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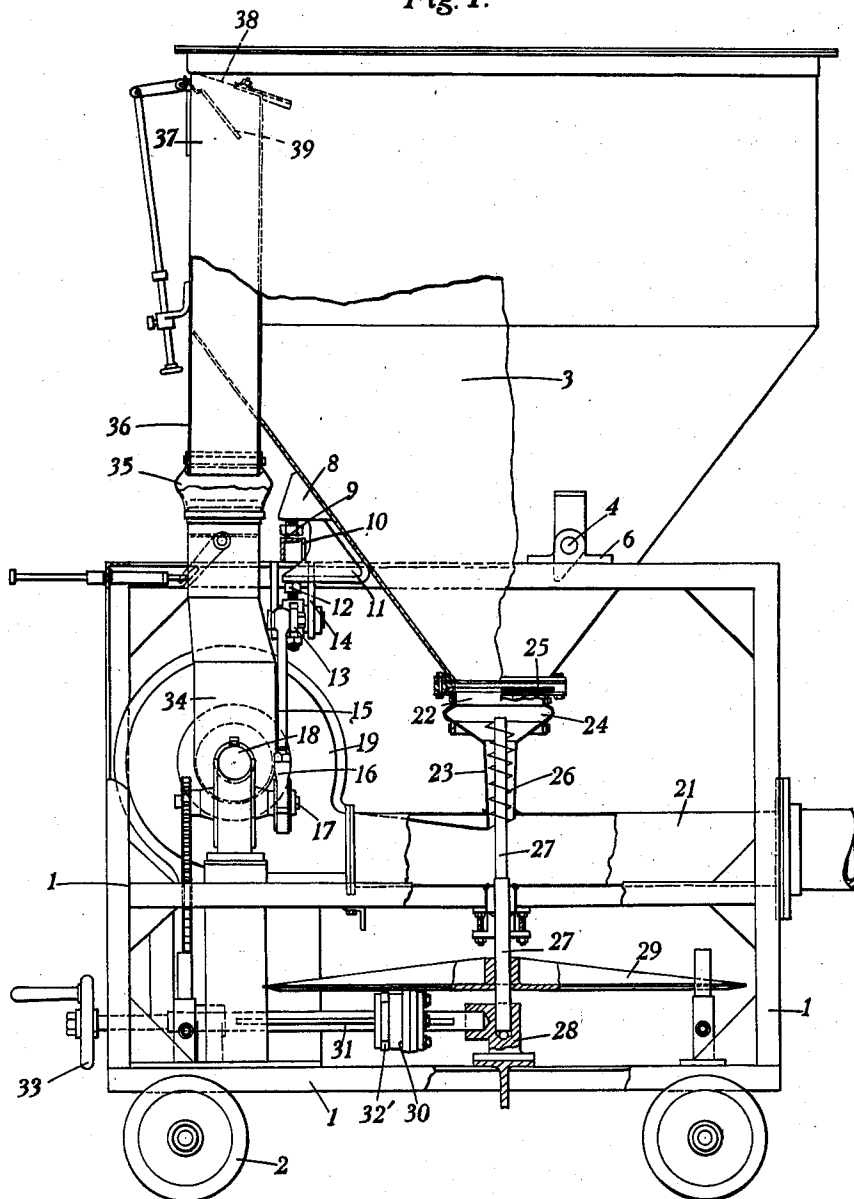
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FEED HOPPER FOR PULVERIZED MATERIALS

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2 Sheets-Sheet 1

Fig. 1.



