

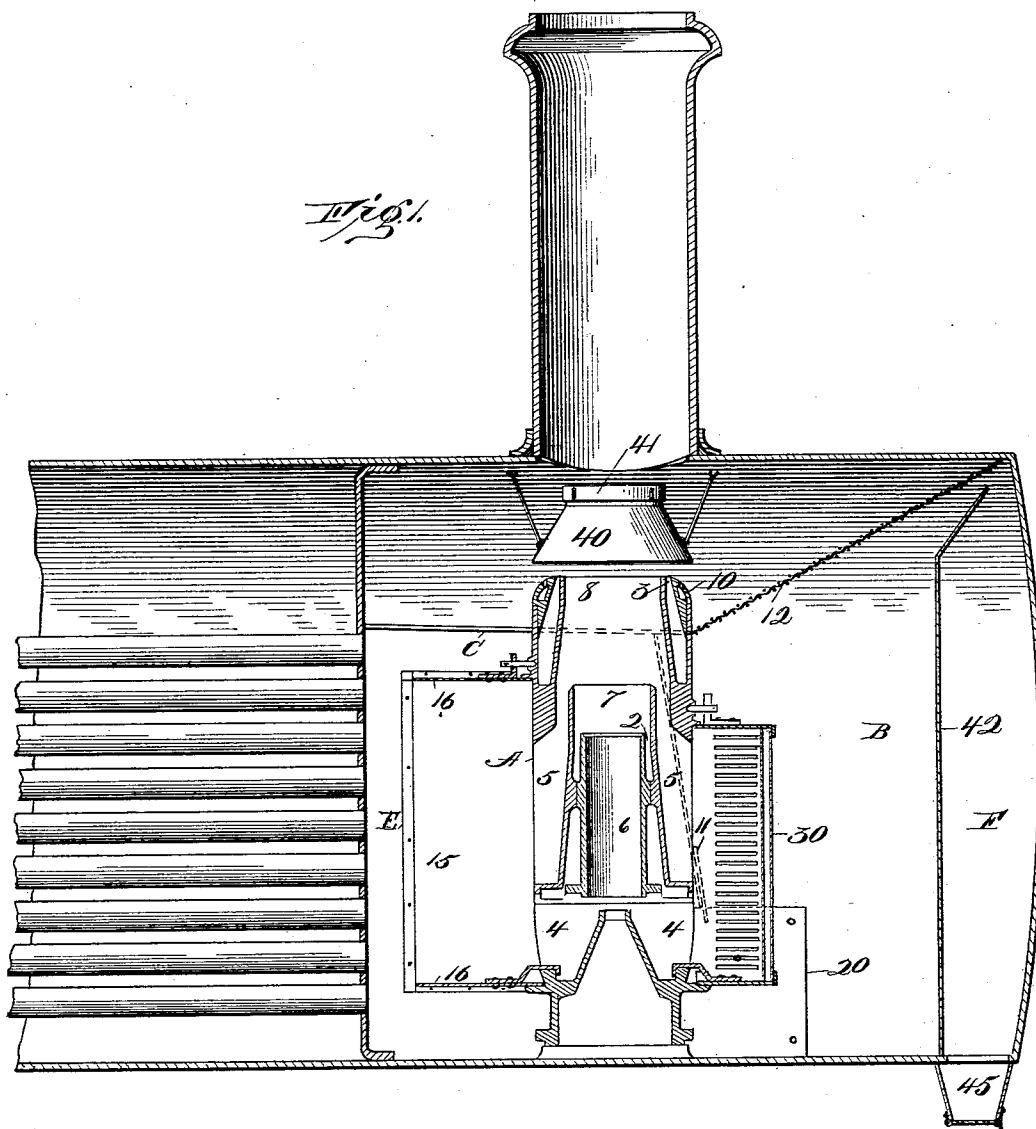
(No Model.)

3 Sheets—Sheet 1.

J. Y. SMITH.
EXHAUST APPARATUS.

No. 573,547.

Patented Dec. 22, 1896.



Witnesses:
J. M. Howley Jr.
Thomas Durant

Inventor:
John Y. Smith.
by *Charles H. Smith*
his Attorneys.

