(No Model.)

C. S. BURTON.

LOCOMOTIVE SMOKE STACK.

No. 589,812. Patented Sept. 14, 1897.

Fig. 1.

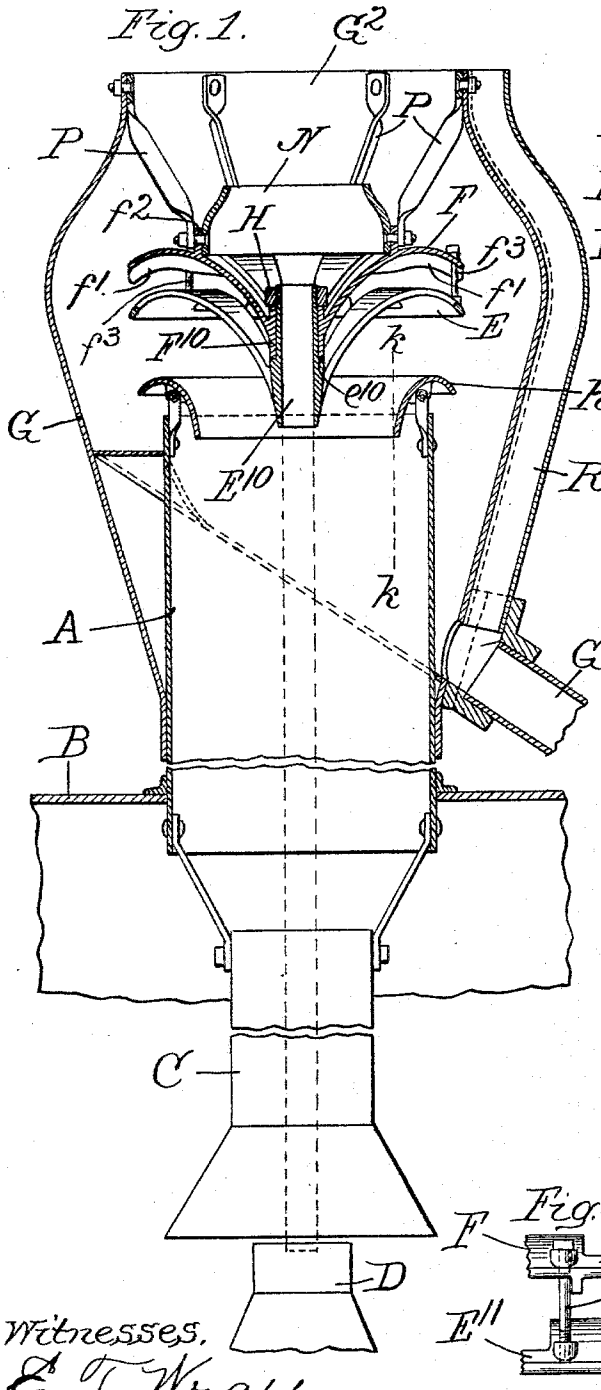


Fig. 2.

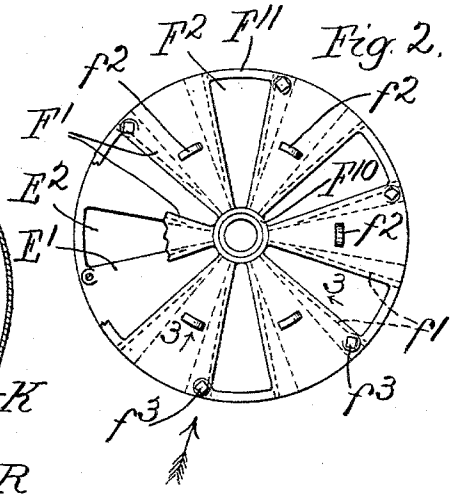


Fig. 4.

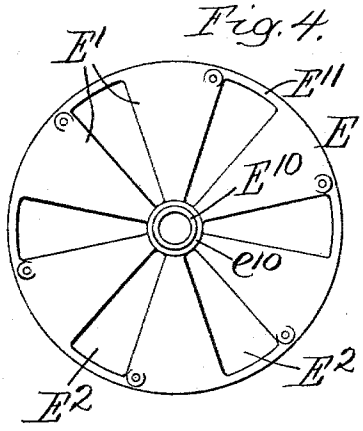


Fig. 3.