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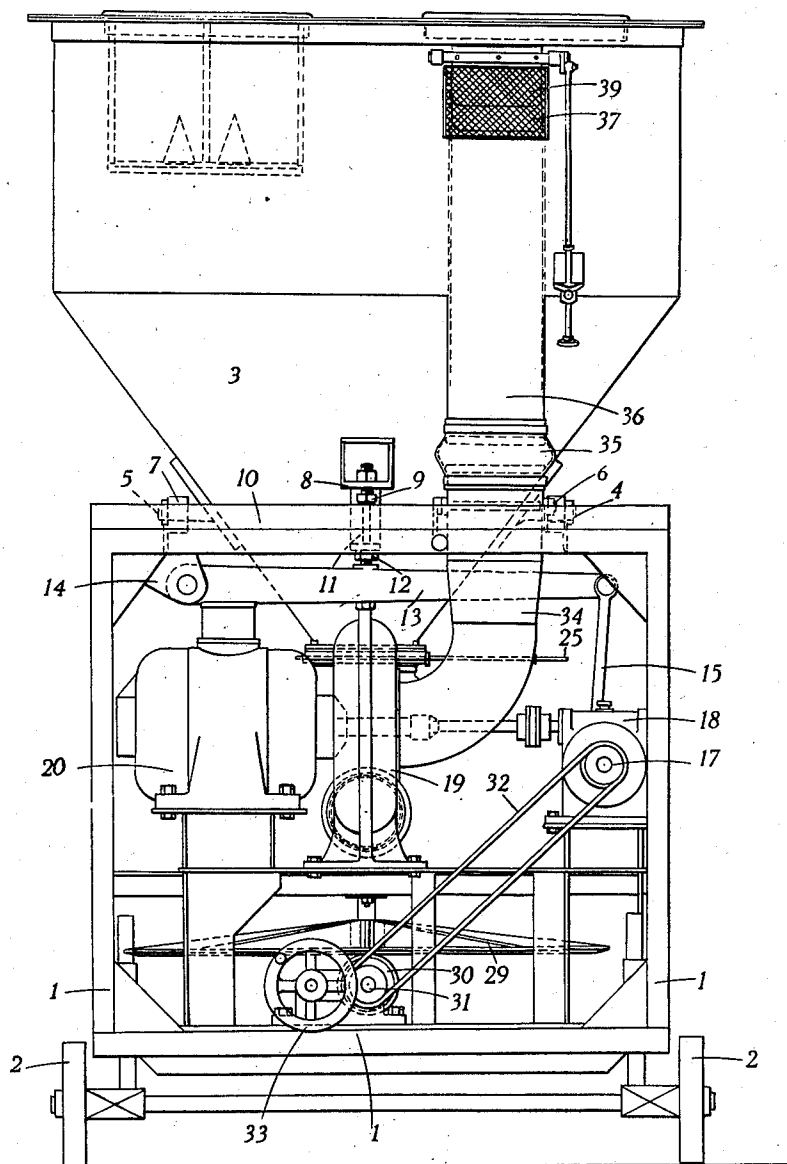
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Fig. 2.



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FEED HOPPER FOR PULVERIZED MATERIALS

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6 Claims. (Cl. 302—56)

This invention consists in an improved feed mechanism comprising feed hoppers for use in connection with pulverized fuel plants and other plants handling pulverulent materials.

As is well known, in connection with pulverized fuel plants, the great drawback to the use of pulverized fuel has been that hitherto where the feed hoppers are of any depth, owing to the weight of the fuel there is a tendency for it to clog about the feed mechanism so that very frequently the uniform feed is interfered with. For example in the case of the helical form of feed, the helix works in a hole owing to the fuel remaining stationary owing to this clogging; or in other instances the fuel becomes de-aerated and is fed by the helix in lumps which only disintegrate when they come into the air blast, with the result that the flame emanating from the burner pulsates between a maximum and minimum calorific value with resulting inefficiency of the furnace. Various proposals have been made to obviate this drawback, and among these has been the provision of an eccentric mechanism which when set in motion produced vibrations on the hopper. In other proposals the hopper was subjected to a rocking and jarring action at the end of its movements with the object of shaking down the contents. While this last proposal went a considerable way towards the solution of the problem, it was not found to be an entirely satisfactory solution of the difficulty, owing to the tendency of the fuel to become de-aerated and so clogged.

It is the main object of the present invention to provide means whereby the portion of pulverulent material being fed into the receptacle is aerated just before it is discharged into the receptacle and thus to ensure its entering the receptacle in its original finely divided form and not in irregular coagulated lumps.

According to the invention the hopper is pivotally mounted so that the discharge orifice moves to and from the inlet orifice of the blast tube into which the material is to be fed while the connection between the hopper discharge orifice and the said blast tube comprises a bellows so that rocking of the hopper flexes the said bellows and causes a kind of pumping action which aerates and maintains the material in its pulverulent condition.

The invention will now be described by way of example with reference to the accompanying drawings which show a pulverized fuel feed plant.

In the said drawings:

Fig. 1 is a side elevation.

Fig. 2 is an end elevation.

Referring more particularly to the drawings, 1 is the frame of the apparatus which rests on wheels 2 so that the whole equipment may be moved to different boilers, furnaces or other heat absorbers. The numeral 3 indicates the hopper which is mounted to oscillate on the frame 1 about an axis offset from its centre line so that the hopper tends to rest in the one position when not in operation and its discharge orifice to move up and down. The said offset pivoting centre comprises two pivot pins 4, 5 projecting from the face of the hopper and offset from its centre-line the said pins being supported on pedestal bearings 6, 7 on the upper portion of the frame 1.

On the side of the hopper 1 remote from the pivot pins 4, 5 there is rigidly secured a reaction lug 8 of robust construction which has an adjustable stop 9 adapted to abut against a reaction cross member 10 on the frame 1. Rigidly secured to the face of the hopper on the same side as the said reaction lug 8 is a horizontal impact abutment 11 against which is adapted to abut an adjustable stop 12 on a horizontal beam 13 pivotally mounted at one end to a lug 14 on the frame 1.

The free end of the beam 13 has articulated thereto a pitman 15 having at its lower end an eccentric strap 16 which engages with an eccentric on a countershaft 17 driven by a worm gear 18 from the spindle of a blower 19, which in its turn is driven by the motor 20.

