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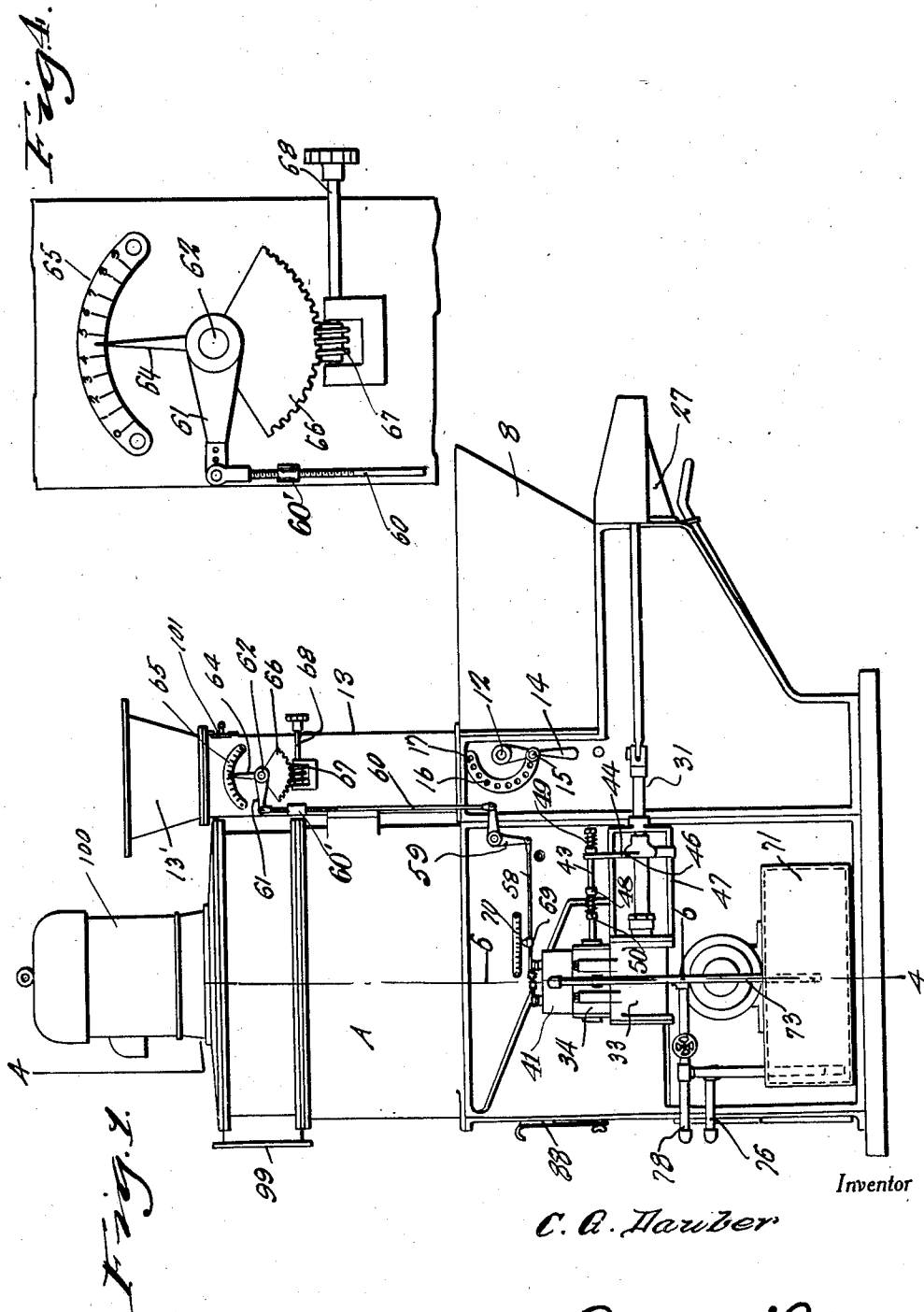
C. G. DAUBER

