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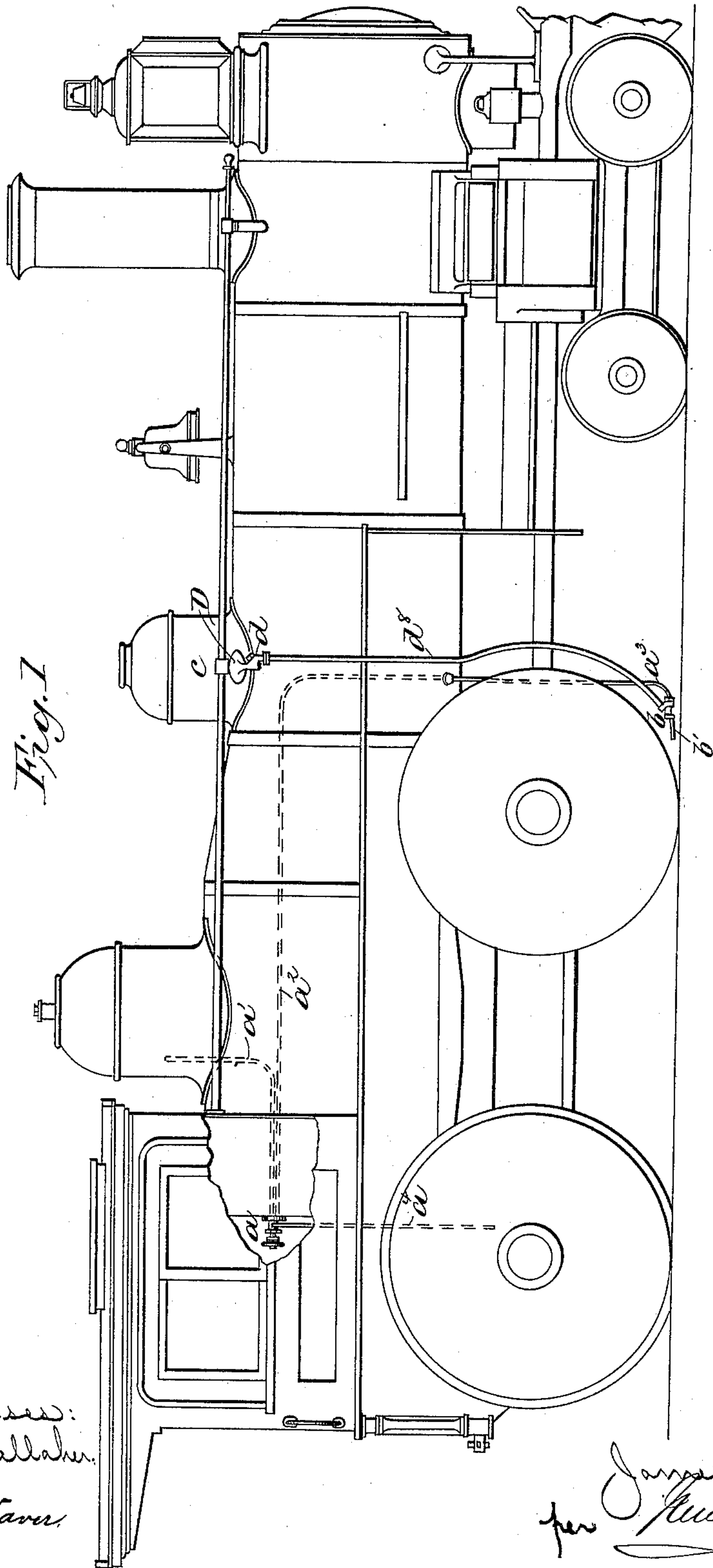
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METHOD OF APPLYING SAND TO RAILS OF RAILWAYS.

No. 409,578.

Patented Aug. 20, 1889.



Witnesses:
C. H. Gallaher.
A. W. Weaver.

