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EXTENSIBLE FILLING APPARATUS
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This invention relates to dispensing apparatus, and particularly to apparatus suitable for filling the sand boxes on railway locomotives.

This invention will be described as employed in the filling of locomotive sand boxes, in which use it provides particular advantages, although it may also be used for other purposes.

Railway locomotives utilize sand discharged on the rails in the vicinity of the wheels to increase friction between the wheels and the rails in starting and on stopping. To store sand for this purpose, the locomotives are equipped with sand boxes that have small inlet doors, located on the sides, tops or ends of the locomotives. It is a troublesome problem to fill these sand boxes. Without specialized equipment for the purpose, it is a difficult and time-consuming task. Even with special equipment, the problem is complicated because of the wide variety of sizes and shapes of locomotives, and the wide variety of locations of sand boxes and sizes of sand box openings on the locomotives.

A primary object of the present invention is to provide a strong and rugged apparatus for storing a quantity of sand at an elevated location and transporting it by gravity from the storage container into the sand boxes of locomotives. Another object is the provision of a feed device having an extensible lower portion that is adapted to feed sand by gravity from the storage sand hopper to the sand box, and is adapted to be adjustable to different heights and locations of sand boxes on locomotives. A further object is the provision of a telescoping tubular feed device embodying a valve that controls the flow of sand, which valve is controllable by rotation of the telescoping lower portion of the apparatus.

These and other objects of the invention will become apparent from the following description of a preferred embodiment of the invention in connection with the accompanying drawings in which:

FIGURE 1 is a side elevation from line 1—1 of FIGURE 2 but to a larger scale, of apparatus embodying the invention comprising an elevated sand hopper and an extensible tubular feed device connected to said hopper;

FIGURE 2 is a plan elevation of the apparatus of FIGURE 1 but to a smaller scale, showing how the extensible feed device is pivoted mounted so it can be swung over two adjacent tracks, to fill the sand boxes of locomotives on the tracks;

FIGURE 3 is a sectional elevation along line 3—3 of FIGURE 1 but to a considerably larger scale of an extensible feed device embodying the invention;

FIGURE 4 is a section along line 4—4 of FIGURE 3;

FIGURE 5 is a section through the valve along line 5—5 of FIGURE 3;

FIGURE 6 is a section along line 6—6 of FIGURE 3;

FIGURE 7 is a detail sectional elevation to an enlarged scale of the valve structure of the feed device, corresponding generally to the upper portion of FIGURE 3;

FIGURE 8 shows in perspective the bottom of the movable member of the valve, and the cooperating spring;

FIGURE 9 is a detail to an enlarged scale of supporting means for the feed device;

FIGURE 10 is a view from line 10—10 of FIGURE 9, parts of the counterweight being broken away to show the suspending and guiding cables therefor.

FIGURE 11 is a side elevation of an alternative means for holding the lower extensible portion of the feed device in its elevated position, shown to a scale larger than FIGURE 3 but smaller than FIGURE 7; and

FIGURE 12 is a section along line 12—12 of FIGURE 11.

In the illustrated embodiment, a rigid frame 1 of welded steel beams is rigidly supported on foundation piers 2 between tracks 3. Its upper end rigidly carries a sand storage hopper 4. This hopper has inclined sides 5 terminating in a bottom 6 of small area having a centrally disposed outlet fitting 7. The hopper may be filled by any suitable conveying means, such as a belt conveyor, not shown.

An inclined steel tube 8 is mounted in a support 9 on the frame 1 so it can be pivoted or swung about a vertical pivot axis A as shown in FIGURE 2. The upper end of tube 8 is connected by a flexible tubular member 11, such as a length of large-diameter reinforced rubber hose, to the outlet fitting 7 of the hopper 4, to permit swinging of the pipe 8 to a wide range of lateral positions, as shown in FIGURE 2.

A brace 12 is mounted on a support 13 for pivotal movement about a vertical axis A coaxial with the axis of support 9, and is rigidly connected to the lower portion of tube 8 to support it in its inclined relation.

The lower end of tube 8 carries a flexible supporting tube 14, such as a length of reinforced rubber hose, suspending an extensible feed device 15 that conducts, to the sand boxes of locomotives on tracks 3, sand which travels by gravity from hopper 4 through tube 8 and feed device 15.

