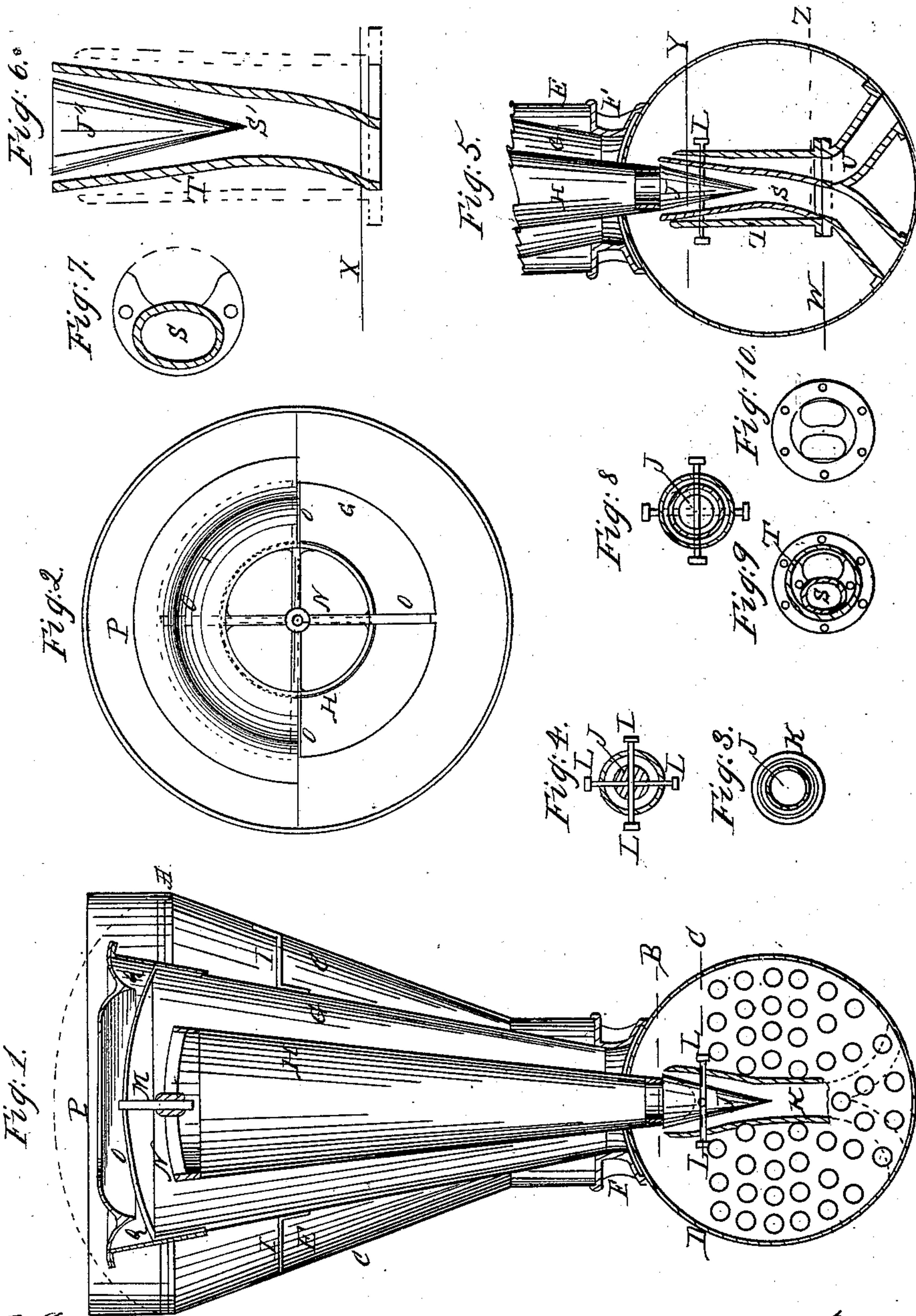


J. Atkins,

Spark Arrester,

No 80,437.

Patented July 28, 1868.