For Inventor
James Gresham
per Henry M. L. Atty

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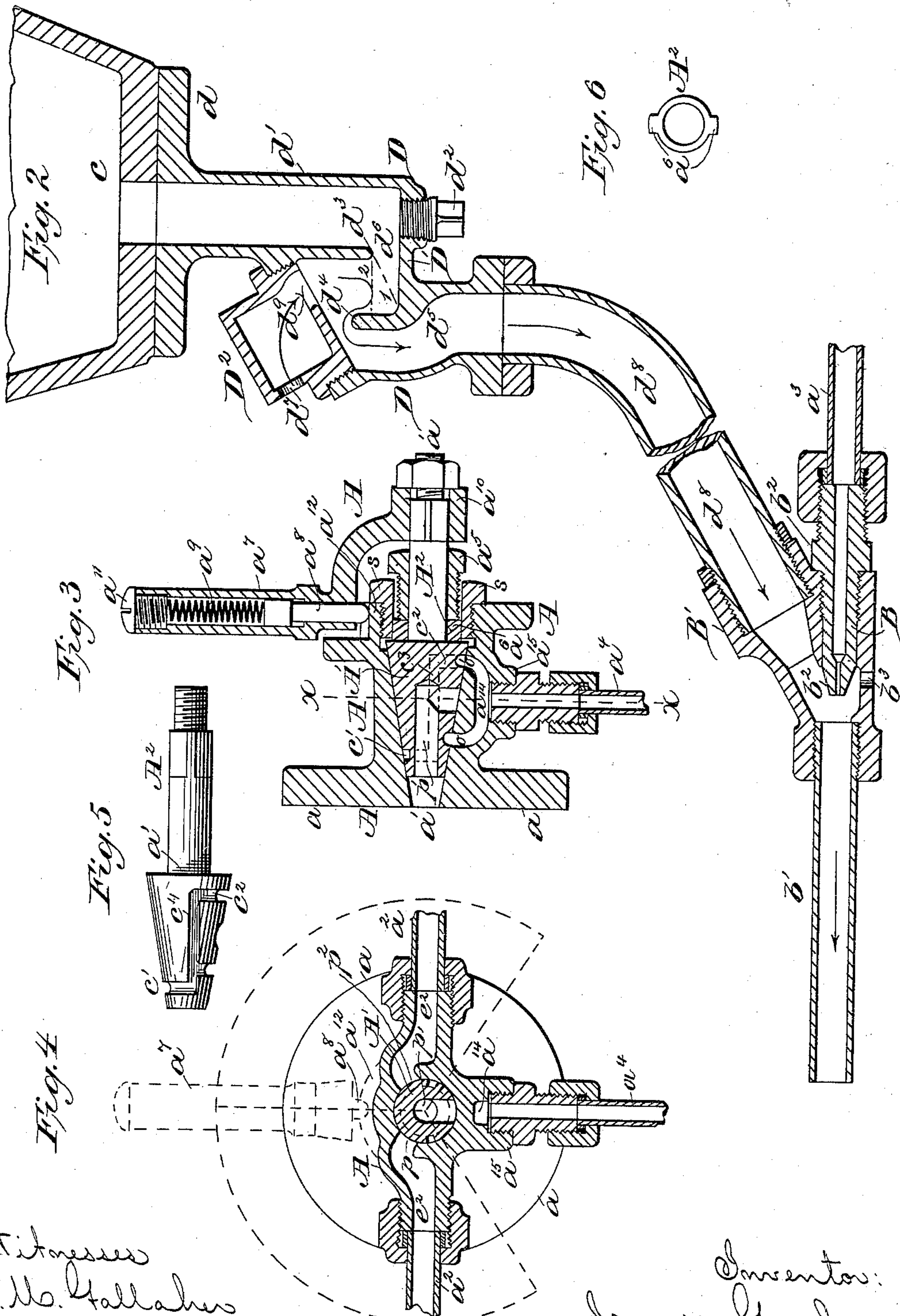
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UNITED STATES PATENT OFFICE.

JAMES GRESHAM, OF STRETFORD, NEAR MANCHESTER, COUNTY OF LANCASTER, ENGLAND.

METHOD OF APPLYING SAND TO RAILS OF RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 409,578, dated August 20, 1889.

Application filed March 30, 1888. Serial No. 269,020. (No model.) Patented in England April 26, 1887, No. 6,072; in France July 25, 1887, No. 184,974; in Germany July 25, 1887, No. 42,954; in Belgium November 2, 1887, No. 79,391; in Italy November 7, 1887, XLIV, 442; in Canada February 7, 1888, No. 28,496; in Austria-Hungary March 8, 1888, and in India March 13, 1889, No. 39.

