

(No Model.)

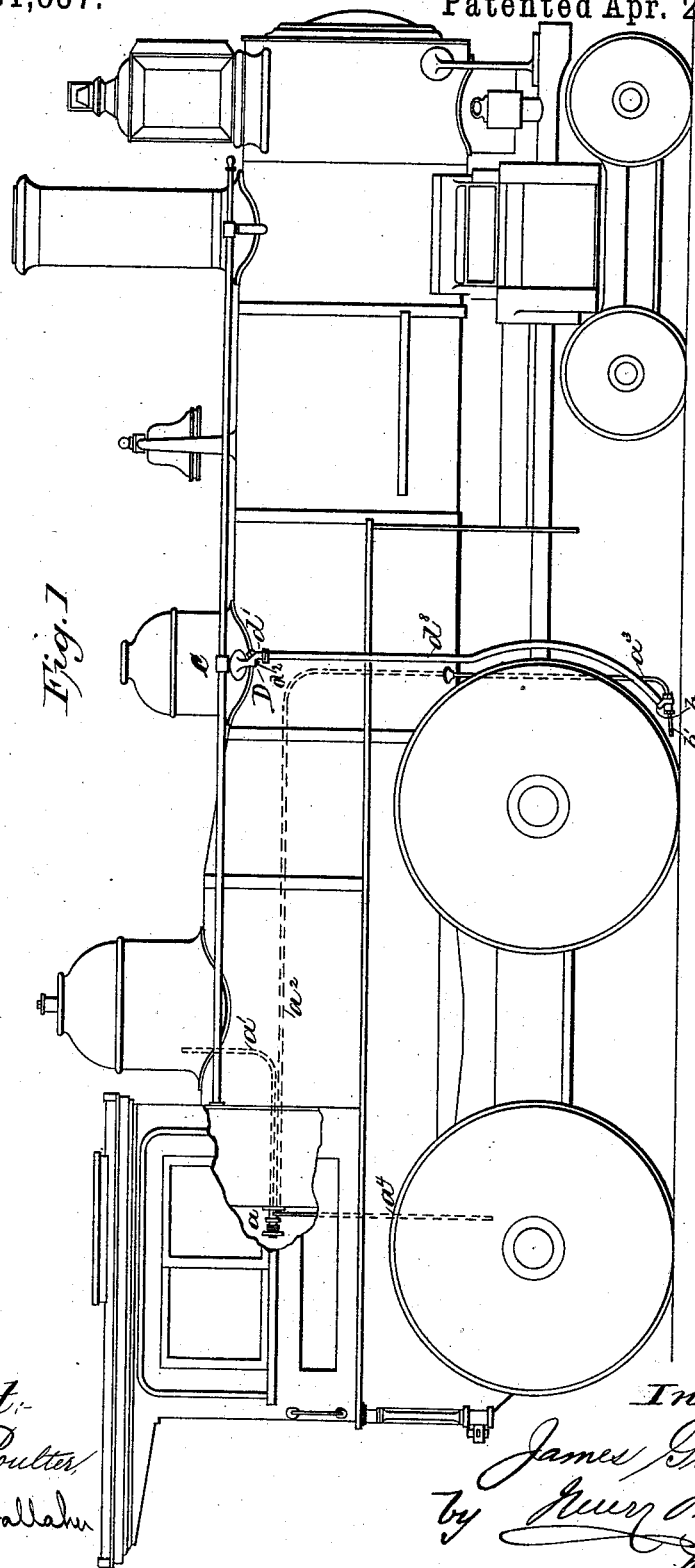
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J. GRESHAM.

APPARATUS FOR APPLYING SAND TO THE DRIVING WHEELS OF LOCOMOTIVES.

No. 381,837.

Patented Apr. 24, 1888.



Attest:-
W. C. Poulter
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Inventor:
James Gresham,
by *Guerry*
his attorney.

