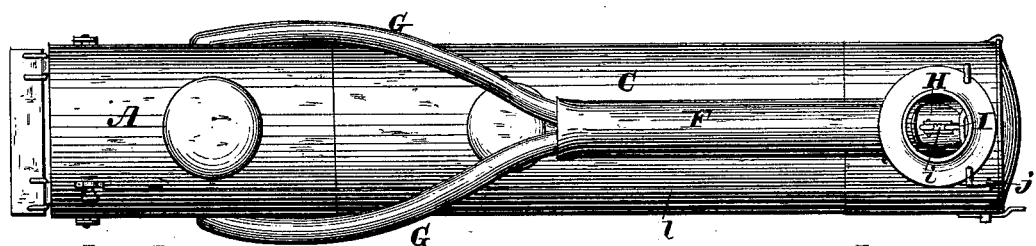
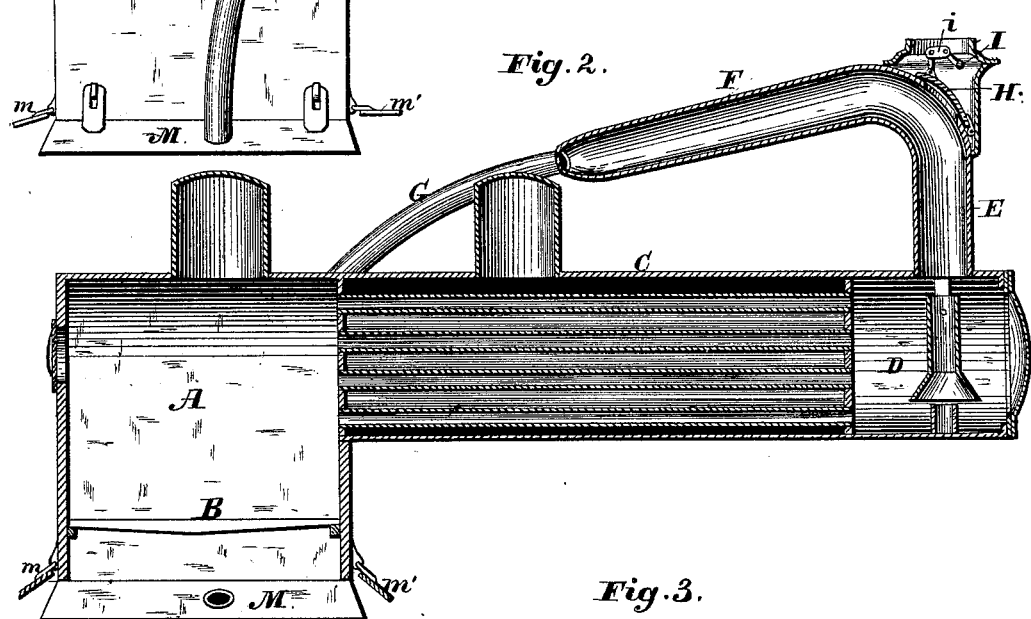
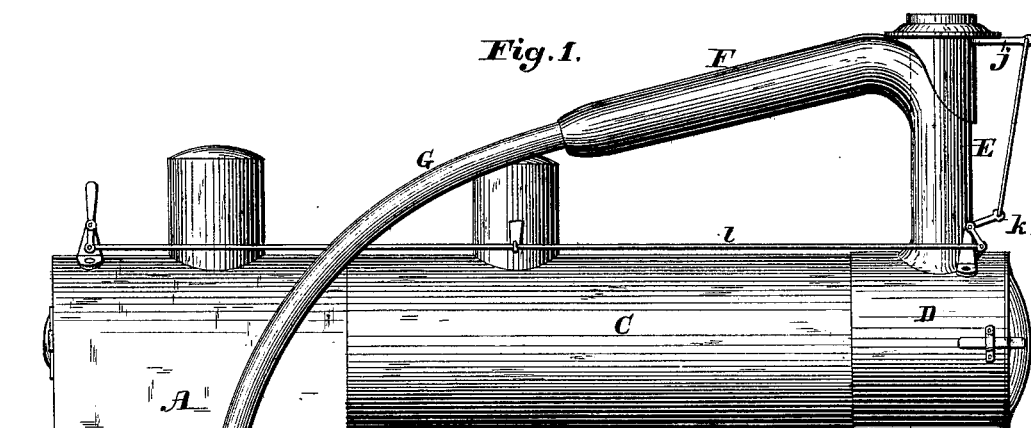


J. BARDSLEY & J. G. CLIFFORD.  
Smoke-Consuming Attachment for Steam-Boilers.

No. 220,113.

Patented Sept. 30, 1879.