The blower 19 communicates with a fuel and air blast pipe 21 leading to the burner nozzle (not shown). Vertically beneath the discharge orifice 22 of the hopper 3 is a vertical casing 23 which is connected to the hopper 3 by means of a flexible sleeve or bellows 24 which may be of rubber. Discharge of fuel from the hopper is controlled by a slide 25.

Inside the casing 23 is a vertical feed screw 26 mounted on a shaft 27 passing through the blast pipe 21 and resting on a pedestal 28 beneath the said pipe. Rigidly mounted on the shaft 27 is a friction disc 29 which is driven by a rubber tired friction roller 30 on a splined shaft 31 which in its turn is driven by a chain 32 from the countershaft 17, the roller 30 being axially movable along the shaft 31 by means of a bridge 32' operated by a handwheel 33. This variable drive does not form part of the present invention.

The air intake 34 to the fan 19 is shown connected by a flexible sleeve 35 to a main air inlet pipe 36 which passes into the hopper 3 and has an inlet orifice 37 open to atmosphere and ad-

jutable orifice 38 open to the interior of the hopper 3, the said orifices being controlled by means of a damper 39 so that a sub-atmospheric pressure may be set up at will inside the hopper 3 for a purpose which does not form part of the present invention.

As will be readily understood, when the motor is set in operation the countershaft 17 will cause the pitman 15 to oscillate and so rock the beam 13. According to the setting of the stops 9 and 12 there will be imparted to the hopper a series of rocking movements ranging from a series of impacts of greater or less magnitude to a smooth harmonic or rocking motion with no impact.

When no rocking motion is required the stop 9 is screwed outwards until it abuts against the reaction member 10 so that the hopper is raised from the rocking mechanism, and the stop 12 lowered so that it does not contact with the impact lug 11.

When no impact is required but a simple smooth rocking motion only, the stop 9 is raised, so that it is always out of contact with the reaction member 10, and the stop 12 adjusted so that it is in contact with the impact lug 11 throughout its movement. Between these two adjustments an infinite variation of impacts is obtainable. For example a light impact is obtained by adjusting the stops 9 and 12 so that the latter abuts against the lug 11 slightly before the upward limit of movement of the beam 13, while maximum impact is obtained by adjusting the said stops so that the stop 12 abuts against the lug 11 as the beam passes the mid-point of its upward stroke.

The above adjustments for impacts introduce lost motion between the rocking mechanism and the hopper so that two impacts are imparted to the hopper for every cycle of the rocking mechanism, the first by the stop 12 when it abuts against the lug 11 and the second by the stop 9 when it abuts against reaction member 10 on the rebound of the hopper 3 after it has been raised by the stop 12.

It will be seen that while the rocking and jarring shakes the fuel down towards the hopper discharge orifice, the reciprocatory movement between the hopper discharge orifice 22 and the feed screw casing 23 combined with the bellows 24 allows air alternately to flow from the blast tube 21 through the casing 23 into the space between the hopper discharge and the upper end of the casing 23 and then to be forced back so

that the aeration and the pulverulent state of the fuel is maintained, and where de-aeration may have occurred, the aeration restored. This leads to the further advantage that it is unnecessary to have a pulverizer with the plant, as the aerated pulverized fuel may be obtained in bulk and stored, it being immaterial whether de-aeration occurs.

The plant according to the invention may be used for any pulverulent material besides pulverized fuel, for example, flour, all kinds of powders, sugar, sawdust or mixtures of different pulverized materials.

We claim:

1. Feed mechanism for plants for handling 15 pulverized materials comprising a rockable feed hopper and means for rocking said hopper, a blast tube into which the material is to be fed, a discharge orifice on said hopper, a bellows connecting said discharge orifice with said blast 20 tube, so that rocking of said hopper flexes said bellows and causes a kind of pumping action which aerates and maintains the material about the discharge tube in its pulverulent condition.

2. Feed mechanism according to claim 1 25 wherein the bellows is made of rubber.

3. Feed mechanism according to claim 1 wherein the axis of oscillation of the hopper is offset from its vertical centre-line so that the hopper tends to rest in the one position when 30 not in operation, and its discharge orifice to move up and down.

4. Feed mechanism for plants for handling 35 pulverized materials comprising a frame, a rockable feed hopper mounted about an offset axis on said frame, a blast tube, a flexible bellows connecting said hopper to said blast tube, a reaction lug on the side of said hopper remote from said offset axis, a frame reaction member 40 on said frame, said reaction lug being adapted to abut against said reaction member, an impact abutment on the same side of said hopper as said reaction lug, and a reciprocating mechanism, a member of said reciprocating mechanism being adapted to abut against said impact lug. 45

5. Feed mechanism according to claim 4 comprising an adjustable stop between the reaction 50 lug and the frame reaction member.

6. Feed mechanism according to claim 4, comprising an adjustable stop between the impact 50 abutment and the reciprocating mechanism.

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