April 15, 1941. A. J. STOCK 2,238,296

CONTROLLING DEVICE

Filed Jan. 5, 1938 2 Sheets-Sheet 1

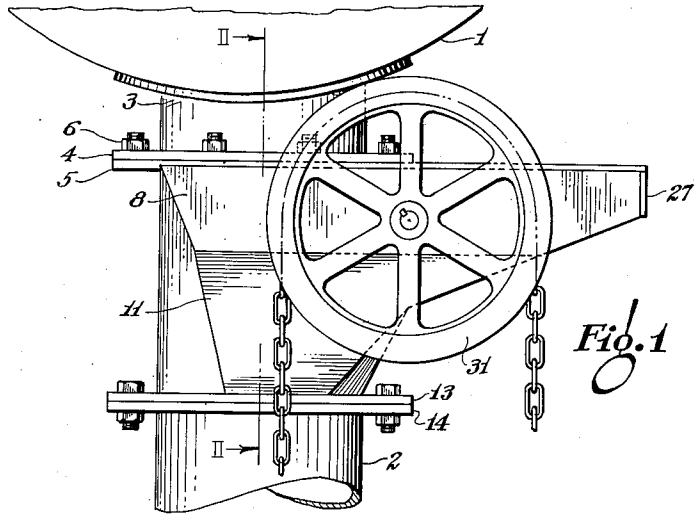


Fig. 1

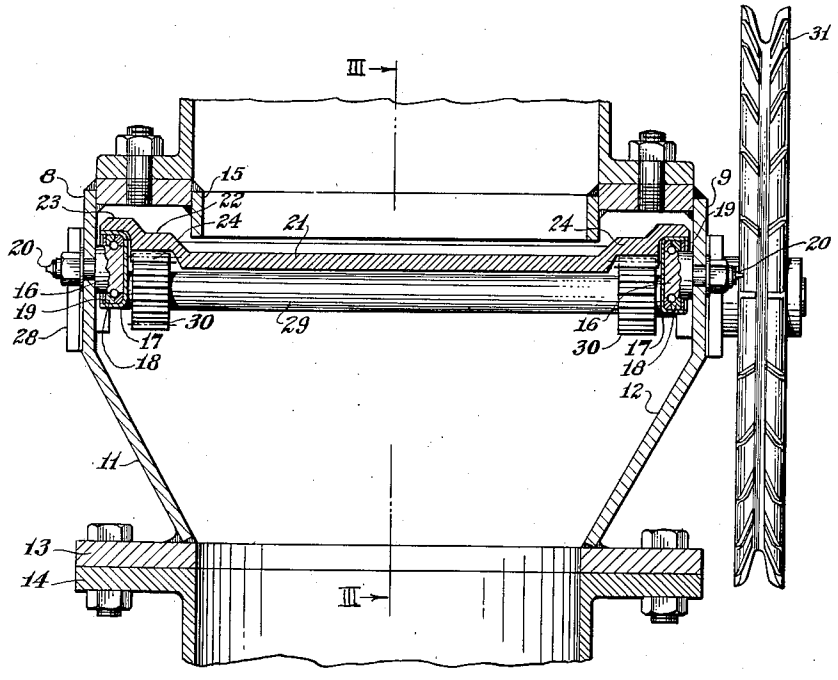


Fig. 2

Arthur J. Stock INVENTOR.

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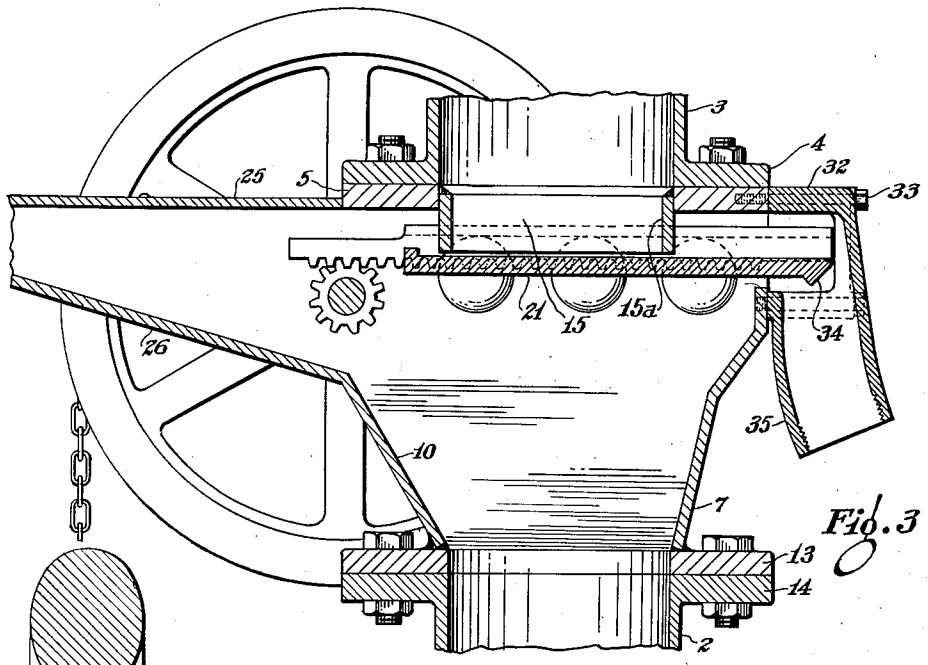


