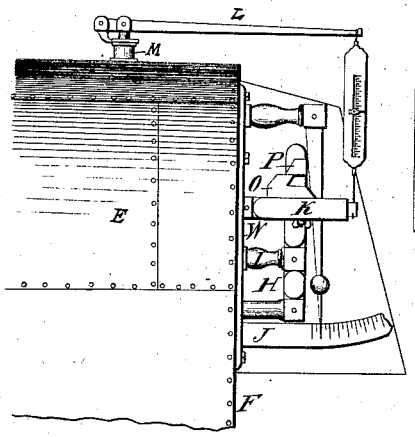
2 Sheets—Sheet 1.

W. M. WRIGHT.

Indicating Safety Guard for Steam Boilers.

No. 3,923. Patented Feb. 24, 1845.

Fig. 2.



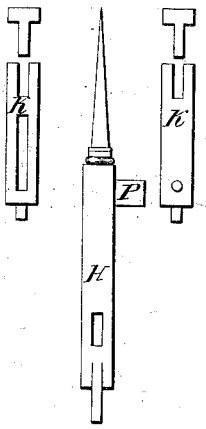
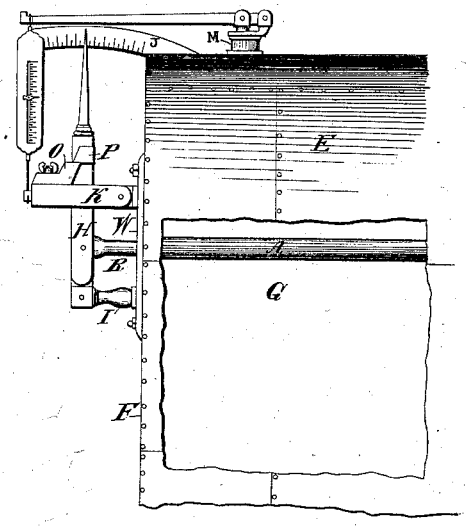
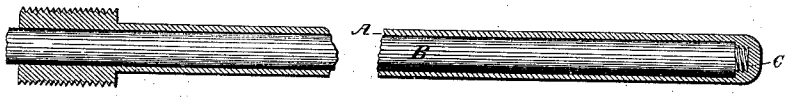
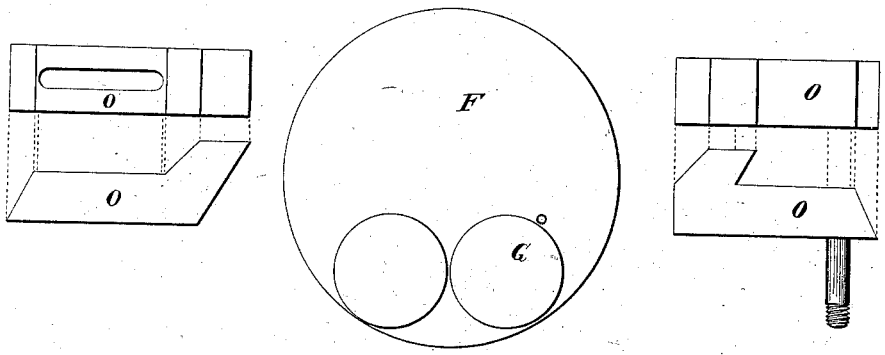


Fig. 1.







W. M. WRIGHT. 2 Sheets—Sheet 2.

Indicating Safety Guard for Steam Boilers.

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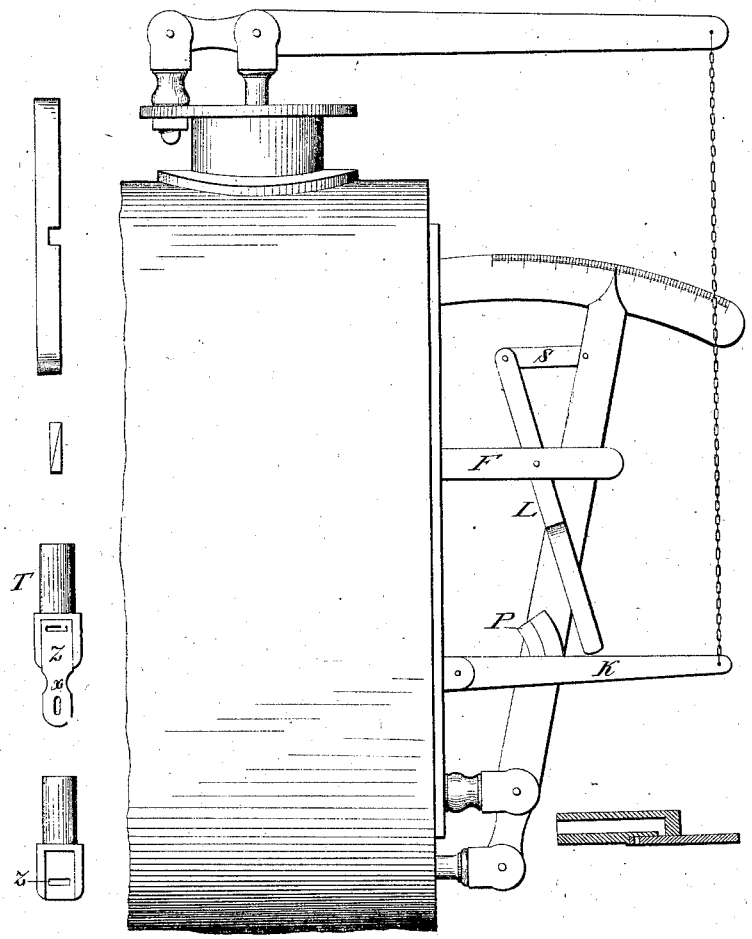

