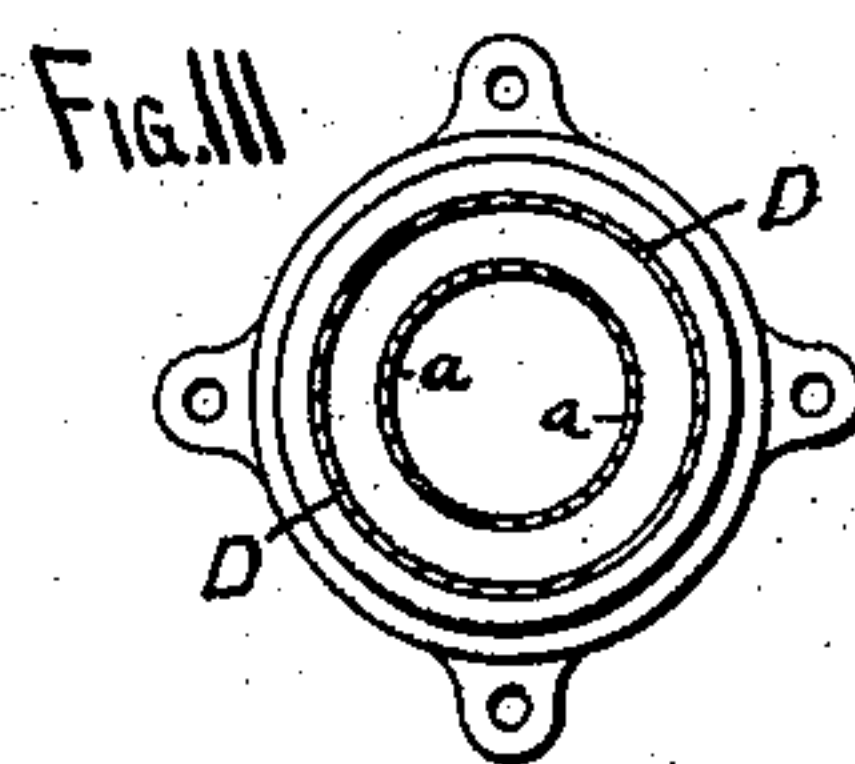
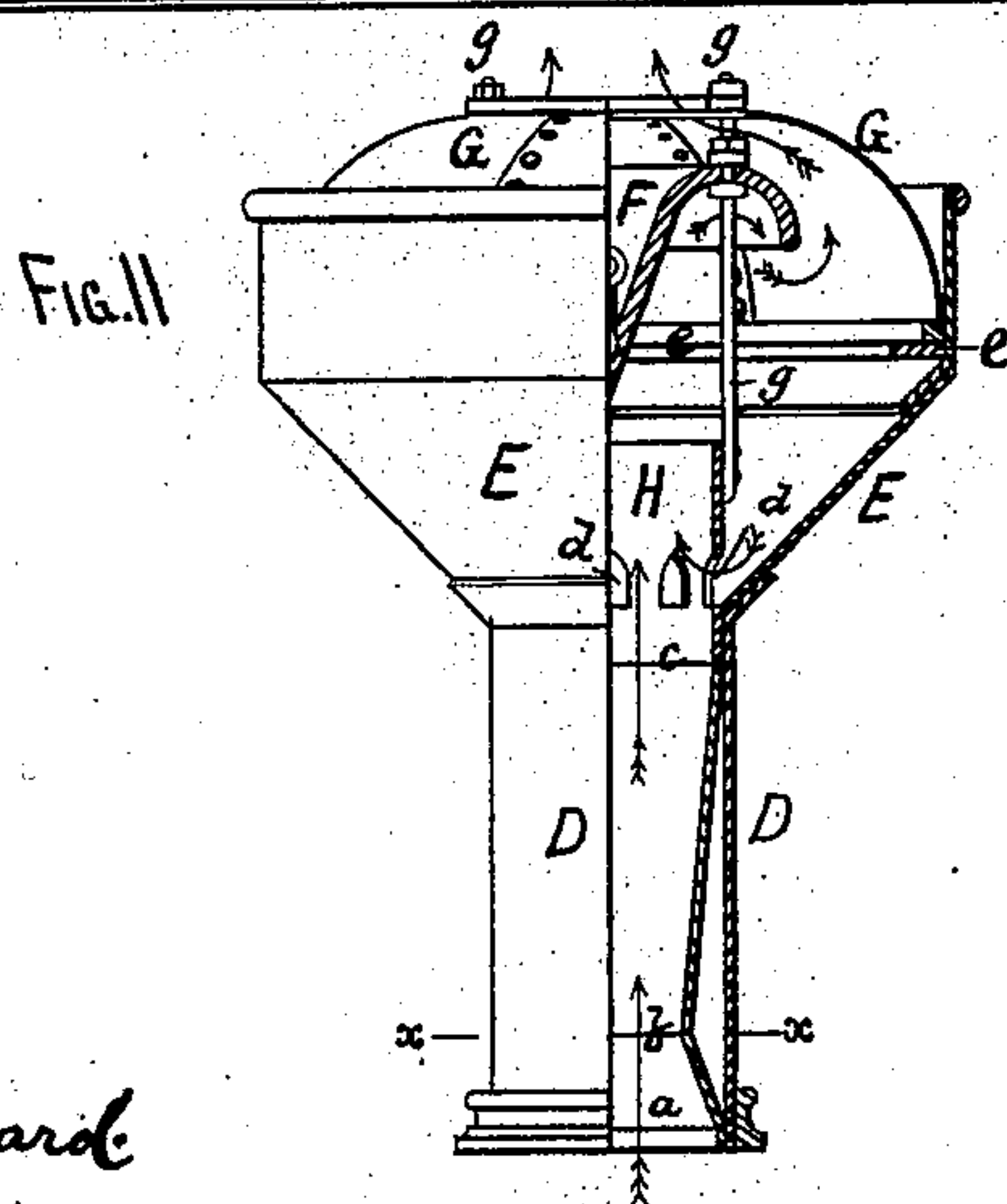