Fig. 3

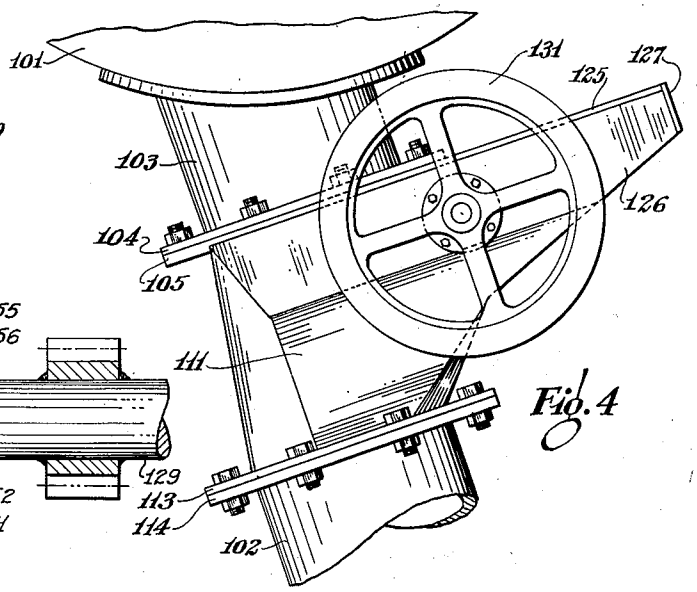


Fig. 4

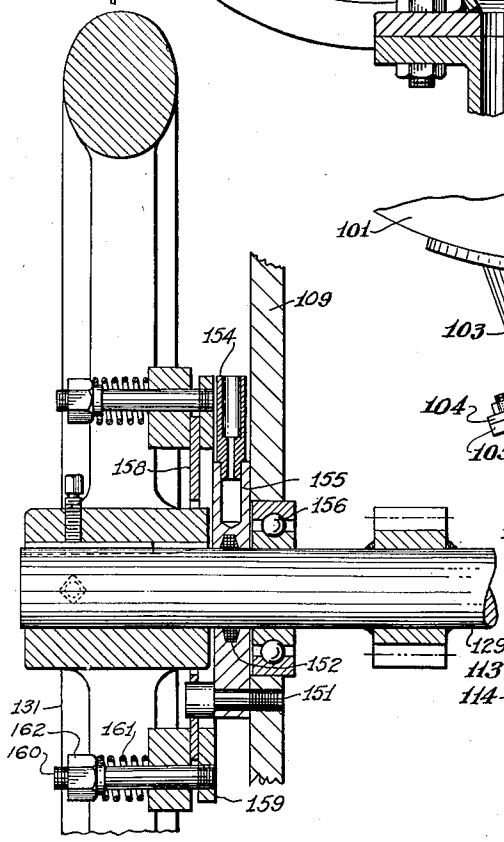


Fig. 5

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Patented Apr. 15, 1941 2,238,296

UNITED STATES PATENT OFFICE

2,238,296

CONTROLLING DEVICE

Arthur J. Stock, Cleveland, Ohio

Application January 5, 1938, Serial No. 183,482

7 Claims. (Cl. 221—145)

This invention relates to means for controlling the discharge of bulk materials, particularly those consisting of numerous solid pieces, such, for instance, as coal, coke, and other solid fuels and the like.

An object of the invention is to provide an improved material controlling device which will be highly efficient in operation.

