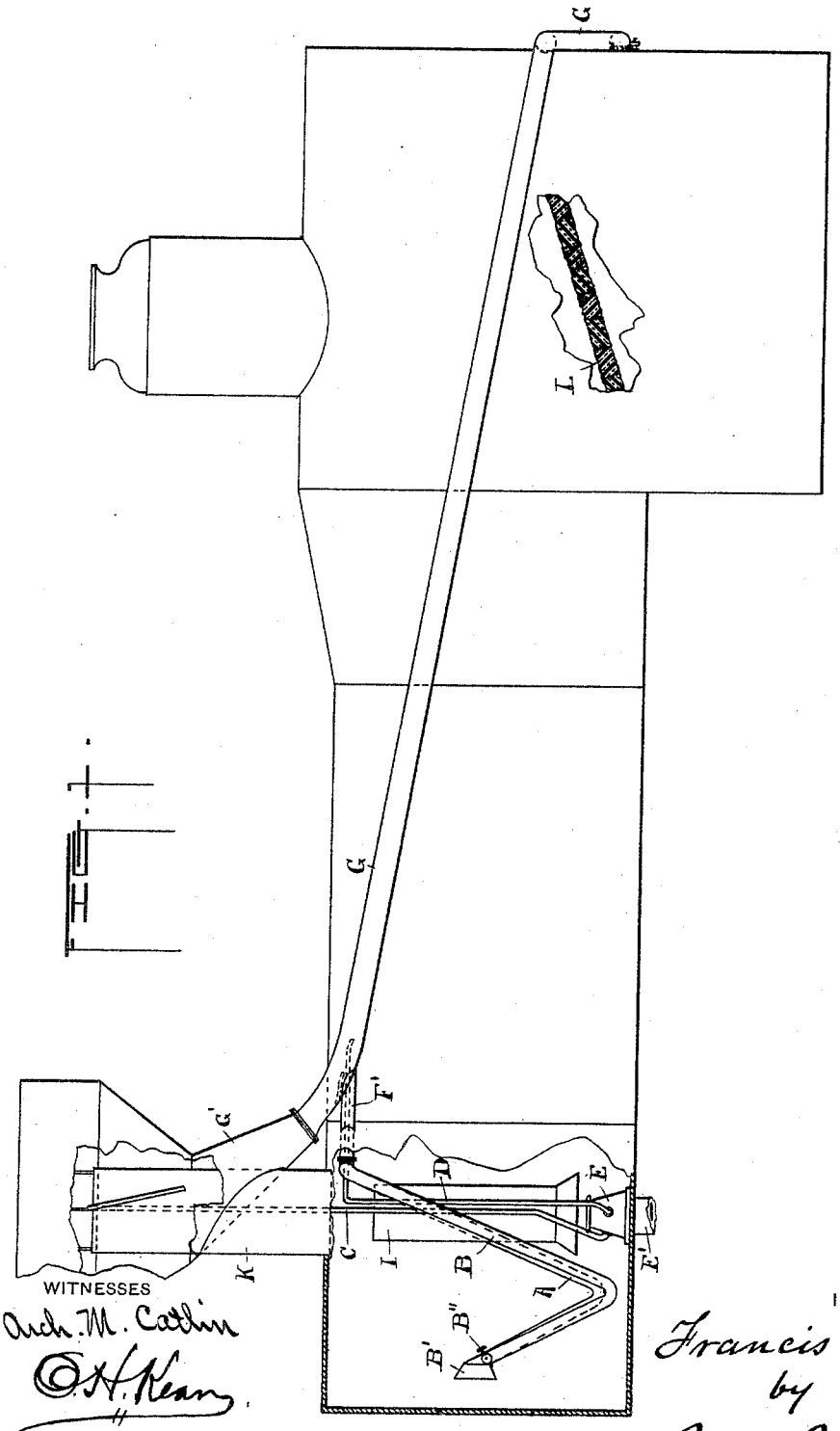
(No Model.) 2 Sheets—Sheet 1.

