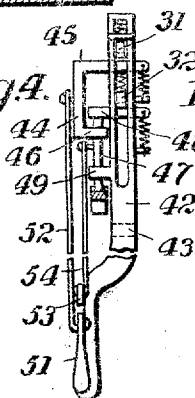
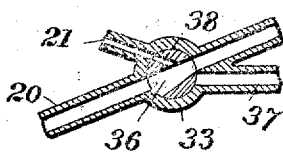
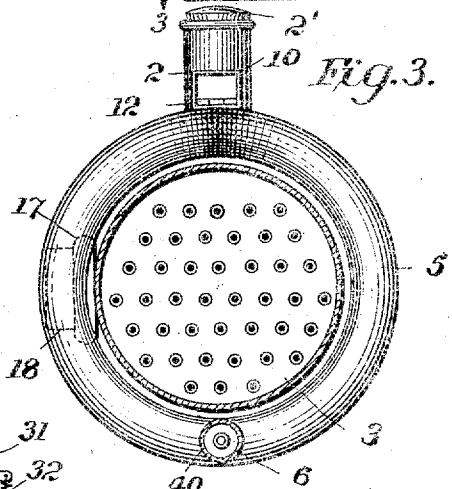
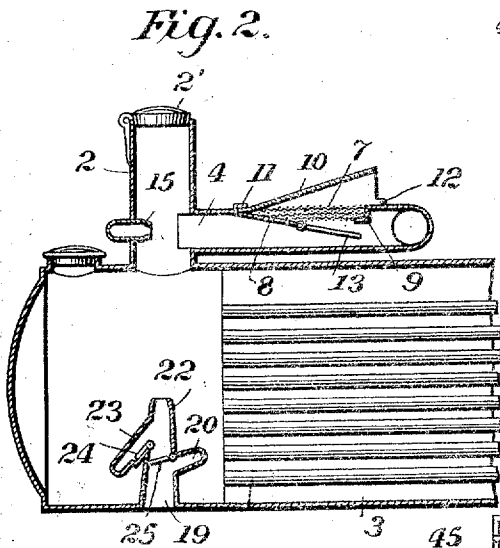
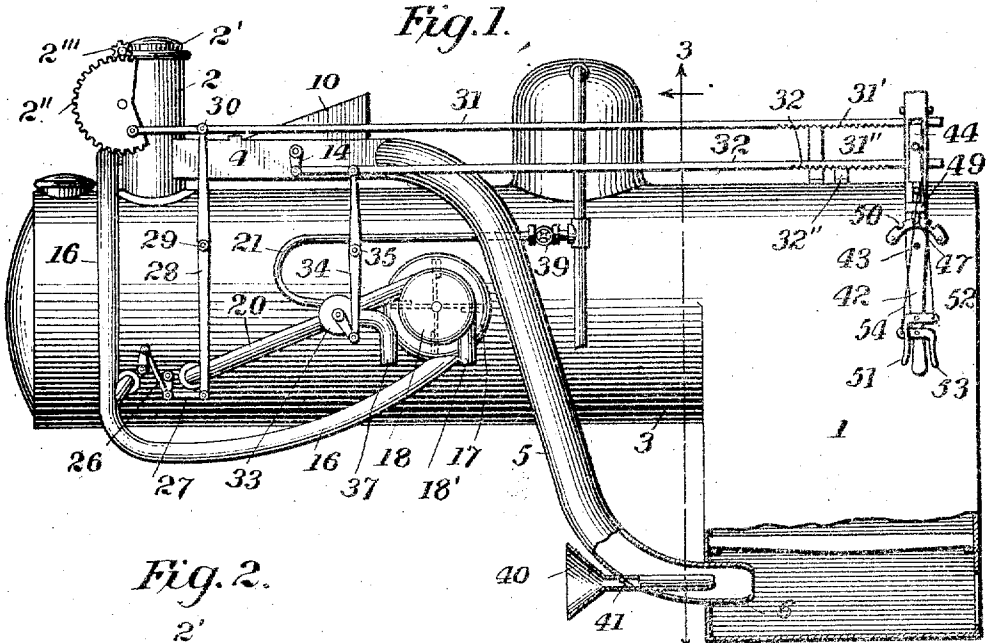


W. T. & J. McS. LUPTON.
 SMOKE ARRESTER AND SMOKE CONSUMER.
 APPLICATION FILED MAR. 9, 1909.

956,589.