2,050,423

MATERIAL TREATING DEVICE

Filed Feb. 7, 1933

4 Sheets-Sheet 1



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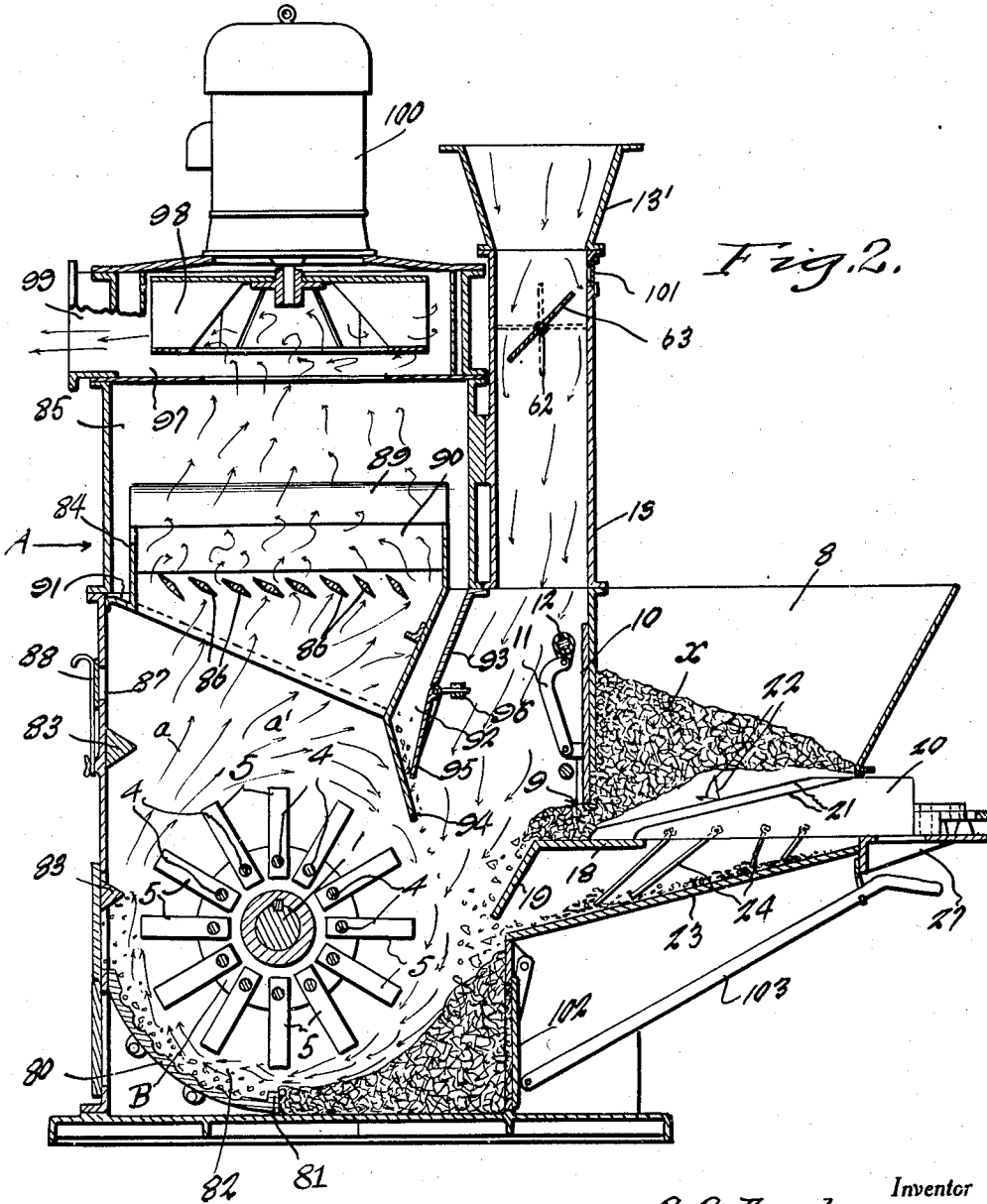
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MATERIAL TREATING DEVICE

