

W. S. Hudson,

Exhaust Mechanism for Locomotives.

N^o 22,808.

Patented Feb. 1, 1859.

Fig. 1.

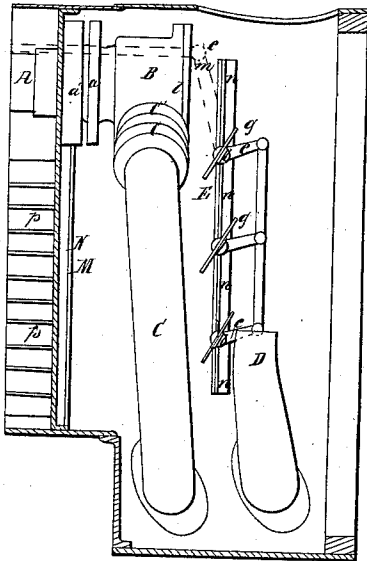


Fig. 2.

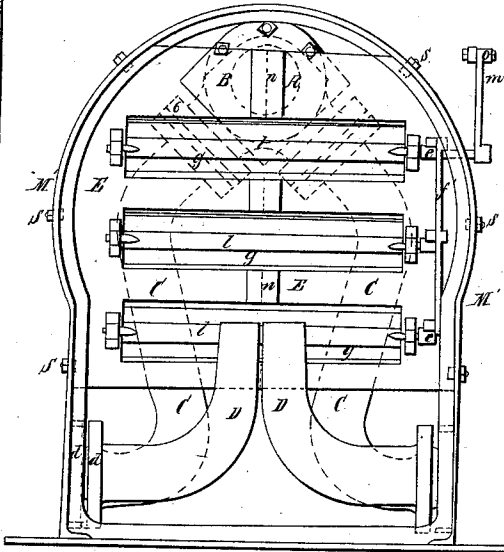


Fig. 3.

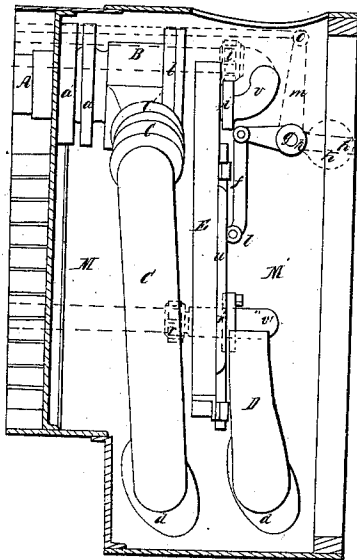
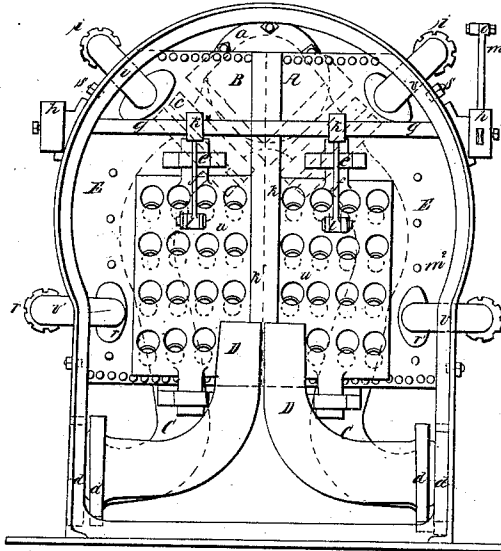


Fig. 4.



UNITED STATES PATENT OFFICE.

W. S. HUDSON, OF PATERSON, NEW JERSEY.

APPARATUS FOR REGULATING DRAFT OF STEAM-ENGINES.

Specification of Letters Patent No. 22,808, dated February 1, 1859.

To all whom it may concern:

Be it known that I, WILLIAM S. HUDSON, of Paterson, in the county of Passaic and State of New Jersey, have invented an Improvement in Modes of Regulating the Draft in Locomotive Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings and to the letters of reference denoted thereon, in which—

Figures 1 and 3 are longitudinal sections of a smoke box with my invention and Figs. 2 and 4 are front elevations of the same.

Similar letters of reference indicate like parts in all the drawings.

The nature of my invention consists in arranging a vertical diaphragm transversely in the upper portion of the smoke box in front of the steam pipes and between them and the exhaust pipes and extending from near the top of the smoke box down to or near the level of the lowest tubes for the purpose of compelling the gaseous products or a portion thereof to descend and pass under it, thereby equalizing the draft in the tubes, retaining the hottest gases in contact with the heating surface of the boiler and with the exterior of the steam pipes and protecting the steam pipes and tube ends from the cooling effect both of the exhaust steam and of any air which may be admitted at the front of the smoke box.

It also consists in making the opening or openings above the base of said diaphragm of such area that when the fire is being kindled, and when the locomotive is standing still, the small quantity of gases flowing from the tubes passes freely through these openings, and that when the combustion is increased by the action of the blast such openings are insufficient for its passage and a portion being compelled to pass underneath the partition substantially the same effect is obtained as would be produced by a continuous diaphragm. I can if preferred make adjustable the aggregate area of such apertures by the employment of slides or revolving slats with suitable connections within the reach of the engineer whereby the area of a portion of the apertures may be increased and diminished at will.

