W. S. QUIGLEY.

APPARATUS FOR FEEDING FINELY DIVIDED MATERIAL.

APPLICATION FILED AUG. 13, 1914.

1,128,043.

Patented Feb. 9, 1915.

2 SHEETS—SHEET 1.

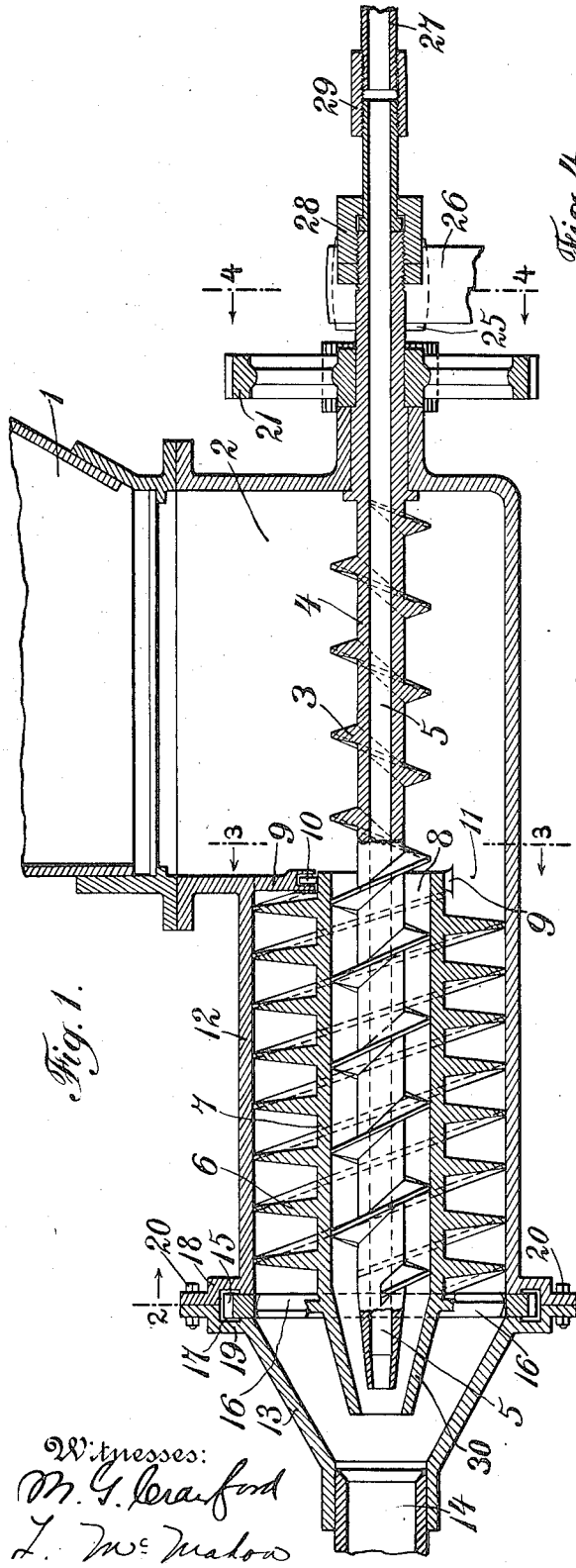

Fig. 1.

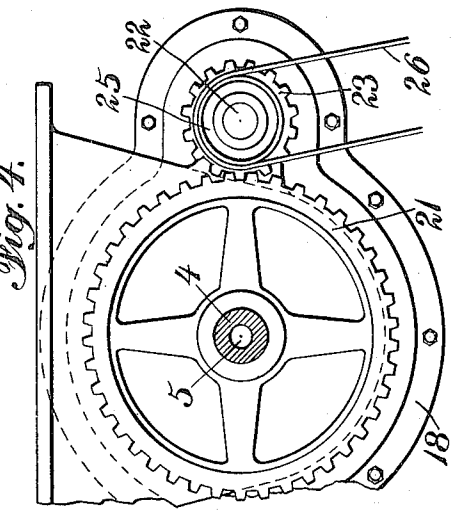

Fig. 4.

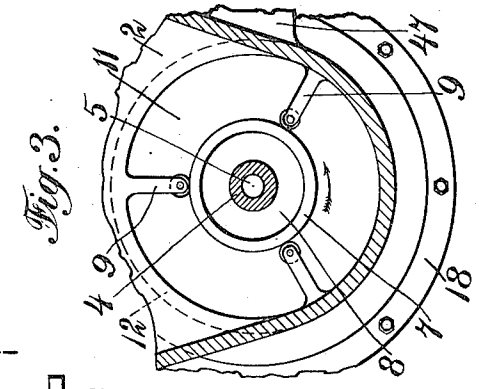

Fig. 3.

