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DISTRIBUTION MEANS FOR PULVERULENT MATERIAL

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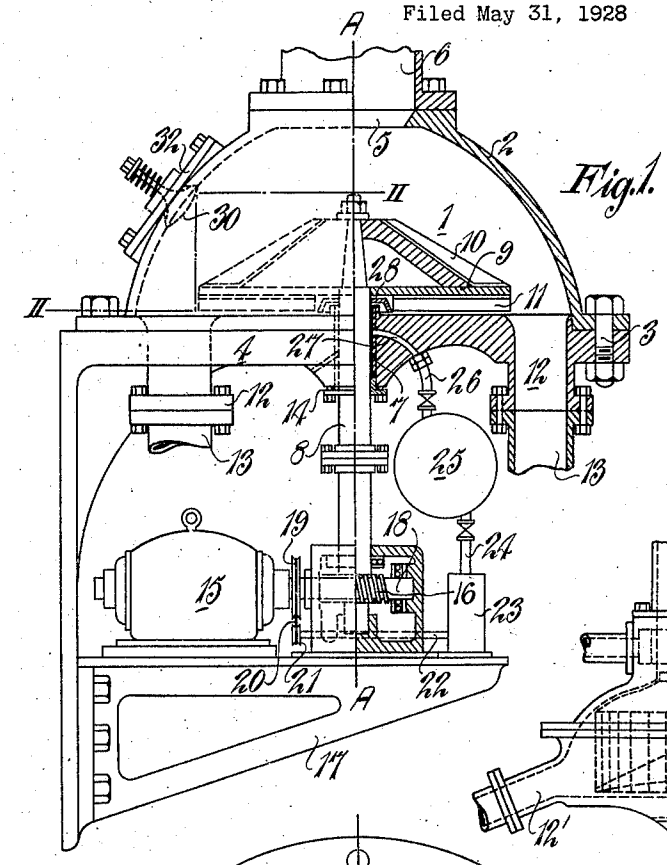


Fig. 1.

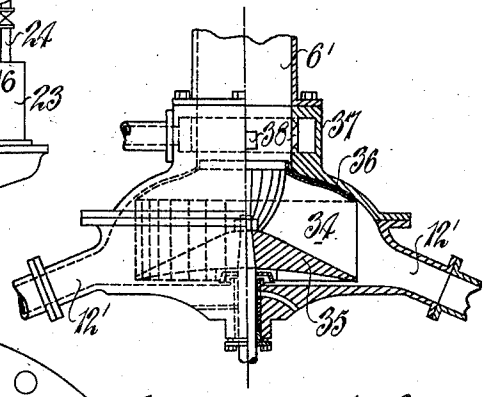


Fig. 4.

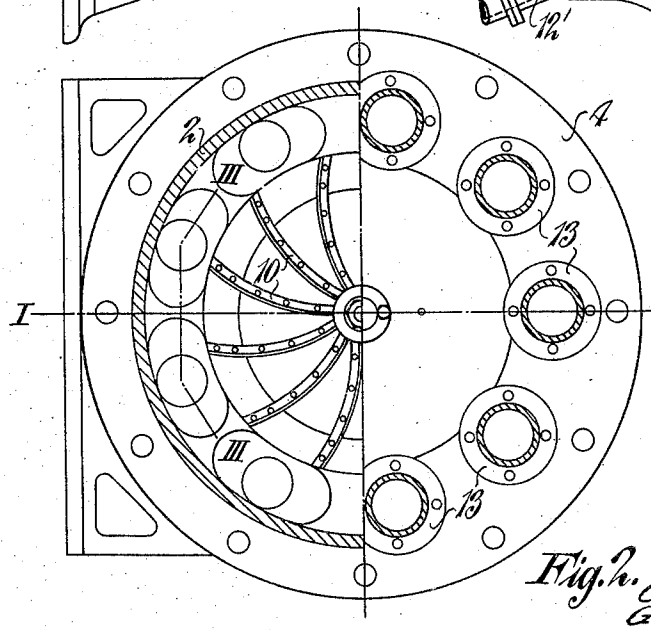


Fig. 2.