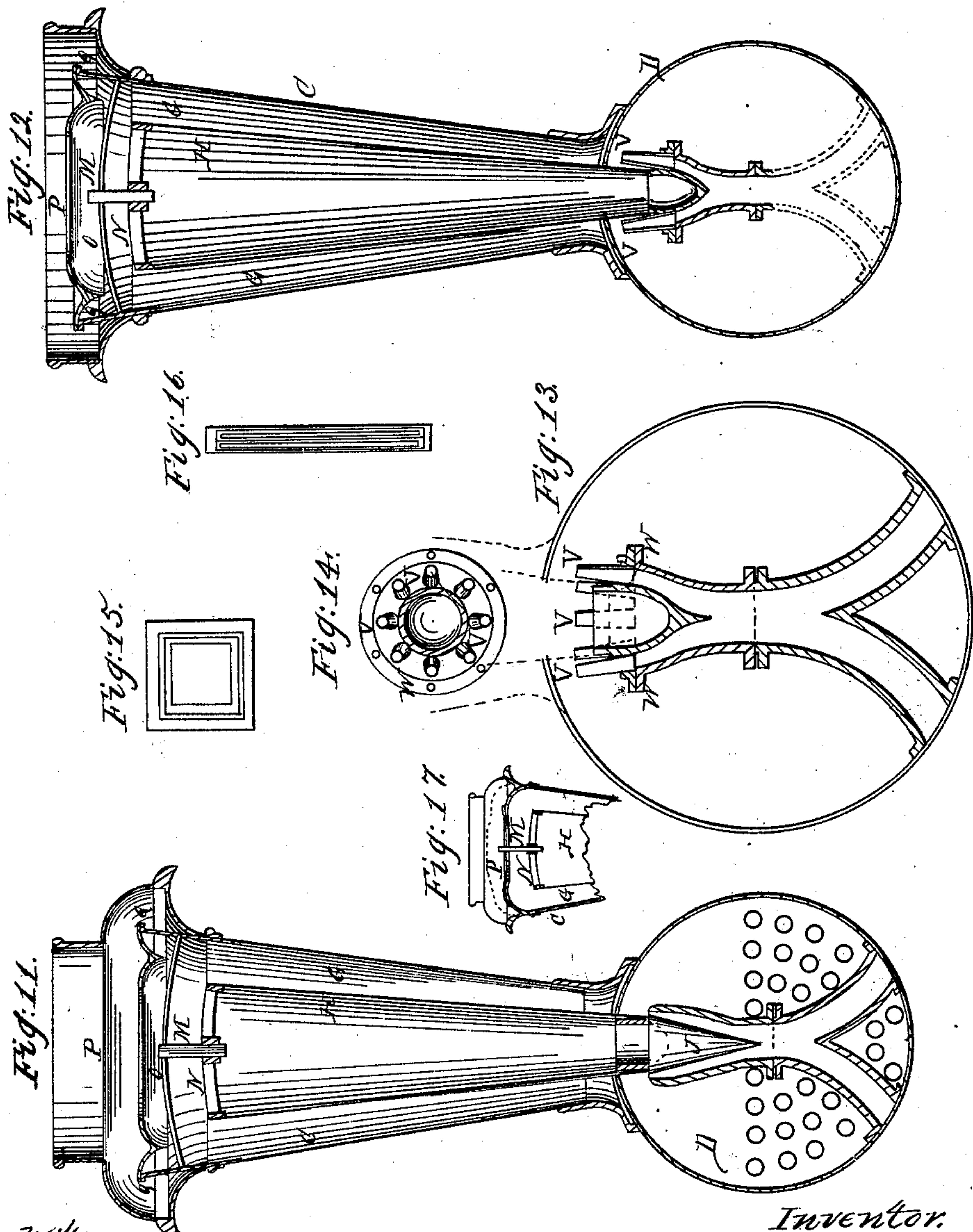
Witnesses.

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Chas. H. Poole

Inventor.

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JEARUM ATKINS, OF WASHINGTON, DISTRICT OF COLUMBIA.

Letters Patent No. 80,437, dated July 28, 1868.

IMPROVEMENT IN SMOKE-STACKS FOR LOCOMOTIVES.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, JEARUM ATKINS, of Washington, District of Columbia, have invented a new and useful Improvement in Locomotive-Engines, &c.; and I do hereby declare the following to be a full and exact description thereof, reference being had to the drawings that accompany and form a part of these specifications.

The nature of my invention consists in producing an annular tapering passage or smoke-stack, through which the products of combustion are caused to pass on their way from the furnaces of locomotives, and, in combination therewith, an exhaust-steam pipe, through which the escaping steam from the cylinders of the engine is injected into said annular smoke-stack, which steam-pipe is provided with an annular or other suitable mouth-piece or nozzle, so arranged relatively with said annular smoke-stack that the force of the escaping steam shall be distributed equally over the entire circumference thereof, for the purpose of increasing the draught of the furnaces, as hereinafter described.

Figure 1, of the annexed drawings, is a vertical cross-section on a line with the centre of the smoke-stack.

Figure 2 is a half plan or bird's-eye view of the top of the stack, and a half horizontal section thereof on line A in fig. 1.

Figure 3 is a horizontal section on line B in fig. 1.

Figure 4 is a horizontal section of the exhaust-pipe on line C in fig. 1.