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4 Sheets-Sheet 2



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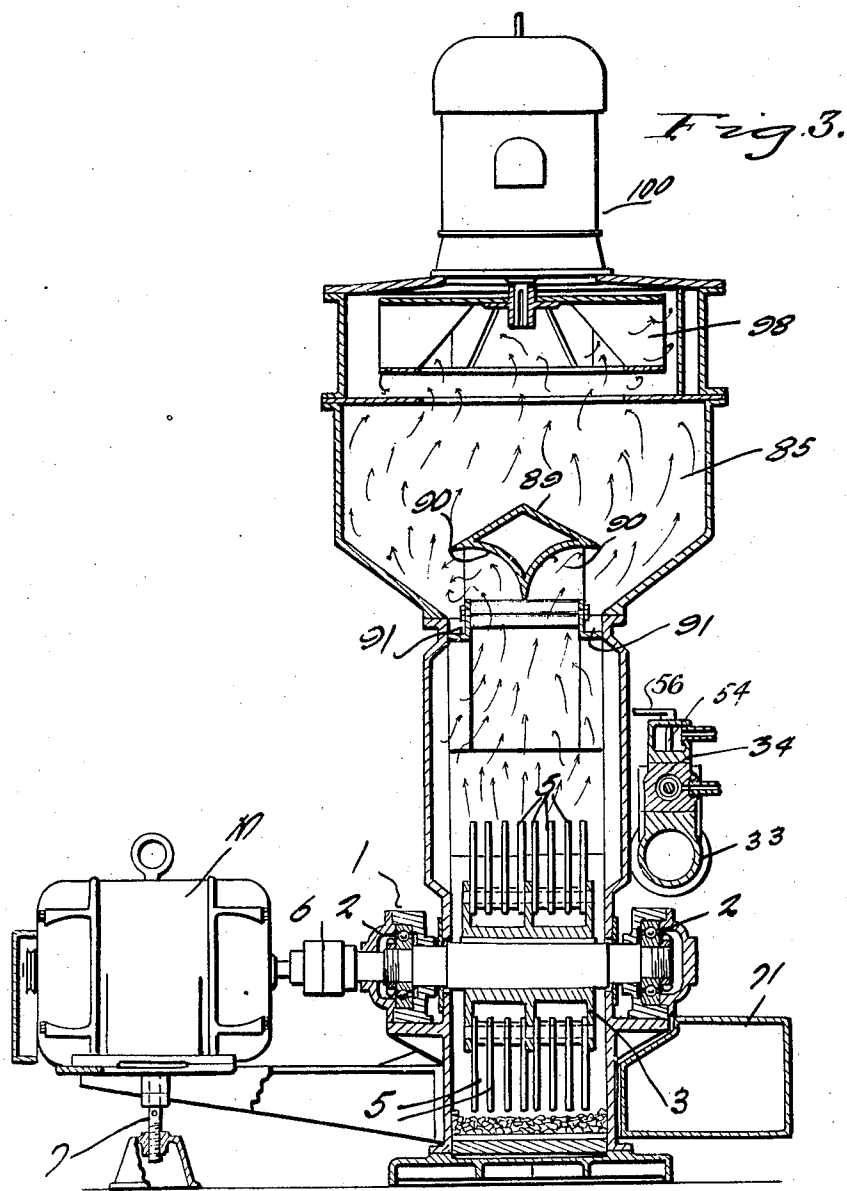
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MATERIAL TREATING DEVICE

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4 Sheets-Sheet 3



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Fig. 5.