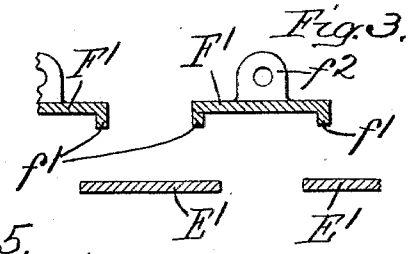


Fig. 5.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CHARLES S. BURTON, OF OAK PARK, ILLINOIS.

LOCOMOTIVE SMOKE-STACK.

SPECIFICATION forming part of Letters Patent No. 589,812, dated September 14, 1897.

Application filed October 19, 1896. Serial No. 609,274. (No model.)

To all whom it may concern:

Be it known that I, CHARLES S. BURTON, a citizen of the United States, residing at Oak Park, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Locomotive Smoke-Stacks, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

This invention is an improvement upon the locomotive smoke-stack shown in my application filed December 9, 1895.

The improvement consists in specific devices herein shown for relieving the back pressure on the exhaust-nozzle by so constructing the deflector as to permit the easy escape of the exhaust steam and gases carried thereby before and during the deflection, to the end that the solid matter driven by the exhaust-steam may be carried by its momentum in the deflected course, while the exhaust-steam itself expanding at all points at which it may find vent shall escape in large part before being deflected.

It consists, further, in the employment of a supplemental deflector below the principal deflector adapted to take the outer annular portion of the ascending column of smoke in the barrel of the stack, thereby relieving the main deflector of that portion of the work and obtaining a better angle of impact for the gases, whereby their deflection is accomplished with less resulting back pressure.

It consists, further, in specific details of construction of the deflector designed with a view to its economical manufacture.

In the drawings, Figure 1 is a vertical axial section of my improved stack. Fig. 2 is a top plan of the deflectors. Fig. 3 is a detail section at the curved line 3 3 on Fig. 2. Fig. 4 is a plan of the lower member of the principal deflector. Fig. 5 is a detail edge view, looking in the direction of the arrow on Fig. 2.

A is the stack-barrel; B, the boiler-shell; C, the petticoat-pipe within the boiler-shell, under which the exhaust-nozzle D is located. The principal deflector E F is for convenience of manufacture made in two parts E and F, each of which has the radial curvature suitable to effect the gradual deflection of the current without abrupt change of direction which would be liable to produce excessive back pressure, and in order to afford the proper relief for the gases, and especially for the exhaust-steam which mainly occupies the center of the ascending column, and to avoid the back pressure which is caused when it cannot find easy vent, and also to avoid throwing the bulk of the exhaust-steam over the top of the barrel against the outer shell G, where its condensation will be rapid and will objectionally moisten the solid matter which it is the purpose of said shell to receive and gather for discharge, it is desirable that the deflector should be very extensively apertured, but such apertures should not be so made or located as to permit the direct discharge of the ascending column or portion thereof through them, since in that event the purpose of the device—to wit, the deflection of the solid matter—would not be accomplished. For this purpose deflectors having similar function have heretofore been made perforated with a very large number of small holes.

The result obtained by the use of such deflectors is that the solid matter being thoroughly pulverized by its impact against the deflector passes through such small apertures in a condition which is harmless as respects the danger of causing fire; but such finely-pulverized matter is liable to be discharged in a shower of black dust over the engine and cab to the great inconvenience of the engineer and to the injury of the machinery into whose joints it penetrates, and, furthermore, if such deflector is made thick enough to endure the wear upon it of the stream of solid matter thus pulverized against it the small apertures no longer afford the relief, but become rapidly clogged, and even before being clogged the friction of the steam and gases passing through them diminishes and almost destroys the value of the relief afforded. To avoid these difficulties, I make my improved deflector consist of two levels of deflecting-surfaces, each level comprising radial strips alternating with radial slits or apertures and constituting what is hereinafter named a "deflecting-crown," the deflecting-strips of the upper level overhanging the apertures of the lower level. Preferably each level or conical series of deflecting-strips with intervening apertures is cast separately from the