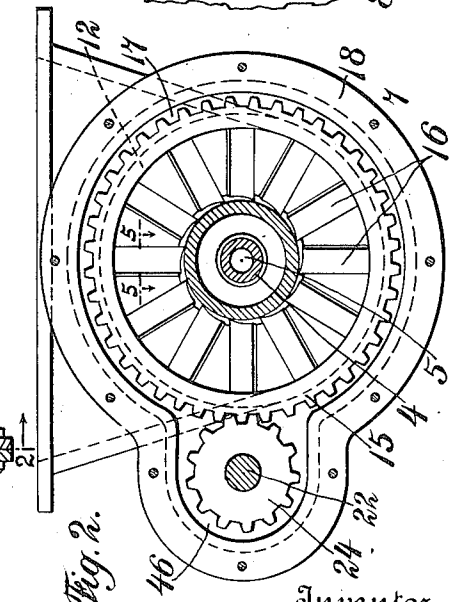

Fig. 2.

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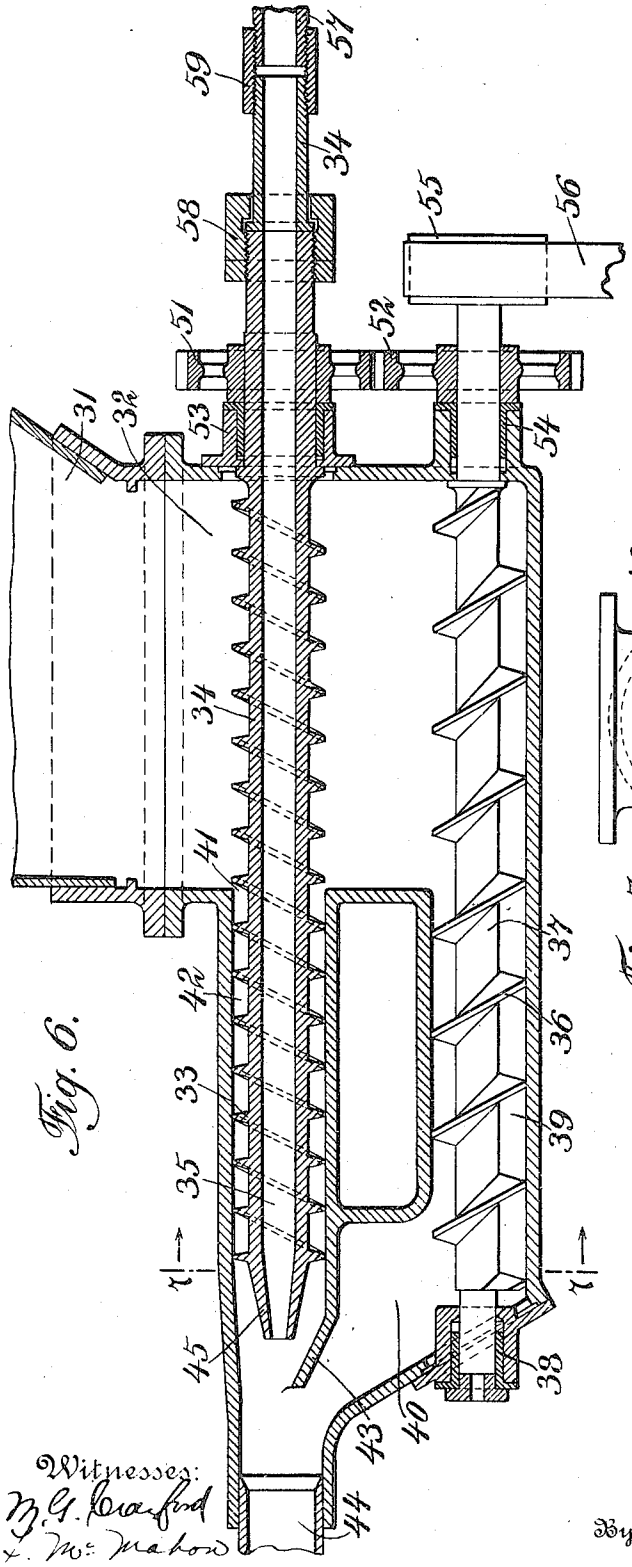

Fig. 6.

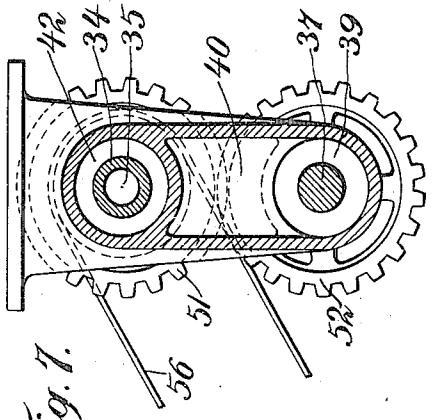

Fig. 7.

