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COAL DRIER

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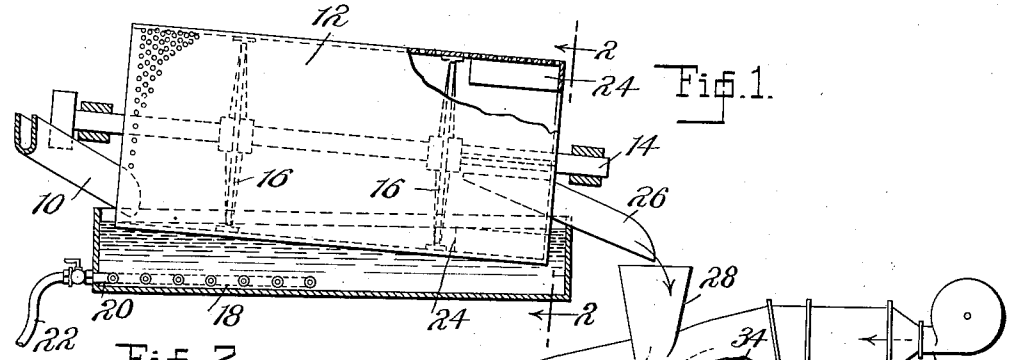
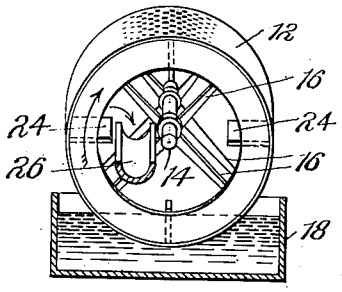


Fig. 1.

Fig. 2.



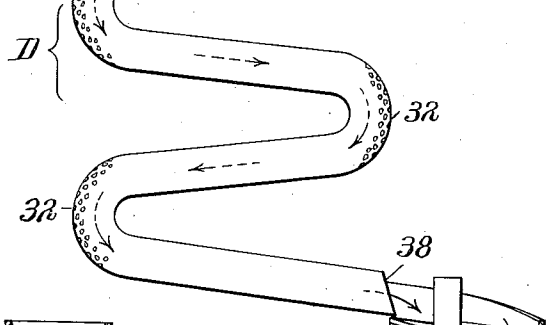
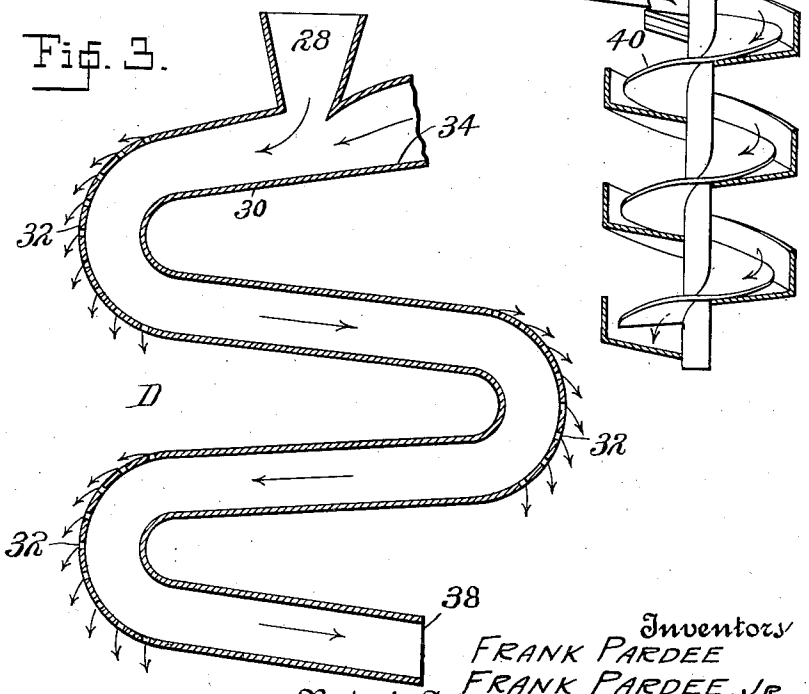


Fig. 3.



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COAL DRIER

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Fig. 4.