F. LITTLE.

CINDER AND SMOKE CONSUMING APPARATUS.

No. 491,738. Patented Feb. 14, 1893.



WITNESSES

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(No Model.) 2 Sheets—Sheet 2.

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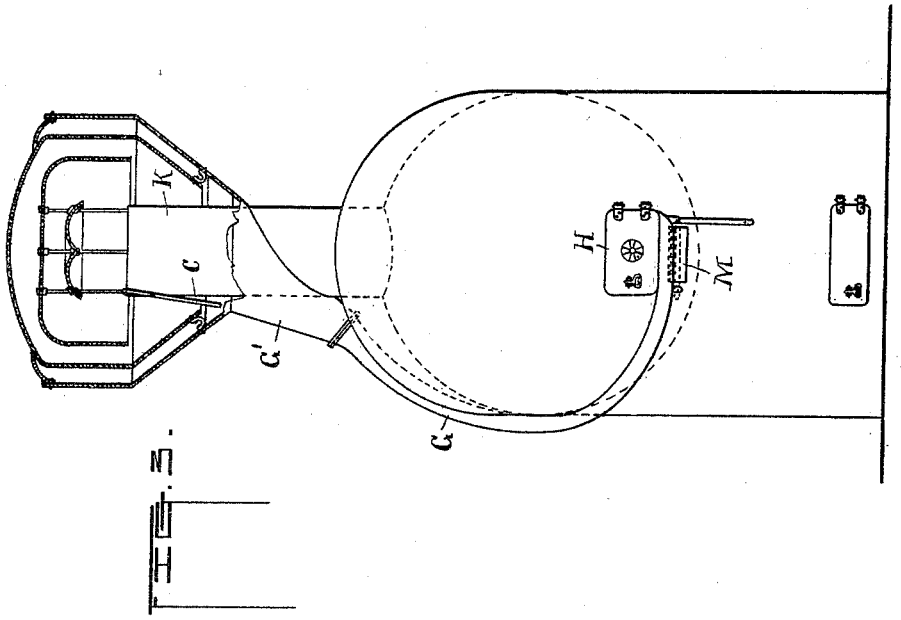

FIG. 1.

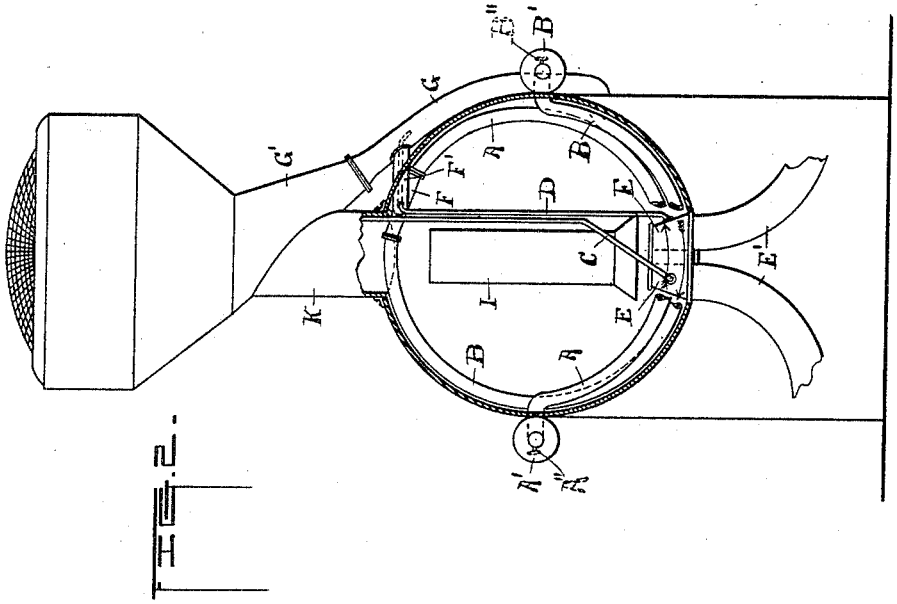

FIG. 2.