other, and the two radially-slotted conical crowns thus constructed are mounted relatively, so as to coöperate in the manner indicated. The lower crown E of this compound deflector has the radial bars E′, alternating with the apertures E^2, the bars E′ preferably uniting in a hub E^{10} at their inner ends and in a ring E^{11} at the outer periphery, the hub E^{10} being axially apertured and adapted to serve as part of a pipe or passage through which a portion of the exhaust-steam passes for the purpose of assisting the draft by its discharge through the upper mouth G^2 of the outer shell G, substantially as set forth in my former application. This central pipe or hub E^{10} is formed with an exterior shoulder or step e^{10} near the bottom, on which the hub F^{10} of the outer crown lodges. The crown F is made with its radial bars F′ alternating with apertures F^2, the bars being joined at the hub F^{10} at the inner ends by the ring F^{11} at the periphery.

It is desirable that the column of gases discharged from the top of the barrel or the stack even at the outer side shall not be so directed against the deflector that the angle of impact shall be other than such as to cause an easy deflection outward. This result is easily attained toward the center, and since the smoke and gases at the central part by their deflection as they strike the deflector will force the outer portion of the column outward such outer portion will not strike the deflector in the direction in which it emerges from the top of the stack, but, on the contrary, will bend from that direction to one which will make its impact with the deflector more favorable. Nevertheless it is desirable that matter carried up in a straight line from the outer side of the stack should not strike the deflector at an unfavorable angle, and in order to accomplish this result without making the deflector of unduly great diameter I interpose underneath the principal deflector a supplemental deflecting-crown K, whose lower edge is about two inches inside the barrel of the stack, and which at its outer edge overhangs the pocket formed between the shell G and the barrel suitably to deliver the deflected matter into such pocket. By this means the area of the material which is directed against the principal deflector is diminished to that of the circle which is defined by the lower inner edge of the outer deflector, and the worst angle of impact possible is that of a straight line parallel with the axis of the barrel of the stack tangent to the lower edge of the supplemental deflector K. Such a line *k k* is placed on Fig. 1.

Since the solid matter deflected by the deflecting-bars E and F would have some tendency to spread laterally over said strips and so pass by their lateral edges and eventually escape with the steam, I prefer to provide said strips with marginal flanges, which will tend to prevent this result by confining the solid matter which is deflected by the bars to the area of the bars, thus causing it to pass off at the ends only of the bars and not at the sides. Such marginal flanges *f′ f′* on the upper crown F depend from the lateral edges of the bars F′. Marginal flanges on the bars E′ of the lower crown are less essential because solid matter passing off the lateral edges of these lower bars would almost certainly be caught by the upper bars and retained by the guard-flanges *f′*. Nevertheless the guard-flanges may be used upon the bars of both crowns.

The supplemental crown K may be made of two apertured sections having relations similar to those of the two sections of the crown of the principal deflector, but it is not so essential because at the outer portion of the column which rises through the stack-barrel there is, under ordinary conditions, no steam, but only the gases of combustion.

Since the steam which escapes from the central portion of the deflector will be somewhat deflected outward before it thus escapes, it may be advisable to employ, to gather or retain the steam in a central body beyond the deflector and cause it to be discharged centrally from the mouth of the stack, an annulus N, which may taper upwardly, forming a gathering-funnel above the deflector, so that this steam thus held together may have the utmost efficiency for the purpose of assisting the draft. This gathering annulus or funnel N is secured to lugs f^2 on the upper side of the crown F and terminates a few inches below the top of the staff.

Two crowns E and F are bound together at their hubs by a nut H and may be secured together for the purpose of stiffness at their outer circumference by bolts f^3, which take through the rings E^{11} and F^{11}, and the entire deflector is suspended from the upper margin of the stack by the flanges P P P, which are secured to the lugs f^2 by the same bolts which secure the gathering-annulus N when such annulus is employed. The deflection effected by the deflectors carries over more or less steam and gases into the pocket designed to receive the solid matter, and in order to permit such steam and gases to find vent, so that they will not be forced down into the receptacle which will be provided for the solid matter, it is desirable to provide a vent-pipe R, which preferably leads from the discharge-duct G′ upwardly outside the expanded head or shell G to the top of the stack, into which it may discharge at the upper end, though this is a matter of convenience.