Patented May 3, 1910.



Witnesses
J. J. Stinkel
W. H. Wood

Inventors;
William Taylor Lupton,
James McSherry Lupton,
By Spencer B. Lupton,
 Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM TAYLOR LUPTON AND JAMES McSHERRY LUPTON, OF BERKELEY COUNTY,
WEST VIRGINIA.

SPARK-ARRESTER AND SMOKE-CONSUMER.

956,589.

Specification of Letters Patent.

Patented May 3, 1910.

Application filed March 9, 1909. Serial No. 482,247.

To all whom it may concern:

Be it known that we, WILLIAM TAYLOR LUPTON and JAMES McSHERRY LUPTON, citizens of the United States, residing in the county of Berkeley and State of West Virginia, have invented certain new and useful Improvements in Spark-Arresters and Smoke-Consumers, of which the following is a specification.

Our invention relates to the reduction of sparks and smoke given-off by furnaces in general, and particularly by locomotive boiler furnaces.

While the invention is capable of a wide range of application, it is particularly adapted to, and therefore will be illustrated and described in connection with, locomotive engines in the furnaces of which soft or bituminous coal is used as fuel. We do not wish to limit the invention, however, to use with any particular kind of fuel.

The principal objects of our invention are to arrest all cinders and sparks; to consume the greater part of the smoke from the furnace during the normal running of the engine; to provide for confining practically all of the products of combustion for short intervals of time, as, for instance, while the locomotive is standing at a station or passing through a tunnel; to provide means for changing to the "straight draft" or exhaust to atmosphere direct; and to provide a single controlling lever in the cab by means of which the mechanism for effecting the above objects may be operated and adjusted.

Further and minor objects will more fully appear hereinafter, reference being had to the accompanying drawings which illustrate what we now believe to be the best embodiment of the invention.

In the drawings, Figure 1 is a view in side elevation of a locomotive engine boiler and furnace equipped with our improvements, a part of the furnace and return flue being broken away; Fig. 2 is a vertical longitudinal section of the forward portion of the same; Fig. 3 is a vertical cross-section of the same, taken on line 3-3, Fig. 1, looking in the direction of the arrow; Fig. 4 is an enlarged detail in section of one of the valves; Fig. 5 is an end elevation of the controlling lever; and Fig. 6 is an enlarged view of the rear end of one of the operating rods.

Referring to the drawings, 1 is the fur-

nace, 2 the smoke stack, and 3 the boiler of a locomotive engine, which may be of any type or construction. The return from the smoke stack to the furnace comprises an entrance portion 4 and downwardly extending portion 5 having a delivery end 6 within the furnace, preferably, although not necessarily, below the grate. Entrance portion 4 of the return pipe may be of any preferred shape in cross-section, being shown as rectangular. The downwardly extending portion is preferably divided, a part being arranged on each side of the boiler, but any other disposition may be made of this portion, and of the delivery end which may enter the furnace at any preferred point.

The return pipe is provided with a vent opening furnished with removable screens 7 of proper mesh to prevent egress of cinders and sparks. These screens are supported in the opening by a fixed deflector 8 and flange 9, and are covered by a removable hood 10 opening rearwardly. Hood 10 is secured in place by lip 11 and bolt 12. The vent opening is controlled by a movable deflector flap 13 connected to arm 14 on the outside of the return pipe. Hood 10 and screens 7 may be readily removed for cleaning the latter. It will be observed that the vent opening is shown as a lateral opening in the return pipe, and that the deflector is mounted adjacent thereto and extending in the general direction or movement of the products of combustion which impinge against it. The heavier particles will therefore be guided away from said opening, and will be carried back to the furnace, while a portion of the lighter products of combustion will escape through said opening.