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UNITED STATES PATENT OFFICE.

FRANCIS LITTLE, OF MARSHALL, TEXAS.

CINDER AND SMOKE CONSUMING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 491,738, dated February 14, 1893.

Application filed May 21, 1892. Serial No. 433,891. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS LITTLE, a resident of Marshall, in the county of Harrison and State of Texas, have invented certain new and useful Improvements in Cinder and Smoke Consuming Apparatus; 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 pertains to make and use the same.

The invention relates to devices for conducting exhaust steam, gases and cinders to the fire place of a boiler and is primarily intended for use in locomotive boilers, and its object is to increase the efficiency of such apparatus.

The invention consists in the construction hereinafter described and particularly pointed out.

In the accompanying drawings, Figures 1, 2 and 3 are respectively side, front and rear elevations of a locomotive furnace and boiler with the present improvement applied thereto, the several figures being partly in section.

The fire place, boiler, steam dome, smoke arch and stack including deflector and screen are of usual form except as hereinafter specified.

Letters A and B denote air supply pipes provided with flaring receiving mouths A′ and B′ and with dampers or cut offs A″ and B″. The mouths of the pipes open toward the front of a locomotive and are located preferably at the side of the smoke arch. Back of these air receiving mouths or funnels the pipes A and B extend through suitable openings or hand holes in the wall of the smoke drum or arch and are coiled around inside said wall for about three fourths of its circumference and extended to a point near the top of the smoke drum where they join respectively the arms of a T coupling F by means of which they both communicate with a cinder conducting pipe G, through the main member F′ of said coupling. The mouth of the branch F′ of the coupling has a downwardly inclined cover for the purpose of excluding cinders descending through the cinder pipe G. The pipe G communicates with the smoke stack and receives cinders, gases and steam therefrom through the cinder horn G′ which is in effect a continuation of said cinder pipe. This horn is frusto-conical in shape and its larger end or mouth is joined to the foot of the stack cone and surrounds the barrel K of the stack and includes an annular space communicating with the stack cone. The cinder pipe has a gradual downward inclination. It runs downwardly along the side of the boiler to the rear of the latter within the cab at a point about on a level with the upper part of the furnace door H and from thence to the bottom of the door way where it is provided with a discharge opening into the furnace. The door is supported to move above and on the discharge end of the cinder pipe and should make a good joint therewith.

L indicates a brick arch situated over the fire bed and adapted to deflect down upon it the cinders, gases and heated air supplied from the cinder pipes through an opening below the door which opening is adapted to be closed when desired by a damper M, provided in the present instance with a handle and latch to hold it in closed position.

The damper is indicated in dotted lines in Fig. 1, the position of the handle corresponding to the closed position of the damper being indicated by dotted lines in Fig. 3. The perforated end of this pipe forms a sill or rest for the door.

E, E, denote the nozzles of exhaust pipes E′ and I is a "petticoat" pipe or chimney over the same. The smoke, gases and cinders are drawn into this pipe by the exhaust and conducted to the foot of the barrel K of the smoke stack. The pipe D leads from one of the exhaust nozzles up alongside the "petticoat" pipe to the upper part of the smoke drum and out through its side into the cinder pipe, where its end is bent and directed toward the furnace. The situation of the pipe C within both the chimney and barrel heats the steam therein and adds to its efficiency while the downwardly bent portion discharges near the mouth of the cinder horn. By preference the pipe D passes through the part F′ of the coupling F. The pipe C also communicates with one of the exhaust nozzles and running alongside pipe D to near the coupling F it is thence extended up through the barrel of the smoke stack and being bent over

its upper edge runs down to a point below the screens and near the upper end of the cinder horn.