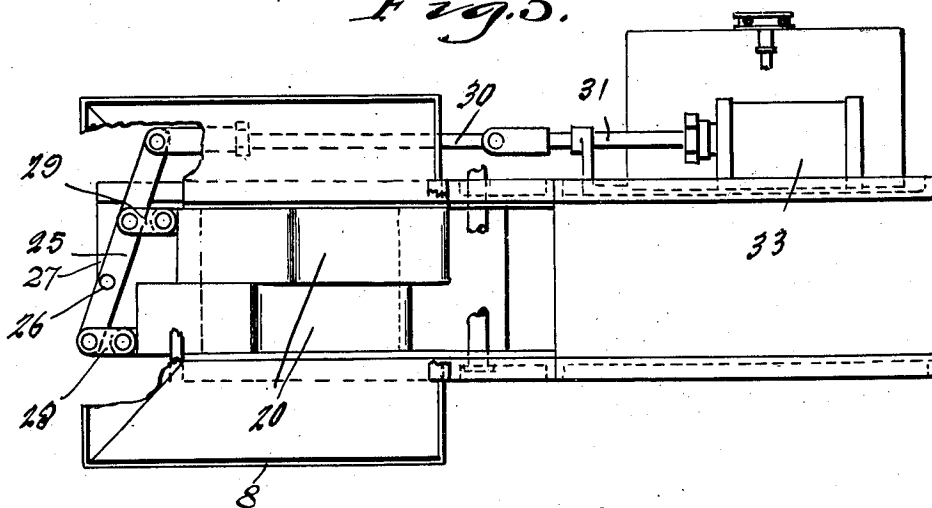
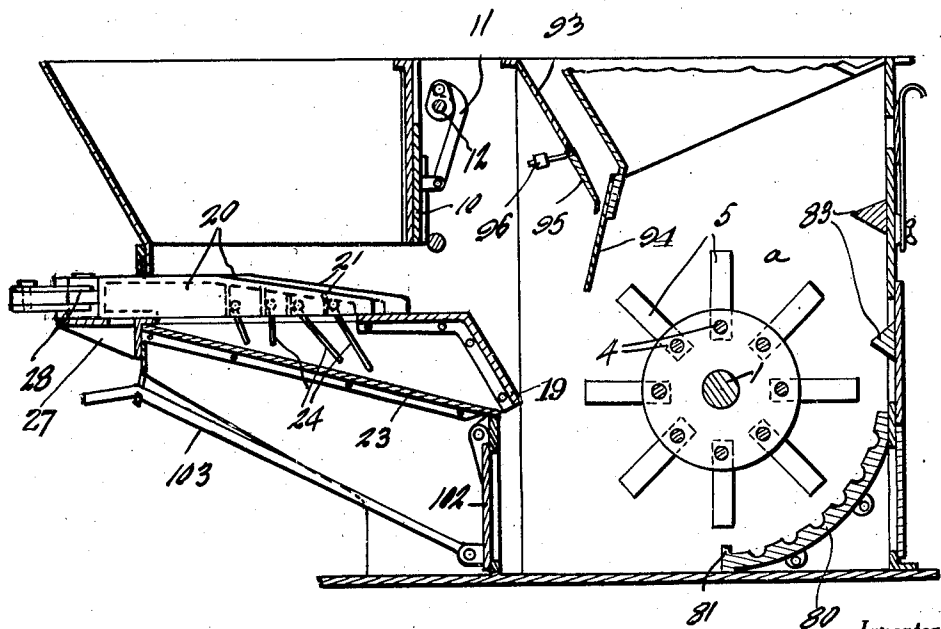


Fig. 6.



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UNITED STATES PATENT OFFICE

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MATERIAL TREATING DEVICE

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2 Claims. (Cl. 83—11)

This invention relates to a material treating device which may be used for reducing or pulverizing coal and similar fuel, and mixing the fuel or other material with air and then conveying the fuel to a furnace or other place of use.

The general object of the invention is to provide means for pulverizing or reducing the material, means for supplying such means with the fuel or material, from a hopper, means for drawing air into the apparatus and for conveying the pulverized or reduced material therefrom, and means for controlling the flow of air into the apparatus in accordance with the amount of the material passed into the apparatus.

The present invention also consists in certain other features of construction and in the combination and arrangement of the several parts to be hereinafter fully described, illustrated in the accompanying drawings and specifically pointed out in the appended claims.

In describing the invention in detail, reference will be had to the accompanying drawings wherein like characters denote like or corresponding parts throughout the several views, and in which:—

Figure 1 is an elevation of the device.

Figure 2 is a vertical sectional view through the device.

Fig. 3 is a section on line 4—4 of Fig. 1.

Fig. 4 is an enlarged view of the manually operated means for controlling the fuel and air controlling means and the indicating means.

Fig. 5 is a top plan view of the hopper and the feeding means therein.

Fig. 6 is a vertical sectional view through the hopper and the reducing means.

In these drawings the letter A indicates a housing, the lower part of which forms a reducing chamber *a* and through this chamber a shaft 1 passes, the ends of the shaft being provided with the anti-friction bearings 2 which are located exteriorly of the housing. This shaft has attached thereto within the chamber *a* a hub 3 having a number of annular flanges which support an annular row of small shafts 4 to which are pivoted the hammers or beaters 5 which act to reduce or pulverize the material introduced into the chamber *a*. The shaft is connected to the shaft of a motor M by a coupling 6 and I prefer to make the motor adjustable as to its height from the supporting base or structure by the means shown generally at 7.

