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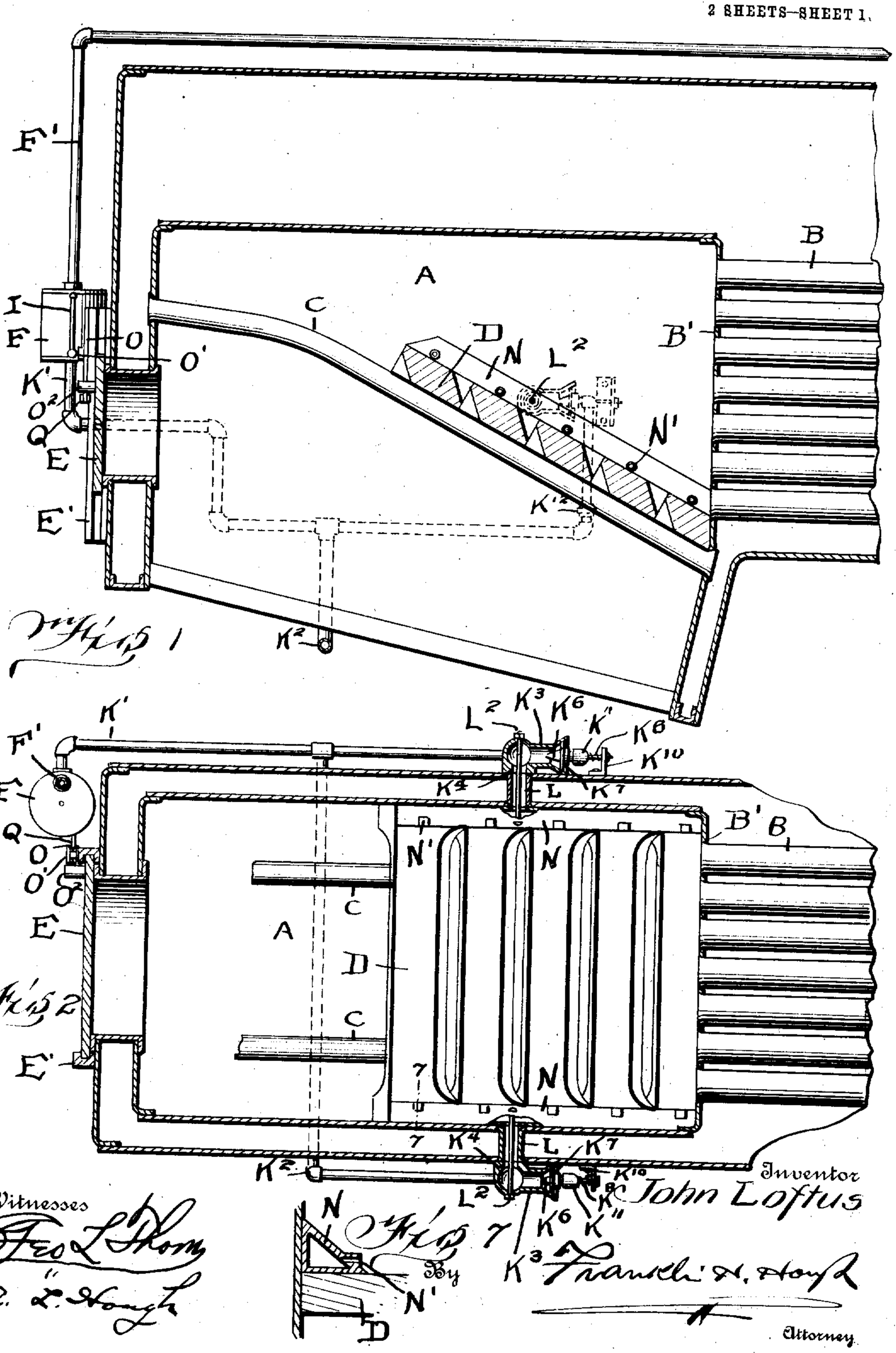
SMOKE CONSUMING APPARATUS FOR LOCOMOTIVES.