In operation air enters the pipes A and B and after being warmed through the walls of said pipes within the smoke drum it is discharged downwardly within the cinder pipe. The amount of air can be regulated by the dampers in said pipes. Simultaneously with the injection of air, exhaust steam is discharged through pipes C and D and by its inductive effect aided by back pressure caused by the striking against the stack cone of the main part of the exhaust draws the cinders and heavier gases from the lower part of the cinder screen down through the horn G′ into and through the cinder pipe and injects the same mingled with the heated air into the furnace where the combustible elements are thoroughly burned. Since the product of complete combustion, that is carbonic-acid is much hotter than the product of partial combustion, that is carbonic oxide and hotter also than vapors and unconsumed carbon or smoke, it is also lighter than these substances and escapes more quickly from the stack whereby it results that the more combustible products such as smoke and carbonic oxide are returned by the devices above described to the furnace to be thoroughly burned, while the incombustible carbonic acid and the highly heated nitrogen closely associated with it are discharged into the open air.

It is not essential that a double exhaust nozzle be employed since a single one would operate in like manner. Neither is the precise location and arrangement of parts nor any particular sizes thereof of the gist of the invention as these can be varied by mechanical skill without departing from the invention provided that substantially the same principles of construction and operation are preserved.

The following diametric dimensions have been found to be suitable and the apparatus constructed accordingly operates with good success. The air pipes may be three inches with mouths seven inches at their widest part. The pipes C and D may be three fourths of an inch. The arm F′ of the coupling has a body about three and one-half inches provided with a flattened or oblong mouth and the other member of the coupling will be nearly as large the size being dependent to some extent on the size of the space, in the particular style of boiler used, between the steam pipes of the boiler and the wall of the smoke arch. The pipes C and D by preference are detachably connected with a nozzle by means of a plug to provide for cleaning said nozzles which latter may have a bore of three fourths of an inch and a discharge orifice of about one half an inch. The cinder pipe may be made to fill about three and one half inches of the door space.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. The combination with a furnace, a smoke stack and the barrel thereof of the air inlet pipes and the cinder pipe provided with the frusto-conical horn and extending from the foot of the stack cone near the top of the barrel to the furnace, said air pipes entering the smoke space of the furnace near its front and extending spirally about the walls of the same to near its top and rear portion and there communicating with the cinder pipe.

2. The combination of the boiler and furnace, the cinder pipe connecting the furnace stack and its fire place at the bottom of its door way and forming a sill or rest for the door, a pipe for discharging exhaust steam into said cinder pipe, a coupling F and air inlet pipes communicating with the cinder pipe by means of the coupling having a mouth provided with a downwardly inclined cover, said discharge pipe for steam passing through the said coupling and under the cover substantially as set forth.

3. The combination of the boiler, furnace, and stack, the latter having a barrel K having a frusto-conical horn surrounding the barrel and communicating with the space between its upper part and the stack cone at the foot of the latter, with the cinder pipe, the air inlet pipes passing through the smoke space of the furnace, and the exhaust steam pipe passing through the said barrel and having its end bent toward the furnace and terminating near the enlarged mouth of the horn substantially as set forth.

4. The combination of the furnace and stack cone with the air inlet and cinder discharge pipe, said pipe having a horn with enlarged mouth fitting the contracted lower end of the stack cone and extending downwardly with a continuous inclination at the side of the boiler and furnace to the bottom of the door and steam pipes above and below the horn whereby cinders and air are forced into the furnace; substantially as set forth.

5. The combination of the furnace and stack cone with the air inlet and cinder discharge pipe, said pipe having a horn with enlarged mouth fitting the contracted lower end of the stack cone and extending downwardly with a continuous inclination at the side of the boiler and furnace to the bottom of the door and steam pipes above and below the horn and a refractory arch whereby cinders and air are forced into the furnace under said arch; substantially as set forth.

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

FRANCIS LITTLE.

Witnesses:
D. COPELAND,
J. H. TOUHY.