The illustrated feed device 15, as shown in FIGURES 3 to 10, inclusive, comprises an outer tube 16. An inner tube 17 is telescoped in the outer tube and extensible from its lower end. The upper end of outer tube 16 is connected to a metal collar 18 attached to the lower end of the flexible tube 14 on inclined tube 8. Outer tube 16 is connected to collar 18 by a spider structure 19 (FIGURES 4, 5 and 7) comprising four radial studs 21 the outer ends of which pass through the lower end of collar 18 and the upper end of outer tube 16, and the inner ends of which are threaded into an inner collar 22. Locknuts 23 are threaded onto the outer ends of studs 21 to rigidly secure the tube 16 to collar 18 and properly centrally locate the inner collar 22.

The studs 21 also rigidly support, inside the outer tube 16, a stationary member 24 of a sand valve 25. This member is of generally cup-shaped configuration having a tapered sidewall 26 having two diametrically opposed, elongated tapered openings 27 in its walls for egress of sand. The outer surface of wall 26 preferably is frustoconical and tapered in cross section. A bottom wall 28, extending in the direction of sand flow through the tube 16, is fixed to the lower end of sidewall 26; it has a circular central opening 29 for a purpose to be described.

Valve member 24 is received in a rotatable valve member 31 of generally cup-shape configuration, having a sidewall 32 having an inner preferably frustoconical surface of circular cross section that mates with the outer surface of the wall 26 of stationary valve member 24. Movably valve member 31 has a bottom wall 33 rigidly fixed to the lower end of its sidewall 32 and having four equally spaced radial grooves 34, as shown in the upper portion of FIGURE 8, for a purpose to be described.

Sidewall 32 of movably valve member 31 also has two diametrically opposed openings 35 (FIGURE 5) of essentially the same size and shape as openings 27 of stationary valve member 24, so that the movably valve member 31 can be rotated relatively to the stationary member 24 about the axis of the mating frustoconical
surface of the members from a position in which openings 35 of member 31 are adjacent the portions of the sidewall 26 between the openings 27 of the stationary valve member 24 and passage of sand through the valve is blocked (FIGURE 5), to a position in which the openings 35 of movable member 31 match the openings 27 of stationary member 24 and maximum flow of sand through the valve is permitted and through intermediate positions in which partial sand flow occurs.

The movable valve member 31 is thus rotated relative to the stationary valve member 24 by means operated by rotation of the inner tube 17. Such means includes a shaft 36, the upper portion 37 of which is circular and is journalled in the inner collar 22 of the spider structure 19. The upper end of the shaft carries two locknuts 38 the lower of which bears against thrust bearing means 39 seated on the top of inner collar 22 to promote free rotation of shaft 36 in collar 22. This bearing means includes a resilient washer 40 that acts as a shock absorber. Shaft 36 also has a lower portion 41 of square cross section the upper end of which is below the bottom wall 28 of the stationary valve member 24 and above the bottom wall 33 of the movable valve member 31. This square cross-sectional portion fits closely but slidably in a square opening 42 in the bottom wall 33 of movable member 31 of the valve, so that rotation of the shaft 36 will rotate valve member 31.

A collar 43, which has an internal square cross-sectional opening to fit the square portion 41 of the shaft, is locked in place by set screws 44. A spring member 45, disposed between the upper end of collar 43 and the underside of the bottom wall 33 of the movable member, is formed of spring sheet steel to have four raised portions 46, each defining a gable-shaped cross section, which are adapted to fit into the grooves 34 of the underside of each bottom wall 33. The clearances between the collar 43, the bottom wall 33, and the nuts 38 are such that the spring member 45 resiliently urges the movable valve member 31 upwardly so its frustoconical inner surface always closely but slidably contacts the mating outer surface of the stationary valve member to prevent sand particles from entering between the valve members where they could cause leakage of sand or scoring of members. This resilient action of the spring is operative during any angular position of the movable valve member relative to the stationary valve.

Shaft 36 is adapted to be rotated by engagement of a lower square cross-sectional portion 47 of the shaft 36 with an inner opening 48 of matching square cross section of the inner tube 17 (FIGURES 3 and 6) that is fixed to the inner surface of the inner tube 17, so that rotation of the inner tube 17 will rotate the shaft. In FIGURE 3, however, in which the inner tube 17 is shown in its extreme upward or retracted position, the inner opening 48 of the spider 49 surrounds a round portion 50 of the shaft above the portion 47 of square cross section and below portion 41 of square cross section. The Illustrated shaft 36 is so formed that the round portions 37 and 50 are of the same diameter, which diameter is equal to or slightly less than the shortest distance between the flat sides of each portion 41 and 46 of square cross section. This facilitates assembly and makes possible the modes of operation described below.

It is apparent that when the inner tube 17 is in its uppermost retracted position, as shown in FIGURE 3, the inner tube can be rotated without rotating the shaft, so that the valve 25 is not affected.

