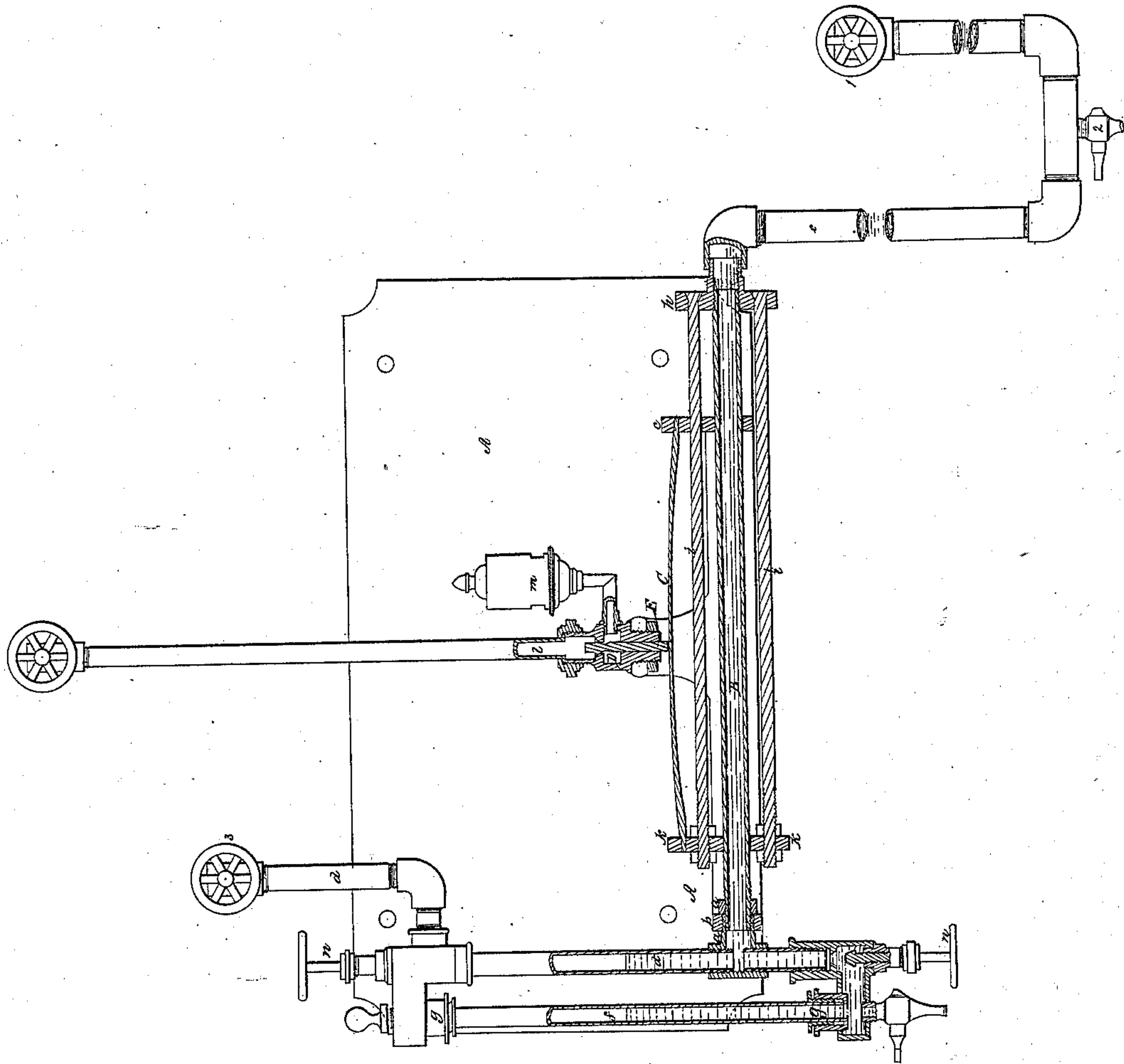


S. W. Warren,
Steam-Boiler Indicator.

N^o 32,237.

Patented Apr. 30, 1861.



Witnesses;
Samuel W. Penell
Chas. H. Harold

Inventor;
S. W. Warren

UNITED STATES PATENT OFFICE.

SYLVESTER W. WARREN, OF BROOKLYN, ASSIGNOR TO HIMSELF, T. C. BANKS,
AND JOHN THOMPSON, OF NEW YORK, N. Y.

IMPROVED HIGH AND LOW WATER INDICATOR FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. 32,237, dated April 30, 1861.

To all whom it may concern:

Be it known that I, SYLVESTER W. WARREN, of Brooklyn, in the county of Kings and State of New York, have invented, made, and applied to use a certain new and useful Improvement in High and Low Water Indicators for Steam-Boilers, &c.; and I do hereby declare that the following is a full, clear, and exact description of my said invention, reference being had to the annexed drawings, making part of this specification, wherein I have represented my said apparatus as ready for use, a portion being shown in section for illustrating the construction more fully.