Forced circulation of the products of combustion back through the return pipe is effected by an air blast delivered into the entrance thereof by injector nozzle 15, which should be positioned with respect to the entrance of said return pipe so as to obtain the maximum efficiency, and is connected by pipe 16 to a source of air pressure, shown as a fan blower 17. Fan blower 17 is driven in any suitable manner, as by a small turbine 18 to be supplied either with exhaust steam from engine exhaust 19 through pipe 20, or with live steam through pipe 21.

Exhaust steam nozzle 22 of the main engine is provided with an alternative air pressure connection 23 having a valve 24, 11

all located in the spark box of the locomotive. Valve 25 is capable of two closure positions and controls the exhaust steam connection both with nozzle 22 and turbine pipe 20. Both valves 24 and 25 are operated simultaneously through rod connections 26 and 27, lever 28 pivoted at 29 and pivotally connected at 30 with one of the main operating rods 31. The other main operating rod 32 is connected to arm 14 of movable deflector 13, and controls both the exhaust steam and live steam connection of turbine 18 by means of three-way valve 33, moved by lever 34 pivoted at 35 and having a pin and slot connection with the valve-operating arm.

Three-way valve 33 has a port 36 arranged to connect pipe 20 either with the turbine or with exhaust pipe 37 to atmosphere; and also has a port 38 to connect live steam pipe 21 with, or cut it off from, the turbine, as clearly shown in Fig. 4. Globe valve 39 is provided in the pipe 21 to regulate or entirely cut off the live-steam from valve 33. The turbine exhaust is shown at 18'.

At the delivery end of the return pipe, we provide an auxiliary draft accelerating device 40 having a check valve 41, this device being supplied with a rush of air or natural draft when the locomotive is in motion.

The discharge of smoke stack 2 is controlled by closure 2', which is operated by rod 31 through gear segment 2'' and piston 2'''.

Operating rods 31 and 32 are moved forward or backward by lever 42 pivoted at 43 and carrying two pawls. Pawl 44 has a forward arm 45 adapted to engage a notch in rod 31, and also a rearward arm 46 having a perforation to receive the shank 47 of the pawl 48, which latter engages a notch in rod 32. Shank 47 extends through a lug 49 on the lever, and is adapted to engage notches 50 of a rack. Pawl 44 is controlled by hand piece 51 through rod 52, this also controlling pawl 48 simultaneously. Pawl 48 is controlled independently by hand piece 53 through rod 54. Rods 31 and 32 are provided with serrations or notches 31' and 32' for engagement with supports 31'' and 32'' after being operated. When being operated the rods are raised clear of these supports by the pawls.

The operation is as follows: The various parts of the apparatus are shown in their respective positions for normal running, exhaust steam being supplied to the turbine and air being delivered through nozzle 22, to assist in carrying the products of combustion upward toward the smoke stack, and also through nozzle 15. Live steam valve 39 is closed. The smoke stack discharge is cut off by closure 2', and deflector 13 occupies an intermediate position. Under