APPLICATION FILED MAY 9, 1910.

973,947.

Patented Oct. 25, 1910.

2 SHEETS—SHEET 1.



Witnesses

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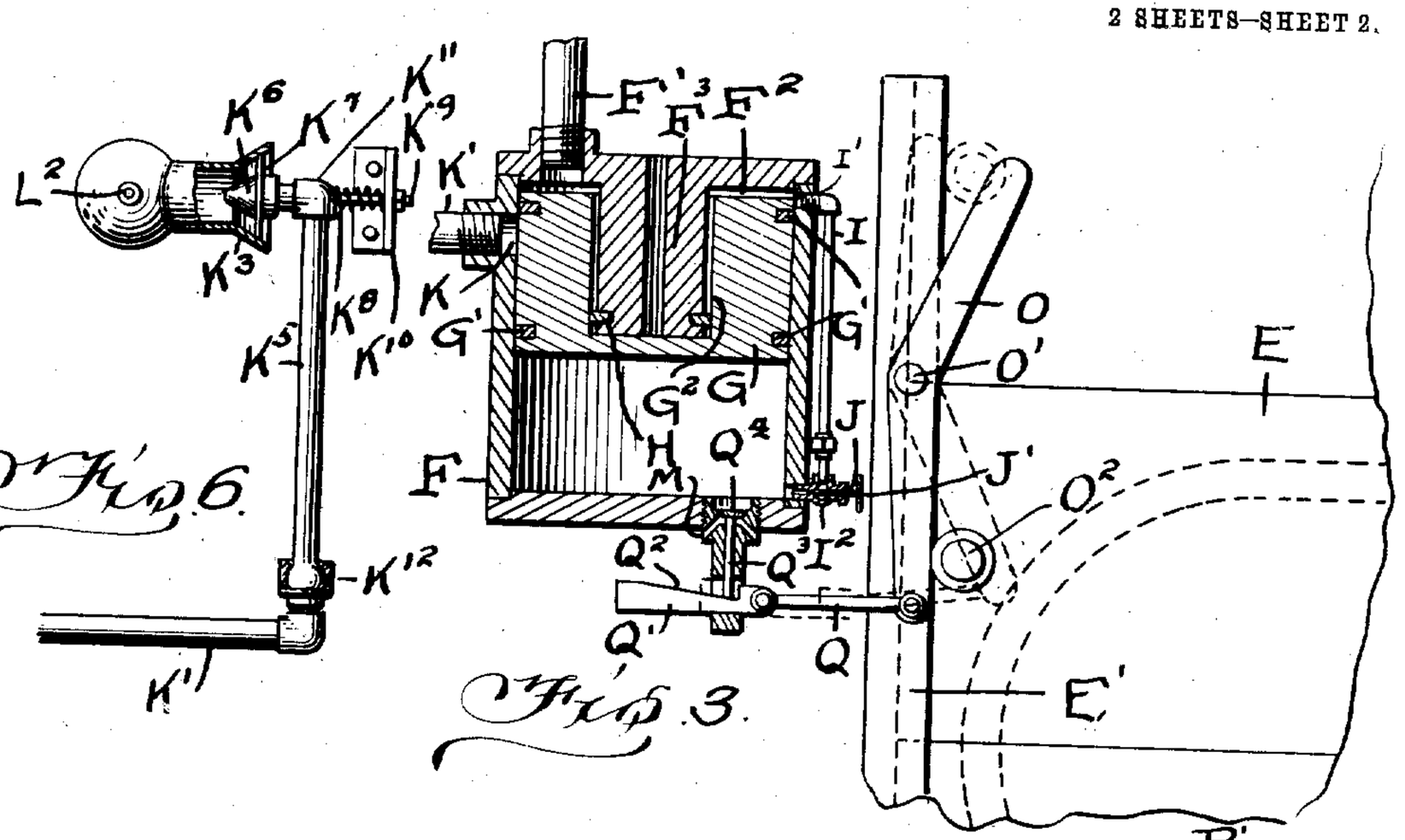


Fig. 6.