However, when the inner tube 17 carrying its spider 49 is lowered or extended so the internal square opening 45 engages the square cross section of the portion 47 of shaft 36, rotation of the inner tube 17 in outer tube 16 will cause the shaft 36 to rotate. Rotation of shaft 36 causes movable valve member 31 to rotate so that its openings 35 may be brought into registry with the openings 27 of the stationary valve member 24 to open the valve to permit passage of sand, or be brought into registry with the wall between the openings 27 of the inner frustoconical member to close the valve and prevent passage of sand.

It is apparent that the movable valve member 31 can be thus rotated so long as the inner square opening 48 of spider 49 engages the square cross sectioned portion 47 of the shaft; in the illustrated embodiment, this portion 47 of the shaft extends from immediately below the position occupied by the spider 49 when the inner tube 17 is in its uppermost position, as shown in full lines in FIGURE 3, to the position of the spider 49 when the inner tube 17 is in its lowermost position, as shown in broken lines 49' in FIGURE 3. Engagement of that portion of the bottom wall 33 of the movable valve member 31 with the underside of the spider 49 with resilient thrust bearing means 51 held in place by locknuts 52 on the lower end of shaft 36 limits downward extended movement of the inner tube 17 relative to the outer tube 16. This bearing means includes shock absorbing washer 52a. Therefore, the movable member 31 of the valve can be rotated to control the flow of sand when the inner tube 17 is in any position from its lowermost position relative to outer tube 16. The inner tube also carries a length of flexible hose 53, constituting the discharge end of the feed device 15 to permit its ready insertion into locomotive sand boxes. Member 53 can be made of any suitable rubber-like material.

Preferably, as shown in FIGURES 3 and 7, the upper end of the inner tube 17 is provided with an annular seal 54, formed of resilient material, that makes resilient sliding contact with the inner wall of outer tube 16, to prevent leakage of sand between tubes 16 and 17.

In the embodiment of the invention shown in FIGURES 1 to 10, inclusive, the inner tubular member 17 is supported by means including counterweight means so that the tubular member can be moved to and located in any one of its telescoped positions between its uppermost or completely retracted and its lowermost or completely extended positions, with minimum manual effort to support or move inner tubular member and its associated parts. This means, as is shown to particular advantage in FIGURES 1, 3, 9 and 10, comprises a collar 55, having diametrically projecting arms 56, that is rotatably but axially immovably mounted on the outer surface of the tubular member near its lower end. The illustrated collar 55 is thus located between collars 57 and 58 that are rigidly fixed to the inner tubular member by set screws. A cable 59, fixed to each of the arms 56, passes upwardly over idler pulleys 60 and 61 (FIGURES 1 and 9) mounted on the inclined tube 8 and then downwardly through a counterweight 62, which weighs approximately the same as the inner tube 17 and its associated parts, is thus suspended by two cables 59, one on each side of the inclined tube 8 and the movable inner tube 17. The counterweight 62 is guided in a central path by guide cable 63 (FIGURE 10) that passes through an opening 64 at the center of the counterweight and is fixed at its upper end to inclined tube 8 and at its lower end to brace 12.

Inner extensible tube 17 has a transversely extending handle 65 to facilitate rotation of the tubular member in the outer tubular member to open and close the valve 25. Since the collar 85 to which the cables 59 are fixed is rotatable on tube 17, there is no difficulty from twisting of cables.

FIGURES 11 and 12 illustrate an alternative arrangement for supporting the inner tubular member in its uppermost retracted position and for releasing it for rotation. In the illustrated embodiment, the inner tube 17 has the outer tube 16 rigidly carries two hooks 66 that are adapted to engage the transversely extending handle 65 of the lower tubular member. When handle 65 of the lower tubular member is lifted and attached partially turned, it can be disengaged from the hooks 66 and lowered sufficiently to permit inner tube 17 to be rotated to actuate the valve 25. In the embodiment of FIGURES
11 and 12, the lower tubular member is not shown as counterweighted, so an operator must support the weight of the inner tube 17 in disengaging it from the hooks and adjusting it to its proper extended position; however, it is apparent that a counterweight arrangement similar to that described could be used.

It is apparent that the invention provides apparatus comprising an extensible feed device that can be positioned up out of the way of any locomotives or rolling stock until needed, which feed device can then be extended to lower its discharge end, which end can be moved if needed, to permit the discharge end to be inserted into a sand box of a locomotive, whether the sand box is on the top, a side, or an end of the locomotive. Flow of sand can then be started merely by rotating the lower portion of the inner tube by means of a handle provided for the purpose to open the valve 25 the desired amount. As filling of the box approaches completion, the extended tube 17 can be turned to close the valve 25 and shut off the flow of sand, after which the tube 17 can be moved upwardly into the outer tube to move the lower end of the tube out of the way.