these conditions, the injector action of nozzle 15 causes, or aids, the return of the products of combustion (mixed with air) through the return pipe to the furnace, the heavier particles such as sparks and cinders, being deflected downwardly by fixed and movable deflectors 8 and 13 to facilitate their progress away from the vent opening into the downward portion 5 of the return pipe, and a portion of the lighter smoke and gases passing out through said vent opening. The remainder of the products of combustion, with the sparks and cinders, are returned to the furnace where the cinders are deposited and the unburned combustible particles and gases are burned. Such of the exhaust steam as is not needed for running the turbine may be vented in any suitable manner. When there is no exhaust steam, as when the engine is shut down (the locomotive standing at a station), valve 39 is opened and the turbine operated by live steam. In order to eliminate all, or practically all, of the fine smoke and gases for a short interval of time, as when passing through a tunnel or standing in a depot, operating lever 42 is pushed forward, pressure being applied to hand piece 53. This clutches and retracts rod 32 and closes (or nearly closes) the vent in the return pipe by flap or movable deflector 13, at the same time, by means of valve 33, cutting off all steam from the turbine 18 and connecting the main engine exhaust to atmosphere at 87'. The fire will thereby be banked for a short time. In order to change to the ordinary direct forced draft arrangement, starting from the former initial position of the parts, lever 42 is retracted, pressure being applied to hand piece 51. This clutches both rods 31 and 32 to the lever and forces them forward. By this motion, rod 31 opens the smoke stack and operates valve 25 to open the exhaust steam connection to nozzle 22 and close its connection to pipe 20, at the same time closing valve 24. By this same movement, rod 32 throws flap 13 down against the bottom of entrance portion 4 of the return pipe, thereby closing the return pipe. The exhaust steam from nozzle 22 will now make a direct forced draft out through smoke stack 2, as in the ordinary construction.

Various of the valves are shown as flap valves, and are arranged to open against pressure, thereby securing certainty in closing. We do not limit ourselves, however, to the use of flap valves.

We are aware that many changes in details of construction and arrangement of parts may be made without departing from the spirit of our invention; also, that various combinations of the elements of apparatus disclosed may be used without the remaining elements or with extraneous de-

vices, and all such changes and combinations we desire to cover in the appended claims.

What we claim, and desire to secure by Letters Patent, is:—

1. In apparatus for eliminating sparks and smoke, the combination with a furnace and a smoke stack, of a return pipe from said stack to said furnace provided with a lateral discharge vent opening to permit escape of a portion of products of combustion, a deflector adjacent said opening extending in the general direction of movement of the products of combustion impinging thereagainst for guiding the heavier particles away from said opening, and means for causing a forced circulation through said return pipe.

2. In apparatus for eliminating sparks and smoke, the combination with a furnace and a smoke stack, of a return pipe from said stack to said furnace provided with a screened discharge vent opening, a movable deflector pivoted adjacent said opening and arranged to close said opening or to deflect the heavier particles away from said opening, and means for creating a forced circulation through said return pipe.

3. In apparatus for eliminating sparks and smoke, the combination with a locomotive furnace and smoke stack, of a return pipe from said stack to said furnace provided with a discharge vent opening, a rearwardly discharging hood for said vent opening, a deflector for the heavier particles adjacent said vent opening, and means for causing the circulation of products of combustion through said return pipe.

4. In apparatus for eliminating sparks and smoke, the combination with a furnace and a smoke stack, of a return pipe from said stack to said furnace provided with a discharge vent opening, means for injecting air into the return pipe to create a forced circulation from said stack, and an auxiliary circulation forcing means at the delivery end of said pipe, of less capacity than said injecting means.

5. In apparatus for eliminating sparks and smoke, the combination with a furnace and its discharge flue, of a return pipe from said flue to said furnace, a pump for forcing the return circulation from said flue through said return pipe, a motor connected to drive said pump, a movable closure for the discharge of said flue, and an operating connection for controlling both said motor and said movable closure.

6. In apparatus for eliminating sparks and smoke, the combination with a locomotive furnace and boiler, and a spark-box and smoke stack, of a movable closure for the discharge of said stack, a return pipe from said stack to said furnace, an injector for forcing the return circulation to said pipe, a motor driven air pump for supplying air

under pressure to said injector, an exhaust steam nozzle in said spark box, an air pressure connection to said nozzle, an exhaust steam connection to the motor of said air pump, and an operating connection for controlling said closure and said exhaust-steam and air-pressure connections.

7. In apparatus for eliminating sparks and smoke, the combination with a furnace and its discharge flue, of a return pipe from said flue to said furnace provided with a vent opening, a valve for controlling said vent opening, a pump and connections for causing a forced circulation through said return pipe, a fluid-pressure engine for operating said pump, a valve for controlling admission of fluid pressure to said engine, and common means for operating said bent valve and said engine control valve.