To all whom it may concern:

Be it known that I, JAMES GRESHAM, a subject of the Queen of Great Britain, residing at Stretford, near Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in a Method of Applying Sand to the Rails of Railways to Prevent the Slipping of the Driving-Wheels of Locomotives, (for which I have obtained Letters Patent in Great Britain, No. 6,072, dated April 26, 1887; in France, No. 184,974, dated July 25, 1887; in Germany, No. 42,054, dated July 25, 1887; in Belgium, No. 79,391, dated November 2, 1887; in Italy, No. 442, Vol. 44, dated November 7, 1887; in Canada, No. 28,496, dated February 7, 1888; in Austria-Hungary, (not yet numbered,) dated March 8, 1888, and in India, No. 39, date of permission to file a specification March 13, 1889;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters and figures of reference marked thereon, which form a part of this specification.

The invention relates to a novel mode of distributing sand to the driving-wheels of a locomotive, or between the tread of said wheels and the rails upon which they run, to give increased adhesion when required and prevent the wheels from slipping on the rails.

To these ends the invention consists in the mode of taking up the sand from the sand-box and projecting the same to the point at which it is to be delivered by means of a current of air and steam, substantially as hereinafter fully described, and set forth in the claims.

Any suitable means may be employed in carrying out my invention, and in my Letters Patent of the United States, dated April 29, 1888, No. 381,837, I have described and claimed certain improved devices for carrying out the method forming the subject-matter of this invention, to which devices I will refer hereinafter.

In the distribution of sand to the rails, or between the rails and the tread of the locomotive-drivers, the sand has heretofore been allowed to fall by gravity from a sand-box to its point of destination, being guided thereto by suitable pipes or tubes or hose. In some cases it has also been proposed to propel the sand to its destination by the aid of a jet of steam. In either of these cases it has been found very difficult to regulate the amount of sand to be delivered to the rails, while, on the other hand, the sanding devices were liable to become choked, especially where the sand is carried in a more or less horizontal plane to its point of destination. These difficulties are avoided by my novel mode of distribution, inasmuch as the volume of sand delivered to the rail is governed by the force of the air-current by which it is taken up and carried to the point from which it is projected, and inasmuch as the force of said current can be regulated at will, so as to take up more or less sand from the surface of a non-moving body, over and in contact with which surface the induced air-currents are caused to pass and lick or take up the sand by the action of passing over it. On the other hand, the sand being driven or carried by a current of air through the ducts leading from the sand-box to the point from which the sand is projected to its destination, the said ducts are not liable to become choked up by the sand even when said ducts have but a very slight inclination.

Referring to the drawings, Figure 1 is an outline of a locomotive, showing the improved sand-distributing apparatus applied to the forward side of the front driving-wheels. Fig. 2 is an enlarged sectional view of the sand-distributing apparatus. Fig. 3 is a vertical transverse section of the steam-cock for admitting steam to the ejector of the sand-distributing apparatus. Fig. 4 is a section taken on line *xx* of Fig. 3. Fig. 5 is an elevation of the plug of the steam-cock, and Fig. 6 is an end view of the washer A'.

The sand employed is, by preference, dry, or nearly so, and is contained in a receptacle *c*, Fig. 2, which is either so located under the

locomotive as to prevent access of rain or other moisture to the sand therein, or said receptacle, when exposed to atmospheric influences, is closed by a suitable lid or cover. The receptacle *c* is connected with the sand-trap D proper by means of a duct or pipe *d'*, of sufficient inclination to allow the sand to flow freely to the trap.

In Fig. 2 I have shown the pipe *d'* as forming an integral part with the trap D and as provided with a flange or collar *d*, from which the sand box or receptacle *c* is supported, and I have shown said pipe in an approximately-vertical position. The lower end of the pipe is enlarged to form a receptacle or trap, into which the sand flows from pipe *d'*, a portion of the lower end of said pipe being cut away, as at *d³*, to leave an opening *d⁶*, communicating with the enlarged part D'. The enlarged portion D' is open at top and communicates with a duct or pipe *d⁵*, also formed integral with the trap, to which pipe *d⁵* the connecting-pipe *d⁸*, leading to the ejector, is connected. Around the trap is formed a chamber *d⁴*, that has a screw-threaded opening, into which is screwed a chambered or hollow plug D², which has an opening *d⁷* in its vertical wall communicating with the atmosphere, and an opening *d⁹* in its bottom immediately above the sand-trap to admit a current of air directly onto the sand therein. Over and in contact with the surface thereof the induced air-currents sweep and take up and carry away a portion. In the bottom of the trap and on a line with the axis of the pipe *d'*, that conducts the sand to the trap, is formed a discharge-opening closed by a plug *d²*, for the purpose of removing small stones or other heavy or bulky substances that may come into the trap in any manner.