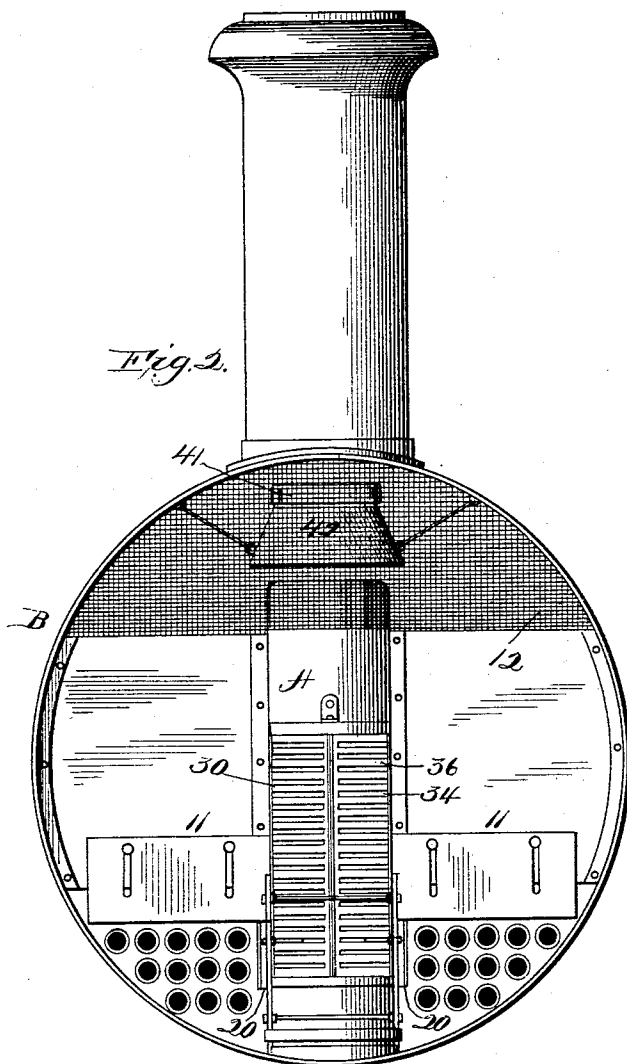
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3 Sheets—Sheet 2.

J. Y. SMITH.
EXHAUST APPARATUS.

No. 573,547.

Patented Dec. 22, 1896.



Witnesses:

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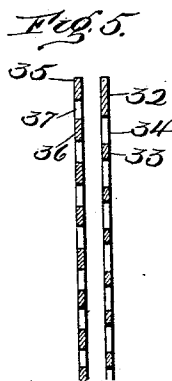
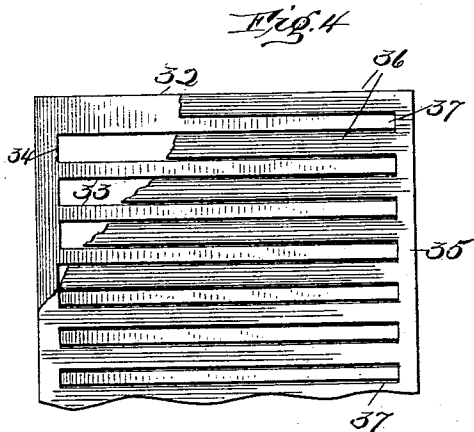
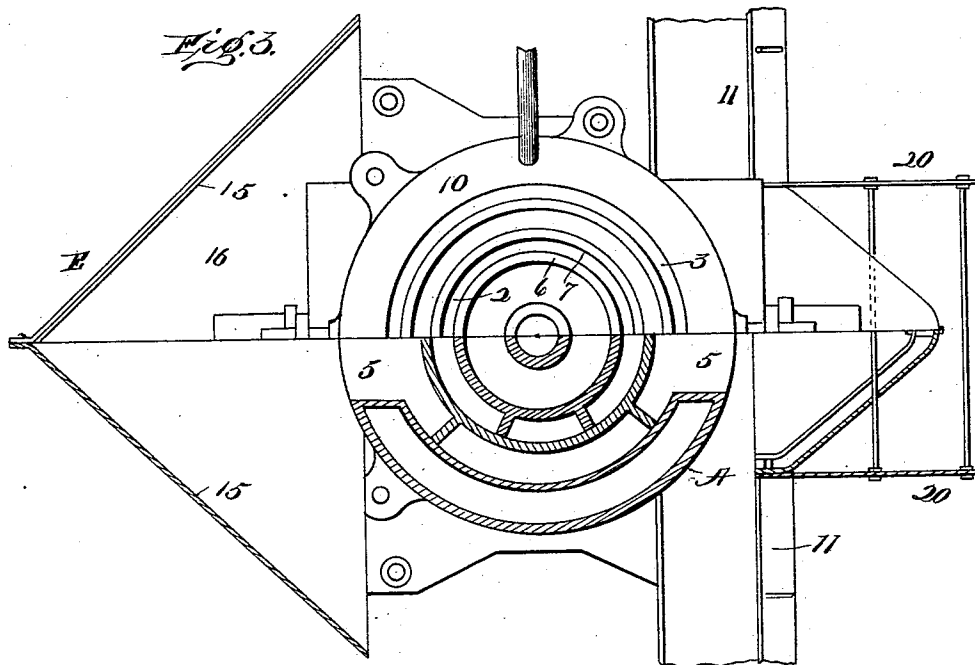
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3 Sheets—Sheet 3.