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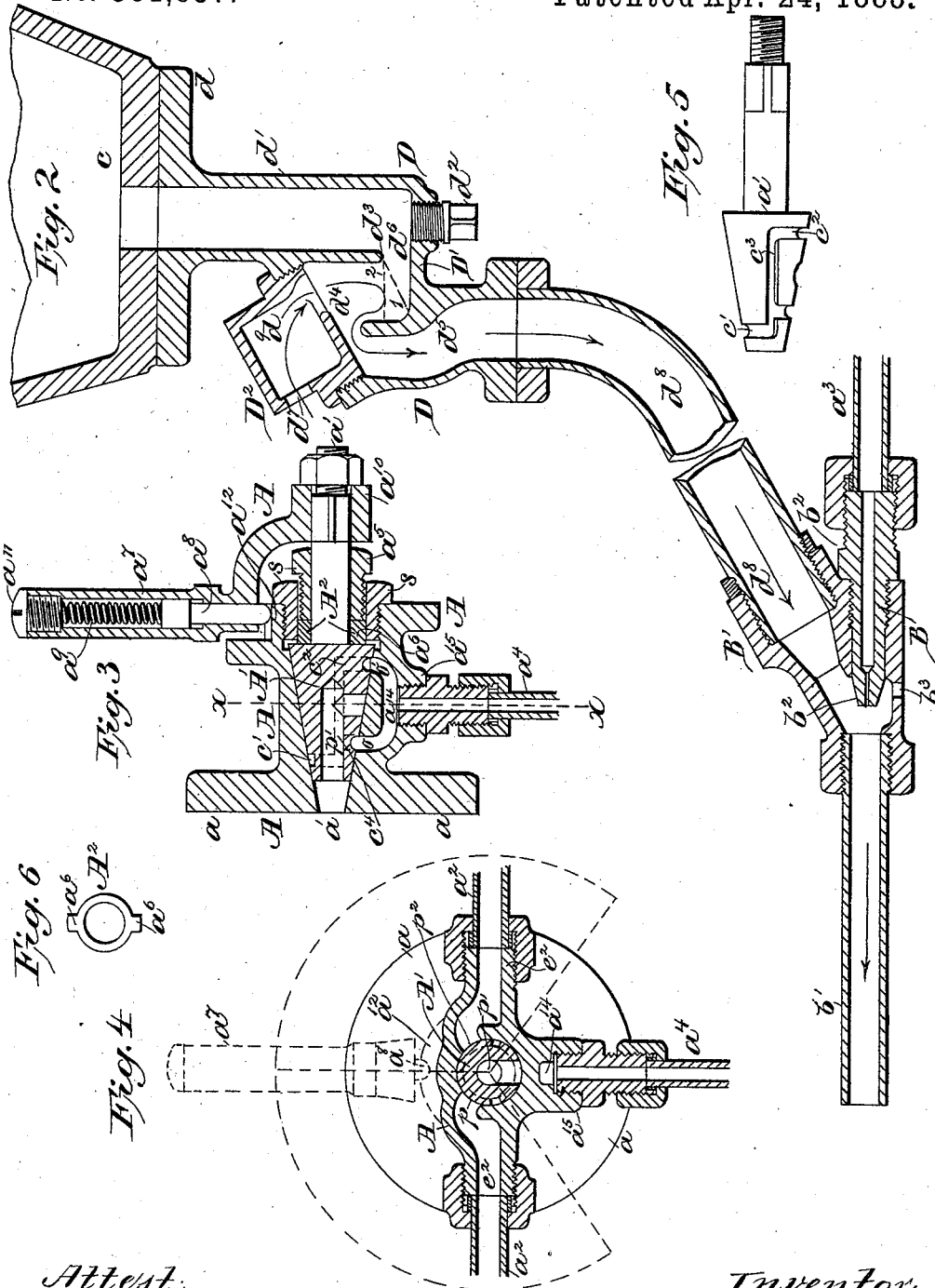
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APPARATUS FOR APPLYING SAND TO THE DRIVING WHEELS OF
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Patented Apr. 24, 1888.



Attest:
W. C. Souther.
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UNITED STATES PATENT OFFICE.

JAMES GRESHAM, OF STRETFORD, NEAR MANCHESTER, ENGLAND.

APPARATUS FOR APPLYING SAND TO THE DRIVING-WHEELS OF LOCOMOTIVES.

SPECIFICATION forming part of Letters Patent No. 381,837, dated April 24, 1888.

Application filed August 22, 1887. Serial No. 247,586. (No model.) Patented in England August 20, 1885, No. 9,861; in France July 25, 1887, No. 184,974; in Germany July 25, 1887, No. 42,054, and in Belgium November 2, 1887, No. 79,391.

To all whom it may concern:

Be it known that I, JAMES GRESHAM, a citizen of Great Britain, residing at Stretford, near Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Apparatus for Applying Sand to the Driving-Wheels of Locomotives, (for which I have obtained Letters Patent in Great Britain, dated August 20, 1885, No. 9,861; in France, dated July 25, 1887, No. 184,974; in Germany, dated July 25, 1887, No. 42,054; and in Belgium, dated November 2, 1887, No. 79,391;) 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 or figures of reference marked thereon, which form a part of this specification.

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 A².

My invention relates to an apparatus for applying sand to the driving-wheels of a locomotive, or to the rails in front of such wheels, 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; and said invention is an improvement on similar apparatus for which I obtained Letters Patent in England under date of August 20, 1885, No. 9,861.

