(No Model.) 3 Sheets—Sheet 1.

C. ANDERSON.

SMOKE EXHAUSTING APPARATUS FOR LOCOMOTIVES.

No. 471,458. Patented Mar. 22, 1892.

FIG. 1

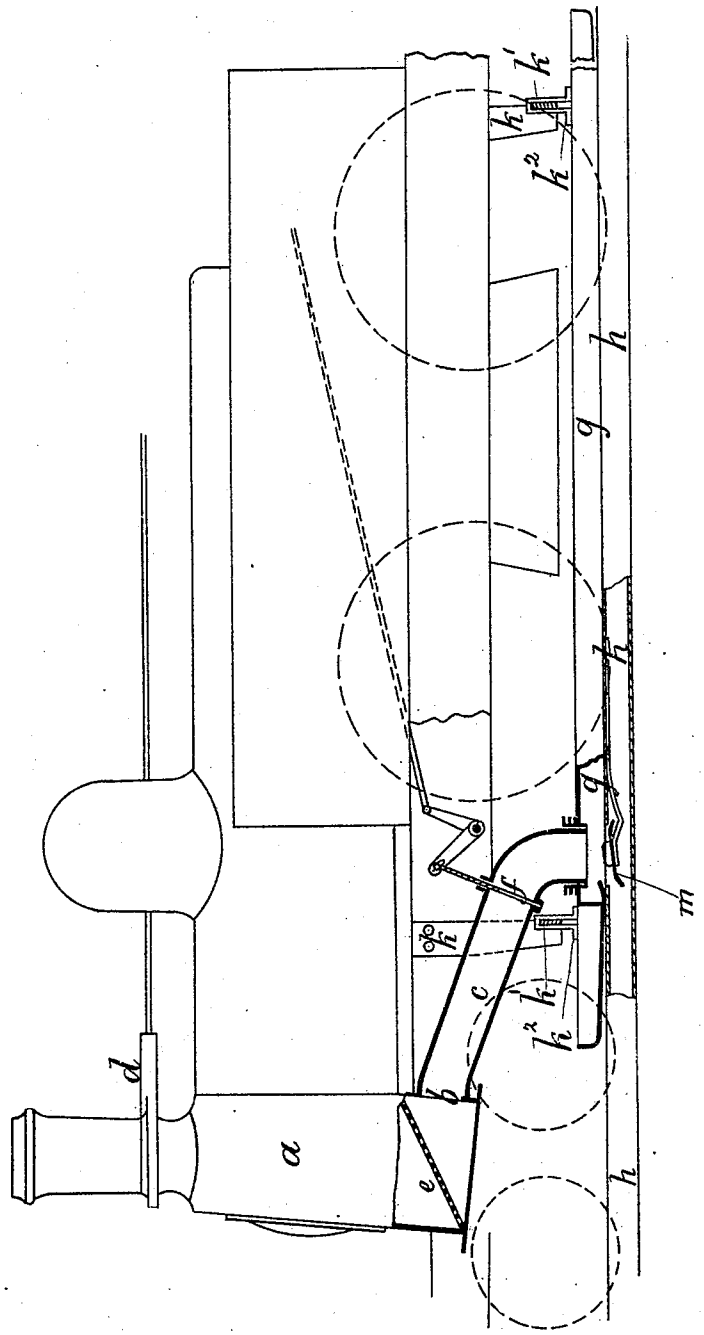

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FIG. 2.

