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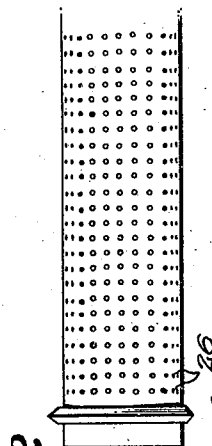
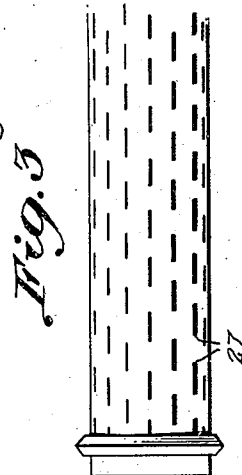
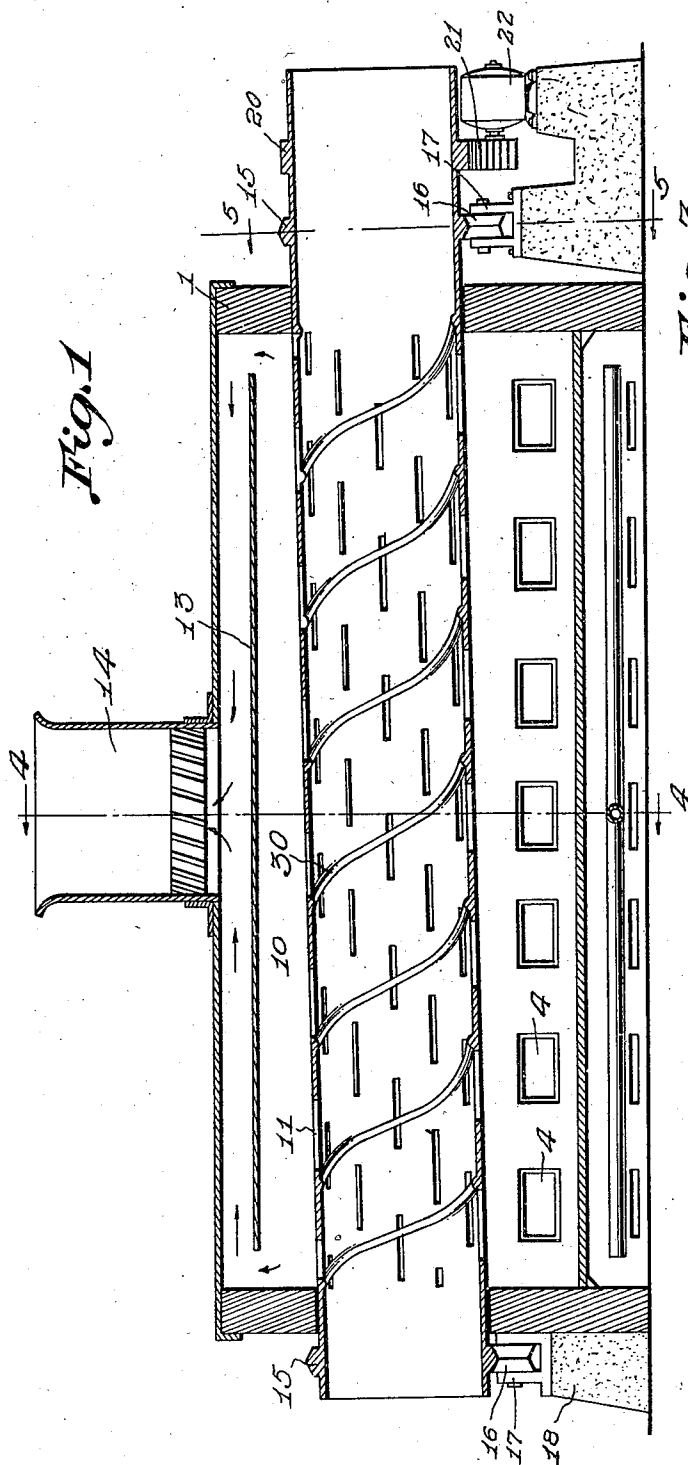
1,697,268