The object of the invention is to provide an apparatus for the purposes above set forth that shall be efficient in operation and so constructed as to avoid all liability of the sand-distributing device, or the connections between said device and the sand-box, from becoming choked, and to avoid all waste of sand, and to provide means to prevent the leakage of steam

or condensed steam at the steam-cock from being conveyed to the injector or its connections, thereby avoiding the freezing of such condensed steam in cold weather, and the consequent choking up of the connections or ejector.

To these ends the invention consists in the construction of the sanding apparatus and in the construction, combination, and co-operation of the parts thereof, substantially as hereinafter described, and as set forth in the claims.

The invention further consists in the combination, with the ejector of the sanding apparatus and the source of steam-supply, of a steam-cock interposed in the connections between the two, and so constructed as to prevent the condenser-pipe from reaching the connections between the cock and ejector, substantially as hereinafter fully described, and as set forth in the claims.

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 *d*³, to leave an opening, *d*², communicating with the enlarged part D'. The enlarged portion D' is open at top and communicates with a duct or pipe, *d*³, also formed integral with the trap, to which pipe *d*³ the connecting-pipe *d*², leading to the ejector, is connected. Around the trap is formed a chamber, *d*⁴, that has a screw-threaded opening, into which is screwed a chambered or hollow plug, D², that has an opening, *d*¹, in its vertical wall communicating with the atmosphere, and an

opening, d^b , in its bottom immediately above the sand-trap to admit a current of air directly onto the sand therein. 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, d^c , 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 d^c 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. The pipe d^b is connected with the ejector-casing B' by a pipe, d^b , 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 b^2 , as shown. Immediately below the nozzle b^2 an opening, b^3 , is formed in the ejector-casing B' to admit air thereto, thereby preventing the formation of an eddy in front of the ejector-nozzle and an accumulation of sand, and also to allow any sand or small stones that may lodge there to escape when the apparatus is stopped.

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, a^3 , and a pipe, a^2 . Said pipe a^2 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 a^3 ; 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 two outlet-ports, p p^2 , Fig. 4, formed in the barrel or casing A, which is provided with branches c^2 c^2 for connecting the cock with the pipes a^2 leading to the ejectors. The plug A' is further provided at each end, respectively, with a peripheral channel or groove c' c^2 half-way around the same, one groove or channel, c' , at one end being formed on one side of the plug and the other, c^2 , at the opposite end on the opposite side of said plug, and said grooves are connected by longitudinal peripheral channels c^3 c^4 , 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 lies opposite two openings or ports, o o' , Fig. 3, formed in the cock-casing, said ports communicating with a passage, a^4 , and the latter with a branch, a^{15} , to which is connected a drip-pipe, a^4 , Figs. 3 and 4.

Any steam leaking from the lateral passage in the cone-plug or passing 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 a^4 , 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 or nut, a^5 , 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, a^6 , that fit into grooves formed in the inner periphery of the gland s . This ring or washer A² prevents the rotation of the plug A' when the gland a^5 is unscrewed for any purpose. The plug a' is operated by a handle or lever, a^7 , projecting from an arm formed on a square or head, a^{10} , secured to the end of the stem a' of the plug A'. The handle or lever a^7 is hollow or tubular and contains a pin, a^8 , free to slide therein, said pin being forced outward by a spring, a^9 , whose ends abut respectively against a screw-plug, a^{11} , and the head of the pin a^8 , as shown in Fig. 3. The cone end of the pin a^8 is forced outward by the spring a^9 against a cylindrical segment, a^{12} , formed on and projecting from the casing A of the cock, in which segment is formed a stop-notch for 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 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 a^{12} .

The steam may be supplied to the ejectors by one pipe for both sides of the locomotive and for one side of the driving-wheels, 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 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 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 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 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 the hollow screw-cap *D*, said air impinging on and taking up the sand in the trap; consequently the volume of sand delivered to the ejectors is readily regulated, as above set forth.

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 has been proposed previous to my invention, as shown by Letters Patent granted in England to Francis 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 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. The 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 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 and through the cavity on the exterior of the steam-nozzle of such ejector.

The forcible delivery of sand, as described, is of great importance, as 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 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 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.

I do not desire to claim herein the mode of projecting sand between the tread of the wheels of a locomotive and the rails, or the mode of regulating the volume of sand so projected, as I intend to file a separate application for patent for the same.

Having now described my invention, what I claim is—

1. In a sanding apparatus for locomotives, the combination of a sand-trap, a sand-delivery pipe communicating with the delivery of the sand-trap, and an ejector connected with the delivery-pipe and operating to induce a current of air through the trap and delivery-pipe, and to eject from said pipe the sand carried thereto by said air-current, substantially as and for the purpose specified.