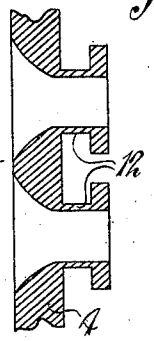


Fig. 3.

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UNITED STATES PATENT OFFICE

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DISTRIBUTION MEANS FOR PULVERULENT MATERIAL

Application filed May 31, 1928, Serial No. 282,036, and in Great Britain May 9, 1928.

This invention relates to the distribution of pulverulent material carried by air or gas under pressure through pipes from a common source of supply.

In the distribution of pulverulent material difficulties have been experienced in obtaining an equal distribution of the material to each of a plurality of pipes branching from a supply main, as for example in the cases where a number of boiler furnaces are to be supplied with pulverized fuel from a common supply hopper or other storage receptacle. It is found that, for reasons which are not always apparent, the pulverulent material shows a tendency to pass more readily into certain of the branch pipes than into others and devices which have hitherto been employed to eliminate this tendency have not been altogether satisfactory.

An object of the present invention is to overcome this disadvantage and to provide a simple device whereby uniform distribution of the pulverulent material from a main pipe or the like to a plurality of branch pipes may be assured.

A further object is to provide a distributing device whereby the intimate mixture of pulverulent material and air or other gas in desired proportions may be obtained and equal quantities of such mixtures delivered to each of a plurality of pipes.

With these objects in view according to the invention a distribution device is provided comprising a circular chamber preferably dome-shaped in form having an inlet coaxial with the axis of the chamber, a plurality of outlets equally spaced apart and equidistant from said axis and means for creating a whirl within the chamber concentrically of said axis. By the positive creation of a whirl in the distributor casing in such a way that each of the outlets thereof is similarly disposed with respect to the whirl, an equal supply of the material to the several outlets is assured.

For producing the whirl an impeller is preferably disposed opposite the inlet of the distributor casing, the shaft of the impeller passing through the casing, and the access of material to the bearing of the impeller is prevented by the aid of blades disposed upon the surface of the impeller adjacent the bearing in addition to those opposed to the inlet. The outlets are equally spaced in the casing around the periphery of the impeller, the mouths of said outlets being shaped to merge gradually with the wall of the casing so as to avoid the formation of crevices in which the material could possibly accumulate.

Means may also be provided for admitting an auxiliary supply of air or the like to form a desired mixture with the pulverulent material in the distributor and air under pressure may also be admitted adjacent the bearing of the impeller shaft for the purpose of maintaining a draught in an outward direction with respect to said bearing. The power required to drive the impeller will be comparatively small even in cases where the impeller is designed to augment the pressure of the pulverulent material and gas leaving the distributor, and as a result of the precautions taken to prevent the material from entering the bearing of the impeller the appliance may be enabled to operate in a satisfactory manner for an indefinite period without attention, which is not possible with distribution means hitherto employed for this purpose.

The invention is illustrated in the accompanying drawings in which Fig. 1 shows one construction of distributor in accordance with the invention, partly in elevation and partly in section on line I—I of Fig. 2, Fig. 2 is a plan view corresponding to Fig. 1, the left-hand portion being a section on line II—II of Fig. 1 and the right-hand portion being a view of the distributor casing from below, Fig. 3 is a section on the line III—III of Fig. 2, and Fig. 4 is a view similar to Fig. 1 showing by way of example, a modified form which the distributor may take.

Referring more particularly to Figs. 1–3, the distributor comprises a circular chamber 1 formed of an upper dome-shaped member 2 detachably secured by bolts 3 to a bottom plate member 4. At the crown of the chamber and in line with the axis A—A thereof is disposed the inlet 5 to which is connected the supply pipe 6 conveying the pulverulent material which it is desired to distribute. Oppo-

site to the inlet 5 the bottom plate 4 is formed with a bearing 7 through which passes a shaft 8, the axis of which coincides with the axis A—A of the chamber 1. On the upper end of the shaft 8 within the chamber 1 is secured an impeller disc 9 of somewhat conical form having blades 10 secured upon its upper surface and blades 11 on its lower surface adapted to serve a purpose hereinafter described.

Around the periphery of the impeller disc 9 in the bottom plate 4 is disposed a number of outlets 12 corresponding to the number of the distribution pipes 13 to which it is desired to supply equal quantities of the material. The outlets 12 are equally spaced apart and are equidistant from the axis A—A.