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METHOD OF AND APPARATUS FOR DRYING COMBUSTIBLE MATERIALS

Filed Sept. 20, 1926

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 4

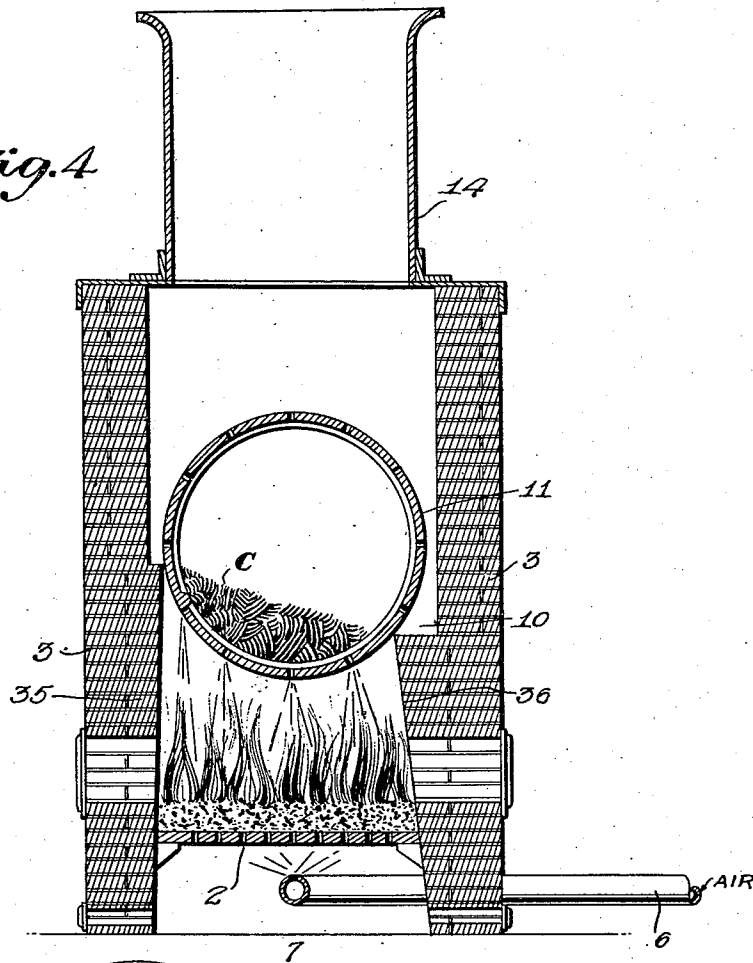
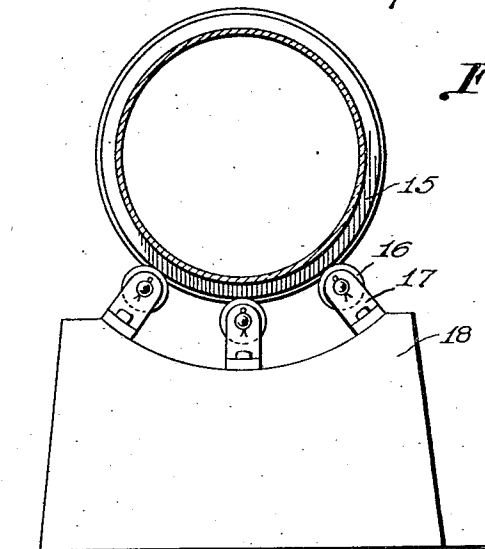


Fig. 5



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UNITED STATES PATENT OFFICE.

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METHOD OF AND APPARATUS FOR DRYING COMBUSTIBLE MATERIALS.

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This invention relates to a method of and apparatus for drying lignite or the like and is especially designed for reducing the moisture content of lignite to a point where the lignite is best adapted for combustion.