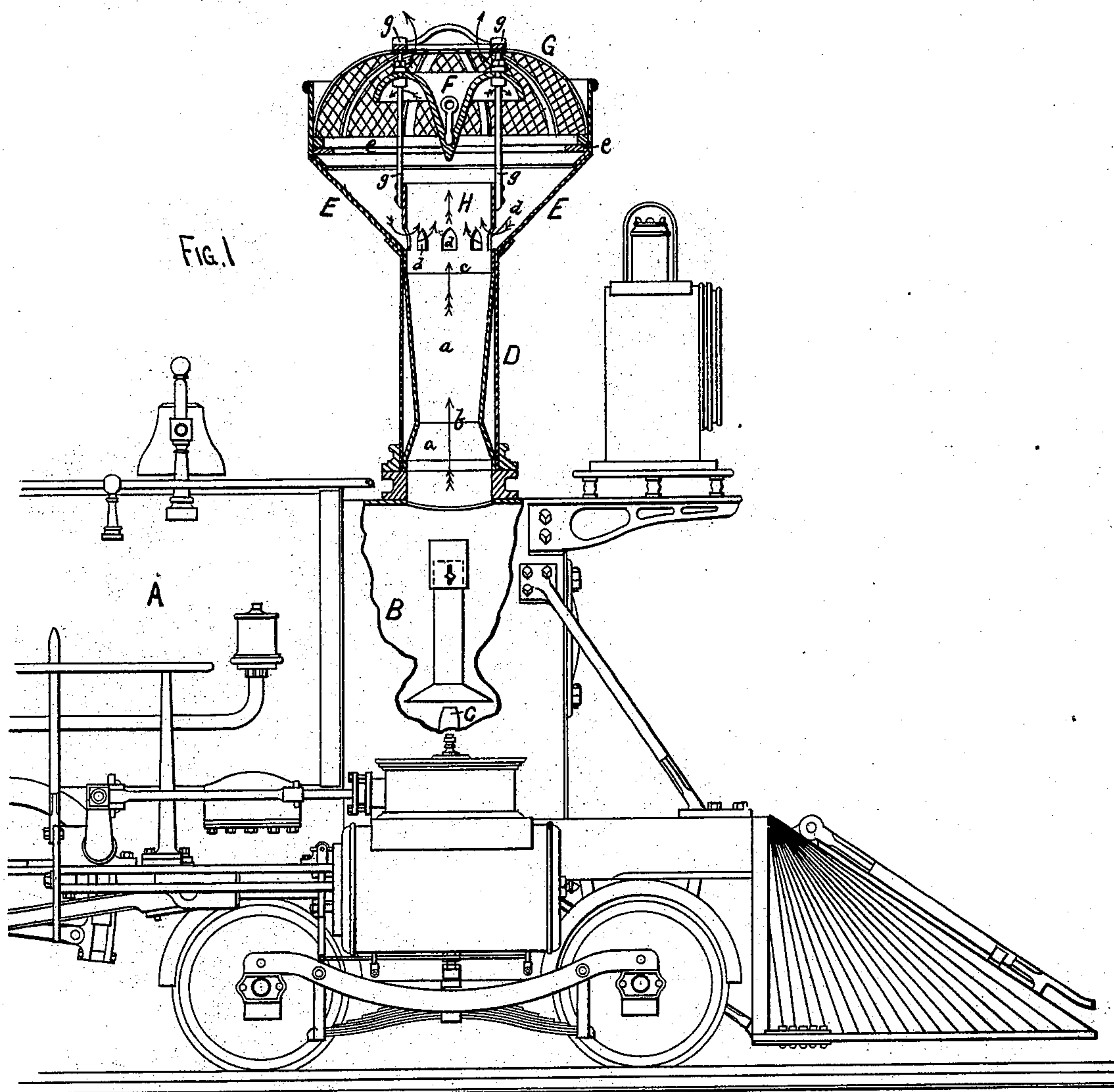