Fig. 5.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR FEEDING FINELY-DIVIDED MATERIAL.

1,128,043. Specification of Letters Patent. Patented Feb. 9, 1915.

Application filed August 13, 1914. Serial No. 856,633.

To all whom it may concern:

Be it known that I, WIRT S. QUIGLEY, a citizen of the United States of America, residing at New York city, county and State of New York, have invented certain new and useful Improvements in Apparatus for Feeding Finely-Divided Material, of which the following is a specification.

My invention relates to the feeding of finely divided material by means of a current of air and comprises self contained mechanism for constantly supplying an excess quantity of such material to the jet of air in a most efficient manner.

My invention is particularly designed for handling pulverized fuel, such as finely ground coal, a regulated quantity of which is carried away by the air blast, said quantity varying according to the force and carrying power of said air blast.

A distinctive feature of my invention resides in the use of a hollow feed screw, the screw thread mechanically feeding the larger quantity of material, while the air blast is preferably delivered through the hollow screw core to utilize the quantity required.

The best form of apparatus at present known to me embodying my invention, and one modification thereof, are illustrated in the accompanying two sheets of drawings in which,

Figure 1 is a vertical longitudinal section of the preferred form of apparatus, parts being broken away. Fig. 2 is a cross section on line 2—2 of Fig. 1, looking in the direction of the arrows. Fig. 3 is a detail cross section on line 3—3 of Fig. 1, looking in the opposite direction, parts being broken away. Fig. 4 is a similar cross section on line 4—4 of Fig. 1. Fig. 5 is a detail cross section of one spoke of the gear wheel shown in Fig. 2, taken on line 5—5 of said figure. Fig. 6 is a vertical central section of a modified form of apparatus, parts being broken away, and Fig. 7 is a cross section on line 7—7 of Fig. 6.

Throughout the drawings like reference characters indicate like parts.

In Figs. 1 to 5, inclusive, 1, is a hopper placed over magazine 2, which latter has an opening 11, at one side from which extends a tubular conduit 12, having a tapered end 13. A discharge pipe 14, is connected to the outer end of conduit 12, preferably at the end of the tapered portion 13, and concentric with the axis thereof. In this conduit 12, is mounted a conveyer screw 6, having a core 7, with central bore 8. This screw is centered in the conduit at one end by bearing wheels 10, carried by radial lugs 9, extending inward from the magazine walls, and at the other end by gear wheel 15, having spokes 16, 16. These spokes are preferably rhomboidal in cross section as shown in Fig. 5, and so inclined as to have the same pitch as the threads of screw 6. The gear 15 is journaled in an annular groove 17, formed by the meeting flanges 18, of conduit 12, and 19, of end piece 13. These flanges are bolted together by bolts 20, 20, or equivalent fastening devices. The screw 6, may have a double thread, as shown, because of its large diameter.

3, is a conveyer screw of smaller diameter journaled in the bore of screw 6, and also having a core 4, with longitudinal bore 5. This inner screw extends across the magazine 2, and through its opposite wall, having the gear wheel 21, on its projecting end. Preferably the outer end of core 7, of the outer screw is tapered to form a nozzle 30, concentric with 13, and the outer surfaces of the end of core 4, of screw 3, may also be slightly tapered as shown in Fig. 1.

In operation the inner, or feed screw 3, is revolved in such direction as will draw material from the magazine 2, and force it through the bore 8, of screw 6, and out of the tapered nozzle 30 on the end thereof. The outer or return screw 6 is revolved in such direction as to feed back to the magazine 2, any surplus material which falls down along the inclined surface of the tapered end 13 of conduit 12. As shown, these screws 3 and 6, are given opposite pitches so that these results are produced when they both revolve in the same direction, *i. e.* counter clockwise, when looked at from the right hand end of Fig. 1, as indicated by arrows in Fig. 3. Other arrangements of parts to produce the same result might be substituted.

A suitable mechanism for rotating these screws in this manner consists of a countershaft 22, having a pinion 23, meshing with gear 21, on screw 3, and a pinion 24, rotating in a housing 46, formed by an extension of flanges 18, and 19, as shown in Fig. 2, and meshing with gear wheel 15. This counter shaft may be driven by pulley 25, and belt 26. A second journal bearing for countershaft 22, (not shown) may be carried by a

lug 47, a part of which is shown in Fig. 3, extending from the outer wall of magazine 2.

The airblast is supplied to the bore 5 of feed screw 3, by a pipe or hose 27, having a rotatable flanged coupling 28 to core 4, and a union 29.