Fig. 3.

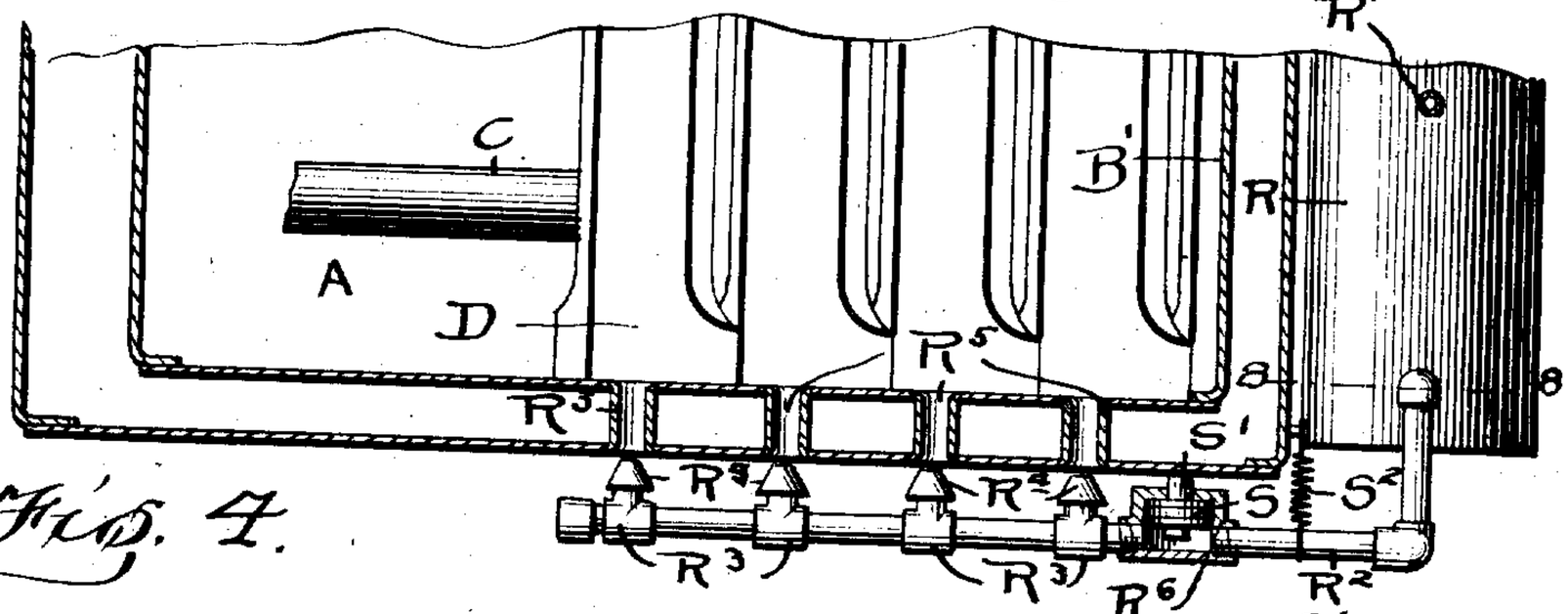
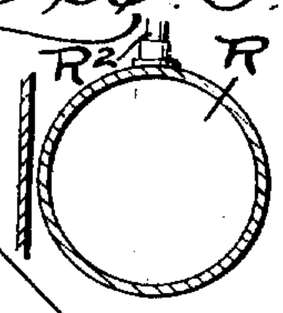


Fig. 4.

Fig. 8.



