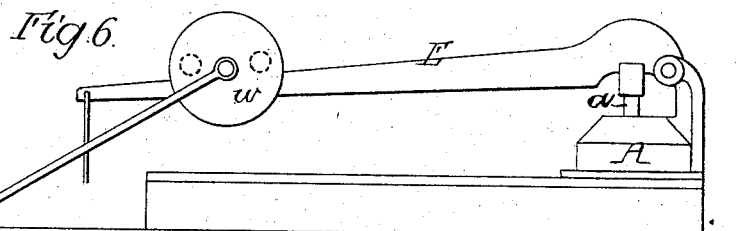
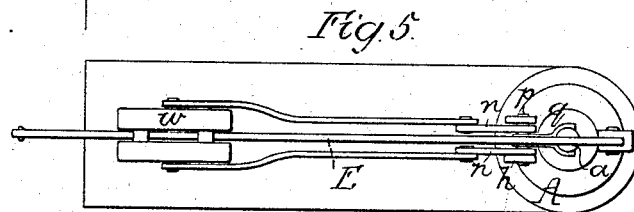
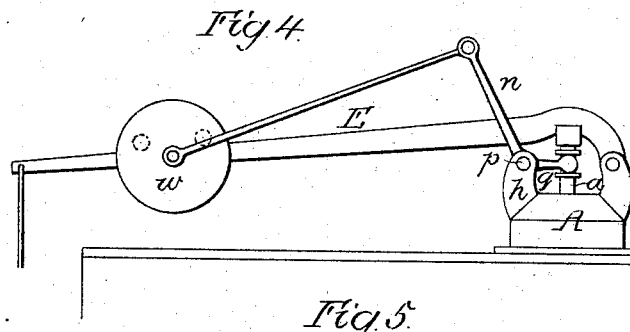
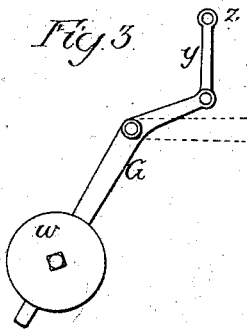
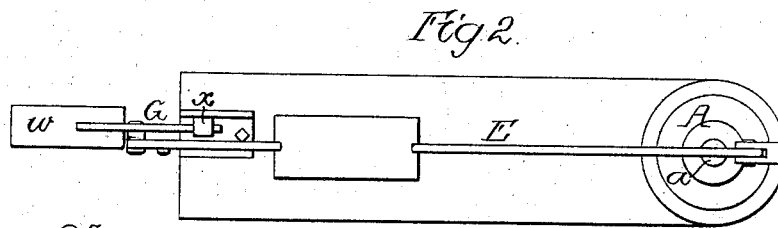
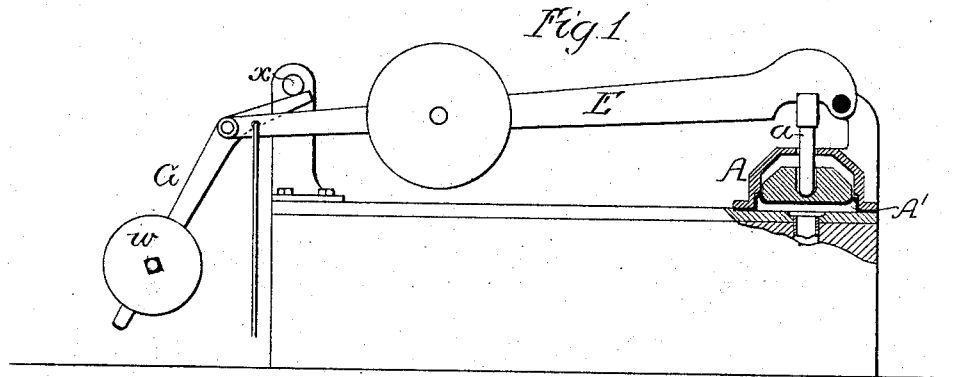


A. C. HARRISON.  
Regulating Devices for Steam-Boilers.  
No. 214,655. Patented April 22, 1879



WITNESSES

Henry Howson Jr.  
Harry Smith

INVENTOR

Alfred C. Harrison  
by his Attorneys  
Howson and Son

# UNITED STATES PATENT OFFICE.

ALFRED C. HARRISON, OF PHILADELPHIA, PENNSYLVANIA.

## IMPROVEMENT IN REGULATING DEVICES FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. **214,655**, dated April 22, 1879; application filed March 8, 1879.