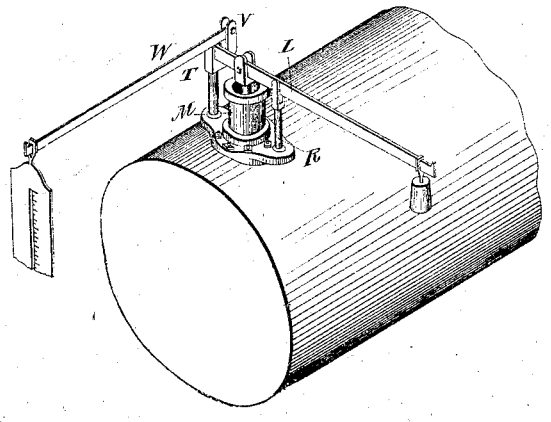

UNITED STATES PATENT OFFICE.

WILLIAM M. WRIGHT, OF PITTSBURGH, PENNSYLVANIA.

MODE OF PREVENTING THE EXPLOSION OF STEAM-BOILERS.

Specification of Letters Patent No. 3,923, dated February 24, 1845.

To all whom it may concern:

Be it known that I, WILLIAM M. WRIGHT, of Pittsburgh, Pennsylvania, have invented a new and useful machine for preventing the explosion of steam-boilers, consisting of the following apparatus, to be called the "indicating safety-guard," exhibited in the annexed drawing.

A tube A of brass or other metal of high expansive power is screwed, or inserted, into the plate W and passed into the boiler E through the boiler head F and extended along the flue G and held in its place by staples loosely enough to enable it to move through them with facility. Into this tube A, which is to be steam tight, is inserted a rod B of iron or other metal of less expansive power, than that of which the tube is composed extending to and secured or inserted into the head of the tube at G and long enough to project beyond the boiler head. This rod is attached by its outer end to a pointer (H) called an indicator. This indicator is attached (so as to move readily from and toward the boiler) to a stanchion I, projecting from the plate W and extends high enough or in any suitable direction to reach a dial J, upon which it is to move as a hand.

The dial is graduated into suitable divisions exhibiting the degrees of heat and pressure of the boiler and may be located where it is convenient.

From the plate W, at a convenient point, projects a hinge K, extending beyond the indicator; to the end of this hinge is attached the chain or saltus balance suspended from the end of the lever L of a safety valve M.

The chain should be so hooked to the point of the hinge, as readily to detach itself when the hinge flies up. This hinge is to have a lateral or other projection O, so constructed as to catch upon a projection P upon the indicator and prevent it from rising, as it otherwise would do by the force of the lever; and it (the hinge) must be heavy enough at the end by its own or a suspended weight to fall very suddenly (when the catch on the indicator passes the catch on the hinge); so that it may avoid the projection on the indicator, which will immediately return outward as soon as the steam begins to blow off, owing to the sudden reduction of the temperature of the boiler and consequent contraction of the tube.

The plate W with apparatus attached to it is to be screwed on the boiler as by this means but one hole may be necessary in the boiler for the insertion of the tube.

To insure the effectual relief of the safety valve, there is to be an upright fulcrum R (see No. 2) with a mortise in the upper end wide and deep enough to enable the lever L of the valve (which is to pass through it) to play freely in it. This fulcrum is placed between the valve and the long end of the lever. The short end of the valve-lever L instead of being permanently fastened by a pin or rivet to the stanchion T as usual is to lie upon it and the stanchion T is to have a slight mortise or indentation to keep the end of the lever, lying on it, in its position. To hold the short end of the valve-lever down a counter lever U passes over it at the stanchion T. The short end of this counter lever is fastened by a rivet to, and supported by, a stanchion V, so as freely to play up and down. The long end of the counter lever U is held down by, and attached to, the indicating apparatus; with this apparatus the loading of the lever of the safety valve ever so much, is immaterial.