By means of the described construction of sand-trap the surface of the body of the sand at the opening *d⁶* will lie about in the angle shown by the dotted line 1, and no amount of pressure exerted on the column of sand in pipe *d'* can effect a change of this inclination, yet the vibrations of the locomotive will cause said surface to assume a horizontal position, as shown by dotted line 2, not quite level with the upper edge of the trap; but the sand will not rise above said partition, either under any pressure in the column of sand in pipe *d'* or under any vibration of the locomotive, so that when the apparatus is not in operation all waste of sand will be avoided, and when the apparatus is in operation the body of the sand will present a still or non-moving surface. The pipe *d⁵* is connected with the ejector-casing B' by a pipe *d⁸* in such a manner that the axis thereof will lie at an angle to the axis of the ejector B and feed the sand in front of the ejector-nozzle *b²*, as shown. Immediately below the nozzle *b²* an opening *b³* is formed in the ejector-casing B' to allow the sand left in the pipe or casing to pass out when the ejector is stopped—that is to say,

when the steam is shut off—and thus prevent the passage from being choked.

The wear produced by the action of the sand-blast is well known, and to protect the ejector-casing against such wear I connect therewith immediately in front of the ejector-nozzle a discharge pipe or nozzle *b'*, so that said pipe may be readily removed when worn and a new one attached at a trifling expense. The ejector B is connected with the steam-cock by a pipe *a³* and a pipe *a²*. Said pipe *a²* may, if desired, and as shown in dotted lines in Fig. 1, extend partly through the boiler to a point in proximity to the sanding apparatus, thence to the outside thereof, where it is connected with the pipe *a³*, or said pipes may be arranged wholly outside of the locomotive-boiler. The steam-cock A may be connected directly with the steam-space of the boiler, or, as shown in dotted lines in Fig. 1, by a pipe *a'* with the steam-dome of the said locomotive-boiler.

The sanding apparatus is duplicated on opposite sides of the locomotive in front of the forward drive-wheels, and, if desired, a like apparatus may be applied in rear of said drive-wheels, if the locomotive is intended to run backward on more or less steep grades.

The steam-cock, Figs. 3 to 6, is constructed as follows: A indicates the casing or barrel, provided with a flange *a* for attachment to the front of the boiler or fire-box thereof. The casing has an axial conical passage, in which is seated a corresponding plug A', provided with an axial passage *p'* for steam, which, by turning the cone-plug, can be brought in communication with one or the other of the outlet-ports *p p²*, Fig. 4, formed in the barrel or casing A, which is provided with branches *e² e²* for connecting the cock with the pipes *a²*, leading to the ejectors. The plug A' is further provided at each end, respectively, with a peripheral channel or groove *c' c²* half-way around the same, one groove or channel *c'* at one end being formed on one side of the plug, and the other *c²* at the opposite end on the opposite side of said plug, and said grooves are connected by longitudinal peripheral channels *c³ c⁴*, formed on opposite sides of the plug and parallel to its axis, as shown in Figs. 3 and 5. When the plug is in a given position, one of the extremes of the partly-annular grooves lie opposite the openings or ports *o o'*, Fig. 3, formed in the cock-casing, said ports communicating with a passage *a¹⁴*, and the latter with a branch *a¹⁵*, to which is connected a drip-pipe *a⁴*, Figs. 3 and 4. Any steam leaking from the lateral passage in the cone-plug or passage between the cone-plug and its casing is intercepted by and enters the channels and grooves on the exterior of the plug and escapes to the drip-pipe *a⁴* as waste or condensed steam, and as the drip-pipe is placed where it is constantly kept warm said pipe cannot freeze up in cold weather, the leakage being thus prevented

from entering the connections between the cock and ejectors or passing to the latter. The cone-plug A' is kept in position by a nut or gland s, and it is held steam-tight by a gland 5 or nut a⁵, that screws into the gland or nut s, its inner end abutting against a washer or ring A², Figs. 3 and 6, that has two projections a⁶, that fit into grooves formed in the inner periphery of the gland s. The ring or washer A² 10 prevents the rotation of the plug A' when the gland a⁵ is unscrewed for any purpose. The plug a' is operated by a handle or lever a⁷, projecting from an arm formed on a square or head a¹⁰, secured to the end of the stem a' 15 of the plug A'. The handle or lever a⁷ is hollow or tubular and contains a pin a⁸ free to slide therein, said pin being forced outward by a spring a⁹, whose ends abut, respectively, against a screw-plug a¹¹ and the head of the 20 pin a⁸, as shown in Fig. 3. The cone end of the pin a⁸ is forced outward by the spring a⁹ against a cylindrical segment a¹², formed on and projecting from the casing A of the cock, in which segment is formed a stop-notch for 25 the end of said pin when the cock is closed to shut off the steam from both ejectors, as shown in Figs. 3 and 4.