One of the principal objects of the invention resides in the provision of a method and apparatus of this character which may be carried out at a comparatively slight expense by reason of the fact that the lignite need not be crushed but is taken as it comes from the mines and dried by direct contact with the products of combustion of the fire whose fuel supply is the finely divided or powdered portion of the lignite being dried.

Heretofore in the art all practical driers available require the crushing of the lignite coal to 4" or less. The chief disadvantage of this method resides in the fact that it produces far too much fine or powdered coal for which there is at present only a limited market. The lump coal brings a good price for domestic use and would bring a much higher price if dried to some extent. The present invention resides in the provision of an apparatus embodying a furnace having a grate and a combustion space above the grate and also having a perforated revolving drum mounted in the combustion space of the furnace. The coal as taken from the mine is fed into the drum and is passed through the drum by virtue of the inclination of the drum and by virtue of feeding ribs or the like on the interior of the drum. During its passage through the drum the coal is subjected to the direct action of the products of combustion which pass therethrough. Due to the revolving motion of the drum the coal is subjected to continual agitation facilitating the passage of the products of combustion therethrough. The high moisture content of the coal, the moisture content being usually at 35%, precludes the possibility of the coal being ignited by this drying action and in fact with the present method and apparatus the moisture content is usually not reduced below 15%. It has been found that lignite coal having a moisture content of about 15% burns better and gives more satisfactory results than where the moisture content is reduced below this amount. In its broader aspects the invention is not limited to the provision of the rotary drum but contemplates means overlying the grate and ex-

tending through the combustion space and having openings permitting the passage of the products of combustion through the coal supported on such means, the coal being kept in a state of movement either by the movement of the means or by exterior devices. In all of its aspects the invention comprehends a method of partially drying lignite or other suitable material which has a high moisture content which method consists in causing the products of combustion to traverse the material to be dried while maintaining the material in a constant state of agitation.

Other objects and advantages reside in certain novel features of the construction, arrangement and combination of parts which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings forming a part of this specification, and in which:

Figure 1 is a view partly in longitudinal central vertical section and partly in side elevation showing an apparatus embodying the present invention.

Figures 2 and 3 are fragmentary views in elevation showing different drum constructions,

Figure 4 is a view in transverse vertical section on the line 4-4 of Figure 1, and

Figure 5 is a similar view on the line 5-5 of Figure 1.

Referring to the drawings the numeral 1 designates generally a furnace in which a grate 2 is provided. The furnace is preferably elongated and the grate bars extend transversely between the side walls 3 thereof. At suitable intervals along the side walls fire doors 4 are provided. An air blast may be provided below the grate by forcing air through a main air supply pipe 6 which connects with a perforated air discharge pipe 7. Above the grate 2 a combustion space 10 is defined and through this combustion space a revolving drum 11 extends. Above the revolving drum a baffle 13 is arranged, the baffle causing the products of combustion to circulate around and through the drum before they can pass to the flue or stack 14.

In the embodiment of the invention shown the revolving valve 11 is in the form of an elongated hollow cylinder which has internal ribs 15 adjacent its ends, the ribs

having double tapered outer surfaces which ride on correspondingly formed rollers 16 provided in bearing brackets 17 mounted on suitable supports 18. Any suitable means 5 may be used for turning the drum and one such means is shown for the purpose of illustrating as comprising a ring gear 20 fixed to the drum and driven by a pinion 21 actuated from an electric motor 22. The 10 portion of the drum 11 located within the combustion chamber 10 is provided with a multiplicity of openings, the openings being shown as slots 25 in Fig. 1. Figure 2 illustrates that the drum may be provided with 15 perforations or openings of relatively small circular form, as indicated at 26. Slits may be employed in lieu of the circular openings or slots, as illustrated at 27 in Fig. 3. To 20 produce the required feed of the material through the drum the drum may be inclined, as shown in Fig. 1, and the feed effected by this inclination may be supplemented by the provision of internal spiral feeding ribs 30. While the drum is preferably 25 inclined it may be disposed horizontal by increasing the size and number of the feeding ribs.