The operation of my invention is this: By the heat of the boiler, the tube expands, and lengthens more than the rod, and draws the rod inward, and causes the indicator to traverse the dial, and indicates on the dial, as it progresses, the increasing heat of the boiler; and when the projection P upon the indicator, is thus drawn past the projecting catch upon the hinge, the hinge suddenly flies up and disengages itself from the chain and completely relieves the pressure on the valve. As soon as the steam issues from the valve, the instantaneous contraction of the tube by the cooling of the boiler causes the indicator to traverse the dial in the contrary direction and exhibit the decreasing heat.

The apparatus may be immediately adjusted.

The boiler itself might be used as a tube, by running a rod through and attaching it to the opposite boiler head; in which case however, the rod would have to be made of brass, or some metal of greater or less expansive quality, than the metal of the boiler and the projections on the hinge and indicator and the graduation of the dial-mold have to be arranged accordingly.

The projections P. and O should be made

of cast steel and hardened so as to prevent wearing; and that on the hinge should be constructed so as to move readily upon the hinge inward and outward; and attached to the hinge by a screw and nut, at any determinable point necessary to indicate the required heat and pressure upon the boiler.

The best position of the tube and boilers, which are made with flues is along the outside of one of the flues, so high, as that the upper side of the tube, may range horizontally with the top of the flue, and in boilers without flues, so that the upper side of the tube, may range with the fire line; by which means, when the water sinks to the fire line, the increasing heat, arising from the deficiency of water, is immediately shown, by the moving of the indicator and the relief of the safety valve.

This whole apparatus may be so incased as to be entirely out of the control of the engineer.

The degree of heat at which the apparatus goes off, and the correspondent pressure which may be desirable on the boiler is readily ascertained, by immersing the rod and tube of the apparatus as connected with the plate, in an oil bath, and by means of a thermometer of high range, marking the degree indicated by the pointer on the dial, at which it is desirable to have the apparatus operate, and fixing the projection upon the hinge accordingly.

The indicating safety guard may be made to adjust itself after it had blown off any proposed quantity of steam by the following contrivance as exhibited in drawing No. 3.

Resetting apparatus.—The chain of the safety guard lever being securely fastened to the end of the hinge H (in drawing No. 1 and 3). When the hinge flies up and relieves the safety valve it is gradually pressed back to its former position by the vertical lever L. This lever L is held in position by a stanchion S, proceeding from the indicator and works upon a pin in the fulcrum stake F, fixed into the plate W. As soon as the hinge K flies up and the cooling of the boiler causes the indicator to make its counter movement which it immediately does, the lever L moves outward upon the hinge and gradually presses it down over the catch P, to its former position.

To prevent the hinge being caught by the catch P on the return movement of the indicator the inner half of the catch P, is sloped from below like an inclined plane upon which the hinge when it flies upward is thrown out from the indicator far enough to ride upon and over the outer part of the catch thereby enabling the lever L to force it gradually back to its original position.

To enable the hinge to fly past the catch P, on the machine going off a mortise or opening is necessary in the hinge wide enough to admit the catch to pass through the hinge as it flies up, which occurs as soon as the motion of the indicator brings the catch P over the mortise.

Locomotive slide valve.—A mode of relief most suitable to locomotive engines is a slide valve as exhibited at Figs. 2 and 3, Drawing No. 3. The open end of a short tube T, is passed into the boiler, in which is an opening at I. Over this opening and in a dovetailed mortise works a slide M with a similar opening. This slide is attached to the indicator by a nut and screw as at moving in a short sloat in the slide. When the increasing heat of the boiler moves the indicator it draws the slide with it and brings the openings over each other and permits the steam to escape. As it is proper however that a portion of the steam should be blown off to reduce the temperature before the return motion of the indicator shoves the slide back and closes the opening into the tube; the steam continues to escape until the indicator reaches the end of the sloat and shoves the slide forward. The length of the sloat in the slide can be increased or decreased by a plate and screw.

To give the indicator a greater range a counter pointer may be used as in Fig. 2, drawing No. 1. The expansive power of the tube and rod may be secured, the rod being made of the most and the tube of the least expansive power and that they may be constructed of any materials of such diversity of expansion. The apparatus will of course be varied accordingly.

What I claim as my invention is—

1. The modes of liberating and reclosing the valves in combination with the expansion tube and rod, the rod being hermetically attached to the inner end of the tube by which arrangement a stuffing box for establishing the connection between the inside and outside of the boiler is dispensed with as described.

2. I also claim so connecting the safety valves with the expansion rod as to reclose the valve by the contraction of the metal after a given quantity of steam has blown off as herein described.

WM. M. WRIGHT.

Witnesses:

B. R. MORSELL,

H. R. NARYMAN.