A hopper 8 is arranged at one side of the housing in which the material X to be reduced or pulverized is placed. The hopper communicates with the chamber *a* through means of an opening 9 which is controlled by a gate 10 which is raised and lowered by means of a link 11 connected to a lug on the gate and having its upper curved end pivoted to a shaft 12 passed through a wall

of a vertically arranged air conduit 13 and said shaft has a handle 14 on its outer end. This handle carries a detent 15 which is adapted to be engaged in any one of a row of holes 16 placed on an arcuate plate 17 fastened to the wall of the conduit as shown in Fig. 1. Thus the gate can be adjusted to the desired position and the detent will hold it in its adjusted position.

The bottom 18 of the hopper slopes downwardly to the opening 9 and is extended through the opening and terminates in a downwardly and inwardly sloping part 19 over which the material falls into the reducing chamber *a*.

The material is forced from the hopper through the opening 9 by a number of reciprocatory members 20, two of which are shown in the drawings but it will of course be understood that any desired number of these members may be used.

Each member 20 is formed with an inclined upper face 21 at its front portion and these members are so actuated that one member moves forwardly while the other member is moved rearwardly so that the material in the hopper is agitated and caused to roll from side to side and to move forwardly as shown by the arrows 22 in Fig. 2. This action allows the hopper 8 to completely empty itself and prevents bridging of the material in the hopper even when said material is wet or moist, such as wet coal screenings. The two members 20 are supported by and slide on the bottom 18 of the hopper and they deliver the material to the reducing chamber *a* in a continuous stream. The material passes over the sloping plate 19, which being greater in width than either member 20 allows the material to be spread out and enter the reducing chamber loosely. This plate or part 19 is also placed in such a position to the air stream passing downwardly through the conduit 13 that said air stream passes over the material as it loosens, thus taking out any excess moisture in the material.

An opening is formed in the bottom 18 of the hopper which is covered by the members 20 and any material passing by said members 20 will drop on an inclined plate 23 arranged under the bottom of the hopper and entering the reducing chamber *a* below the sloping part 19 and the material dropping onto this plate 23 will be pushed down the same by the scrapers 24 pivoted at their upper ends to the lower portions of the members 20, as shown in Fig. 2.

A lever 25 is pivoted intermediate its ends at 26 to a bracket 27 attached to a part of the hopper at the outer side thereof and this lever, on one side of the pivot, is connected by a link 28 with one of the members 20 and on the other side of the pivot by a link 29 with the other member 20. Thus rocking movement of the lever will impart the beforementioned movement of the members 20. The outer end of the lever is connected

by a link 30 to a piston rod 31, the piston, not shown being arranged in the cylinder 33 suitably supported at one side of the housing. A valve chest 34 is connected with the cylinder and contains a valve for controlling the flow of fluid to and from the cylinder 33 for actuating the piston thereof, the valve rod being shown at 43.

The valve rod 43 is operated from the piston rod 31 by means of an upright member 46 attached to the piston rod 31 and slidably supported in a yoke 47 as shown in Fig. 1. This member has its upper end forked and this end is adapted to engage the collars 48 slidably arranged on the shaft 43 and engaging the inner ends of the springs 49 on the shaft 43 with the outer ends of the springs bearing against the stationary collars 50, attached to the rod 43.

As will be seen from Fig. 1, the member 46 has its upper end located between the collars 48 so that it will engage one collar on the outward movement of the piston and its rod and will engage the other collar on the inward movement so that the valve member to which the rod 43 is connected is shifted from one position to the other by the movement of the piston and its rod.

The chest 34 exhausts into the chamber forming member 41 and the exhaust ports are controlled by valves, the stem of one of which is shown at 54 in Figure 3. These valves act to maintain a constant determined pressure in the chest 34, which tends to hold the valve member therein in position until the member 46 on the piston rod 31 has pressed a spring 49 to move the valve member in the chest into position where all pressures on the valve member are equalized and the spring 49 expands to its normal position, thus throwing the valve member past the central position to permit fluid to enter the cylinder 33. The stems 54 are each provided with an arm 56 and these two arms are adjustably connected together by means not shown. A link 58 is connected to one of the arms 56 and is also connected to a bell crank 59 pivotally supported from the housing A and a link 60 connects the other end of the bell crank with arm 61, fastened to a shaft 62 which passes through the upper end of the air conduit 13 and has an air control valve 63 fastened thereto which controls the passage of air to the conduit. A pointer 64 is fastened to an exterior part of the shaft 62 and operates over a graduated member 65 supported from the wall of the conduit.