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

I construct the diaphragm of plate iron, about No. 9 wire gage in thickness, and fasten it in the smoke box of a locomotive steam engine boiler, to the shell or outer case thereof, by brackets, knees or angle irons and bolts, so as to make it secure after the manner shown in the drawings, the smoke box being constructed in any of the known forms. Through the diaphragm I make several openings so that they can be regulated by plates or vanes which I construct of iron and so attach and connect them by suitable levers and rods that they can be regulated by the engineer from the foot board of the locomotive. I leave an opening into the chimney at the top of the diaphragm which together with the other openings through it (the diaphragm) give or allow the engine sufficient draft when firing up or when standing. The intervention of this diaphragm causes the heat to remain longer in the flues in consequence of the great body of the escaping gases passing under it, a greater amount of caloric is by this means absorbed by the flues and communicated to the water so as to save fuel which I have experimentally ascertained it does. This diaphragm or partition may answer without the plates or vanes for engines using wood as fuel, by making the openings of suitable size. I find that an area of about thirty square inches of opening at the top of the diaphragm and two openings 14 inches wide and 4 inches high placed at about equal distances from each other and from the top and bottom of the diaphragm answers the purpose.

M represents the last sheet near the cylindrical part of a locomotive boiler.

M' is the smoke box.

N is the flue sheet and *p* the flues riveted into the flue sheet.

A is the steam pipe leading the steam to the throttle valve B.

The branch pipes C C carry the steam to the cylinders to which they are connected by flanges C² C² C² C².

The exhaust pipe D is connected to the cylinder by flanges *d*, *d* to lead the exhaust steam into the chimney.

The Figs. 1 and 2 present the arrangement peculiar to the draft regulator.

The sheet iron plate E extends across the whole width of the smoke box. It separates in the center so as to form two plates of equal dimensions which are united by four

plates *n n n* riveted to the one and bolted to the other half. The outer edge of the plate resting against the inside of the smoke box is provided with angle iron riveted to the plate and bolted at *S S S S S S* to the smoke box. The surface of the plate *E* is provided with three longitudinal openings which are fitted with plates *g* of precisely the same dimensions as the openings. The plates have each a bar *l* riveted to them extending beyond the plate and forming spindles which are fitted into bearings secured to the plate *E*. At one end of each plate the spindle extends beyond the bearing and the arms *e e e* are fitted and secured to them. The end of these arms *e e e* are secured by pins to a rod *f' f'* so that motion communicated to one of the movable plates will be at once communicated to the whole number. The upper spindle extends at one end outside of the smoke box where the arm or lever *m* is fitted and secured to it receiving at its upper end the rod *O* secured by a pin and which extends to the foot board where it is under the control of the engineer.

The Figs. 3 and 4 present the arrangement peculiar to the draft regulator in connection with the feed water heater.

The operation of these apparatus is as follows whether the regulator is used separately or in connection with the feed water heater it is operated as already referred to by the engineer through the intervention of the rod *O* which being connected to lever *m* communicate motion in Figs. 1 and 2 to levers *e e e* united by the rod *f' f'* and so the openings may either be entirely closed or partially or entirely opened by the plates *g g g* to which the levers *e e e* are connected. It is understood that in firing up or at a time when the blast of the exhaust pipes is not active a free passage of the gases is desirable at which period the plates *g g g* may be set horizontal while when the engine is in motion with an active blast the best result is obtained by a vertical position of the plates which closes partially or entirely the passage at these points and obliges the gases

to pass below the apparatus with the exception of a part escaping at the top.

The action in reference to the escaping gases is precisely the same in Figs. 3 and 4 the difference in construction consisting in the shape of the openings for the passage of the gases which are round in this case as shown at *m' m'*. The rod *O* as in the former case communicates motion through lever *m* to the shaft *g* which having secured to it the levers *K K* communicates motion to the plates *u u* through the intervention of connecting links *f' f'* jointed to the plates at *l l*. It will be perceived that by raising or lowering the plates the ferrules may be opened or closed and in the latter case obliges the gases to pass below the apparatus.

The operation of the water heater is simply the admission of water through the branch pipes *V' V'* which after it has circulated around the ferrules and passed through the body of the heater escapes through the branch pipes *V V* from whence the water is led to the check chambers and passes into the boiler.

Having now fully described my invention what I claim as new therein and desire to secure by Letters Patent is—

1. The interposition of a perforated diaphragm *E*, constructed substantially as within described, between the steam and exhaust pipes, and extending down to or near the level of the lower tubes substantially as and for the purposes herein shown and described.

2. Making the apertures above the base of the diaphragm *E* of such area that when the locomotive is standing still the gaseous products of combustion may flow through without serious obstruction but that when the combustion is increased by the blast a large portion is compelled to pass underneath substantially as above set forth.

WILLIAM S. HUDSON.

Witnesses:

ROBT. S. HUGHES,
JOHN McMURRAY.