(No Model.)

2 Sheets—Sheet 1.

G. S. STRONG.

Locomotive Smoke Stack.

No. 235,825. Patented Dec. 21, 1880.

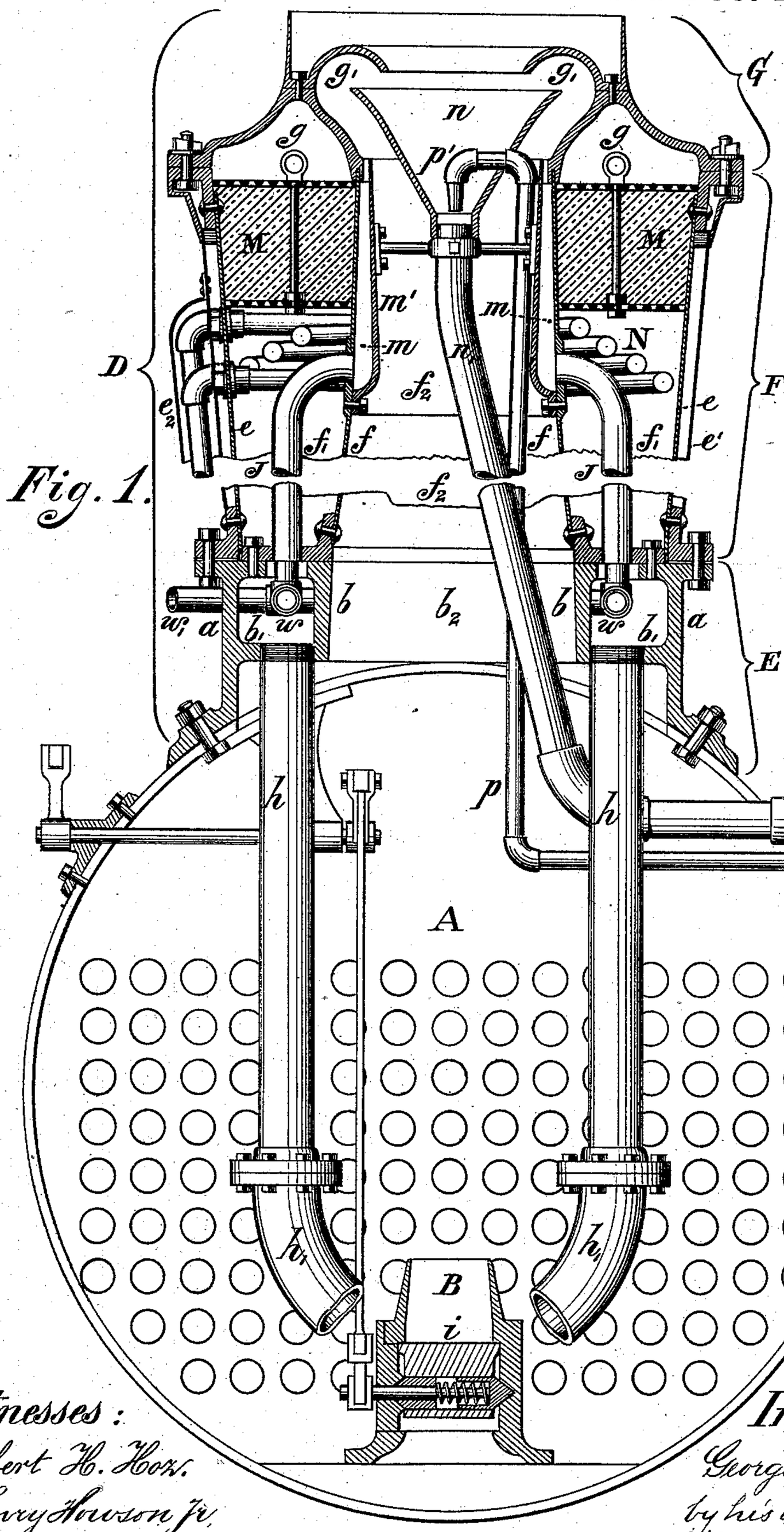

Fig. 1.