A toothed sector 66 is also attached to the exterior part of the shaft and is engaged by a worm 67 operated by a shaft 68 so that by turning the shaft by hand both the shutter or air valve 63 is adjusted and the two discharge valves 52. This arrangement will regulate the flow of air into the apparatus and at the same time regulate the operation of the feeding members 20 so that the flow of air and feed of material into the apparatus are controlled or regulated simultaneously which permits the proper amount of air to be supplied to the apparatus in accordance with a certain amount of material fed into the same. The link 58 also carries the pointer 69 which operates over a graduated member 70 on the housing which permits adjustment of the air controlling means and of the material feeding means to secure the introduction into the apparatus of a certain amount of air with the desired amount of material. In order to permit adjustment of the material feeding means independently of the air controlling means, the link 60 should be made ad-

justable as to its length and this may be done by making the link of two parts and connecting the two parts together by the turnbuckle 60'.

A tank 71 contains a suitable liquid and the discharge of the chest 41 has a pipe 73 connected therewith which leads into the tank so that the fluid or liquid after operating the piston will be returned to the tank. A pump, not shown, is driven from the motor M and is connected by a pipe 76 with the bottom of the tank and the pump delivers the liquid into the inlet chamber of the chest 34 through the pipe line 78.

An arcuate plate 80 is placed in the lower corner of the reducing chamber *a* opposite that side in which the material is introduced, this plate having a concaved surface arranged adjacent the hammers and this surface is corrugated or roughened as shown in Fig. 2 and Fig. 6. This face of the plate cooperates with the hammers to reduce the material and its forward end is enlarged to provide a blunt end 81. This plate provides a restricted area 82 perpendicularly below the center of the reducing means which causes the material and air to increase in velocity and thus obtain quicker reduction of the material. The end 81 of the plate 80 resting on the bottom of the reducing chamber tends to prevent any foreign matter in the material from passing beyond the forward end of the plate. Substantially triangular-shaped bars 83 are placed on the rear wall of the reducing chamber as shown in Fig. 2 and in Fig. 6 and these bars act as retarding means to prevent the material from travelling up the said wall of the chamber.

Immediately above the hammer assembly, the reducing member *a* is increased in area as shown at *a'* to cause a decrease in velocity of the air passing through the chamber and allowing the material to drop in velocity. A passage forming member 84 connects the reducing chamber *a* with a chamber 85 in the upper part of the housing, this member 84 forming a restricted passage for the mixture of air and reduced material from the chamber *a* into the chamber 85. Baffle bars 86 are arranged in a horizontal row in this member 84 and each bar is of substantially diamond-shape in cross section and are diagonally arranged as shown in Fig. 2. These bars act as baffles and are so placed that the pieces of material not fully reduced can be thrown at a tangent from the hammer assembly to strike the bars and drop back into the reducing means or bounce around in the area *a'*, thus further reducing them.

An opening 87 is formed in the upper portion of the rear wall of the reducing chamber *a* and is covered by a valve 88 of any suitable type and by opening this valve or partly opening it an auxiliary air supply is provided for the reducing chamber which does not pass around the reducing member.

Any air entering this opening 87 passes at an angle to or across the natural line of travel of the material in the part *a'* of the reducing chamber, thus slowing down the said material and hence causing the larger particles to drop or discontinue their line of travel and change the direction of the movement. This will allow for better separation and also give control over the mixture to be delivered.

A hollow baffle member 89 may be supported at its ends by the upwardly extended ends of the member 84, this member 89 having a top part of ridged construction with its lower part forming two oppositely arranged upwardly and outwardly curved surfaces 90, as shown in Fig. 3 which direct

the mixture of air and reduced material from the member 84 through the upper portion of the sides thereof into the chamber 85 as shown by the arrows in Figs. 2 and 3.