The shaft 8 passes through a gland 14 and is driven from a motor 15 by the aid of a worm gear 16 carried together with said motor upon a bracket 17. The casing of the worm drive also includes thrust bearings for the shaft 8. Upon the motor shaft 18 is mounted a sprocket wheel 19 which drives, by means of a chain 20, a further sprocket wheel 21 mounted upon the end of a shaft 22 operatively connected to an air compressor 23 also mounted upon the bracket 17.

The compressor 23 is adapted to supply air through a pipe 24 to a receiver 25 from which a pipe 26 leads to a bore 27 in the bottom plate 4. The bore 27 communicates with the inside of the bearing 7 of the impeller shaft whereby the compressed air may be blown through the upper portion of the bearing 7 so as to pass beneath a conical disc 28 to the space between the bottom plate 4 and the impeller disc 9.

The operation of the device will be apparent. The pulverulent material entering the chamber 1 through the inlet 5 will be propelled outward by the impeller blades 10 and caused to whirl in a uniform manner within the chamber 1 about the axis thereof. In this way the pulverulent material is rendered available in a similar manner to each of the outlets 12 and provided that the pressures in the distribution pipes 13 are equal, a similar supply of pulverulent material through the several distribution pipes is always assured. The access of the material to the underside of the impeller disc where it might enter the bearing of the impeller shaft and interfere with the operation thereof is prevented by the action of blades 11 together with the air supply from the compressor 23 and receiver 25, which cause a continual draught through the shaft bearing into the impeller and outwardly therein with respect to the said shaft.

It will be observed more particularly from Figs. 2 and 3 that the mouths of the outlets 12 are outwardly flared and formed somewhat bell-shaped so as to merge smoothly into the walls of the chamber 1. This in an important feature since it eliminates any tendency there may be for the pulverulent material to lodge or accumulate within the chamber and insures that a substantially stream-line flow of the material to the several outlets is maintained.

One or more auxiliary air inlets 30 may be provided in the wall of the chamber 1 having a spring-loaded valve 31 adapted to admit air from the external atmosphere should the pressure within the casing 1 fall below a predetermined limit. Obviously such inlets might be arranged to admit air at any desired pressure from any other suitable source. The inlet valves 30 are mounted upon detachable cover members 32 whereby access to the interior of the chamber may be had without removing the upper member 2 of the distributor casing. It will be apparent that air admitted through the valves 30 will be intimately mixed in a uniform manner with the pulverulent material supplied to outlets 12.

If desired the impeller may be of such form as to considerably increase the pressure or velocity of flow of the material through the pipe system to which the distributor is connected and in such case would preferably be of a form similar to that shown in Fig. 4. In this figure the impeller is of a substantially similar form to that usually employed in the well-known Sturtevant blower, the impeller blades 34 extending between a lower disc 35 and a cover disc 36 so as to completely occupy the central portion of the chamber 1. The pulverulent material supplied by way of pipe 6′ enters the eye of the impeller 34 and is ejected with increased velocity so as to whirl rapidly within the lower peripheral portion of the chamber 1. The outlets 12′ are disposed at an angle to the axis of the chamber so as more readily to receive the material whirling in the adjacent region of the chamber.

This figure also shows a modified construction of auxiliary air inlets in which an annulus 37 surrounds the inlet portion of the distributor casing adjacent the supply pipe 6′, said annulus being adapted to receive air from any suitable source and to admit same to the distributor through ports 38 formed in the walls thereof. In other respects the construction and operation of the distributor shown in Fig. 4 is substantially the same as that previously described with reference to Figs. 1–3.

It will be evident from the foregoing that the invention provides a distributing device whereby pulverized fuel may be delivered, together with a suitable proportion of air or other gas, in a uniform manner to a plurality of branch distribution pipes, it being understood that the quantity of material delivered through such branch pipes may be controlled by regulating valves or the like in said branch pipes. The invention assures, however, that so far as the inlet ends of the branch pipes

are concerned, a similar quantity of material is rendered available to each pipe.