Attest:

*J. Henry Kaiser.*  
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Inventors:

*James Bardsley*  
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Att'y.

# UNITED STATES PATENT OFFICE.

JAMES BARDSLEY AND JOHN G. CLIFFORD, OF PARIS, ILLINOIS.

## IMPROVEMENT IN SMOKE-CONSUMING ATTACHMENTS FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. **220,113**, dated September 30, 1879; application filed August 13, 1879.

*To all whom it may concern:*

Be it known that we, JAMES BARDSLEY and JOHN G. CLIFFORD, of Paris, in the county of Edgar and State of Illinois, have invented certain new and useful Improvements in Smoke-Consuming Attachments for Steam-Boilers, of which the following is a specification.

This invention relates to an improved attachment for steam-boilers, its object being to enable the consumption, by a fire-box, of the smoke and gases arising therefrom, and to arrest and confine the light cinders carried off by the draft. This end is reached by conducting said smoke, gases, and cinders back to the fire-box, from whence they emanate, and liberating them under the grate, where the smoke and gases mingle with the cold air flowing to said grate, and are drawn upward by the draft through the same and the burning mass of fuel supported thereby. Thus exposed to the incandescent fuel in conjunction with a fresh supply of oxygen, the combustible gases and finely-divided particles of carbon of which the smoke is composed are consumed, and at the same time the cinders are deposited in the ash-pan.

Our invention consists in the combination, with a smoke-stack of a boiler-furnace and the fire-box, of one or more return-passages leading from said smoke-stack to the fire-box, and terminating under the grate thereof, and a deflecting-damper arranged between the junction of said passage or passages and the smoke-stack and the exhaust-port of the latter, whereby the outward draft through the smoke-stack may be regulated without obstructing the passage or passages therefrom to the fire-box, so that whether the combustion in the latter be active or slow, the smoke will be returned to the fire for consumption and the cinders conducted to the ash-pan.

In the accompanying drawings, Figure 1 is a side elevation of a locomotive boiler and fire-box provided with our invention. Fig. 2 is a vertical longitudinal section, and Fig. 3 a plan view, of the same.

The letter A indicates the fire-box; B, the grate; C, the boiler; D, the smoke-chamber at front end of the boiler, and E the smoke-stack rising from said smoke-chamber. From

near the top of the smoke-stack a pipe, F, of equal diameter therewith, extends rearwardly, and from its rear end extend two branch pipes, G G, leading downward and rearward on opposite sides of the fire-box, and have their terminals bent under the grate.

Immediately in front of the junction of pipe F with the smoke-stack, and within the latter, is hinged a damper, H, on the opposite side of the smoke-stack from which are inclined seats  $\frac{1}{2}$ , which support this damper at an angle in front of the opening of pipe F, so that when the said damper is closed it acts as a deflector to guide the rising smoke and cinders into the pipe F, by which and the branches G they are conducted to the fire-box and discharged below the grate thereof.

Above the hinged edge of the damper H a shaft, I, is arranged at one side of the smoke-stack, and this shaft is provided with an arm connected to the upper portion of the damper by a link, *i*.

The shaft is prolonged at one end through the wall of the smoke-stack, and terminates in a bent arm, *j*, connected to one arm of a bell-crank lever, *k*, pivoted to a support upon the smoke-chamber wall. From the other arm of the bell-crank a rod, *l*, leads back to a lever pivoted at the rear end of the fire-box.

The manner of operating the damper by means of the devices just described is obvious.

The letter M designates the ash-box below the grate. It is provided with front and rear doors, *m m'*, either of which may be left open to regulate the flow of cold air under the grate to mingle with the smoke.

The ends of the branch pipes G G pass through openings in the side walls of the ash-pan.

By the explanation and description now given, the operation of our invention will be readily understood. By it we secure a great economy in fuel, by utilizing the heat-producing gases of the smoke, reduce the wear of the rolling-stock of railways by protecting it from the fine cinders, and obtain immunity from fires heretofore occasioned by flying sparks. Besides, we contribute in a high degree to the comfort and convenience of travelers by rail.

Though we have described our invention

with especial reference to a locomotive, it is obvious that it may be used in connection with stationary boilers and furnaces.

What we claim is—

In combination with the smoke-stack E, the curved branching flue F, having an aperture at its bend, and curved damper H, adapted to slide upon the curved portion of the branching pipe, and mechanism for operating it to open and close the aperture, and the fire-box

of the furnace, the whole arranged to operate substantially as specified.

In testimony that we claim the foregoing we have hereunto set our hands in the presence of the subscribing witnesses.

JAMES BARDSLEY.  
JOHN G. CLIFFORD.

Witnesses:

JAS. A. FINLAY,  
D. M. WIEDER.