J. Y. SMITH.
EXHAUST APPARATUS.

No. 573,547.

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UNITED STATES PATENT OFFICE.

JOHN Y. SMITH, OF DOYLESTOWN, PENNSYLVANIA, ASSIGNOR TO THE
SMITH EXHAUST PIPE COMPANY, OF SAME PLACE.

EXHAUST APPARATUS.

SPECIFICATION forming part of Letters Patent No. 573,547, dated December 22, 1896.

Application filed May 21, 1896. Serial No. 592,501. (No model.)

To all whom it may concern:

Be it known that I, JOHN Y. SMITH, of Doylestown, in the county of Bucks, State of Pennsylvania, have invented certain new and
5 useful Improvements in Exhaust Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the figures and letters of reference marked thereon.

This invention relates to improvements in the construction and arrangement of the blast or exhaust apparatus for use in connection with locomotive and other boilers as a means for inducing and maintaining the draft through the combustion-chamber and flues; and it has for one of its principal objects to diminish wear of the blast-pipe and
15 prevent the escape of sparks from the smoke-stack.

To this end the said invention consists in the novel construction, combination, and arrangement of parts hereinafter fully described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a longitudinal vertical section through the front end of a locomotive-boiler, showing the exhaust apparatus containing my improvements. Fig. 2 is a front elevation showing the interior of the smoke-box. Fig. 3 is a top plan view, partly in section, of the exhaust-pipe and deflectors. Fig. 4 is a side elevation, and Fig. 5 is a sectional view, of one of the deflecting-plates.

Similar letters and figures indicate corresponding parts.

The blast or exhaust pipe A shown is of the triple-expansion type illustrated in my
40 prior patent, No. 549,029, of October 29, 1895, comprising the three steam-nozzles 1 2 3, air-inlets 4 5, and air-passages and confining-chambers 6 7 8, together with the annular blower or nozzle 10, surrounding the discharge end of the apparatus. The steam-nozzles 1 2 3
45 communicate with the cylinders and are supplied with exhaust-steam therefrom, and the blower 10 communicates directly with the boiler, from which it receives live steam, said blower operating either as an adjunct to the exhaust-steam nozzle for increasing the draft

or as a substitute when the engine is at rest or the exhaust is cut off.

The exhaust-pipe is located in the smoke-box B at the front end of the boiler and extends upward through the diaphragm-plate C, with its discharge end beneath and in line with the smoke-stack. The diaphragm-plate has its front edge extended downward toward the front of the smoke-box and is provided
60 with an adjustable section or sections 11. A wire-netting or perforated plate 12 bridges the space between the diaphragm-plate and walls of the smoke-box.

The air-inlets of the exhaust-pipe are disposed longitudinally of the boiler, that is to say, the inlets on one side face the flues and those on the opposite side open toward the front end of the smoke-box.