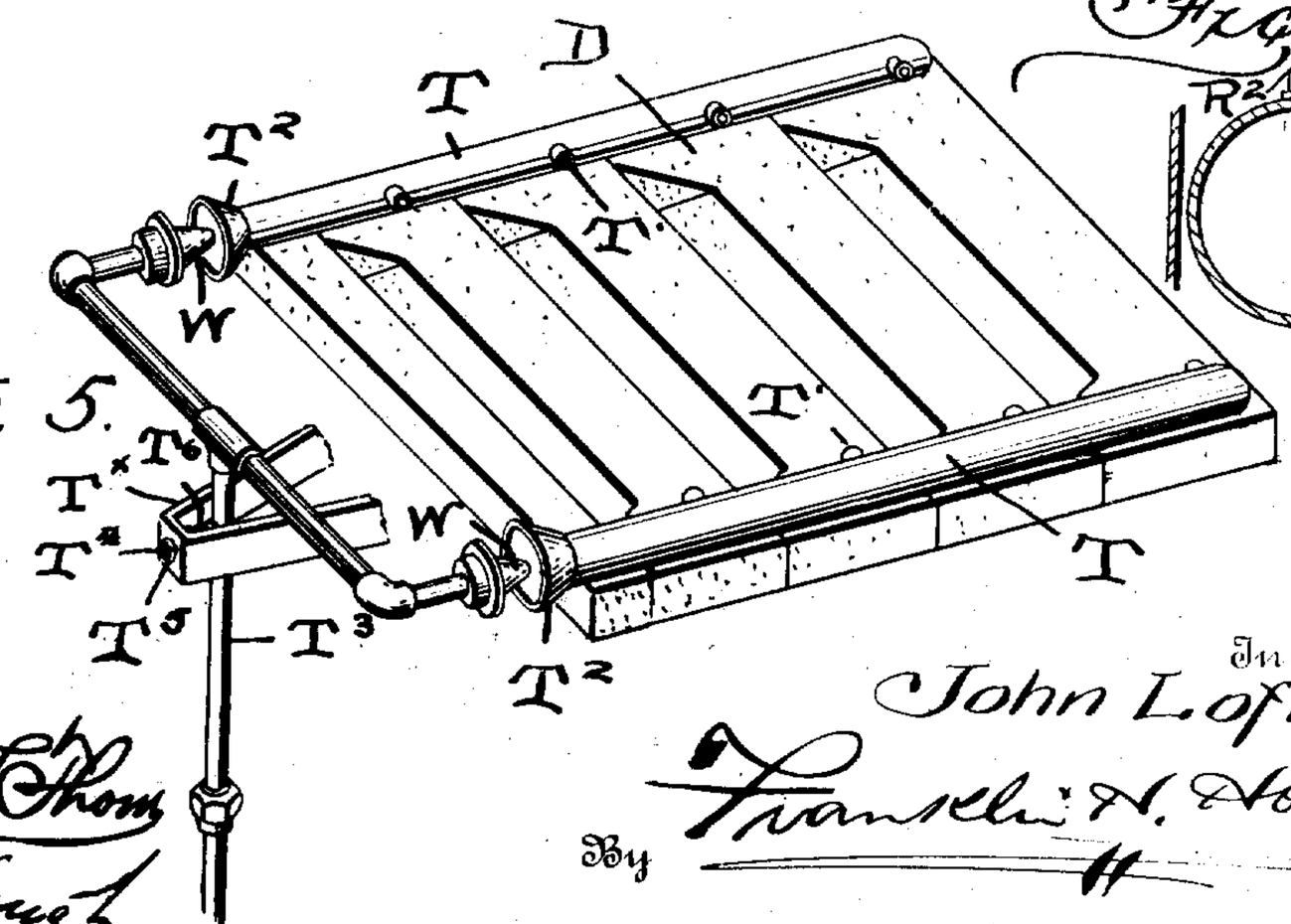


Fig. 5.

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SMOKE-CONSUMING APPARATUS FOR LOCOMOTIVES.

973,947. Specification of Letters Patent. Patented Oct. 25, 1910.

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To all whom it may concern:

Be it known that I, JOHN LOFTUS, citizen of the United States, residing at Albany, in the county of Albany and State of New York, have invented certain new and useful Improvements in Smoke-Consuming Apparatus for Locomotives; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to new and useful improvements in smoke consuming apparatus for locomotive fire boxes and the object in view is to generally improve upon and render more efficient the apparatus covered by Letters Patent No. 942,575 of December 7, 1909 for arches for fire boxes of locomotives, the essence of the invention consisting of the introduction of heated air jetted into the fire box by steam and introduced so as to commingle with the currents or drafts passing through the openings in the fire arch.