G. W. TURNER.
Locomotive Smoke-Stack.

No. 209,994.

Patented Nov. 19, 1878.



WITNESSES.
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UNITED STATES PATENT OFFICE.

GEORGE W. TURNER, OF ST. PAUL, MINNESOTA.

IMPROVEMENT IN LOCOMOTIVE SMOKE-STACKS.

Specification forming part of Letters Patent No. **209,994**, dated November 19, 1878; application filed October 5, 1878.

To all whom it may concern:

Be it known that I, GEORGE WESLEY TURNER, of St. Paul, in the county of Ramsey and State of Minnesota, have made certain new and useful Improvements in Locomotive Smoke-Stacks, which improvements are fully set forth in the following specification and accompanying drawings, in which—

Figure 1 is a side elevation of the front portion of a wood-burning locomotive, with the smoke-stack and a portion of the smoke-jacket in section. Fig. 2 is a half-sectional elevation of a coal-burning smoke-stack detached. Fig. 3 is a cross-sectional view on the line *x x* of Fig. 2.

This invention relates to the smoke-stacks of locomotives; and consists in forming the interior of the shaft with a double conical lining, whereby a larger nozzle may be used upon the exhaust-pipe, to produce a better effect upon the fire, as well as a stronger stack, with little or no additional expense or weight, as hereinafter set forth.

The invention also consists in the method of forming the top of the stack, whereby it may be altered from a wood to a coal burner, as hereinafter set forth.

A is the boiler. B is the smoke-jacket, and C the exhaust-nozzle, all arranged in the usual manner.

D is the shaft of the smoke-stack, set upon top of the smoke-jacket in the usual manner, and E the flaring top, in which the cone F and bonnet G are arranged.

Inside of the lower part of the shaft D is a lining, *a*, which is secured to the shaft at the bottom, and is contracted at *b*, so as to reduce the interior diameter of the shaft. From *b* the lining again expands gradually toward the top of the shaft until the point *c* is reached, when it will again join the interior of the shaft.

By this arrangement a double conical lining is produced, by which several very important results are obtained.

First. By contracting the interior of the stack I am enabled to enlarge the mouth of the exhaust-nozzle C, as the contraction in the pipe D partially takes the place of the nozzle. Consequently the fire is not blown as hard, for the reason that, there being nearly the same quantity of steam to exit through the nozzle at all times, the smaller it is the more power

the steam exerts upon the fire in drawing it through the flues; hence any enlargement of the exhaust-nozzle must reduce the power of the steam to form a vacuum. By dividing the work of the exhaust-steam into two parts, as the nozzle and contraction *b* practically do, the action of the draft upon the fire is much reduced as to time, thereby enabling the fuel an opportunity of being more thoroughly consumed, and with a consequent economy of steam to a given amount of fuel.