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Inventor:
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by his Attorneys
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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

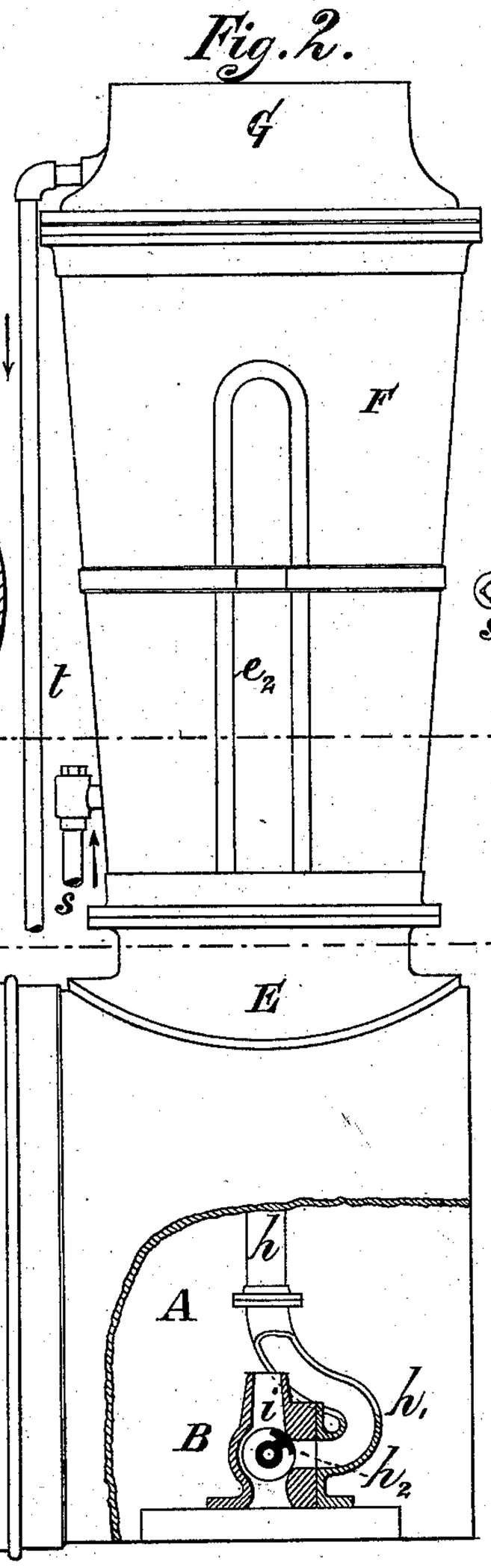


Fig. 3.

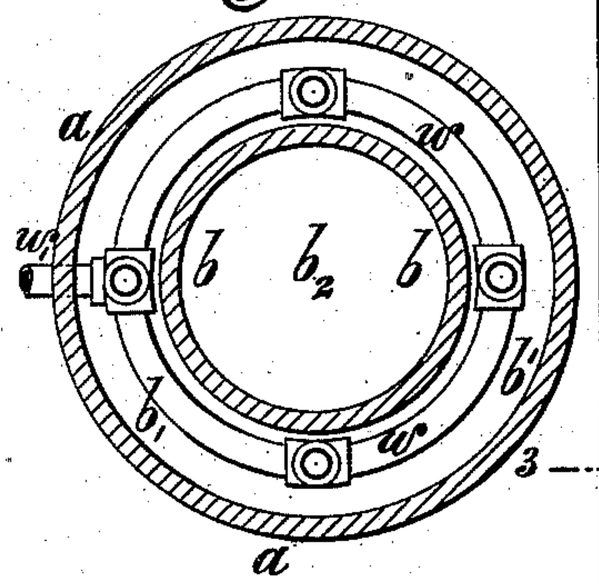
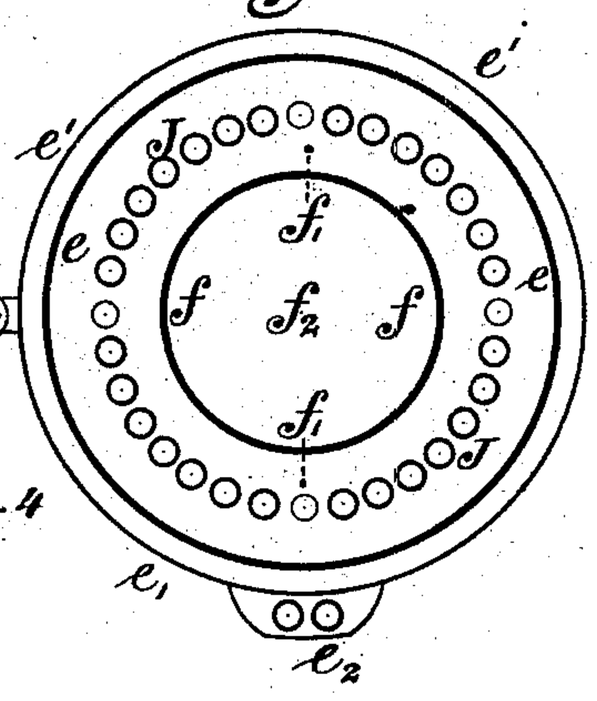


Fig. 4.