I claim—

1. In a locomotive smoke-stack, in combination with an uptake-pipe, a deflector which is situated so as to be encountered by the ascending column from the uptake-pipe before the same has been reflected, and which is radially concave toward such ascending column, whereby it is adapted to deflect the gaseous current sufficiently to precipitate the solid matter therefrom, such precipitating-de-

flector consisting of bars which are radially continuous and separated by radially continuous apertures, and a second series of radially continuous bars overhanging such apertures, whereby the steam is allowed to escape by expansion laterally between the upper and lower series of radial bars simultaneously with the deflection of the gases which precipitates the solid matter.

2. In combination with the smoke-box and the steam-jet discharging upward at the bottom thereof, the uptake-pipe leading upward from the smoke-box in direct line with the discharge of the steam-jet, whereby the steam-jet entrains the gases of combustion in a column with it in the uptake-pipe; an inverted conical deflector interposed directly in the path of such column, such deflector being coaxial with the uptake-pipe and radially concave toward the upper margin of the latter, whereby it is adapted to deflect the gases of combustion sufficiently to precipitate the solid matter therefrom outside the uptake-pipe, and consisting of radially continuous bars alternating with radially continuous apertures, and a second series of radially continuous bars overhanging such apertures, whereby, simultaneously with the deflection of the gases which precipitates the solid matter outside the uptake-pipe, the steam has opportunity to expand and escape laterally between the two series of radial bars.

3. In a locomotive smoke-stack, in combination with an uptake-pipe, a deflector which is situated so as to be encountered by the ascending column from the uptake-pipe before the same has been reflected, and which is radially concave toward such ascending column, whereby it is adapted to deflect the gaseous current sufficiently to precipitate the solid matter therefrom, such precipitating deflector consisting of bars which are radially continuous and separated by radially continuous apertures, and a second series of radially continuous bars overhanging such apertures, whereby the steam is allowed to escape by expansion laterally between the lower and upper series of radial bars simultaneously with the deflection of the gases which precipitates the solid matter; the upper series of bars having depending flanges from the lateral margins at the outer portion of their radial extent.

4. In a locomotive smoke-stack, in combination with an uptake-pipe, a deflector which is situated so as to be encountered by the ascending column from the uptake-pipe before the same has been reflected, and which is radially concave toward such ascending column, whereby it is adapted to deflect the gaseous current sufficiently to precipitate the solid matter therefrom, such precipitating-deflector consisting of bars which are radially continuous and separated by radially continuous apertures, and a second series of radially continuous bars overhanging such apertures, whereby the steam is allowed to escape by expansion laterally between the lower and upper series of radial bars simultaneously with the deflection of the gases which precipitates the solid matter, and an expanded head within which such deflector is inclosed and into which the uptake-pipe protrudes, and a duct leading from the pocket thus formed outside the protruding part of the uptake-pipe to conduct away the precipitated matter.

5. In a locomotive smoke-stack, in combination with the uptake pipe or barrel, the principal deflector which overhangs the same radially concave toward the mouth of the uptake-pipe, and a supplemental annular deflector interposed between the upper mouth of the uptake-pipe and the principal deflector, and overhanging the outer annular portion only of the uptake-pipe and extended radially beyond the same.

6. In a locomotive smoke-stack, in combination with the uptake pipe or barrel and an expanded head within which said uptake-pipe discharges; a deflector overhanging the uptake-pipe consisting of two inverted conical crowns having each a plurality of radially-extended apertures alternating with radial bars, the bars of the upper crown overhanging the apertures of the lower, whereby vent for the exhaust-steam is afforded through the deflector; a steam-gathering annulus mounted above the upper crown adapted to gather the exhaust-steam which passes through the apertures of the deflector at the central part, and cause the same to be delivered centrally from the discharge-mouth of the stack.

7. In a locomotive smoke-stack, in combination with the uptake pipe or barrel and an expanded head into which the uptake-pipe discharges; an inverted conical deflector overhanging the uptake-pipe radially concave toward the margin thereof and a supplemental annular deflector interposed between the mouth of the uptake-pipe and the principal deflector and overhanging the margin only of the uptake-pipe, whereby the outer annular portion of the column discharged from said pipe is deflected over the margin of the latter without impact against the principal deflector: substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois, this 15th day of October, 1896.

CHARLES S. BURTON.

Witnesses:
E. T. WRAY,
JEAN ELLIOTT.