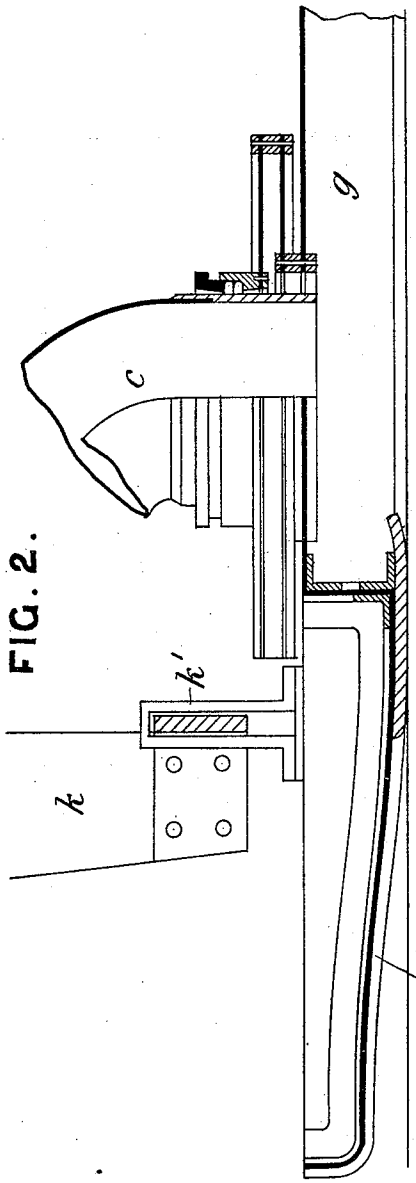
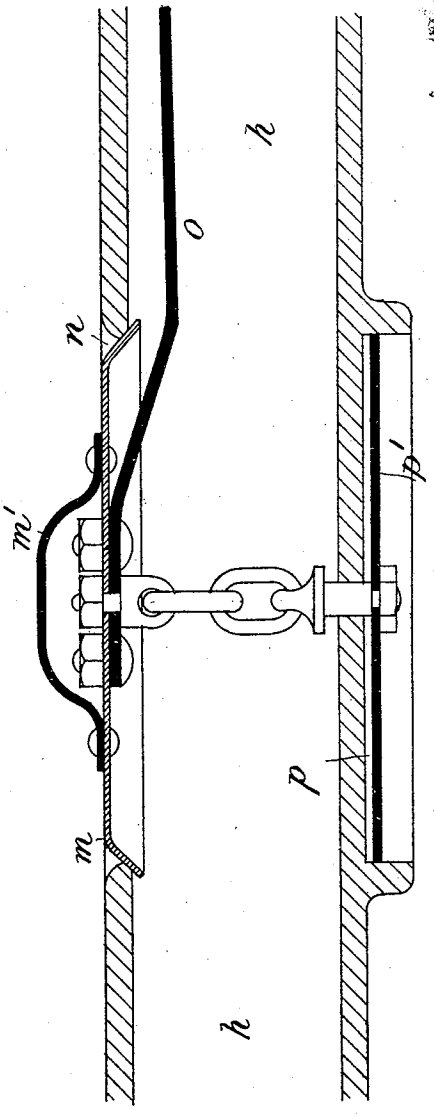


FIG. 3.



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(No Model.) 3 Sheets—Sheet 3.