While we have described and illustrated the invention in its preferred forms, it will be apparent from the foregoing that various changes or modifications therein may be possible without departing from the spirit of the invention and we desire therefore that only such limitations shall be placed thereon as are imposed by the prior art or as are specifically set forth in the appended claims.

We claim as our invention:—

1. A distributor for pulverized fuel comprising a circular chamber having an axially disposed inlet and a plurality of outlets equally spaced apart and equi-distant from the central axis of the chamber, an impeller mounted in the chamber and rotatable about the axis thereof, and means for admitting auxiliary air to agitate the fuel in the region of the junction of the chamber with the supply pipe and before entry into the impeller.

2. A distributor for pulverized fuel comprising a circular chamber formed of a domed upper member and a bottom plate member detachably secured together, said chamber having an inlet centrally disposed in said domed upper member, an impeller rotatably mounted centrally of said lower plate member opposite the said inlet, said chamber having a plurality of outlets equally spaced in the walls of the casing around the outer periphery of the impeller, and means for admitting auxiliary air to agitate the fuel in the region of the junction of the chamber with the supply pipe and before entry into the impeller.

3. A distributor for pulverized fuel comprising a dome-shaped chamber having an inlet centrally disposed at the crown thereof, an impeller rotatably mounted in said chamber opposite said inlet and having blades disposed to impel fluid from the centre outwardly, a shaft for said impeller passing through and journalled in the wall of the chamber, means for creating a draught through the shaft bearing into the chamber, said chamber having a plurality of auxiliary air inlets in its upper part above the impeller and a plurality of outlets equally spaced in its wall about the periphery of the impeller.

4. A distributor for pulverized fuel and air comprising a dome-shaped chamber having an inlet centrally disposed at the crown thereof, an impeller rotatably mounted in said chamber with the eye of the impeller opposite said inlet, and a conduit for admitting a supply of auxiliary air adjacent said inlet and above the eye of the impeller, said chamber having a plurality of outlets equally spaced in its wall about the outer periphery of the impeller.

5. A distributor for pulverulent material comprising a dome-shaped chamber having an inlet centrally disposed at the crown thereof, an impeller mounted upon a shaft passing through and journalled in the wall of said chamber opposite said inlet, auxiliary air inlet means above the impeller, means for supplying air under pressure through the impeller shaft bearing to the lower side of the impeller, and a plurality of outlets equally spaced about the outer periphery of the impeller.

6. A distributor for pulverulent material comprising a dome-shaped chamber having an inlet centrally disposed at the crown thereof, an impeller rotatably mounted in the chamber opposite said inlet, a shaft for said impeller passing through the wall of the chamber opposite said inlet, means for rotating said shaft, air compression means driven thereby, and means for supplying compressed air between the impeller and the wall of the casing through which said impeller shaft passes.

7. A distributor for pulverized fuel and air comprising a dome-shaped chamber, an inlet pipe centrally disposed at the crown of said chamber, said chamber having a plurality of auxiliary air inlets, an annular chamber enclosing said inlets, a pipe for supplying air to said annular chamber, and an impeller rotatably mounted in the dome-shaped chamber and closely enclosed thereby, the eye of the impeller being disposed opposite said inlet pipe, said dome-shaped chamber having a plurality of outlets equally spaced about the outer periphery of the impeller.

8. The combination with a main supply pipe through which air mixed with pulverized fuel is caused to pass under pressure, of a circular chamber co-axial with said pipe, a plurality of pipes arranged around the periphery of said chamber, an impeller in said chamber closely enclosed by the walls thereof and adapted to distribute the air and fuel substantially equally to said plurality of pipes, and auxiliary air inlets disposed around the junction of the main pipe and circular chamber.

9. The combination with a main supply pipe through which air mixed with pulverized fuel is caused to pass under pressure, of a circular chamber co-axial with said pipe, a plurality of pipes arranged around the periphery of said chamber, an impeller in said chamber closely enclosed by the walls thereof and adapted to distribute the air and fuel substantially equally to said plurality of pipes, and means for supplying auxiliary air at a plurality of points around the junction of the main pipe with the circular chamber.

In testimony whereof we have hereunto subscribed our names this Twenty-first day of May, 1928.

CHARLES SKENTELBERY.
GEORGE ROSCOE ALDEN.