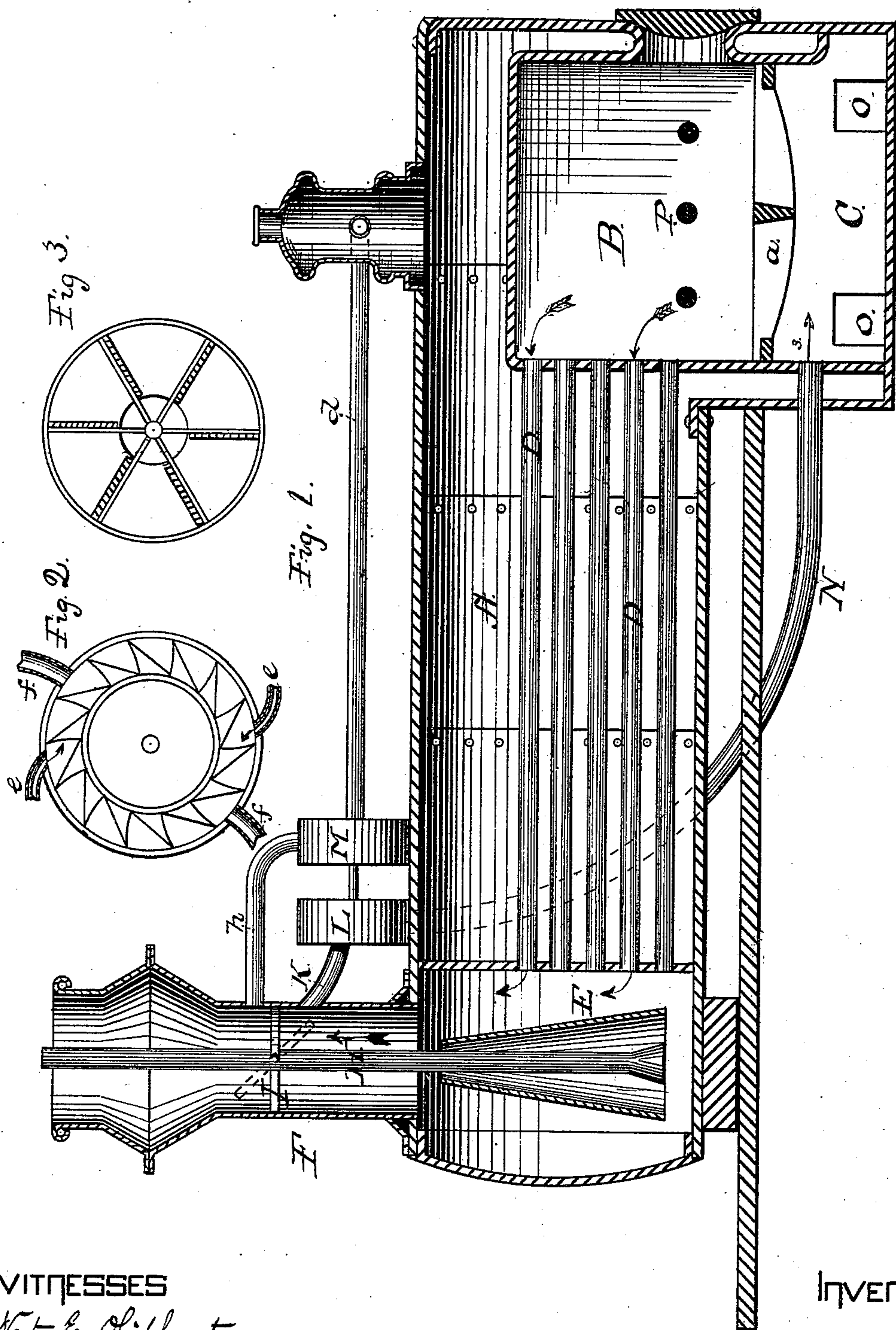


R. B. MILLER & W. CUNNINGHAM.
Spark-Arrester and Smoke-Consumer.
No. 211,921. Patented Feb. 4, 1879.



WITNESSES

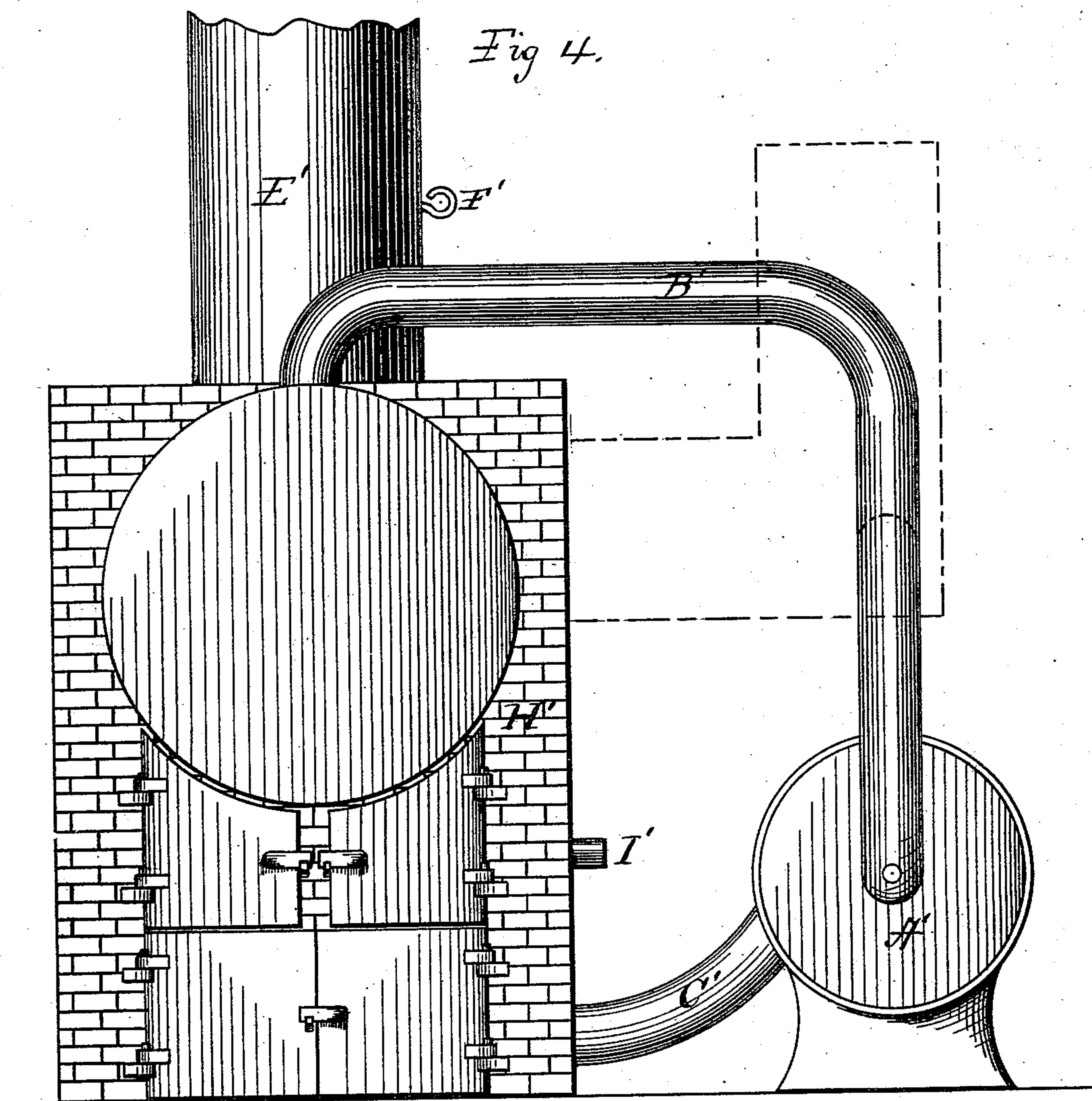
Nat. C. Oliphant.

D. P. Cowl

INVENTOR

Robert B. Miller
William Cunningham
by Heyman & Stone
attys.

R. B. MILLER & W. CUNNINGHAM.
Spark-Arrester and Smoke-Consumer.
No. 211,921. Patented Feb. 4, 1879.



WITNESSES

Nat. E. Oliphant
D. P. Cowl

INVENTOR

Robert B. Miller
William Cunningham
By Heymunt Kane
Atty.

UNITED STATES PATENT OFFICE

ROBERT B. MILLER AND WILLIAM CUNNINGHAM, OF WATSONTOWN, PA.

IMPROVEMENT IN SPARK-ARRESTERS AND SMOKE-CONSUMERS.

Specification forming part of Letters Patent No. **211,921**, dated February 4, 1879; application filed November 30, 1878.

To all whom it may concern:

Be it known that we, ROBERT B. MILLER and WILLIAM CUNNINGHAM, of Watsonstown borough, in the county of Northumberland and State of Pennsylvania, have invented a new and valuable Improvement in Spark-Arresters and Smoke-Consumers; and we do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a representation of a longitudinal central sectional view, showing our improvement attached thereto. Fig. 2 is a sectional view of the rotary engine. Fig. 3 is a central sectional view of the fan-case. Fig. 4 is a modification of the invention, showing it applied to stationary boilers.