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FIG. 6

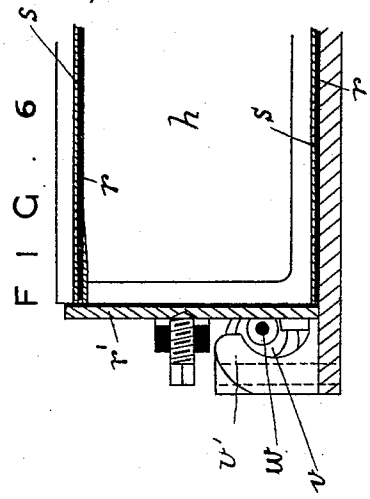


FIG. 7

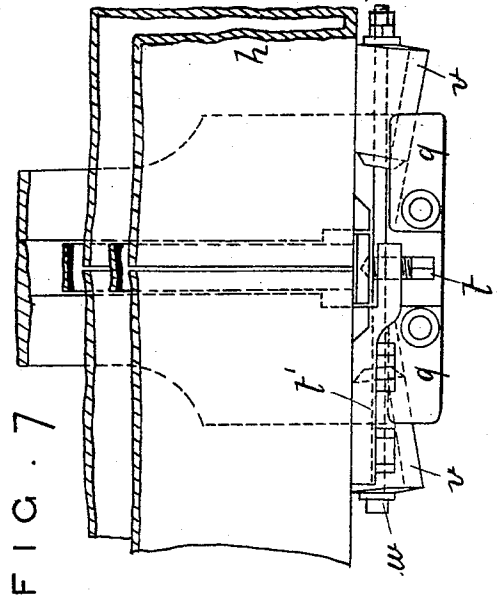


FIG. 4

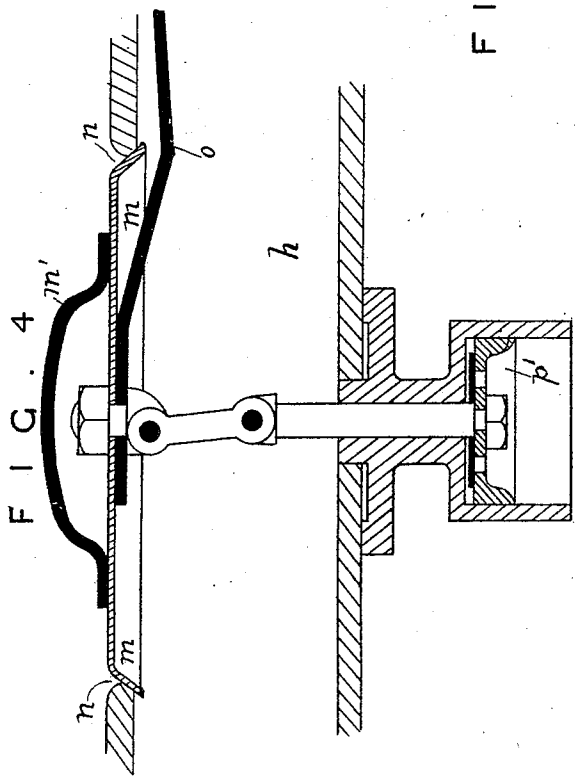
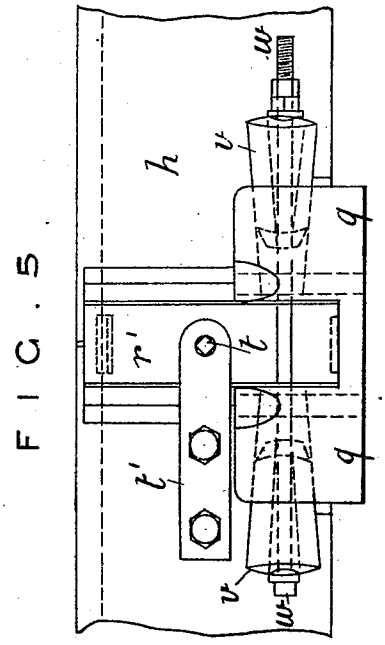


FIG. 5



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UNITED STATES PATENT OFFICE.

CHRISTOPHER ANDERSON, OF LEEDS, ENGLAND.

SMOKE-EXHAUSTING APPARATUS FOR LOCOMOTIVES.

SPECIFICATION forming part of Letters Patent No. 471,458, dated March 22, 1892.

Application filed January 20, 1892. Serial No. 418,729. (No model.) Patented in England February 26, 1891, No. 3,486.

To all whom it may concern:

Be it known that I, CHRISTOPHER ANDERSON, barrister-at-law, a subject of the Queen of Great Britain, residing at 1 Park Square, Leeds, in the county of York, England, have invented new and useful Improvements in Smoke-Exhausting Apparatus for Locomotives, (for which I have obtained a patent in Great Britain, No. 3,486, bearing date February 26, 1891,) of which the following is a specification.