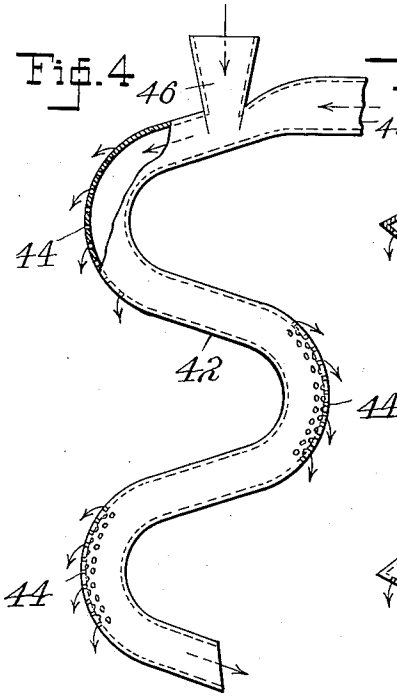


Fig. 7.

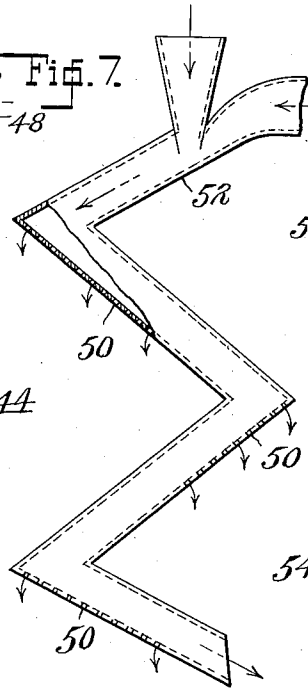


Fig. 8.

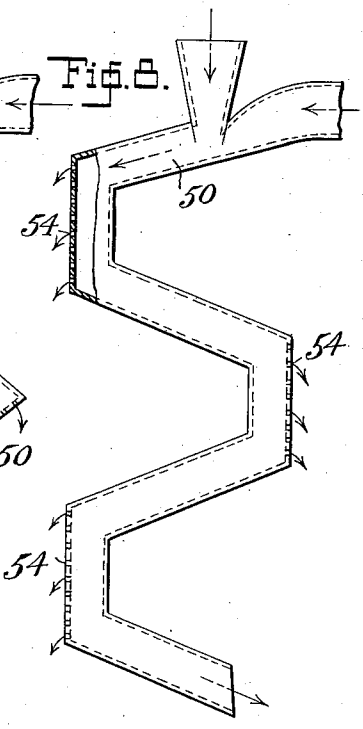


Fig. 5.

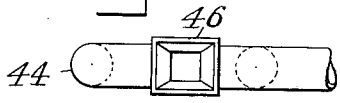


Fig. 6.

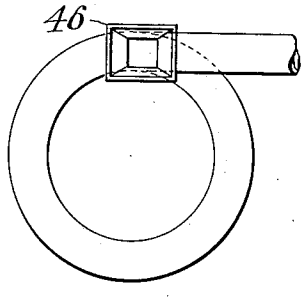


Fig. 9.

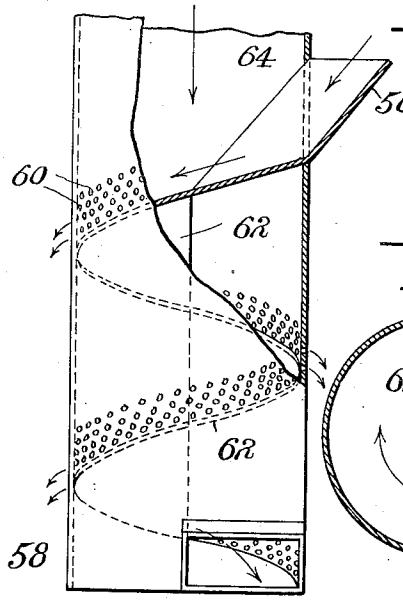
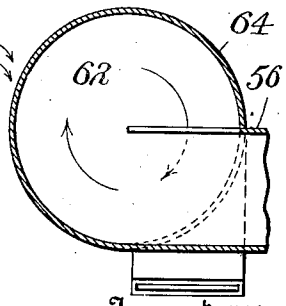


Fig. 10.



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COAL DRIER

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Fig. 11.

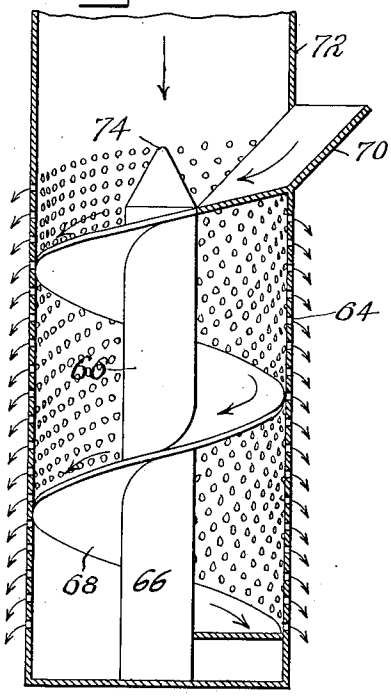


Fig. 13.