The invention consists further in the provision of means for automatically introducing heated air into the fire box commingled with the smoke whenever the furnace doors are opened, the supply of air being cut off as the doors are closed.

The invention comprises further various details of construction and combinations and arrangements of parts which will be hereinafter fully described and then specifically defined in the appended claims.

I illustrate my invention in the accompanying drawings, in which:—

Figure 1 is a vertical sectional view through a fire box and arch of a locomotive. Fig. 2 is a horizontal sectional view through the fire box above the arch. Fig. 3 is a front elevation of a portion of the furnace door and illustrating in section a steam-actuated cylinder for automatically allowing steam to be injected into the fire box above the grate as the furnace door is opened. Fig. 4 is a sectional view through the fire box above the arch showing a slight modification of my invention. Fig. 5 is a detail perspective view showing a modified form of the means for introducing the steam above the grate. Fig. 6 is a detail view, partly in section, of a flexible nozzle. Fig. 7 is a detail sectional view on line 7—7 of Fig. 2, and Fig. 8 is a detail sectional view on line 8—8 of Fig. 4.

Reference now being had to the details of the drawings by letter, A designates the usual fire box of a locomotive and B the flues which pass through the flue sheet B′.

C designates water tubes passing through the fire box at an inclination and upon which the fire brick D are mounted, which fire brick may be of any desired construction, preferably spaced apart as shown in order to break up the volume of heat as it passes from the fire box to the flues, it being the purpose of the present invention to combine with this feature the introduction of steam to further the combustion of the carbon constituents of the smoke.

E designates a furnace door which, in the present instance, is shown as mounted to slide vertically as is common on modern types of locomotives, said door movable in guideways E′, and F designates a steam cylinder mounted at any suitable location, preferably near the door of the furnace, and F′ designates a pipe leading to and communicating with the contracted chamber F^2 formed in the upper end of the cylinder. It will be noted that the top of said cylinder has an integral core F^3 which is centrally apertured as at F^5 and which core extends down within the cylinder a suitable distance in order to form said contracted portion of the cylinder. A piston G, provided with suitable packing rings G′, is mounted to reciprocate within said cylinder and has a hollow central portion G^2 adapted to receive said projecting core F^3, a suitable packing ring H being interposed between the circumference of the core and the adjacent wall of the recessed or chambered portion

of the piston. A pipe I communicates at one end with a port I′ leading through the upper portion of the cylinder and its lower end communicates with a valve casing I^2 which communicates at one end with the lower portion of the cylinder beneath said piston and a needle valve J is mounted within said casing and adapted to regulate the amount of steam to be introduced into the lower portion of the cylinder, a suitable hand wheel J′ being fastened to and adapted to control the needle valve. Communicating with a port K in the circumferential wall of the cylinder is a pipe K′ which has a branching pipe K^2 leading therefrom, as shown in Fig. 2 of the drawings, said pipe connected to a pipe K^5 having a nozzle K^6 with a washer K^7 thereon, said nozzle and washer being normally held in the positions shown in Figs. 2 and 6 of the drawings, by a coiled spring K^8 which is mounted upon the pin K^9 and is interposed between a bracket plate K^{10} and an elbow K^{11} which connects the pipe K^5 with the nozzle K^6.

It will be noted upon reference to Fig. 6 of the drawings that the pipes K^5 and K′ have flexible connection, as at K^{12}, allowing the pipe K^5 to tilt slightly as the force of the steam makes exit through the nozzle, thereby withdrawing the latter from the funnel-shaped entrance to the casing K^3. Each of said casings K^3, one upon either side of the boiler, is provided with a laterally projecting port K^4 which communicates with a duct L leading into a hollow triangular flue N, a cross sectional view of which is shown in Fig. 7 of the drawings, and which flue rests upon the upper faces of the brick forming the arch at the ends thereof. Said flue is provided with exit openings N′ positioned at intervals, preferably over and adjacent to the upper surface of each line of brick and intermediate the openings between the rows of brick. Bolts L^2 are passed through said casing K^3 and the flue N, as shown in Fig. 2 of the drawings, and serve to hold the casings and flue securely in place.