2. In a sanding apparatus for locomotives, the combination of a sand-receptacle, a sand-trap provided with an air-inlet and with a feed-port connected with the sand-receptacle and arranged at a point below the delivery of said trap, a sand-delivery pipe communicating with the delivery of the trap, and an ejector connected with the delivery-pipe and operating to induce a current of air through the trap and delivery-pipe, and to eject from said pipe the sand carried thereto by the air-current, substantially as and for the purpose specified.

3. In a sanding apparatus for locomotives, the combination, with a sand-trap open at top, of a feed-duct forming one of the walls of the trap, an air-duct arranged at an angle to said duct to cause the air admitted to the sand-trap to impinge upon said duct, a delivery-pipe communicating with the open end of the trap, and an ejector connected with the delivery-pipe and operating to induce a current of air through the trap and delivery-pipe, and to eject from said pipe the sand carried thereto by the air-current, substantially as and for the purpose specified.

4. In a sanding apparatus for locomotives, the combination of a sand-receptacle, a sand-trap consisting of a vessel or receiver open at top, a feed-duct connected with the sand-receptacle and projecting into the sand-trap, a supply port or passage connecting the trap with the feed-duct, said port or passage being arranged relatively to the trap and the feed-duct to cause the sand to flow into the trap at an angle of not less than thirty degrees, a steam-ejector, a sand-delivery pipe extending to the upper edge of the sand-trap and in front of the ejector-nozzle, an air-duct adapted to conduct the air over the mouth of the sand-delivery pipe into the sand-trap to take up the sand and carry the same to said sand-delivery pipe, and a delivery-nozzle for delivering the combined sand, air, and steam, substantially as and for the purpose specified.

5. In a sanding apparatus for locomotives, the combination, with the source of steam-supply, a steam-ejector, a pipe or pipes connecting the ejector with said source of steam-supply, and a pipe adapted to supply sand in front of the ejector - nozzle, of a steam-cock interposed in the connections between the source of steam-supply and the ejector, and a drip-pipe connected with the steam-cock, said steam-cock being provided with ports and passages formed in the periphery of its plug and communicating with the drip-pipe to conduct the leakage or condensed steam to said drip-pipe when the cock is closed and prevent said leakage or condensed steam from passing to the ejector or its connections with the source of steam-supply, substantially as and for the purpose specified.

6. In a sanding apparatus for locomotives, the combination, with a steam-ejector, of the sand-receptacle *c*, a delivery-pipe, *d'*, opening into the sand-receptacle, the sand-trap *D*, a port or passage, *d''*, between said trap and delivery-pipe, the pipe *d'*, connecting the trap with the ejector, as described, and the hollow plug *D'*, (provided with the air-ports *d'* and *d''*), screwed into the casing of the sand-trap, said parts being constructed and operating substantially as and for the purpose specified.

7. In a sanding apparatus for locomotives, the combination, with a plurality of steam-ejectors, the locomotive-boiler, and pipes connecting the ejectors with the steam-space of the boiler, of a steam-cock interposed in said connections, comprising a casing having branches to which said ejector connections are coupled, and ports communicating with said branches, a plug provided with an axial steam-passage, and a steam-port in communication with said passage and adapted to communicate with the ports leading to the branches of the casing, the glands *s* and *a''*, the washer *a''*, and the lever *a'* on the stem *a'* of the plug, said parts be-

ing constructed and operating substantially as and for the purpose specified.

8. In a sanding apparatus for locomotives, the combination, with a plurality of steam-ejectors, the locomotive-boiler, and pipes connecting the ejectors with the steam-space of the boiler, of a steam-cock interposed in said connections, comprising a casing provided with a plurality of branches, *e''*, and a branch, *a''*, a plug, *A'*, provided with an axial steam-passage, and a lateral port adapted to communicate with the ports leading to said branches *e''*, and with peripheral semi-annular channels *c'* *e''* and longitudinal peripheral channels *c''* *e'*, adapted to communicate with the branch *a''*, said parts being constructed and operating substantially as described, for the purpose specified.

9. In a sanding apparatus for locomotives, the combination, with a plurality of steam-ejectors, the locomotive-boiler, and pipes connecting the ejectors with the steam-space of the boiler, of a steam-cock interposed in said connections, comprising a casing provided with a segment, *a''*, in which is formed a stop-notch, with a plurality of branches, *e''*, and with a branch, *a''*, a plug provided with an axial steam-passage, *p'*, a lateral port adapted to communicate with the ports leading to the branches *e''*, and with semi-annular and longitudinal peripheral channels *c'* *e''* *c''* *e'*, adapted to communicate with the branch *a''* of said casing, a manipulating-lever connected to the stem of the plug, and a spring-actuated pin arranged in said lever and adapted to engage the stop-notch in the segment *a''* of the casing, substantially as and for the purpose specified.

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

JAMES GRESHAM.

Witnesses:

PETER J. LIVSEY,
JAMES WOOD.