My said invention is an improvement upon that set forth in Letters Patent granted to me July 6, 1858; and it consists in arranging the said indicator in such a manner that it will answer as a high-water indicator. I also make use of certain improvements in the construction of the parts themselves, whereby I am enabled to check as far as possible any circulation of hot water in the pipe when used as a low-water indicator, and I also arrange my glass inspection-gage in such a manner that the connections thereto can be shut off without interfering with the action of the indicator.

The general principles upon which my said invention act are similar to those set forth in the aforesaid patent, viz., that of the expansion of a pipe under heat producing a motion by end compression upon an arched spring in a manner similar to a toggle-joint, whereby considerable movement is given to the middle part by a very slight end motion, this movement acting to open a valve to an alarm-whistle or similar device for calling attention to the boiler.

In the drawing, B is a pipe held firmly at one end by the nuts *a a* and flange *b* upon the plate A, that is attached on the front end of the boiler or to any other convenient place.

h is a cross-head affixed to the other end of the pipe B and having rods *i i* to the sliding follower *k k*. The flange *c* serves to guide the pipe B; but the hole in said flange is sufficiently large for the pipe to expand or contract freely by any change of temperature.

C is a spring between the flange *c* and the follower *k*, slightly arched upward, and near

its center is the valve E, for opening or closing the passage-way in the chamber D, between the steam-pipe *l* and alarm-whistle *m*.

It will now be seen that if the pipe B is expanded by a considerable increase in the heat the distance between the follower *k* and flange *c* will be shortened, and these, pressing upon the ends of the spring C, will bend the same, giving considerable movement and opening the valve to the whistle *m*, as in my aforesaid patent.

The pipe B is to be located slightly below the usual and proper water-level, so that the same will always remain full of water, as hereinafter described, except when the water falls in the boiler below the level of said pipe, when steam occupying the space of the water will heat said pipe and cause the aforesaid expansion and alarm.

At one end of the pipe B is the pipe *e*, that passes down in the form of a siphon and enters the boiler some distance below the surface of the water. The lower down this connection is made the better, because the water is cooler near the bottom of the boiler.

1 is a cock or valve by which the pipe *e* can be shut off from the boiler, and 2 is a cock by which any sediment can be drawn off from the siphon.

d is an ascending pipe passing into the boiler at 3, where there is a cock or valve for shutting off said pipe. This connection to the boiler is to be as high as the greatest level to which it is safe to fill the boiler before any liability would arise of the water foaming over into the engine and injuring the same by becoming confined in the steam-cylinder and forcing the heads off.

It will now be evident that while the water is at a higher level than the tube B the said tube will be comparatively cold, because no circulation of the hot water can take place except that induced by the hot water formed by the condensation of steam in the apparatus, and this condensation is very slight. If, however, the water falls in the boiler, so that the pipe B is filled with steam, the expansion and alarm, as aforesaid, are given. If, on the other hand, the pump is left on too long and the boiler becomes too full and the water rises above the connection 3, the pipes *d*, *e*, and B

are all full of water, and there is almost an instantaneous circulation of hot water that expands the tube B, as before indicated, giving an alarm as a high-water indicator.

In addition to the siphon-pipe *e* preventing any circulation of the water while the pipes are partially filled with steam it also allows of the expansion in the pipe B without there being any liability to make said pipe leak at the joints, the double bend allowing the pipes to spring.

My glass gage *f* is inserted in the metallic socket *g g* in the manner represented, and arranged parallel to the pipe *d*, and *n n* are valves applied between said pipe *d* and the gage *f*, so that the connection can be closed for cleaning said glass gage or for replacing the same; but the connections of the pipe B with the boiler are not by this operation shut off, the alarm-indicator remains in full operation whether there is a glass gage or not.

What I claim, and desire to secure by Let-

ters Patent as an improvement upon my aforesaid patent of July 6, 1858, is—

1. The siphon-pipe *e*, in combination with the expansion-pipe B, arranged in the manner and for the purposes set forth.

2. Introducing the pipe *d* into the steam-boiler at the level of the greatest height to which the water is to be supplied, so as to produce a high-water indicator by the circulation of hot water through the expansion-pipe B, for the purposes set forth.

3. The arrangement of the glass-indicating gage *f*, and valves or cocks *n n*, in combination with the pipes *d* and B, for the purposes set forth.

In witness whereof I have hereunto set my signature this 16th day of February, 1861.

SYLVESTER W. WARREN.

Witnesses:

THOS. GEO. HAROLD,
LEMUEL W. SERRELL.