Another object is to provide an improved material controlling device which will be simple and rugged in construction.

Another object is to provide an improved material controlling device which may be easily actuated.

Another object is to provide an improved material controlling device which may be arranged in a plurality of manners as desired.

Another object is to provide an improved material controlling device which will occupy little space.

Another object is to provide an improved material controlling device in which working parts will be protected from corrosive or abrasive material.

Another object is to provide an improved material controlling device which may be easily and economically manufactured.

Another object is to provide an improved material controlling device which may be readily installed or removed.

Another object is to provide an improved material controlling device which may easily be kept clean.

Another object is to provide an improved material controlling device which will prevent leakage of dust or other small particles.

Other objects will hereinafter appear.

The invention will be better understood from the description of three practical embodiments thereof, illustrated in the accompanying drawings, in which:

Figure 1 is a side elevational view of one embodiment of the invention arranged to control material passing downwardly in a vertical direction;

Figure 2 is a sectional view, to a larger scale, taken on the line II—II of Figure 1;

Figure 3 is a sectional view of another embodiment, corresponding to a view taken on the line III—III of Figure 2 and showing a manner of providing drainage;

Figure 4 is a figure similar to Figure 1 showing an embodiment of the invention for material passing obliquely downwardly; and

Figure 5 is an enlarged fragmentary view of the brake mechanism illustrated in Figure 4.

In Figures 1 to 3 the invention is shown as embodied in a device commonly known as a "coal valve", applied to a gravity fuel supply, in which coal or other solid fuel is permitted to run from a bin or hopper 1 to the upper side of the coal valve, which, when open, permits it to drop through to a conduit, pipe or chute 2 delivering the fuel to a pulverizer, boiler, furnace, or other place of use or combustion, as by depositing it upon a stoker or grate.

The details of the bin, chute, or pipe, furnace, or the like, may be of any desired or well-known construction, and are, therefore, not specifically described.

The outlet of the bin or conduit by which fuel is supplied is indicated at 3, this outlet constituting an aperture through the wall of the bin surrounded by a generally horizontal flange 4.

To this flange is secured the supporting framework of a coal valve, which consists of a flange 5 secured to the flange of the bin by bolts 6 or the like, and to which is welded a housing consisting of depending walls 8 and 9 which merge into downwardly converging bottom walls 7, 10, 11, and 12, terminating in a discharge opening surrounded by a flange 13.

This flange is bolted or otherwise secured to a corresponding flange 14 on the upper end of the conduit, pipe or chute 2, which conducts the material from the valve to the device to be supplied.

Within the housing is a downwardly extending nozzle or marginal flange 15 which overlies the edges of the gate to be hereinafter described, and beneath this nozzle and secured to the side walls of a housing upon suitable stub shafts 16 are two rows of rollers 17, which are shown as mounted upon anti-friction bearings such as ball bearings 18, and equipped with dust seals 19, the bearings being supplied with lubricant through the stub shafts from pressure lubricant fittings 20 on exterior of the housing.

While ball bearings are shown within the rollers, it will be obvious that, particularly when the gate is to be used in relatively inaccessible positions, it will probably be more advantageous to use journal bearings of a self lubricating type, or other known types of bearing in which frequent lubrication will not be necessary.

Arranged to reciprocate upon the rollers is the gate, which consists of a substantially flat horizontal bottom 21 and upwardly stepped side flanges 22 and 23. Upon the lower surface of the innermost flanges 22 are formed or secured

two racks 24, while the under surface of the outermost flanges 23 is flat, to roll freely upon the upper surface of the rollers.

A hollow extension of the housing consisting of top 25, bottom 26, and extensions of side walls 8 and 9 permits the gate to be moved entirely out of the way of material passing through the opening defined by flange 15.

The end of this extension is closed by a cover plate 27 secured to the housing by machine screws and the like, which limits the movement of the gate, but may be readily removed if it is desired to remove the gate for replacement, repair, or any other purpose.

It will be apparent that the entire housing, including the upper and lower flanges, but exclusive, of course, of the rollers, cover plate, and gate, may be made as a unitary structure, and that this can very conveniently be done by fabricating the housing of metal plates welded together.

Mounted in bearings 28 in the sides of the housing and extending transversely thereacross is a horizontal shaft 29 to which are secured two pinions 30 engaging the racks on the underside of the gate.