In operation, a surplus of powdered coal or other material is forced from magazine 2, by screw 3, through bore 8, of screw 6, and nozzle 30. The blast discharged from the end of bore 5, of feed screw 3, picks up a certain portion of the material being forced out through nozzle 30, according to the pressure and carrying power of the jet, and carries it out through discharge pipe 14. The remainder falls down the inclined surface of the tapered end 13, of conduit 12, is delivered to return screw 6, by inclined spokes 16, 16, of gear 15, and by said return screw 6, carried back to magazine 2, to be used over again.

In the modification shown in Figs. 6 and 7, there is a similar hopper 31, magazine 32, double threaded feed screw 33, having core 34, and central bore 35, mounted in journal bearing 53, on the right hand wall of the magazine and projecting into conduit 42, through opening 41, from the magazine. The under side of conduit 42, has the upwardly projecting lip 43, at its outer end, and below this is an overflow chamber 40, connecting with return conduit 39, in which is return screw 36, having solid core 37, journaled in bearings 38, and 54. The feed screw 33, preferably ends in a tapered nozzle 45, and preferably, in line with this, is the discharge pipe 44. The gear 51, on feed screw 33, meshing with gear 52, on return screw 36, form convenient means for rotating the screws in opposite directions, they being given similar pitches. A convenient driving means consists of pulley 55, on return screw 36, and belt 56, running over said pulley. Blast is supplied to the bore 35 of feed screw 33, by blast pipe 57, having coupling 58, with the core 34, and union 59.

In operating this form of my invention a larger quantity of powdered coal or other material is fed from magazine 32, by screw 33, through conduit 42, over lip 43, in front of nozzle 45, on said screw than the maximum air blast can pick up. The airblast, entering through bore 35, and nozzle 45, picks up its due proportion of the coal or other material and carries it out through discharge pipe 44. The residue falls through overflow chamber 40, to return conduit 39, through which return screw 36 forces it back to the magazine 32.

While I have shown the line of blast inlet and the discharge outlet parallel to the feed screw in each case, it is evident that the line of air blast might be differently arranged so long as it was so located as to enable the blast to pick up its proper amount of the fuel or other material delivered by the feed screw at the end thereof, and to permit the excess material to fall into the control of the return screw.

Other changes in details of construction could be made without necessarily departing from the broad principle of my invention, which includes any arrangement of apparatus in which the air blast picks up the material delivered at the end of the feed screw, as distinguished from picking up the material from a side opening, or radial discharge opening from the feed screw conveyer conduit.

Having, therefore, described my invention, I claim:

1. In an apparatus for feeding finely divided material the combination of a magazine having an opening at one side and a conduit connected thereto, a hollow imperforate conveyer screw extending from the interior of said magazine along said conduit, a second hollow imperforate conveyer screw mounted on and surrounding said first mentioned screw, and extending along said conduit, means for delivering a supply of air under pressure to the interior of the first mentioned conveyer screw, means for rotating said screw in a direction to force material out of the magazine and means for rotating the second mentioned conveyer screw in a direction to force material into the magazine.

2. In an apparatus for feeding finely divided material, the combination of a hollow, imperforate conveyer feed screw, a hollow, imperforate return screw mounted on and around said feed screw, a conduit along which said screws extend, and means for delivering a current of air to the delivery end of the feed screw through the interior thereof.

3. In an apparatus for feeding finely divided material the combination of a magazine, a hollow feed screw extending through and out of said magazine, means for delivering a supply of compressed air through said hollow screw to the outer end thereof, and means for returning to the magazine the surplus material not picked up by the air jet.

4. In an apparatus for feeding finely divided material the combination of a magazine, a hollow feed screw extending through and out of said magazine, means for delivering a supply of compressed air through said hollow screw to the outer end thereof, and means for returning to the magazine the surplus material not picked up by the air jet, said means comprising a return screw located parallel to the feed screw and extending back to the magazine.

5. In an apparatus for feeding finely divided material the combination of a maga-

zine having an opening at one side, a tubular conduit extending from said opening, a conveyer screw mounted in and filling said tubular conduit, a gear wheel mounted on said screw having a rim whose inner diameter is approximately equal to the inner diameter of the tubular conduit and which is provided with spokes of rhomboidal cross section having a pitch similar to the pitch of the conveyer screw, and an externally located driving pinion meshing with said gear, together with means for delivering finely divided material from said magazine to said conveyer screw.

6. In an apparatus for feeding finely divided material the combination of a tubular conduit having a tapered end portion, a conveyer screw filling the cylindrical portion of said conduit and having a hollow core terminating in a tapered nozzle concentric with the tapered end of the conduit, a feed screw mounted in and filling the cylindrical portion of the space in the core of the first mentioned conveyer screw, means for producing a jet of air at the end of the nozzle on the outer screw, means for rotating the inner screw so that it will feed material to and through the nozzle on the outer screw core, and means for rotating the outer screw so that it will feed in the opposite direction any material falling into the conduit in which it is located.

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