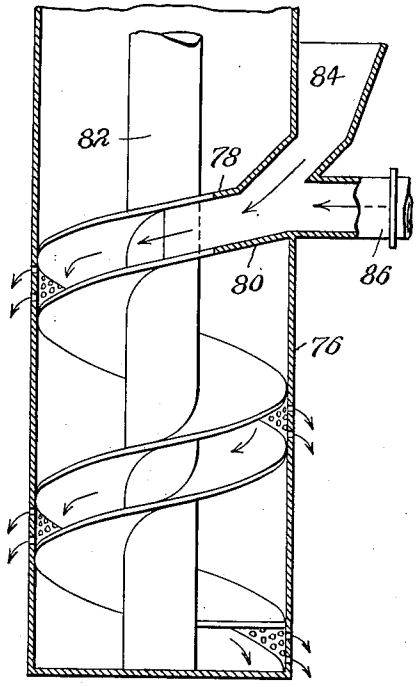


Fig. 12.

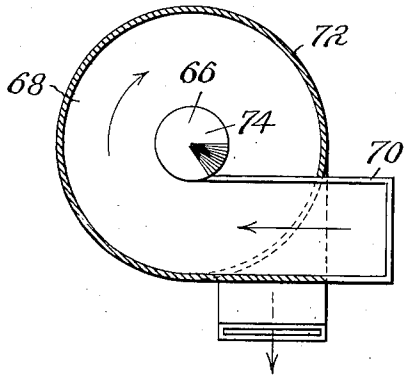
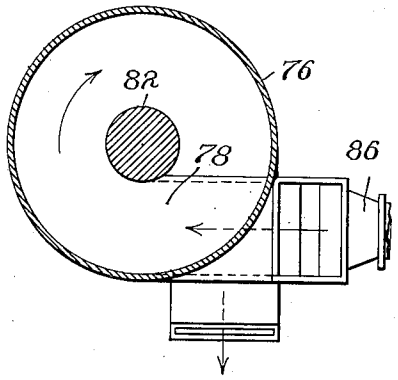


Fig. 14.



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Patented Oct. 4, 1932

1,880,273

UNITED STATES PATENT OFFICE

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COAL DRIER

Original application filed November 30, 1926, Serial No. 151,656. Divided and this application filed May 6, 1929. Serial No. 360,858.

This invention relates to improvements in the apparatus as disclosed in my co-pending application, Serial No. 151,656, filed Nov. 30, 1926, of which the instant application is a division, for preparing coal for commercial purposes. While not limited thereto the invention aims particularly to provide an improved apparatus for handling small sizes of coal ranging from that which will pass through a 3/8 inch screen down to about 1/8 inch and even smaller. Ordinarily, coal of this size does not command a high price, hence, it is important that any separating or other handling which is done must be of an extremely efficient nature. It is desirable, therefore, to separate such fine coal on spiral separators. It is customary to treat many classes of coal in a wet state and these fine sizes are largely the residue from breakers used in sizing larger commercial sizes. In the operation of these breakers the coal is usually drenched. Small sizes of wet or drenched coal cannot be satisfactorily separated on the spiral separator. This is particularly true of sizes from about 3/8 down to 1/8 and smaller. Such fines adhere to the plates of the spiral runway when wet. We have determined that such fine sizes can be satisfactorily separated, however, if the coal stock is comparatively dry. Drying of stock drenched with cold water, however, is a slow and costly procedure which from a commercial standpoint is impractical.

Our invention aims to overcome the objections above stated and to provide an improved apparatus embodying the features of novelty which will be apparent from the following specification when read in connection with the accompanying drawings and pointed out with particularity in the appended claims. In the drawings—

Fig. 1 is a somewhat diagrammatic view showing the improved arrangement of apparatus;

Fig. 2 is a sectional view on line 2—2 of Fig. 1;

Fig. 3 is a vertical section of part of the drying apparatus shown in Fig. 1;

Figs. 4 and 5 are respectively side and top views of a slightly modified drying apparatus;

Fig. 6 illustrates a further modification in plan;

Figs. 7 and 8 are views in elevation of other alternative forms of drying apparatus;

Figs. 9, 10, 11 and 12 illustrate further modified forms of drying apparatus embodying our invention;

Figs. 13 and 14 illustrate in elevation and plan respectively a further modification of the drying apparatus.