8. In apparatus for eliminating sparks and smoke, the combination with a furnace and its discharge flue, of a closure for said flue, a return pipe from said flue to said furnace, a pump and connections for causing a forced circulation through said return pipe, a fluid pressure motor connected to drive said pump, and common means for controlling said closure and the fluid pressure supplied to said motor.

9. In apparatus for eliminating sparks and smoke, the combination with a furnace and its discharge flue, of a closure for said flue, a return pipe from said flue to said furnace provided with a vent opening, a valve for controlling said vent opening, a pump and connections for causing a forced circulation through said return pipe, and common means for controlling said closure said valve and said pump.

10. In apparatus for eliminating sparks and smoke, the combination with a locomotive engine, boiler, furnace and discharge flue, of a return pipe from said flue to said furnace, a pump and connections for causing a forced circulation through said return pipe, a small steam engine for operating said pump, an exhaust steam connection from said locomotive engine to said small steam engine and a live steam connection from said boiler to said small steam engine, and a valve having a movable element to connect either live or exhaust steam to said small engine or to shut off both and connect said exhaust to atmosphere.

11. In apparatus for eliminating sparks and smoke, the combination with a furnace and its discharge flue, of a closure for said flue, an operating rod for said closure, a return pipe from said flue to said furnace provided with a discharge vent opening, a valve for controlling said vent opening, an operating rod for said valve, means for causing a forced circulation through said return pipe, and a common operating lever for said rods.

12. The combination with a furnace and

its discharge flue, of a return pipe from said flue to said furnace, a movable closure for the discharge end of said flue, a controlling valve in said return pipe, a notched operating rod for each said closure and valve, a single operating lever carrying pawls for respectively engaging said notches, and hand pieces upon said lever for controlling said pawls.

10 13. In apparatus for eliminating sparks and smoke, the combination with a furnace and its discharge flue, of a return pipe from said flue to said furnace provided with a discharge vent opening, suitable controlling valves for said parts and operating means therefor comprising a serrated rod, a fixed support engaging the serrations thereof, and a lever for raising said rod from said support and moving said rod.

20 14. In apparatus for eliminating sparks and smoke, the combination with a furnace and its discharge flue, of a return pipe from said flue to said furnace provided with a discharge vent opening, suitable controlling valves for said parts and operating means therefor comprising a rod, a fixed support engaging and holding the same, and means for raising and disengaging said rod from said support and moving said rod to operate said controlling valves.

30 15. In apparatus for eliminating sparks and smoke, the combination with a furnace and its discharge flue, of a return pipe from said flue to said furnace, auxiliary apparatus cooperating with said parts for causing and controlling the flow of gases there-through, an operating rod for said appara-

tus, a fixed support for engaging and holding said rod, a lever for moving said rod, and means carried by said lever for gripping said rod and disengaging the same from its engaging and holding support.

16. The combination with a furnace and a smoke stack, of a return pipe from said stack to said furnace provided with a lateral discharge vent opening to permit escape of a portion of products of combustion, a deflector adjacent said opening extending in the general direction of the movement of products of combustion impinging there-against for guiding the heavier particles away from said opening, and means for injecting air into said return pipe to create a forced circulation from said stack.

17. The combination with a furnace and a smoke stack, of a return pipe from said stack to said furnace provided with a lateral discharge vent opening to permit escape of a portion of products of combustion, a movable deflector pivoted adjacent said opening and extending in the general direction of movement of products of combustion impinging thereagainst, said deflector being arranged to close said opening or to deflect the heavier particles away from said opening, and means for creating a forced circulation through said return pipe.

In testimony we have affixed our signatures, in presence of two witnesses.

WILLIAM TAYLOR LUPTON.

JAMES McSHERRY LUPTON.

Witnesses:

EDWARD RUTLEDGE,

CHARLES A. YOUNG.