Referring to Fig. 3 of the drawings will be seen an angle lever O pivotally mounted at O′ upon a pin adjacent to the sliding furnace door, and O^2 designates a lug or pin projecting from the door and is designed to contact with said lever to tilt the latter as the door is raised and lowered. Pivotally connected to the lower end of said lever is a link Q which in turn is pivotally connected to a sliding member Q′, the upper surface of which is inclined as at Q^2 and upon which inclined surface the lower end of the valve stem Q^3 of the valve Q^4 is adapted to ride, it being the office of the member Q′ to open said valve as the link Q is drawn toward the furnace door in the opening of the heater and thereby allowing the steam which will have accumulated in the cylinder below the piston to escape to the atmosphere through the exhaust ports M.

In Fig. 4 of the drawings, I have shown a slight modification of the invention in which a steam supply reservoir R is provided to which steam is supplied from the boiler through a pipe R′ and leading from said cylinder to the reservoir are two pipes, designated by letter R^2, each of which is adapted to have a flexible connection whereby the pipe R^2 may have a movement toward or away from the boiler. Each of said pipes R^2 is provided with a series of nozzles R^3 having tapering portions R^4, each opposite each duct R^5 which lead through the boiler and communicate with the interior of the fire box immediately above the brick forming the arch. Said pipe R^2, there being one upon either side of the boiler similarly constructed, is provided with a steam cylinder R^6 in which a piston S is mounted, the stem S′ of which piston is fastened to the outer face of the boiler. A spring S^2 is fastened at one end to the pipe R^2 and its other end connected to the reservoir R, the office of which spring is to normally hold the nozzles R^4 in contact with the ducts R^5 to close the same.

Referring to Fig. 5 of the drawings will be seen a still different modification of my invention and in which I have shown flues T resting upon the upper surface of the brick of the fire arch and the ends thereof and each of said flues is provided with a nozzle T′ opening between the openings in the arch and corresponding ends of said flues and funnel-shaped as at T^2. Said funnel-shaped ends are adapted to be positioned preferably at or near the front wall of the fire box, and T^3 is a pipe adapted to have flexible connections at its lower end with a supply pipe leading from the boiler. A yoke $T^\times$ is adapted to be fixed to the wall of the furnace and has a screw T^4 fixed thereto with an adjusting nut T^5 upon the end thereof. A coiled spring T^6 is mounted upon said screw and interposed between the pipe T^3 and the yoke, the office of said spring being to normally hold the nozzles W, one mounted at the end of each branching portion of the pipe T^3 and centrally in alinement with the openings in the funnel ends of the pipes T, in closed relation and serving to normally close said openings.

The operation of my invention will be readily understood and is as follows:—Referring to Fig. 6 of the drawings, steam is adapted to be supplied to the cylinder through the pipe F′, a constant jet of live steam being allowed to pass by the needle valve into the lower portion of the cylinder. As the lower portion of the cylinder has a