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Inventor:

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UNITED STATES PATENT OFFICE.

GEORGE S. STRONG, OF PHILADELPHIA, PENNSYLVANIA.

LOCOMOTIVE SMOKE-STACK.

SPECIFICATION forming part of Letters Patent No. 235,825, dated December 21, 1880.

Application filed August 9, 1880. (No model.)

To all whom it may concern:

Be it known that I, GEORGE S. STRONG, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Locomotive Smoke-Stacks of which the following is a specification.

The objects of my invention are to render the draft uniform, to so dispose of sparks and cinders as to prevent their discharge from the top of the stack, and to combine with the stack a feed-water heater similar in general construction and operation to that forming the subject of my former Letters Patent No. 227,072, April 27, 1880. These objects I attain in the manner too fully described hereinafter to need any extended mention in this part of the specification.

In the accompanying drawings, Figure 1, Sheet 1, is a transverse vertical section of a locomotive smoke box and stack with my improvements; Fig. 2, Sheet 2, a side view of Fig. 1, partly in section, and drawn to a reduced scale; Fig. 3, a sectional plan on the line 1 2, Fig. 2, and Fig. 4 a sectional plan on the line 3 4.

A represents the smoke-box of the locomotive, B the exhaust-nozzle, and D the stack, the latter comprising, in the present instance, three sections, E, F, and G.

The section E comprises an outer casing, *a*, and an inner casing, *b*, said casings inclosing an annular chamber, *b'*, and a central passage, b^2, for the products of combustion.

The section F comprises an outer casing, *e*, and an inner casing, *f*, inclosing an annular chamber, *f'*, and a central passage, f^2, the latter forming a continuation of the passage b^2.

The section G contains an annular chamber, *g*, and is provided with an internal concave deflector, *g'*, the lower edge of which is connected to the upper edge of the inner casing, *f*, of the section F of the stack.

The chamber *b'* communicates, through two pipes, *h*, and a forked pipe *h'*, with the exhaust-nozzle B, the communication between the pipe *h'* and the interior of the nozzle being through a side opening, h^2, the size of which may be enlarged or diminished by operating a rotating valve, *i*, in the nozzle, the stem of this valve being connected, by means of a suitable system of arms, rods, and shafts, with a bar under control of the engineer or fireman, so that the valve may be adjusted to accord with the varying conditions under which the engine may be working, the valve being of such construction that the direct passage of the steam through the nozzle will be diminished as the size of the passage h^2 is increased, and vice versa, so that the proportion of steam deflected from its upward passage and caused to enter the pipes *h* may be regulated with nicety.

In order to prevent the binding of the valve-pivots in their bearings, owing to the expansion and contraction of the valve and nozzle under different degrees of temperature, I make one of said pivots laterally yielding under the action of a spring contained in a recess in the valve, so that there will always be a tendency of the pivots to properly seat themselves in their bearings without any risk of binding therein and preventing the proper operation of the valve. (See Fig. 1.)

The steam which passes through the pipes *h* enters the chamber *b'* of the section E of the stack and passes upward therefrom through a series of pipes, J, arranged in the chamber *f'* of the section F, the upper ends of the pipes J being bent inward so as to communicate with an annular chamber, *m*, formed by an internal casing, *m'*, arranged within the upper end of the passage f^2, centrally within which is also arranged a funnel, *n*, the upper end of which is directly beneath the inwardly-curved top of the deflector *g'*, the lower or contracted end of the funnel communicating through a pipe or tube, *n'*, with the fire-box or ash-pit of the locomotive, or with the space beneath the smoke-box.

A pipe, *p*, communicates with the steam-space of the boiler and terminates in a downwardly-projecting nozzle, *p'*, in the funnel *n*.

When the locomotive is at work two agencies combine to maintain the proper draft through the stack, the first being the intermittent blasts from the nozzle B and the second the continuous annular jet of steam which escapes from the contracted outlet of the chamber *m* near the top of the stack. By thus dividing the blast the draft is rendered more uniform than usual, the force of the intermittent jets projected into the smoke-box not being sufficient to tear up the bed of fuel in the fire-box and draw large particles of unconsumed fuel through the tubes, such sparks and other ignited particles as do pass up through the central opening of the stack being subjected, as they pass up between the deflector

g' and funnel n, to the action of the annular jet of steam from the chamber m, and being extinguished thereby.