Figure 5 is a vertical cross-section, through the front of the boiler and the lower portion of the smoke-stack and exhaust-steam pipes, on a line with the centre of the stack.

Figure 6 is a vertical section of the exhaust-pipes, enlarged from fig. 5.

Figure 7 is a horizontal cross-section of the exhaust-pipes, taken on line X in fig. 6.

Figure 8 is a horizontal cross-section of the exhaust-pipes on line Y in fig. 5.

Figure 9 is a horizontal cross-section of the exhaust-pipes on line Z in fig. 5.

Figure 10 is a horizontal cross-section of the exhaust-pipes on line W in fig. 5.

Figure 11, sheet 2, is another vertical cross-section, similar to fig. 1, sheet 1, representing certain modifications in the construction of the same.

Figure 12, sheet 2, is still another vertical cross-section, similar to fig. 11, sheet 2, showing other modifications in the stack, and also in the exhaust-pipes.

Figure 13, sheet 2, is a vertical section through the centre of the exhaust-pipes, enlarged from fig. 12, sheet 2.

Figure 14, sheet 2, is a horizontal projection or bird's-eye view of the top of the exhaust-pipes, as represented in fig. 13, sheet 2.

The boiler D, smoke-stack E, and saddle F, which serves as a base for the stack, and connects it with the boiler, are essentially the same as those in common use.

In place of the usual straight or cylindrical flue, which occupies the centre of the stack for carrying off the products of combustion, I introduce the large conical flue G, and within it the smaller conical tube H, the annular and conical space formed between it and the flue G being that through which the smoke and gases from the fire find their way to the open air.

The foot of the flue G is fixed in the saddle F, and is further supported by being connected with the smoke-stack E by means of the transverse stay-rods I.

The exhaust-pipes, leading from the two cylinders of the engine, unite in one vertical pipe, K, which is enlarged at its outlet, and contains within it the core J, whose axis coincides with that of pipe K. The core J is fixed in its place by means of four screw-bolts, L, a horizontal view of which is given in fig. 4.

An annular passage is thus formed between the exhaust-pipe K and core J, through which the steam which escapes from the cylinders finds its way to the annular passage, formed for the products of combustion, between the conical pipes G and H. The pipe K is bored out nearly cylindrical a few inches from its outlet, which, in conjunction with the core J, forms an annular steam-nozzle, as before stated, which is narrowest at the point of

impact, and gives the steam, which escapes therefrom, a direction nearly on a line with the centre of the passage formed for the escaping gases from the furnace.

On the top of core J there is formed a cylindrical projection, over which the foot of the central pipe, H, fits loosely, and by which it is held in position. The top of core J being larger than the cylindrical portion, which enters pipe H, forms a shoulder for said pipe to rest upon.

The upper end of the central pipe H is held in position by means of an axis, M, fixed in its centre by the cross-arms N, seen edgewise in fig. 2. The cross-stay rods or braces O, attached to the top of flue G, form a central bearing for carrying the axis M, sufficient end play being allowed in said axis M to admit of its being lifted up until its lower end clears the top of the cylindrical projection on core J, when it may be carried slightly to one side for cleaning out the ashes which will accumulate in said central tube.

An important advantage of the annular flue, described herein, is found in the receptacle provided for ashes and cinders, which are carried from the fire-chamber, and, being turned downwards by the deflector P, are received in the central tube H, or within the jacket E, and cannot be disturbed therein by any action of the draught. A great objection to the use of coal-burning locomotives is the discomfort occasioned by the ashes and cinders, which are discharged from the stack and envelope the train. This discomfort is almost or entirely obviated by the use of a receptacle to receive and retain the ashes and cinders within the stack, and which it is easy to provide in connection with an annular passage, without materially affecting the capacity of the flue.

This last-described arrangement may also be found useful for fixing the tube H at different degrees of elevation, from time to time, thus varying the size of the smoke-passage for the purpose of determining what amount of area in said passage gives the best results. The annular deflecting-plate P, which is carried upon the braces Q, serves to arrest the sparks in their ascent, and prevent their escape into the open air through the wire netting, which is represented by the dotted line R.

Figs. 5, 6, 7, 8, 9, 10 represent a proposed modification in the construction of the smoke-stack and exhaust-pipe, (for which I design to apply for Letters Patent,) by which the escaping steam from each cylinder would be injected into the smoke-stack independently of the other.

The single exhaust-pipe S, fig. 5, which is connected with only one cylinder, carries at its outlet the before-described core J, forming an annular steam-nozzle, which does not differ from that represented in fig. 1, though the steam from only one cylinder, instead of both, escapes through it, as is clearly shown in the drawings.