By apparatus like that illustrated, the sand boxes of locomotives can be rapidly filled with a minimum of physical exertion, with a minimum of spilling of sand under the locomotive or in the vicinity of the locomotive, and with complete adaptability to a wide variety of different sizes of locomotives and different locations of said boxes.

It is apparent that various changes, other than those indicated, can be made in the apparatus illustrated without departing from the spirit of the invention.

It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty reside in the invention.

What is claimed is:

1. Material-dispensing apparatus comprising two tubular members disposed in telescoping relation, the first of said tubular members being non-rotatable, and the second of said tubular members being rotatable and extensible and retractable with respect to said first tubular member; a first valve member having at least one port through which material may pass when the port is unobstructed, said valve member being fixed inside said first tubular member; a second valve member having at least one port through which material may pass when the port is unobstructed, said second valve member being disposed in operative relation adjacent said first valve member and rotatable with respect to said first valve member from a position in which said valve member ports are open to a position in which said valve member ports are closed; means operatively connecting said second tubular member to said second valve member to cause said second valve member to be rotated upon rotation of said second tubular member throughout a range of extended and retracted positions of said second tubular member relative to said first tubular member; and means for holding said first and second valve members in operative relation to each other while said second tubular member is in various positions in said range.

2. The apparatus of claim 1 in which said last mentioned means is resilient means operating between said shaft and said second valve member.

3. Material-dispensing apparatus comprising a first tubular member that is non-rotatable, and a second tubular member that telescopes within said first tubular member and is rotatable and extensible and retractable with respect to said first tubular member; a first valve member having at least one port through which material may pass when the port is unobstructed, said first valve member being fixed inside said first tubular member; a second valve member having at least one port through which material may pass when the port is unobstructed, said second valve member being disposed in operative relation adjacent said first valve member and rotatable with respect to said first valve member from a position in which said valve member ports are open to a position in which said valve member ports are closed; a shaft longitudinally disposed in said second tubular member in sliding engagement therewith and adapted to be rotated therewith, said shaft non-rotatably engaging said second valve member to cause said second valve member to be rotated upon rotation of said second tubular member throughout a range of extended and retracted positions of said second tubular member relative to said first tubular member; and means for holding said first and second valve members in operative relation to each other while said second tubular member is in various positions in said range.

4. The apparatus of claim 4 in which said last mentioned means is resilient means operating between said shaft and said second valve member.

5. Material-dispensing apparatus comprising a first tubular member that is non-rotatable; a second tubular member that telescopes within said first tubular member and is rotatable and extensible and retractable with respect to said first tubular member; a first valve member having at least one port through which material may pass when the port is unobstructed, said valve member being fixed inside said first tubular member; a second valve member having at least one port through which material may pass when the port is unobstructed, said second valve member being disposed in operative relation adjacent said first valve member and rotatable with respect to said first valve member from a position in which said valve member ports are open to a position in which said valve member ports are closed; a shaft longitudinally disposed in said second tubular member in sliding engagement therewith and adapted to be rotated therewith, said shaft non-rotatably engaging said second valve member to cause said second valve member to be rotated upon rotation of said second tubular member throughout a range of extended and retracted positions of said second tubular member relative to said first tubular member; and means for holding said first and second valve members in operative relation to each other while said second tubular member is in various positions in said range.

6. The apparatus of claim 5 in which said last mentioned means is resilient means operating between said shaft and said second valve member.

7. The apparatus of claim 6 in which said last mentioned means is resilient means operating between said shaft and said second valve member and being axially immovable but rotatably sup-ported relative to said first tubular member to permit said second valve member to be rotated upon rotation of said second tubular member throughout a range of extended and retracted positions of said second tubular member relative to said first tubular member; and means for holding said first and second valve members in operative relation to each other while said second tubular member is in various positions in said range.

8. The apparatus of claim 1 in which said first valve member is of generally cup-shaped configuration and has a sidewall having a surface of circular cross section and having at least one port in said sidewall; and in which said second valve member is of generally cup-shaped configuration and has a sidewall having a surface of circular cross section that mates with said surface of circular cross section.
section of said first valve member and having at least one port in said sidewalk.