5 Downwardly and forwardly sloping gutter forming parts 91 connect the bottom of the member 84 with portions of the interior walls of the housing A so that any material separated from the mixture by the change of direction imparted
10 to the flow of mixture by the surfaces 90 of the member 89 will drop into these trough forming members 91 and this coarse material will pass down these parts and collect in the space 92 formed by a part of the member 84, the wall 93,
15 the extension 94 of said wall of the member 84, and the gate 95 which is hinged to the lower edge of the wall 92. This gate is normally held closed by a weight 96 but when the weight of the material collecting in the space 92 overbalances
20 the weight the gate will open so that the material will drop back into the reducing chamber α where it will be again brought into contact with the hammers and be re-reduced. This gate can be made to open after the desired amount of material
25 has collected in the space 92 by adjusting the weight and it prevents air from entering the chamber 85 without first passing through the reducing chamber.

The baffles 86 and the curved surfaces 90 also
30 tend to act as means for mixing the reduced material and the air. The chamber 85 being of a greater area than any other part of the entire device through which the material and air passes causes a corresponding decrease in the velocity
35 of the movement of air and material so that separation and mixing is more readily obtained and so that only such material as has been reduced to a point where it will float or remain in suspension from the beforementioned decreased air
40 movement will pass on into the fan chamber 97 wherein is mounted a fan 98 which delivers the material and air by means of an outlet 99 to a conduit which carries the material and air to the combustion chamber of a furnace or boiler, or the
45 like. The fan 98 is driven by a motor 100 which draws in the air to the conduit 13 which has its upper end flaring as shown at 13', this air passing through the apparatus as before described.

If desired the air conduit 13 can be connected to a source of heated air and a valve or gate 101, controlling an opening in the top part of the conduit 13 will permit cool air to enter the conduit so as to control the temperature of the air to the device.

55 A door 102 covers an opening in the front wall of the reducing chamber α and the door can be operated by means of a handle 103. This door will permit removal of the material in the reducing chamber whenever necessary such as for
60 cleaning purposes or the like.

Thus it will be seen that I have provided means for reducing or pulverizing material such as coal or the like and mixing the material with air which also acts to convey the reduced material through the apparatus and to separate
65 the larger particles therefrom and also as means for drying the material when the same is moist, with means whereby the air supply is regulated in accordance with the feeding of the material
70 from the hopper to the reducing means and with means for separating heavier or coarser particles

from the mixture passing upwardly in the device and returning such particles to the reducing means.

It is thought from the foregoing description that the advantages and novel features of the 5 invention will be readily apparent.

It is to be understood that changes may be made in the construction and in the combination and arrangement of the several parts provided that such changes fall within the scope 10 of the appended claims.

Having thus described my invention, what I claim as new is:—

1. A material reducing device comprising a 15 vertically arranged housing having its lower part forming a reducing chamber, a hopper connected to the front side of said chamber and having a lateral opening communicating with said chamber, means for feeding the material from the hopper into the chamber, a vertically ar- 20 ranged air conduit having its upper end open and its lower part communicating with the chamber adjacent the lateral opening, means for spreading the material passing from the opening into the air stream flowing through the conduit, a horizontally arranged reducing member 25 in the reducing chamber and laterally arranged in said chamber, said reducing member being arranged closer to the rear wall of the chamber than the front wall thereof, a concave in the lower rear corner of the reducing chamber, means for rotating the reducing member in a direction to cause the material to pass upwardly and rearwardly over said concave, a passage forming member located in an intermediate part of 35 the housing and connecting the reducing chamber to the upper part of the housing, said passage forming member having a downwardly and forwardly extending lower end, a gutter forming member connecting said lower end of the 40 passage forming member with the housing, the front portion of the lower end of the passage forming member having a downwardly and forwardly projecting extension extending into the air stream entering the reducing chamber, baffle 45 bars extending across the passage forming member, a baffle member extending across the top of the passage forming member, the top part of the housing having an outlet passage therein, a fan in the top part of the housing for discharging 50 the reduced material and air through the outlet, a valve in the air conduit for controlling the flow of air therethrough.

2. In a device of the class described, a hopper having a lateral discharge opening in a side 55 wall thereof, a part of the bottom of the hopper having an opening therein, slidable feeder members mounted in said hopper and having portions bridging the opening in the bottom thereof, said feeder members being arranged side by 60 side and movable alternately up to and away from said discharge opening, means for operating said feeder members, a member located under the bottom of the hopper and sloping downwardly to a point below said side wall of the 65 hopper, whereby material passing between the feeder members will drop upon said inclined member, and fingers pivoted to and depending from the feeder members for forcing the material down said inclined member.

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