When the exhaust apparatus is in operation, the products of combustion are drawn with considerable force through the flues and discharged into the smoke-stack through the exhaust-pipe, the draft being sufficient to carry loose particles of varying dimensions and degrees of temperature forward into the smoke-box, where they are either detained or discharged through the exhaust apparatus. These particles, if discharged, are a source of danger and damage from fire, besides which
80 if discharged through the exhaust-pipes they act as abrading agents upon the surfaces of the passages and contribute materially in shortening the life of the blast-pipe.

One of the objects of my present improvements is to reduce or overcome in a large measure those defects by favoring the arrest and detention of the larger and more destructive particles within the smoke-box. With this end in view a barrier or deflector E is
90 interposed between the flues and the induction-openings facing said flues, the said deflector consisting of a pair of vertical walls or plates 15, set on converging lines, the apex facing the flues, while the exhaust-pipe occupies a position intermediate the rear edges of said plates. The induction-openings on the rear side of the exhaust-pipe are preferably located in line with the base of said deflector or slightly within said base, as shown,
100 and the plate or plates 15 may for convenience be secured at top and bottom to heads 16, at-

tached to the exhaust-pipe A. If found necessary or desirable, a netting may be arranged to cover the induction-openings, but ordinarily this is not necessary. The larger particles drawn through the flues and moving at high velocities striking against the surface of the barrier E are deflected laterally and compelled to pass to the front of the exhaust-pipe beyond the induction-openings, while the gaseous products, being very much less influenced by inertia, are free to circulate around the edges or wings of said barrier or deflector and enter through the space between plates 15 and the exterior of the exhaust-pipe into the induction-passages.

The relation which the induction-openings bear to the wings of the deflector may be varied and adjusted to suit special conditions, but it is found in practice the best results are obtained when the sides of the deflector extend to a point slightly in front but removed laterally from the induction-openings, under which conditions a free passage is formed for the gaseous products, which latter are drawn around the wings of the deflector, while the larger solid particles, striking the exterior faces of the deflector, are carried by their inertia beyond the wings of the deflector and out from the influence of the current flowing into the exhaust-pipe. The air-induction openings at the front of the exhaust-pipe are also provided with means for retarding and preventing the entrance of the larger particles carried through the flues.

Extending slightly above the front or lower edge of the diaphragm-plate and ranged on opposite sides of the exhaust-pipe are two vertical walls or plates 20, within their rear edges fitted to the sides of the exhaust-pipe and having their front or free edges at some distance beyond the induction-openings. These plates 20 serve to impede the passage of the larger particles entering the front of the smoke-box under the diaphragm-plate and prevent them from lodging at the base and immediately in front of the exhaust-pipe, where they would form an obstruction to the free entrance of gases through the lower induction-openings. The induction-openings in the front of the exhaust-pipe are also protected by a spark plate or guide 30, of special construction, adapting it to permit a free passage for gaseous materials and to retard and deflect the larger solid particles drawn toward it by the action of the exhaust. This guide or barrier 30 presents two vertical series of plates or bars, preferably horizontally disposed, the bars or plates of each series being separated to form slots or openings, with the bars or plates of one series opposite the slots or openings of the other series and slightly removed therefrom. In one of the preferred forms (see Figs. 4 and 5) the inner or rear plate 32 is provided with a series of parallel bars 33, separated to form slots 34. The outer plate 35, held removed a short distance from the inner plate, as indicated in Fig. 3, is also

provided with a series of bars or plates 36 and intermediate slots 37, the two plates being so constructed and arranged that the bars 36 of the outer plate will stand opposite the slots 34 of the inner plate. The slots in the inner plate are preferably slightly wider than the bars of the outer plate to diminish the retarding action upon the gases, and an open space is formed or left between the rear edges of the two plates for the escape of particles passing through the slots of the outer plate and impinging against the inner bars or plates. The operation of this compound plate is somewhat similar to and it may be employed in lieu of the deflector-plate in rear of the exhaust-pipe; that is to say, it provides an obstructing media for arresting or deflecting the flight of the solid particles moving in comparatively straight lines and under the momentum due to superior weight, at the same time presents a somewhat tortuous passage through which the gases readily flow. The solid particles entering the slots of the outer plate encounter the plates or bars of the rear plate and are deflected, while the gases are drawn through the adjacent slots in the rear plate.