The plate g' deflects the products of combustion inward and downward into the mouth of the funnel n before permitting them to escape from the mouth of the stack, so that only the smoke and gaseous products of combustion will pass upward from said stack, the sparks and cinders being thrown to the bottom of the funnel and brought within the influence of the jet of steam from the nozzle p', whereby they are forced through the pipe p to the ash-pit or fire-box, or to the track beneath or at one side of the engine.

The casing e of the section F of the stack is surrounded by a supplementary casing, e', arranged at such a distance from the casing e as to form an air-jacket between the two.

The upper end of the annular chamber f' of the stack is closed by an annular filter, M, and in the chamber f', immediately beneath this filter, is arranged a steam-coil, N, the supply and discharge pipes of which are contained in a casing, e^2, on the outside of the casing e'. Cold water is admitted to the lower portion of the chamber f' through a pipe, s, Fig. 2, provided with a suitable check-valve, and communicating with the pump or injector. This water is heated by contact with the steam-pipes J and casing f and rises in the chamber f', attaining its highest degree of heat by contact with the live-steam coil N directly before its passage through the filter M, by which it is thoroughly purified prior to being drawn off from the chamber g through the pipe t, whereby it is conveyed to the boiler.

The principle of imparting a high degree of heat to the water prior to filtration, and, in fact, the general construction and arrangement of the heater and filter, are in accordance with my former Patents Nos. 226,939 and 227,072, my present invention, so far as concerns this feature, being limited to the method of construction whereby the heater and filter are combined with the stack and put in communication with the exhaust-nozzle B.

An annular blow-off pipe, w, is arranged within the chamber b', this pipe communicating through suitable branches with the lower portion of the chamber f', and being provided with a discharge-branch, w'.

By constructing the stack in sections, as set forth, I am enabled to readily gain access to any part of the same for inspection or repairs, the filter M being so adapted to the chamber f' that it can be lifted directly therefrom after first removing the top section, G, of the stack. This exact method of constructing the stack is not essential to my invention, however. For instance, the section F of the stack and its annular steam collecting and distributing chamber b' might be replaced by an annular pipe with branches similar to the pipe w. The construction shown is, however, preferred.

I claim as my invention—

1. The mode described of equalizing the draft in the stack, said mode consisting in dividing the blast at the exhaust-nozzle and admitting a portion of the exhaust-steam into the lower end of the smoke-box and conveying another portion upward and admitting it into the upper part of the chimney, but at some distance below the top thereof, all substantially as set forth.

2. The combination of the smoke-box, the stack, and the exhaust-nozzle opening into the smoke-box, with an annular chamber opening into the interior of the stack at the upper end, and with pipes whereby a portion of the exhaust-steam is conveyed to the said annular chamber, as specified.

3. The combination of the exhaust-nozzle and a stack having an annular water-chamber therein with pipes, whereby a portion of the steam from the nozzle is conveyed through said water-chamber in the stack, as set forth.

4. The combination of the exhaust-nozzle B, a stack having an annular water-chamber, f', and an annular steam collecting and distributing pipe or chamber, b', pipes h, for conveying exhaust-steam from the nozzle B to said pipe or chamber b', and other pipes. J, for conveying the steam from said pipe or chamber b' through the chamber f', as set forth.

5. The combination of the nozzle B, the tapping-pipe h', and a rotary valve, i, constructed and arranged in respect to the nozzle and pipe as set forth, whereby the direct upward passage through the nozzle is contracted as the entrance to the pipe h' is enlarged, and vice versa.

6. The combination of the nozzle B, the tapping-pipe h', and the valve i, having a yielding pivot or pivots, whereby the effects of expansion and contraction are compensated for, as set forth.

7. The combination, in a locomotive smoke-stack, of three sections, E, F, and G, the section E having an annular chamber, b', and central passage, b^2, the section F having a central passage, f^2, and an annular chamber, f', with pipes J, and the section G having a central passage and an annular chamber, g, as set forth.

8. The combination of the sections E and G of the stack with the section F, having an annular chamber, f', with pipes J, and a filter, M, at the top, as set forth.

9. The combination of the stack having a deflector-plate, g', with the funnel n, having pipe n', and the steam-nozzle p', whereby the sparks and cinders thrown into the funnel by the deflector are caused to pass through the pipe n', as set forth.

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

GEO. S. STRONG.

Witnesses:
HENRY HOWSON, Jr.,
HARRY SMITH.