*To all whom it may concern:*

Be it known that I, ALFRED C. HARRISON, of Philadelphia, Pennsylvania, have invented a new and useful Improvement in Regulating Devices for Steam-Boiler Dampers, &c., of which the following is a specification.

My invention relates to an improvement in that class of damper-regulators in which a diaphragm or piston exposed to the pressure of steam is loaded with a weighted lever connected to the damper; and my improvement consists in combining the said lever with a movable weight, and with mechanism whereby the said weight is moved outward and the load on the diaphragm or piston increased as the lever rises under an excess of pressure of steam in the boiler, as described hereinafter.

In the accompanying drawings, Figure 1 is a side view, partly in section; and Fig. 2, a plan view, illustrating a damper-regulator with my improvement; Fig. 3, a modified plan of part of Fig. 1; and Figs. 4, 5, and 6, modifications of my invention.

In Figs. 1 and 2, A is a casing, containing an elastic diaphragm, A', steam from the boiler acting through the medium of this diaphragm, a suitable block or piston above the same, and a rod, *a*, on a weighted lever, E, which is pivoted to the said casing A, the outer end of the lever being connected to the damper of the boiler-flue by any such system of rods, levers, or other appliances as the character of the damper and its locality in respect to the lever may suggest.

This is a well-known device in common use for causing the pressure of steam to operate a damper in the flue of a steam-boiler, and is described in the Letters Patent No. 10,387, granted to Patrick Clarke January 3, 1854.

There is one defect in this otherwise useful instrument, and that is its tendency to entirely close the damper, whether the excess of pressure of steam in the boiler be great or small; hence the operation of the damper is not in accord with the degree of pressure which exceeds the desired normal pressure of steam in the boiler, and the consequence of this is that the damper is frequently closed when there is a slight excess of pressure of steam, and when the damper should be partly open.

It is well known to engineers that to cut off

or nearly cut off the draft in a boiler-flue at intervals is to interfere with the economical consumption of fuel, for, while the heat beneath the boiler is diminished as long as the damper remains closed, the conversion of a portion of the fuel into ashes and clinkers takes place, this being due to the intense heat which is confined to the fire-place, so that when the flue is again opened time must elapse before the fuel can resume its proper combustion, the services of the fireman being, moreover, required in removing the ashes and clinkers.

In order to overcome this defect, I pivot to the end of the lever E, Figs. 1 and 2, a bell-crank lever, G, the long arm of which is weighted, the short arm bearing against the under side of a fixed pin or projection, *x*; or the end of the short arm of the lever may be connected to the lower end of a link, *y*, the upper end being hung to a fixed pin, *z*, as shown in Fig. 3.

When there is an excess of pressure of steam in the boiler the diaphragm in the casing A, and consequently the lever E, will rise, but only to an extent commensurate with the excess of pressure, for as the lever rises the weight *w* will also be elevated, the lever E will be virtually lengthened, and the load on the diaphragm will be increased until it is sufficient to resist the actual excess of pressure, when the upward movement of the lever will cease, the damper being closed to an extent demanded and determined by the excess of pressure of steam. Simultaneously with the gradual resumption by the steam of the desired normal pressure the lever E will gradually fall, and there will be a gradual diminution of the load on the diaphragm.

It will be seen that, whatever may be the excess of pressure of steam, the damper will be opened in accord with that excess, it being understood that the lever G is such, and the extent of its movement so regulated, that it will properly fulfill the duties which it has to perform—that is, the prevention of the closing of the damper to an extent beyond that which the excess of pressure demands, so that there can be no such objectionable effect on the fuel as that above referred to.

In Figs. 4 and 5, arms *n n* are secured to a

pin,  $p$ , which is adapted to bearings in projections  $h$  on the casing  $A$ , a short forked arm,  $q$ , secured to the pin, fitting between collars on the rod  $a$ , and the arms  $n$   $n$  being connected to a sliding weight,  $w$ .

Simultaneously with the rising of the lever under an excess of pressure of steam on the diaphragm the weight  $w$  will be moved outward on the said lever, and the load on the diaphragm will consequently increase as the excess of pressure of steam increases.

Another plan of imparting a differential load to the lever is shown in Fig. 6, where the sliding weight is connected by a link or links to a pin attached to any fixed object.

I claim as my invention—

The combination of the diaphragm or piston and lever of a damper-regulator with a movable weight, and with devices, substantially as described, whereby the said weight is caused to move outward from the fulcrum of the said lever as the latter rises under an excess of pressure of steam, as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALFRED C. HARRISON.

Witnesses:

WILLIAM J. COOPER,  
HARRY SMITH.

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