As before stated, the double-barred form may be employed on the rear side of the exhaust-pipe, in which case both series of bars or plates will serve as deflectors for the larger solid particles drawn through the flues, those particles entering between the plates or bars of the outer series being caught by the bars or plates of the inner series and deflected and discharged through the opening between the two plates at the rear edges thereof.

It is customary to arrange a petticoat-pipe 40 between the induction end of the blast or exhaust-pipe A and the base of the smoke-stack for the purpose of modifying the action of the blast and regulating the expansion of steam in the smoke-stack.

Under the varying conditions of application it not infrequently happens that the position of the petticoat-pipe requires change and adjustment to produce the most efficient action. As this part of the apparatus is attached or suspended at the base of the smoke-stack it is not readily accessible for adjustment as a whole. Moreover, the lower portion or hood having been properly adjusted with reference to the upper or induction end of the blast-pipe, the upper end may be found to require further adjustment with relation to the smoke-stack, necessitating the removal of the petticoat-pipe and the substitution of a longer or shorter pipe.

To overcome these defects and provide for the ready adjustment in the most advantageous relation to the exhaust-pipe and smoke-stack, the petticoat-pipe is furnished with an adjustable upper section or ring 41, attached to the petticoat-pipe in a manner to permit vertical adjustment or extension, so that the upper end of the said pipe may

readily be extended or retracted and its position with relation to the smoke-stack changed without disturbing the relation between the exhaust-pipe and lower section of the petticoat-pipe, which latter relation is ascertained and fixed before the apparatus is applied to the boiler.

For the purpose of isolating the larger particles which accumulate in the smoke-box and to provide for their convenient removal a chamber F is formed at the front end of the smoke-box by the insertion of a plate 42, extending from the bottom to a point near the top of the smoke-box at some distance in front of the exhaust-pipe. The upper edge of this plate or partition 42 is preferably inclined upward and forward and terminates just below the netting, leaving a space or passage through which the solid particles striking against the netting are conducted into the dead-air space or chamber in front of the plate 42. The lower portion or bottom of said chamber is furnished with a discharge-valve 43, by means of which the accumulation of cinders can readily be removed or discharged.

Having thus described my invention, what I claim as new is—

1. In an exhaust apparatus, such as described, the combination of the following elements, to wit; a blast or exhaust pipe located in the smoke-box in advance of the flues and having an air inlet or inlets facing the flues; and an imperforate deflector located between the flues and exhaust-pipe in the line of movement of solid particles issuing from the flues; substantially as described.

2. In an exhaust apparatus, such as described, the combination with the exhaust-pipe and flues of the deflector provided with converging vertical walls, the apex of said deflector facing the flues, and the exhaust-pipe being located at the base between the

diverging edges of the deflector, substantially as described.

3. In an exhaust apparatus such as described, the combination with the smoke-box, flues, smoke-stack and diaphragm-plate, of the exhaust-pipe located in the smoke-box and projecting through the diaphragm-plate beneath the smoke-stack, and the deflector located in the smoke-box beneath the diaphragm-plate between the exhaust-pipe and flues, said deflector comprising converging vertical plates with the apex facing the flues and the sides extending laterally to or beyond the air-inlet openings of the exhaust-pipe; substantially as described.

4. In an exhaust apparatus, such as described, and in combination with the exhaust-pipe of a deflector for the air-inlet openings provided with two series of bars or plates and intermediate slots or openings, the bars of one series being opposite the slots or open spaces between the bars of the other series and slightly removed therefrom to form an open space or passage between the bars of the two series, substantially as described.

5. In an exhaust apparatus, such as described, the combination with the exhaust-pipe provided with an air-inlet opening of a screen or deflector covering said inlet-opening, said screen or deflector comprising two series of horizontal bars or plates lying in different vertical planes, to form a passage between them, the bars or plates of one series alternating with the bars or plates of the other series in vertical succession, so as to bring the bars or plates of the outer series opposite the spaces or openings between the bars or plates of the inner series, substantially as and for the purpose specified.

JOHN Y. SMITH.

Witnesses:

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