Surrounding the steam-exhaust pipe S, there is an outer pipe, T, of larger diameter, between which and pipe S there is another annular exhaust-nozzle formed, which communicates with the other cylinder through the pipe U.

Fig. 6 is an enlarged vertical section of the exhaust-pipe S', corresponding to S in fig. 5, and T' to T in fig. 5.

Fig. 7, as aforesaid, is a horizontal section on line X in fig. 6, showing the oval form of pipe S at this point, and the shape of the flange at the bottom of the pipe, with one side cut away to make room for the steam to pass from pipe U to the outer exhaust-nozzle.

Fig. 10, which is a horizontal section on line W in fig. 5, represents the form of the top of the pipes which lead from the cylinder to the exhaust-nozzles, which pipes may be cast in one piece, or otherwise, as may be found expedient.

Fig. 9, which is a horizontal section on line Z in fig. 5, represents the form of both exhaust-pipes, as also the flanges at the foot of both, for bolting them to the top of the pipes which lead to the cylinders.

Fig. 11, sheet 2, represents a smoke-stack, designed for coal-burning engines, combined with the before-described annular exhaust-pipes, the same letters referring to corresponding parts in fig. 1 of sheet 1.

The stack last named does not differ essentially from that shown in fig. 1, sheet 1, already described, except in being without the outside casing E, which is deemed unnecessary in a coal-burning engine.

Some changes are also represented in the construction of the top of the stack from that described in fig. 1, sheet 1, which are so clearly shown in the drawings as not to require any further description.

Fig. 12, sheet 2, represents a stack, similar to that last described, excepting in the form of the top, in combination with a divided or multi-tubular exhaust-nozzle, similar to that described in my Letters Patent, granted me, March the 17th, A. D. 1868.

Fig. 13, sheet 2, is an enlarged vertical section of the exhaust-steam pipes, which lead from the cylinders, and the described nozzle, which terminates in the several small tapering tubes, V, inserted in the flanged conical cap W, which cap is bolted to the top of the exhaust-pipe. A horizontal projection or top view of the cap W, with its several tubes V, is shown in fig. 14, sheet 2. The cap W is formed with a cylindrical projection and a square shoulder to receive the foot of the central pipe H, shown in dotted lines in fig. 13.

The exhaust-tubes V are arranged so as to throw the jets of steam on a line, or nearly so, with the centre of the smoke-passage, and distribute the force with which said steam-jets act upon the products of combustion for increasing the draught equally over the circumference of said smoke-passage, as is the case when the annular steam-jet is used for the same purpose as before described.

These tapering smoke-passages might be made square, as shown in Figure 15, sheet 2, or they might be made in the form of an ellipse or a rectangle, the form not being essential to the result attained. Again, a tapering flue might be made in the form of a long, narrow rectangle in its cross-section, as represented in Figure 16, sheet 2, in which case the outer ends of the exhaust-pipes, in order to adapt the steam-jets to the form of the flue, would require to be fastened, as represented in said fig. 16. The exhaust-pipes might, in such case, be made to carry the steam from each cylinder to the smoke-stack independent of the other, as shown in the figure.

The before described mode is designed as an improvement in my invention for which Letters Patent were granted me, March 17, 1868, in which the advantage gained by the use of the expanding flues was fully set forth;

and it may be stated that an additional advantage is gained by the jets of steam expanding so as to fill the smoke-passages in travelling only a few inches from the point of impact, and consequently acting upon the products of combustion with nearly the whole force due to its initial velocity, whereas, in the smoke-stacks as constructed at present, the exhausting steam travels so far from the point of impact before it can expand so as to fill the same, (which it must do before it can become effective in forcing the smoke and gases upwards for the purpose of increasing the draught,) that its force is, in a great measure, exhausted before the effect is produced; and it is, therefore, apparent that a great increase in the draught is effected by the use of the apparatus constructed in accordance with the principles above set forth, over and above any hitherto known.

There is still another mode of constructing the upper portion of the stack to produce the desired effect, which is shown in Figure 17, sheet 2, in which the deflector P is attached to and supported by the outer casing C, no space being left between it and said casing for any portion of the products of combustion to pass through. By this arrangement, all the smoke and gases make their escape through the circular opening in the centre of the deflector, the principal object in this construction being to give the sparks an invariable tendency to settle directly into the central tube H.

What I claim, and desire to secure by Letters Patent, is—

1. The combination of the annular exhaust-nozzle, or its equivalent, and the annular smoke-passage, substantially as herein described.
2. The arrangement of the annular smoke-passage and the annular deflecting-plate P, substantially as set forth.
3. In combination with the annular passage G and annular deflector P, the central receptacle H, substantially as and for the purposes set forth.

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Witnesses :

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