Second. By dividing the work of the exhaust-steam, and causing a portion of it to act upon the fire from a point above the flues, and covering a larger field, as at *b*, a better effect is produced upon the flues upon the side of the boiler than when only a small nozzle upon the exhaust-pipe C is used, which acts only in a small space in the center of the smoke-jacket.

Third. By continuing the lining *a* in a straight line from the contraction *b* to the top of the shaft D, as shown, I form a gradually-expanding conduit for the smoke and steam after they leave the contraction *b* and until they strike the cone F, thereby insuring a much freer exit for them than if the pipe were straight, or than if the lining *a* ceased at *b*, and the steam were allowed to expand from that point against the sides of the stack.

Fourth. By forming the lining in this manner no projections are left in the interior upon which sparks and cinders can lodge, thereby making the stack self-cleaning. All stacks with irregular interiors, upon which cinders, &c., can lodge, are objectionable, from the fact that the continual moisture from the steam and from "run-overs" (when there is too much water in the boiler) acts upon such lodgments and converts them into a pasty consistency, which, when they become dry, harden and cling tenaciously to the metal, so that it is with difficulty that they are removed. Openings are usually left in the lower parts of such stacks for their removal; but they frequently become so hard that it is impossible to remove them in this manner; hence the lodgments are added to daily until the metal becomes so oxidized that the stacks are soon destroyed. By my arrangement, however, all the cinders which are not carried off through the bonnet G fall down upon the flaring top E, and thence back into the shaft D through

the holes *d* in the inside-stack projection H, where they will be caught by the escaping steam and smoke and again thrown against the cone F, and so on until their size is reduced enough to enable them to escape through the meshes of the wire-cloth bonnet when wood is used as a fuel, or light enough to be carried around the cone F when coal is used. Should, however, any of the cinders be heavy enough to resist the action of the steam, they will be conveyed down into the smoke-box, from whence they can easily be removed, and where they will do no harm. Where the interior of the shaft D, however, is so constructed as to leave irregular surfaces, dead-air and dead-steam spaces must necessarily be formed, and consequently many of the cinders which fall back through the holes *d* would find lodgment thereon.

Fifth. The double conical lining, being riveted to the shaft D, forms a strengthening-brace, so that a much lighter quality of iron can be used to produce a stack of equal strength with one where a single thickness of heavier metal is used, or an ordinary stack is greatly strengthened, and thus be able to stand a much severer strain. Actual experiment upon locomotives has shown that with this double conical lining *a b c*, and with an enlarged exhaust-nozzle, a large saving of fuel is obtained without reducing the quantity of steam raised.

The bonnet G is arranged to rest upon a flange, *e*, set in the flaring top E, and is held in place by continuing the bolts *g g'*, which hold the cone F in place, up through it. By this means the bonnet may be readily removed for repairs or to enable another to be put in its place, either for wood or coal, so that by

simply changing the bonnets the stack can be altered from a wood to a coal burner.

I am aware that it is not new to contract the interiors of locomotive smoke-stacks by means of conical-shaped sleeves, &c.; but such I do not claim, broadly.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The arrangement within the smoke-stack of a locomotive of a double conical lining, *a*, contracted at *b*, to aid the exhaust-steam in its action upon the fuel, and having each end in contact with the smoke-stack, to form a strengthening-brace, substantially as herein described.

2. The combination of the stack D E F G, having the double conical lining *a b c*, and the exhaust-nozzle of a locomotive, arranged and operating substantially as hereinbefore set forth.

3. The combination of the shaft D, having the double conical lining *a b c*, and the exhaust-nozzle of a locomotive, constructed and arranged substantially as hereinbefore set forth.

4. The combination of the shaft D, inside extension-pipe H, having the perforations *d*, and the double conical lining *a b c*, constructed and arranged substantially as hereinbefore set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

GEORGE WESLEY TURNER.

Witnesses:

C. W. WOODWARD,
LOUIS FEESER.