greater area than the upper part, owing to the core projecting down within the cylinder, the piston will be held normally at its highest position and in which position exit of steam from the cylinder to the pipe K′ will not be permitted. When the furnace door is opened, the pin or lug O^2 thereon coming in contact with the inclined edge of the lever O will cause the latter to tilt upon its pivot and the link Q connected to the lower end of said lever pulling upon the member Q′ upon which the valve stem Q^3 rides will cause the latter to be raised and the valve at the upper end thereof unseated, thus allowing the accumulation of steam within the lower portion of the cylinder to escape through the exhaust ports M to the atmosphere. As the steam exhausts from the lower portion of the cylinder, the live steam introduced through the pipe F′ direct from the boiler will cause the piston G to be forced down within the cylinder as the supply of steam being fed through the pipe F′ will overbalance the continuous jet of steam introduced through the needle valve into the lower portion of the cylinder. As the upper portion of the piston passes below the port K leading to the exit pipe K′, steam will escape from the upper portion of the cylinder through the pipe K′ and thence to and through the nozzles K^6, the steam drawing in a jet of air into the casings K^3 which air will pass thence through the ducts into the flues N which may be of any size or shape and which rest upon the upper surfaces of the arch. The air becomes heated within said flues before it issues through the openings N′ which are so positioned as to cause the air to come into intimate contact with the currents of heat and smoke passing up through the openings in the arch, thereby affording means whereby the carbon of the intense smoke may be more thoroughly consumed. As the steam makes exit from the nozzles K^6, the pipes K^5 will be caused to swing away from the casing K^3, thus allowing air to be drawn by suction caused by the inrushing of the steam and fed into the flues within the fire box preparatory to its being heated and fed therefrom into the fire box. This operation of introducing the air will continue while the furnace door is open. When the door is closed, the pin O^2 coming in contact with the edge of the lower arm of the lever O will cause the latter to be returned to its normal position, as shown in Fig. 3 of the drawings, and which movement will move the member Q^4 from the boiler and the valve Q^4 will seat. After the furnace door is closed, the steam will continue to be fed from the upper portion of the cylinder to the fire box until the pressure below the piston in the cylinder overcomes the pressure in the upper contracted portion of the latter. This continuation of the feeding of the air may occur for a few seconds until the supply being fed through the needle valve returns the piston to its highest upper limit, after which the supply of steam and air will be cut off by the piston. As the air ceases to be fed into the fire box above the arch, the coiled spring K^8 will serve to throw the nozzles K^6 into closed relation, as shown in Fig. 6 of the drawings, thereby preventing the ingress of outside atmospheric air into the fire box.

In the modified form shown in Fig. 4 of the drawings, a supply of steam is fed to the cylinder F as the door is opening and thence making exit through the pipes R^2 will cause the latter to be thrown to the position shown in Fig. 4 of the drawings, the outer limit of the movement of the pipes R^3 being limited by the pistons S coming into contact with the inner ends of the cylinders R^6 when the steam entering through the nozzles R^4 will cause air to be injected into the fire box with the steam. When the supply of steam is cut off from the reservoir, the coiled springs S^2 will serve to normally return the pipes R^2 to their normal positions, the nozzles R^4 closing the ducts R^5.

In the form shown in Fig. 5 of the drawings, the principle is identical to the other forms, the nozzles W being thrown back to allow steam and air to enter the flues and be introduced over the arch in the fire box.

From the foregoing, it will be noted that, by the provision of an apparatus as shown and described, a simple and efficient means is afforded whereby the smoke containing large quantities of carbon and unburned gases may be consumed by the introduction automatically of steam and air at times when most needed or while the fire is being recharged.

What I claim to be new is:—

1. A smoke consuming device comprising, in combination with the fire box of a locomotive having an inclined arch with openings therethrough, flues positioned above and at the sides of said arch and having exit apertures adapted to discharge air transversely of the arch between the openings in the latter, and means for automatically introducing air into said flue.

2. A smoke consuming device comprising, in combination with the fire box of a locomotive having an inclined arch with openings therethrough, flues positioned above and at the sides of said arch and having exit apertures adapted to discharge air transversely of the arch between the openings in the latter, a door to the fire box, and automatically operated means actuated by the opening of the door for allowing air to

be introduced into the flue to be heated previous to its issuing therefrom into the fire box.

3. A smoke consuming device comprising, in combination with the fire box of a locomotive having an inclined arch with openings therethrough, flues positioned above and at the sides of said arch and having exit apertures adapted to discharge air transversely of the arch between the openings in the latter, a door to the fire box, a casing communicating with the flues, a steam supply pipe leading to and normally closing an opening into said casing and designed to be automatically opened to allow air to be drawn into the casing as the steam is turned on by the opening of the door.