The described cock may be used for supplying steam to each pair of ejectors in front 30 and rear of the driving-wheels of the locomotive by moving the handle to one or the other side of the stop-notch in segment a¹². The steam may be supplied to the ejectors by one pipe for both sides of the locomotive and for 35 one side of the driving-wheel, so that sand is simultaneously applied, say, in front of a pair of driving-wheels by turning the cock one way, and by reversing the position of the cock steam will be simultaneously supplied to 40 ejectors to apply sand in rear of a pair of driving-wheels. The current of air and volume of sand ejected are greatest when the steam is fully turned on, and they decrease in proportion to the volume of steam 45 supplied to the ejectors, so that the volume of sand delivered to the rails or between the rails and tread of the drivers may be regulated.

From the above description the operation 50 of my improved sanding apparatus for locomotives will be readily understood and need not be further described, except to say that as the level of the sand in the sand-trap cannot rise above the upper edge of said trap 55 there is no waste of sand, also that the volume of sand delivered by or discharged from the delivery-nozzles b' is dependent on the volume of steam and the consequent volume and velocity of the air that is drawn in through 60 the hollow screw-cap D', said air impinging on and taking up the sand from its surface in the trap. Consequently the volume of sand delivered to the ejectors is readily regulated, as above set forth.

65 I do not desire to claim, broadly, the forcible delivery of sand through the medium of an ejector to the drivers of a locomotive or to

the rails in front of said drivers or between the tread of the drivers and the rails, as such had been proposed previous to my invention, 70 as shown by Letters Patent granted in England to Frances Holt under date of July 18, 1885, No. 8,680; but the construction of apparatus therein shown has many serious defects. For instance, the pipes that deliver the 75 sand to the ejectors are so arranged as to be liable to choke, there being quite a sharp angle or bend in said pipes, while a portion thereof is nearly horizontal. I have above 80 stated that sand will not flow unless the angle of motion or flow is greater than thirty degrees, as experience has fully demonstrated, and, in fact, the angle of flow should not be much less than forty-five degrees. Nor is there any provision made for avoiding a waste of 85 sand, the latter having access to the delivery-pipes, choking them up, and no amount of steam supplied to the ejectors can dislodge it, and, in fact, the sand is liable to choke up the ejector itself, since the sand has to pass in 90 and through the cavity on the exterior of the steam-nozzle of such ejector. The conveying of the sand to the ejector by means of a current of air and the forcible delivery of such sand, as described, are of great importance, as 95 it is well known that it bites into and roughens the metal upon which it impinges, thus giving an additional hold to the drivers on the rails, and by this means I believe coupled 100 drivers may be in great measure dispensed with, thereby doing away with the danger and other disadvantages inherent to the use of coupled drivers.

I also believe that I am the first to discover that the sand may be supplied to the ejector 105 by causing a current of air to lift it and carry it to the ejector to be delivered by the jet of steam. The importance of this feature of my invention will be readily understood by locomotive-engineers. 110

Having now described my invention, what I claim is—

1. The method, substantially herein described, of sanding railroad-rails, which consists in inducing an air-current within a closure open to the outer air and over and in contact with the surface of a non-moving body of sand contained within said closure by means of the sucking action of a steam-jet, and inducing the sand-laden current so produced 120 into the path of the steam-jet by means of the same force.

2. The method herein described, which consists in utilizing the inducing force of a jet of steam as the means of causing a current of 125 air to be drawn within a closure over and in contact with the surface of a non-moving body of sand and to take up and carry by such inducing action into the path of the steam-jet a portion of the sand from its surface and 130 varying the volume of the sand so taken up by the induced air-current by varying the velocity of the latter.

3. The method, substantially herein de-

scribed, of sanding railroad-rails, which consists in supplying the sand-blast by means of a current of air induced by means of a jet of steam, and caused to impinge upon the surface of the sand and to take up by such impingement and carry a portion therefrom into the path of the said jet through a conduit having perpetual communication with the said sand surface and the said steam-jet.

In testimony whereof I affix my signature in the presence of two witnesses.

JAMES GRESHAM.

Witnesses:

PETER J. LIVSEY,
WILLIAM FAULKNER.