My invention relates to certain arrangements whereby the products of combustion as they arrive in the smoke-box are diverted from their usual course through the funnel and carried through a communicating pipe to a channel in the permanent way formed to receive the same products of combustion, which are then withdrawn through other flues external to the tunnel; and the object of my present invention is to effect further improvements in such apparatus.

In order that my said invention may be particularly described and ascertained, reference is hereby made to the accompanying drawings, in which similar letters of reference indicate corresponding parts.

Figure 1 is a longitudinal sectional elevation of a locomotive-engine fitted in accordance with my invention. Fig. 2 is an enlarged vertical section of one end of the sliding box. Fig. 3 is a vertical section of a portion of the suction-trunk, showing one method of fitting the air-valve. Fig. 4 is a vertical section showing another method of fitting the air-valve. Fig. 5 is an elevation, Fig. 6 a section, and Fig. 7 a plan, showing the method of fitting expansion-joints to the air-trunk and of securing the air-trunk to the chairs.

a is the smoke-box of the engine. An opening is made at *b*, preferably about the center of the smoke-box, and the conduit-pipe *c*, formed of sheet copper or brass, is riveted thereto.

d is a sliding damper fitted to the lower end of the funnel just above the smoke-box.

e is a screen to catch ashes coming through the tubes to the smoke-box.

f is a sliding damper fitted to the conduit-pipe *c*. Rotating dampers may be substituted for sliding dampers. The dampers *d* and *f* may be opened and closed by means of rods and levers from the foot-plate of the engine, as shown in Fig. 1. The lower end of the pipe *c* passes through a stuffing-box fixed to the sliding box *g*.

h h is the suction-trunk, which is laid midway between the rails of the permanent way.

The dampers *d* and *f* can be opened and shut from the foot-plate at the will of the engine-driver for the purpose of allowing the products of combustion to escape by the ordinary funnel when running in the open air or of causing them to descend to the suction-trunk *h* when running in a tunnel.

To assist the downward action of the draft, I fit the blast-pipes leading into the smoke-box in such a manner that the nozzle may be turned downward, whereby the steam is directed into a funnel-shaped pipe leading into the pipe *c*.

The slider *g* is rectangular in section and is formed of sheet metal and angle-iron riveted together. The under side is perfectly level, except at the two ends *g' g'*, where a wave-line or undulated form of prow is adopted for the purpose of opening the valves without shock. The length of the prow is designed for a speed bearing some practical proportion to the highest speed of the trains which are to run upon the roads to which the invention is applied. The slider is made of sufficient length, width, and depth for the pitch or distance of the air-valves in the trunks *h* and the draft requirements of the boiler. The lower plates of the slider, which come in contact with the working surface of the air-trunk, may be renewed as they wear out.

To enable the engine to draw the slider along the upper surface of the air-trunk *h* in the manner required, brackets *k k* are

fitted to the engine, the lower ends of which carry a cross-bar k' at right angles to the bracket. The ends of this cross-bar enter the looped brackets or carriers k^2 k^2, fixed to the slider g. These carriers k^2 provide for the vibration and oscillation of the engine and prevent its communication to the slider. The under side of the slider is open to the trunk between the side bearing-surfaces and the two ends, so that communication is always maintained with the trunk h by means of one or two valves m m, which are held open by the slider g. These valves are shown in section in Figs. 3 and 4 as fitted to the upper plates of the air-trunk h. The dished valve m is pressed upward against the opening n by the spring o.