9. The apparatus of claim 2 in which said first valve member is of generally cup-shaped configuration with its bottom extending in the direction of flow of material through said tubular members, and with a sidewalk having an outer surface of circular cross section and having at least one port in said sidewalk; and in which said second valve member is of generally cup-shaped configuration and has a sidewalk having an inner surface of circular cross section that mates with the outer surface of said first valve member and having at least one port in said sidewalk.

10. The apparatus of claim 4 in which said first valve member is of generally cup-shaped configuration and has a sidewalk having a surface of circular cross section and having at least one port in said sidewalk; in which said second valve member has a bottom wall and is of generally cup-shaped configuration and has a sidewalk having a surface of circular cross section that mates with said outer surface of circular cross section of said first valve member and having at least one port in said sidewalk; and in which said shaft non-rotatably engages said bottom wall of said second valve member.

11. The apparatus of claim 6 in which said first valve member is of generally cup-shaped configuration with its bottom extending in the direction of flow of material through said tubular members, and with a sidewalk having an outer surface of circular cross section and having at least one port in said sidewalk; in which said second valve member has a bottom wall and is of generally cup-shaped configuration and has a sidewalk having an inner surface of circular cross section that mates with the outer surface of said first valve member and having at least one port in said sidewalk; and in which said shaft non-rotatably engages said bottom wall of said second valve member.

12. Material-dispensing apparatus comprising two tubular members disposed in telescoping relation, the first of said tubular members being non-rotatable, and the second of said two members being rotatable and extensible and retractable with respect to said first tubular member; a first valve member fixed inside said first tubular member, said valve member being of generally cup-shaped configuration with its bottom extending in the direction of flow of material through said first tubular member, and with a sidewalk having an outer surface of circular cross section and having at least one port in said sidewalk; a second valve member of generally cup-shaped configuration having a sidewalk having an inner surface of circular cross section that mates in operative relation with the outer surface of said first valve member and having at least one material-discharge port in said sidewalk, said second valve member being rotatable with respect to said first valve member from a position in which said valve member ports are open to a position in which said ports are closed; a shaft longitudinally disposed in said first and second tubular members and being axially immovable but rotatably supported relative to said first tubular member; means connected to second tubular member slidably and non-rotatably engaging said shaft, said shaft being adapted to non-rotatably engage said second valve member at its bottom wall to permit said second valve member to be rotated upon rotation of said second tubular member throughout a range of extended and retracted positions of said second tubular member relative to said first tubular member; and resilient means operating between said shaft and said second valve member for holding said first and second valve members in operative relation to each other while said second tubular member is in various positions in said range.

13. Material-dispensing apparatus comprising a first tubular member that is non-rotatable; a second tubular member that telescopes within said first tubular member and is rotatable and extensible and retractable with respect to said first tubular member; a first valve member fixed inside first tubular member, said valve member being of generally cup-shaped configuration with its bottom extending in the direction of flow of material through said tubular member and with a sidewalk having an outer surface of circular cross section and having at least one material-discharge port in said sidewalk; a second valve member that is of generally cup-shaped configuration and has a bottom wall and a sidewalk having an inner surface of circular cross section that mates in operative relation with the outer surface of said first valve member and having at least one material-discharge port in said sidewalk, said second valve member being rotatable with respect to said first valve member; and a shaft longitudinally disposed in said first and second tubular members and being axially immovable but rotatably supported relative to said first tubular member; means connected to second tubular member slidably and non-rotatably engaging said shaft, said shaft being adapted to non-rotatably engage said second valve member at its bottom wall to permit said second valve member to be rotated upon rotation of said second tubular member throughout a range of extended and retracted positions of said second tubular member relative to said first tubular member; and resilient means operating between said shaft and said second wall member for holding said first and second valve members in operative relation to each other while said second tubular member is in various positions in said range.

14. A railway sand-dispenser for dispensing sand into the sand boxes of railway locomotives, comprising a sand-storage means, supporting means for supporting said sand-storage means in an elevated position, a sand-feeding device carried by said supporting means comprising two tubular members disposed in telescoping relation so that one member can be extended and retracted relative to the other member, conduit means connecting said other member to said sand-storage means, and counterweighted strand means engaging said extensible and retractable tubular member at least partly to counterbalance its weight.

15. A railway sand-dispenser for dispensing sand into the sand boxes of railway locomotives, comprising sand-storage means, supporting means for supporting said sand-storage means in an elevated position, a sand-feeding device carried by said supporting means comprising two tubular members disposed in telescoping relation so that one member can be extended and retracted relative to the other member, conduit means connecting said other member to said sand-storage means, and means at the lower portion of said other tubular member to disengageably support said extensible and retractable tubular member.

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