The lignite coal as it comes from the mine is fed in any suitable manner into the high 30 end of the drum and it passes through the drum under the influence of the inclination of the drum and under the action of the spiral ribs 30. Of course, during the passage of the coal through the drum it is subjected to the direct action of the flames or of 35 the products of combustion which rise from the fire built on the grate 2. Preferably the drum is sufficiently high above the grate and above the bed of fire thereon to be out of the 40 path of the flames which rise immediately from the bed of the fire although this is not absolutely necessary. The products of combustion pass in through the openings of the drum and traverse the coal therein to partially 45 dry in that the moisture content of the coal is reduced from about 35% to about 15%. If desired fans or other means may be employed for circulating air through the drum 10 to withdraw the moisture but this 50 is not absolutely necessary. For the purpose of insuring the passage of the products of combustion through the coal within the drum 11 the side walls of the furnace have internal enlargements providing converging 55 surfaces 35 and 36, the converging surfaces terminating at the plane or level of the coal C within the drum. As shown in Fig. 4 the surface of the coal will lay on an incline due to the rotation of the drum and, therefore, the surfaces 35 and 36 terminate at 60 different vertical heights. These converging surfaces prevent the products of combustion from passing around the drum and insure their passage through the coal within 65 the drum.

While the coal is passing through the drum the finely divided portion thereof drops down through the openings onto the fire so that the furnace is automatically stoked from the drier since the fuel supply 70 is replenished by the powdered coal which drops through the openings of the drum 11. This greatly contributes to the efficiency of the apparatus and method because the powdered or finely divided coal is the least valuable 75 element and it is used to carry out the drying process. The expense of crushing the coal is avoided but its moisture content is reduced to the point to give the coal the most desirable properties and sizes for 80 market purposes.

I claim:—

1. In a machine of the character described, a furnace comprising a grate and a combustion chamber overlying the grate, a 85 slightly inclined perforated revolving drum extending through the combustion chamber, means carried by said drum for feeding material through the interior thereof whereby 90 the material is partially dried by direct contact with the products of combustion, the perforations of the drum being arranged to permit a certain amount of the material to fall onto the fire on the grate to replenish the 95 fuel supply thereof.

2. In a machine of the character described, a furnace having a grate and also having a combustion chamber overlying the grate, and a perforated revolving drum extending 100 through the combustion chamber, said furnace having converging walls lying closely adjacent portions of the drum located at the level of the material in the drum when the latter is rotated.

3. In a machine of the character described, a furnace having a grate and a combustion chamber overlying the grate, and an elongated revolving drum extending through 105 the combustion chamber and having staggered openings therein, the inner walls of the combustion chamber converging from the grate to opposed portions of the revolving drum and terminating at the level assumed by the material in the drum when the latter 110 is rotated.

4. A machine for partially drying lignite coal and including a furnace having a combustion space, a revolving drum extending through the combustion space of the furnace and adapted to receive the coal to be dried, the drum having openings to permit the products of combustion to pass through the drum and through the coal therein, and means within the furnace acting to concentrate the products of combustion on that part 115 of the drum occupied by the coal when the drum is rotated.

5. A drier comprising the combination with a grate, of a rotatable drum adjacent the grate, and means associated with the 120

drum for continuously supplying fuel therefrom to the grate when the drum is rotated.

5 6. The method of drying which comprises passing the material to be dried through a zone of heat, and utilizing a portion of the aggregates of the material being treated for fuel while the same are passing through the heating zone.

10 7. The method of drying combustible material which comprises passing the material to be dried under constant agitation through a heating zone and continuously supplying fuel to the heating means from the material being dried as it passes through the heating
15 zone.

8. The method of drying coal which comprises passing the same through a heating zone over a bed of burning fuel, while constantly permitting the fine particles of the coal to fall upon the fire bed to replenish
20 the fuel thereof.

9. The method of drying combustible materials which comprises passing the same through a heating zone over a bed of burning fuel while replenishing the fuel by the
25 constant addition of fine particles of the material as the same is passing through the heating zone.

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