m' is a striking-plate riveted to the valve. A central longitudinal bar, forming part of the slider g, presses down the plate m' and valve m, and thereby opens the communication between the slider g and air-trunk h. The valves m of the air-trunks h are preferably made of pressed-steel plate and of circular form. The springs o raise the valves m after the slider has passed over them. The whole arrangement of valve and spring is made to insure a good fit of the valve, non-liability to failure or sticking, and prompt action. The air-valve is prevented from rising too violently to its seat by an air-cushion p, formed by a circular or other convenient recess or cylinder, in which a disk or plate of metal p', acting as a piston, is fitted. The piston p' fits the short cylinder with sufficient freedom to enable it to fall by its own gravity when the air-valve is depressed, the air-cushion acting as a brake when rising by the power of the spring o. Another form of air-check is shown in Fig. 4, having inlet-valves to the piston to form a cushion or cataract against the too speedy closing of the valve. The lengths of the air-trunk are so fitted together as to allow for the natural expansion and contraction of the metal. The method preferred is shown in Figs. 5, 6, and 7; but other methods may be adopted. The joints are shown covered with plates overlapping the butt-joints. The top joint of the trunk is made by placing a plate r (previously bent to a suitable curve) under the joint and inside the trunk, with felt, asbestus, or other suitable lining s next to the joint. The bottom joint of the trunk is made by laying the same kind of felt-lined spring r in a groove in the bearing-chair q and under, but outside, the trunk-joint, with the lining S also next to the joint. The top joint-spring is held in position by housing the sprung ends in notches or slots made through the sides of the trunk ends close under the top sides of the trunks. The side joints of the trunks are made by means of felt-covered steel plates or springs r', which, in addition to the side joints, also cover the ends of the top and bottom joint-springs and keep them in position endwise. The side plates r' are held to the side joints by means of set-screws t and brackets t', the latter being bolted to the side of the trunk. Sufficient play is left in the joints and housings, in which the springs and plates are placed, to admit of the expansion and contraction of the air-trunks from the varying temperature of the gases which pass through them.

For the purpose of securing the air-trunks in their proper position on the bearing-chairs conical wooden keys or wedges v are used, which engage in lugs v' on the trunks and on the chairs in such a manner that the trunks are held in a central position on the chairs and also held down to the chairs, and to prevent the keys shaking loose between the lugs a bolt w is provided, which passes through holes in the keys and secures each pair of keys together.

Any sediment or deposit of ash or oxide or other matter which may take place in the air-trunks may be loosened by wire or other brushes in the form of balls or cylinders or spiked balls or teasels, which may be blown through the trunks by a strong reversed current of air, and the loosened dust or matter may be carried away at the same time to suitable traps, pits, or sumps, which are provided for the purpose of catching and retaining such solid matter.

At the end of the system of air-trunks, where the gases from the engines are exhausted by the apparatus, a large chamber or sump is provided and partly filled with water, so that the incoming gases are by means of suitable deflectors caused to throw down dust or solid matter, which they carry in suspension into the water, and thus separate matter which would otherwise be detrimental to the exhausting apparatus.

I claim—

1. In means and appliances for preventing the pollution of the atmosphere in railway-tunnels, the combination, with a locomotive-engine smoke-box, of a conduit-pipe c, fitted with a damper f or its equivalent and connected with the sliding box g by a stuffing-box, substantially as hereinbefore described.

2. In means and appliances for preventing the pollution of the atmosphere in railway-tunnels, the combination of brackets k k', fitted to the locomotive-engine, and the lugs k', engaging in brackets k^2, for propelling the slider g and providing for oscillation, substantially as hereinbefore described.

3. In means and appliances for preventing the pollution of the atmosphere in railway-tunnels, the combination, with an air-trunk h, having valves m, of the slider g, having an undulated or wave-line prow g', for opening and closing the valves without violent shocks, substantially as described.

4. In means and appliances for the pur-

poses aforesaid, the combination, with the air-trunk *h*, of valves *m*, supported by springs *o* and fitted with striking-plates *m'*, said valves being controlled by cataract appliances of any suitable construction, substantially as hereinbefore described.

5. In means and appliances for preventing the pollution of the atmosphere in railway-tunnels, the combination, with the air-trunk composed of sections, of expansive packing at the joints of the sections, substantially as and for the purposes described.

Dated this 18th day of December, 1891.

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