4. A smoke consuming device comprising, in combination with the fire box of a locomotive, an arch made up of fire brick with spaces intermediate the same and positioned within the fire box, the walls of the fire box having apertures intermediate the openings in the arch and above the same, a steam cylinder, a piston mounted therein, one end of the cylinder being contracted, a steam supply pipe leading to the contracted end of the cylinder, a by-pass pipe communicating between the opposite ends of the cylinder, a needle valve controlling the passage of steam through said by-pass pipe into the lower end of the cylinder, an exit pipe leading from the contracted portion of the latter, a nozzle communicating with said exit and having flexible connections therein, a casing having a funnel-shaped end in which said nozzle is adapted to seat to normally close the opening therein, said casing communicating through a duct with said apertures in the wall of the fire box, and automatic means for causing said piston to open communication between the cylinder and said exit pipe.

5. A smoke consuming device comprising, in combination with the fire box of a locomotive, an arch made up of fire brick with spaces intermediate the same and positioned within the fire box, the walls of the fire box having apertures intermediate the openings in the arch and above the same, a steam cylinder, a piston mounted therein, one end of the cylinder being contracted, a steam supply pipe leading to the contracted end of the cylinder, a by-pass pipe communicating between the opposite ends of the cylinder, a needle valve controlling the passage of steam through said by-pass pipe into the lower end of the cylinder, an exit pipe leading from the contracted portion of the latter, a nozzle communicating with said exit pipe and having flexible connections therein, a casing having a funnel-shaped end in which said nozzle is adapted to seat to normally close the opening therein, said casing communicating through a duct with said apertures in the wall of the fire box, an exhaust valve controlling an exit opening in the cylinder, and automatically-operated means for unseating said exhaust valve.

6. A smoke consuming device comprising, in combination with the fire box of a locomotive, a furnace door, a pivotal lever mounted upon the wall of the furnace and adapted to be tilted as the door is opened and closed, a steam cylinder, a piston movable therein, a steam supply pipe leading to the cylinder, a piston within the latter, a valve-regulated by-pass pipe communicating with opposite ends of the cylinder, an exit pipe leading from the cylinder, nozzles having flexible connections with said exit pipe, casings communicating with the interior of the fire box and having funnel-shaped ends in which said nozzles are adapted to seat and normally close the same, an exhaust valve mounted in the cylinder, a sliding member having an inclined edge upon which the stem of the exhaust valve rests, and link connections between said member and pivotal lever.

7. A smoke consuming device comprising, in combination with the fire box of a locomotive, a furnace door, a pivotal lever mounted upon the wall of the furnace and adapted to be tilted as the door is opened and closed, a steam cylinder having an apertured core projecting from one end thereof, thus reducing the capacity of one end of the cylinder, a supply pipe communicating with the contracted portion of the cylinder, an exit pipe leading from the latter, nozzles having flexible pipe connections with said exit pipe, casings communicating with the interior of the fire box and having funnel-shaped ends normally closed by said nozzles, a recessed piston movable within the cylinder, a valve-regulated by-pass pipe communicating between the opposite end of the cylinder, an exhaust valve in the latter provided with a stem, a movable member having an inclined edge upon which the lower end of said stem rides, and pivotal link connections between said pivotal lever and member.

8. A smoke consuming device comprising, in combination with the fire box of a locomotive, a furnace door, a pivotal lever mounted upon the wall of the furnace and adapted to be tilted as the door is opened and closed, a steam cylinder having an apertured core projecting from one end thereof, thus reducing the capacity of one end of the cylinder, a supply pipe communicating with the contracted portion of the cylinder, an exit pipe leading from the latter, nozzles having flexible pipe connections with said exit pipe, casings communicating with the interior of the fire box and having funnel-

shaped ends, springs normally holding said nozzles within the funnel-shaped openings in the casing to close the latter, a recessed piston movable within the cylinder, a valve-regulated by-pass pipe communicating between the opposite end of the cylinder; an exhaust valve in the latter provided with a stem, a movable member having an inclined edge upon which the lower end of said stem rides, and pivotal link connections between said pivotal lever and member.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

JOHN LOFTUS.

Witnesses:
BERTHA A. LOFTUS,
JAMES D. PALMATIER.