Secured to the outer end of this shaft is an actuating device, shown as a chain receiving sheave 31, by which the shaft may be rotated. Of course, it will be apparent that a hand wheel, crank, gear, pulley, or any other actuating device might be substituted therefor, and that the same may be operated manually or by power, as desired.

However, ease of operation is such that power drives are, in general, unnecessary, the gate sliding very freely on the anti-friction rollers, and the structure of the device being such that it is not seriously impeded by solid articles passing over its edge or by the weight of material on its upper surface.

By providing two pinions secured rigidly to the same shaft and two racks adjacent opposite edges of the gate, any tendency to twist or deflect the gate from a straight line travel, as by coal or other solid material passing over one side of its leading edge, is prevented. Thus jamming of the gate, due to its assuming an oblique position, is precluded and the gate moves readily at all times.

The end of the gate is shown in Figure 3 as extending beyond the housing proper, and into a manifold-like fitting 32 secured to the housing by machine screws 33. The underside of the gate adjacent this end is provided with a depending lip 34 so that any moisture which may accumulate on the gate will run out over the end and drip off the lip into a downwardly extending discharge portion or drain 35, formed integrally with the fitting 32, from which it may be conveyed away in any desired manner.

The side 15*a* of the nozzle 15 nearest the drainage means comes closely adjacent to the upper surface of the gate, there being between the nozzle and the gate enough space for water to readily pass, but not sufficient for the passage of solid particles of substantial size, so that the flange and gate act, in effect, as a strainer, draining off the water from the solid material.

The operation of the device, it is thought, is apparent from the description of its parts. Control of the flow of material through the valve is obtained by the positioning of the gate, which may be readily moved from open to closed position, or to any intermediate position, by the actuation of the horizontal shaft through the hand-chain, or other driving element.

The nozzle 15 deflects the material passing through the valve away from the channel-shaped space in which the rollers and pinions are located, so that only fine and air-borne particles may find their way into this space, these, due to the tendency of the air to continue through with the solid material, will not readily or to any very serious extent enter into this space.

Thus, the inwardly extending nozzle 15 protects the rollers from any large particles, flowing material, and any dust or dirt which may reach the racks and pinions will fall from these under the influence of gravity, so that the teeth do not become clogged. However, the space underneath the rollers and pinions serves as a receptacle for any coal which is crowded out of the path of a closing gate, and which may thus move toward the sides 11 and 12, so that it does not seriously impede the motion of the gate.

The coal valve illustrated in this application is, in practice, found remarkably easy to operate, and it is believed that one reason why this is so is that the coal may be pushed into the spaces at the sides, and that it is not therefore necessary to compress any of the coal in actuating the valve. The importance of the provision of these spaces for the reception of coal is very considerable, as it must be borne in mind that coal may fill the entire chute 2 at the time the gate is closed and be piled up within the casing, flaring downwardly and outwardly from the bottom of the flange 15, as determined by its angle of repose. Thus, the only space into which coal can be moved by the gate as it is moved into closing position is that underneath the rollers and pinions and above inclined plates 11 and 12.

The rollers and shaft bearings are readily lubricated from the exterior of the device and there are no openings through which dust may escape, but the entire housing is effectively closed at all times and sealed to both the bin and chute.

Any moisture in the coal runs off the flat central portion of the gate, away from any of the moving parts, and if it is desired to remove the gate, the remoteness of the cover plate from the course of the solid material permits such removal without any substantial emission of dust.

In Figures 4 and 5 a coal valve is shown in inclined position, which is sometimes advantageous, due to some arrangements of bins and chutes or pipes, and also to effect a saving in over-all height of the apparatus.

The valve consists of parts corresponding very closely to those of the embodiment previously described, excepting that the housing is slanted at its lower end 107, to facilitate material dropping therefrom.

It will be noted that the force of gravity, in this arrangement, assists in the closing of the gate.

To prevent accidental closing of the gate, due to the influence of gravity, brake mechanism has been provided, most clearly illustrated in Figure 5.

In this figure a bearing cap 150 is shown secured to the side wall 109 by socketed headed machine screws 151. The cap is provided with a felt washer 152 surrounding the shaft 129 to prevent the egress of lubricant from the bearing.

This lubricant is supplied through a sleeve 153 provided at its outer end with a fitting 154 and communicating with ducts 155 leading to the bearing 156.

On the outer end of the shaft 129 is keyed the hand wheel or chain sheave 131, and this is provided with an annular ring 157 formed integrally therewith, and having a plain face to act as part of the brake mechanism.