Referring in detail first to Figs. 1 to 3 inclusive, wet coal stock consisting largely of small sizes of a mixture of coal, slate and other impurities are fed to a chute 10 which empties into the interior of a perforated drum 12 which is rotatably supported on a shaft 14 by means of suitable spoked spiders 16. The drum is preferably mounted in an inclined position so that the coal will travel by gravity toward the right hand or outlet end. Located below the drum is a receptacle 18 for holding a body of hot water which is preferably maintained at a temperature just below boiling point by any suitable means, for example by means of a coil of pipe 20 connected by pipe 22 to a steam heating system. As the coal travels from the left end toward the right end of the drum, it is immersed in the hot water, thus the coal stock is simultaneously wetted and heated. As it reaches the right end of the drum, it is carried upwardly for some distance by means of paddles 24 which as they rotate cause the coal stock to drop onto an inclined discharge chute 26.

The impact of this discharge knocks off some of the water. But for effectively drying the coal stock the same is directed to a drier indicated as a whole by letter D. The coal from chute 26 enters a hopper 28 of the drier D. In the embodiment illustrated in Fig. 1, this drier consists of a sinuous or zigzag pipe 30 having foraminous portions 32. As the coal stock travels down the inclined runway surface or floor 34 of the drier, it strikes the foraminous portions 32 with considerable impact with the result that an appreciable amount of the water is knocked off. The

drying action is augmented by subjecting the coal stock to the action of a blast of air which is supplied by means of a suitable blower indicated diagrammatically at 36. The coal is thus effectively dried by the combined action of the air blast and the impact as it makes the different turns in the zigzag drier. The coal stock emerging from the outlet end 38 of the drier is fed to the runway of a separator 40 of known type consisting of a spiral runway on which the separating action takes place due to the action of gravity and centrifugal force. Pure coal being more of a cubical fracture and a brighter and harder texture travels an outer path and the slate and other impurities having greater frictional characteristics travels an inner path along the runway, hence, the two classes of material are directed to different discharge bins not shown.

The drier D may be made in various forms other than that shown in Figs. 1 to 3. For example, as shown in Figs. 4 and 5, it may be in the form of a simple zigzag pipe 42 having foraminous portions 44 at the bends with a suitable coal hopper 46 near the upper end and an air inlet opening 48. Or, instead of forming the pipe flatwise it may be of spiral or helical fashion as indicated in plan Fig. 6.

Figs. 7 and 8 illustrate further alternative forms of drier in which the runway chute 50 is in the form of a zigzag tube of rectangular or square cross-section. In Fig. 7, the air outlet perforations 52 are formed in the inclined portions of the runway whilst in Fig. 8, the outlet openings 54 are formed in substantially vertical portions of the structure.

Fig. 9 illustrates a form of drier in which coal stock is freed from water partly by centrifugal action. In this figure, the drier comprises a suitable hopper 56, an outer casing 58 perforated at 60 and a runway 62 along which the drenched coal travels. The air is introduced through a suitable inlet port 64.

As shown in Figs. 11 and 12, the drier consists of an outer perforated shell 64, an inner post 66 and a spiral runway 68. In this form the coal to be dried is fed to the hopper 70 and the air is introduced through the inlet portion 72. The top of the post is of substantially conical form as indicated at 74 so as to direct the air stream outwardly. In the modification shown in Figs. 13 and 14, the outer wall or shell 76 is perforated only in that area located between the spaced roof plate 78 and floor plate 80 of the drier. In effect, this form of device is practically the same as would be secured by providing a spiral pipe of square or rectangular cross-section, this form of drier having an interior post or core 82 and a suitable feed hopper 84 and air inlet pipe 86.

The angle of inclination or pitch of the various types of drier runways may be varied to suit requirements.

Various modifications and substitution of equivalents may be made by those skilled in the art without departing from the invention as defined in the appended claims.

What we claim is:—

1. An apparatus of the class described including rotary means for simultaneously heating and wetting lump coal stock, a zigzag chute having foraminous portions restricted to the area at the bends thereof against which the coal stock is adapted to be separated from part of its adherent water by impact and means for directing an air blast against the coal stock.

2. An apparatus of the class described including a chute of sinuous form having foraminous portions at the bends in the chute only against which the stock is adapted to be directed by gravity and means for supplying a blast of air to such chute.

3. An apparatus of the character described including a closed runway shaped to compel the material fed thereto to travel in a sinuous path, said runway having foraminous portions restricted to the area at the bends adapted to permit the escape of water adhering to the coal and means for supplying an air blast to the runway adapted to have a drying influence on the coal.

In witness whereof, we have hereunto signed our names.

FRANK PARDEE.
FRANK PARDEE, JR.