This invention has relation to spark-arresters and smoke-consumers applicable to locomotive-engines and boilers in general; and the improvement consists in the novel means for arresting the smoke, sparks, and cinders at a point near or immediately below a valve or damper in the smoke-stack, then conveying them through pipes into the ash pan or pit of the boiler-furnace by means of a fan, operated by a rotary engine mounted on top at the forward part of the boiler, having the double function of a suction and a blast fan; also, in the combination and arrangement of parts, as will be hereinafter more fully set forth.

In the annexed drawings, forming a part of this specification, the letter A represents a locomotive-boiler, having the fire-box B, grate-bars *a*, ash-pit C, flues D, smoke-box E, and smoke-stack F, with the exhaust-pipe H, for the escape of the exhaust-steam. In the smoke-stack F, near its upper end, or about midway, is arranged a valve or damper, I, journaled or otherwise attached thereto. This damper is provided with a slot or an opening to extend around the exhaust-pipe, so as to permit the same being operated by means of a connecting-rod (not shown) extending to the engineer's house; or the valve may be divided and attached to a frame surrounding the exhaust-pipe.

Immediately opposite the opening in the

damper, or just below the damper, we connect a pipe, K, with the smoke-stack, and extend the same downwardly, forming a connection with the center of the fan-casing L, attached upon the forward end of the boiler, as shown. To this end of the boiler, and immediately in rear of the fan-case, is attached a rotary engine, M, for operating the fan within the casing. Steam to operate the rotary engine is taken from the steam-drum of the boiler through the pipe *d*, and passed through its branch pipes *e e*, on opposite sides, substantially as shown in Fig. 2 of the drawings.

By this arrangement of the branch pipes steam is admitted to the engine at both points, near top and bottom, at the same time. The exhaust-steam escapes from the engine through the branch pipes *f f* to the main pipe *h*, and into the smoke-stack above the damper, substantially as shown in Fig. 1.

From the sides of the fan-case extend two discharge-pipes, N, (only one shown,) leading into the rear end of the ash-pit C of the furnace. These discharge-pipes, one on each side of the fan-case and passing around the boiler, may connect with a larger pipe communicating with the ash-pit, arranged immediately under the boiler; but this is not desirable. The products of combustion pass from the combustion-chamber or fire-box through the flues into the smoke-box and smoke-stack, coming in contact with the damper I, as shown by the arrows. The rotary engine being in operation drives the fan mounted on the same shaft, but in a separate case. The smoke, cinders, and sparks, which are arrested and deflected by the damper I in the smoke-stack, are drawn into the pipe K by the suction of the fan, and conducted into the casing, and from thence blown through the side conveying-pipes into the ash-pit, as shown by the arrows 3.

The rotary engine and fan are connected by a single shaft—that is to say, they are keyed to the same shaft passing through the center of each case, and their cases can be attached or secured to the boiler in any suitable manner, or mounted on a single frame bolted or riveted to the boiler.

The letter O indicates regulating-doors on the sides and ends of the ash-pit C, to admit

air or give relief to the locomotive in case the fan should fail to work or give out suddenly. The letters P are a series of holes communicating with the fire-box for the purpose of admitting air into the fire-box, to aid in consuming the smoke and gases which are forced through the grate-bars by the fan.

In case the rotary engine should get out of order, the valve or damper can be opened and the products of combustion allowed to pass through the smoke-stack in the usual way.

Fig. 4 of the drawings is a modification of our invention applied to a stationary boiler, in which A' represents the fan-casing with its fan; B', the pipe leading from either the stack or smoke-box of the boiler and communicating with the fan-casing. C' is a pipe leading from fan-casing to the ash-pit. E' is the smoke-stack, with damper F'. H' is a brick-work surrounding the boiler with an opening, I', to admit air to the fire-box.

This invention can be readily applied to existing locomotives without any material changes to the boiler, thereby enabling us to attach our improvement at a small expense.

We do not wish to confine our invention to the specific construction of the parts nor the arrangement of the pipes, as they may be varied without departing from the spirit of our invention.

What we claim is—

1. The combination, with a locomotive-boiler, of a valve arranged in the smoke-stack for arresting the smoke and products of combustion, a fan and engine mounted on the boiler, with a connecting-pipe for exhausting the smoke and products of combustion from the smoke-stack and forcing the same through conveying-pipes to the ash-pit of the boiler, for the purpose set forth.

2. The combination, with a locomotive-boiler, of a valve arranged in the smoke-stack for arresting the smoke and products of combustion, a fan and a rotary engine arranged on the same shaft and mounted on top of the boiler, the engine forming a steam connection with the steam-drum of the boiler and exhaust connection with the smoke-stack above the valve, whereby the working of the engine communicates motion to the fan, which, in return, exhausts the smoke and products of combustion from the smoke-stack, as described.

In testimony whereof we have hereunto subscribed our names.

ROBERT B. MILLER.
WILLIAM CUNNINGHAM.

Witnesses:

WM. F. SHAY,
PHILIP SHAY.