This face is in contact with a brake disc 158 provided with apertures sliding over the heads of screws 151 and by these held against rotation. Bearing on the other side of the disc 158 is a disc 159 into which are threaded studs 160 passing through apertures in ring 157.

The rings 157 and 159 are resiliently pressed on opposite sides of disc 158 by springs 161 surrounding the studs 160 and maintained under compression by nuts 162, whereby the compression of the springs and the resistance in the brake may be adjusted.

The operation of this device is substantially the same as that of the first three figures, excepting, of course, that the resistance to the motion of the gate is increased by the brake mechanism, and this resistance is sufficient to preclude any unintentional closing of the gate. Obviously, a brake might be applied to the horizontal gate of the first three figures, but it is found in practice to be unnecessary, and is therefore omitted from these figures of the drawings.

While I have described the illustrated embodiments of my invention in some particularity, obviously many others will readily occur to those skilled in this art, and I do not, therefore, limit myself to the precise details shown and described, but claim as my invention all embodiments, variations, and modifications thereof coming within the scope of the appended claims.

I claim:

1. An apparatus for handling aggregate which comprises a pipe including an upper section and a lower section, the lower section having greater cross-section than said upper section, a flange extending at right angles from all sides of said upper section to said lower section to form a shoulder at the junction between the two sections, means connected to said lower section whereby a static column of the aggregate may be formed in said pipe, a nozzle extending into said lower section from the opening between said sections, a gate positioned immediately below the shoulder within the lower section to cover the open end of said nozzle, said gate having raised step flanges along two opposed edges and adapted to underlie said shoulder between the nozzle and the walls of said lower section and be mounted upon means adapted to permit movement of said gate transversely of said opening, and means for moving said gate transversely of said opening on said supporting means, said gate supporting means and said gate moving means being positioned beneath said shoulder and between said nozzle and the walls of said lower section to thereby protect said two means from possible contact by said aggregate and also permit the closing of said gate through a static column of the aggregate by furnishing space into which aggregate in the path of the gate may be displaced.

2. An apparatus for handling aggregate which comprises a pipe including an upper section and a lower section, the lower section having greater cross-section than said upper section, a shoulder at the junction between the two sections, means connected to said lower section whereby a static column of the aggregate may be formed in said chute, a gate positioned immediately below the shoulder within the lower section to cover the opening between said sections, said gate being mounted upon means adapted to permit movement of said gate transversely of said opening, and means for moving said gate transversely of said opening on said supporting means, said gate supporting means and said gate moving means being positioned beneath said shoulder to thereby protect said two means from possible contact by said aggregate and also permit the closing of said gate through a static column of the aggregate by furnishing space into which aggregate in the path of the gate may be displaced, means outside said lower section for controlling said moving means, and means between said control means and said lower section for locking said moving means and thereby locking said gate in desired position.

3. An apparatus for handling aggregate which comprises a dust-tight casing having an upper inlet opening and a lower outlet opening, inlet and outlet pipes attached at said openings, said casing being substantially greater in cross-section than said pipes, the lower portions of all sides of the casing being slanted to meet at the edge of the outlet opening, a nozzle extending into said casing from said inlet opening, rollers mounted on two opposite sides of said casing laterally of said inlet nozzle, the upper edges of said rollers being not below the lower edge of said nozzle, a shaft extending through said casing laterally of said rollers and parallel to their axes and mounted in dust-tight bearings, gears mounted on said shaft within said casing adjacent said sides, a closure having two raised step flanges along two opposed edges thereof, bearing surfaces on the lower sides of the outer two of said step flanges to rest upon said rollers, racks extending from the lower sides of the inner two of said step flanges and adapted to mesh with said gears, and a control handle mounted upon said shaft outside of said casing whereby said closure may be moved to an opened position away from said nozzle or to a closed position normal to and closely adjacent said inlet nozzle.

4. An apparatus for handling aggregate which comprises a dust-tight casing having an upper inlet opening and a lower outlet opening, inlet and outlet pipes attached at said openings, said casing being substantially greater in cross-section than said pipes, the lower portions of all sides of the casing being slanted to meet at the edge of the outlet opening, a nozzle extending into said casing from said inlet opening, rollers mounted on two opposite sides of said casing laterally of said inlet nozzle, the upper edges of said rollers being not below the lower edge of said nozzle, a shaft extending through said casing laterally of said rollers and parallel to their axes and mounted in dust-tight bearings, gears mounted on said shaft within said casing adjacent said sides, a closure having two raised step flanges along two opposed edges thereof, bearing surfaces on the lower sides of the outer two of said step flanges to rest upon said rollers, racks extending from the lower sides of the inner two of said step flanges and adapted to mesh with said gears, and a control handle mounted upon said shaft outside of said casing whereby said closure may be moved to an opened position away from said nozzle or to a closed position normal to and closely adjacent said inlet nozzle, and a brake between said control handle and said casing to secure said handle and consequently said closure in a desired position.

5. An apparatus for handling aggregate which

comprises a dust-tight casing having an upper inlet opening and a lower outlet opening, inlet and outlet pipes attached at said openings, said casing being substantially greater in cross-section than said pipes, said casing being extended at the upper portion of one side thereof to form a protruding housing, said casing also being extended at the upper portion of the side opposite said protruding housing and arranged to form a drain, the upper sides of said casing between said extended portions being parallel, the lower portions of all sides of the casing being slanted to meet at the edge of the outlet opening, a nozzle extending into said casing from said inlet opening, rollers mounted on the opposite parallel sides of said casing laterally of said inlet nozzle, a shaft extending through said casing and mounted in dust-tight bearings in said parallel sides adjacent said rollers, gears mounted on said shaft within said casing and adjacent said opposite sides thereof, a closure having two raised step flanges along each of two opposed edges thereof, the outer two of said flanges having bearing surfaces on the lower sides thereof to rest upon said rollers, racks extending from the lower sides of the inner two of said step flanges and adapted to mesh with said gears, a drainage lip along one end of said closure, a raised flange along the opposite end of said closure and between said step flanges, and a control handle mounted upon said shaft exterior of said casing whereby said closure may be moved to an opened position to lie within said protruding housing or to a closed position normal to and closely adjacent said inlet nozzle and with the drainage lip thereof lying within the casing extension above said drain.

6. An apparatus for handling aggregate which comprises a dust-tight casing having an upper inlet opening and a lower outlet opening, inlet and outlet pipes attached at said openings, said casing being substantially greater in cross-section than said pipes, said casing being extended at the upper portion of one side thereof to form a protruding housing, said casing also being extended at the upper portion of the side opposite said protruding housing and arranged to form a drain, the upper sides of said casing between said extended portions being parallel, the lower portions of all sides of the casing being slanted to meet at the edge of the outlet opening, a nozzle extending into said casing from said inlet opening, rollers mounted on the opposite parallel sides of said casing laterally of said inlet nozzle, a shaft extending through said casing and mounted in dust-tight bearings in said parallel sides adjacent said rollers, gears mounted on said shaft within said casing and adjacent said opposite sides thereof, a closure having two raised step flanges along each of two opposed edges thereof, the outer two of said flanges having bearing surfaces on the lower sides thereof to rest upon said rollers, racks extending from the lower sides of the inner two of said step flanges and adapted to mesh with said gears, a drainage lip along one end of said closure, a raised flange along the opposite end of said closure and between said step flanges, a control handle mounted upon said shaft exterior of said casing whereby said closure may be moved to an opened position to lie within said protruding housing or to a closed position normal to and closely adjacent said inlet nozzle and with the drainage lip thereof lying within the casing extension above said drain, and a brake between said control handle and said casing to secure said handle and consequently said closure in a desired position.

7. An apparatus for handling aggregate which comprises a pipe including an upper section and a lower section, the lower section having greater cross-section than said upper section, a flange extending at right angles from said upper section to said lower section to form a shoulder at the junction between the two sections, means connected to said lower section whereby a static column of the aggregate may be formed in said pipe, a nozzle extending into said lower section from the opening between said sections, a gate positioned immediately below the shoulder within the lower section to cover the open end of said nozzle, said gate having raised step flanges along two opposed edges and adapted to underlie said shoulder between the nozzle and the walls of said lower section and be mounted upon means adapted to permit movement of said gate transversely of said opening, and means for moving said gate transversely of said opening on said supporting means, said gate supporting means being positioned beneath said shoulder and between said nozzle and the walls of said lower section to thereby protect said means from possible contact by said aggregate and also permit the closing of said gate through a static column of the aggregate by furnishing space into which aggregate in the path of the gate may be displaced.

ARTHUR J. STOCK.