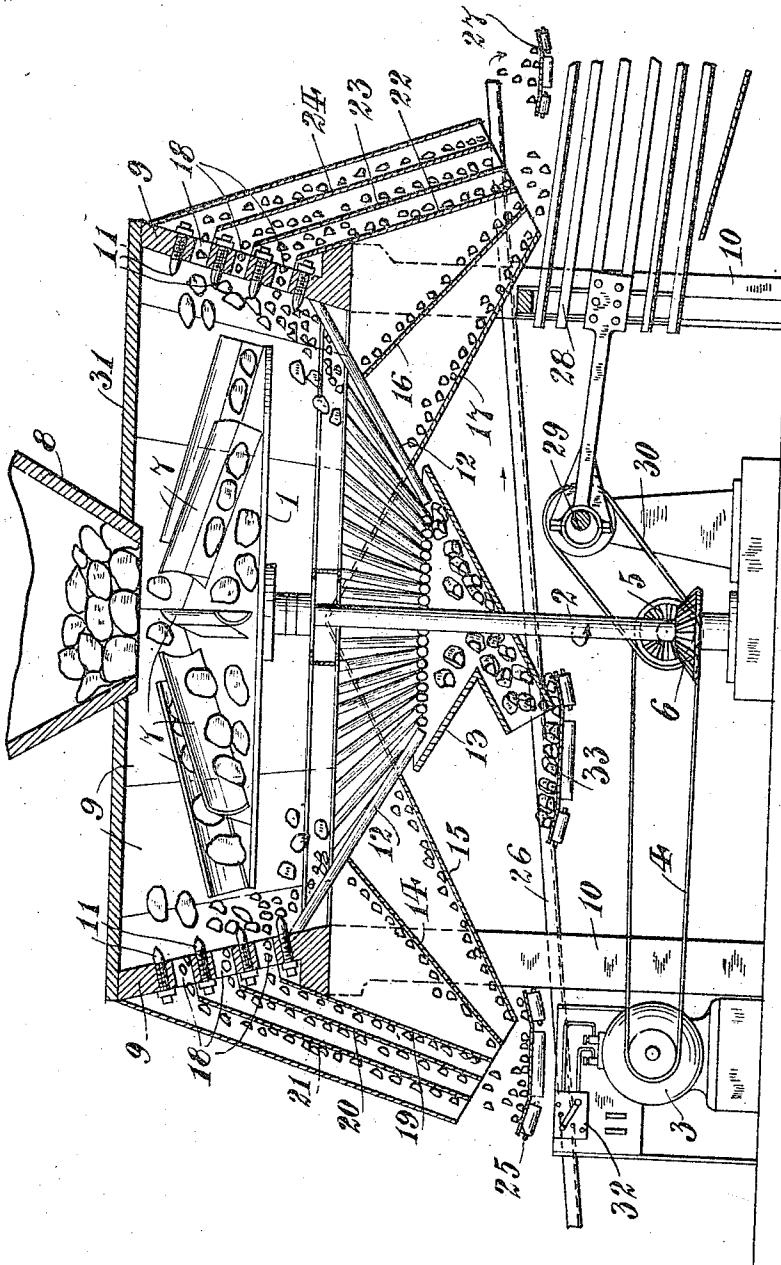


1,293,655.

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APPARATUS FOR REDUCING COAL.
APPLICATION FILED SEPT. 20, 1915.

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APPARATUS FOR REDUCING COAL.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HENRY ADAMS, a citizen of the United States, and a resident of Stamford, county of Fairfield, and State of Connecticut, have invented certain new and useful Improvements in Apparatus for Reducing Coal, of which the following is a specification, reference being had to the accompanying drawing, which forms a part hereof.

This invention relates to a new and improved apparatus for reducing coal as it comes from the mine into commercial sizes without the employment of crusher rolls heretofore in general use for reducing coal whereby the disadvantages attendant upon the use of said crusher rolls for such purpose are obviated. The invention also relates to grading the coal thus reduced and separating it into the various commercial sizes.

In accordance with the present invention the coal, in lump or smaller size, is caused to fly at high speed against a breaking face whereby the coal is broken or shattered into smaller pieces of varying sizes. The coal thus broken is caused to travel from the breaking face substantially free from pulverizing or breaking concussion and attrition between the largest and the smaller broken pieces and to separate into gradations. If such separation into gradations is not sufficiently complete for commercial purposes, a further separation into various commercial sizes may be made, and if the largest size of the broken coal is too large for the market it may be subjected to another breaking operation, as in a second apparatus. Coal broken in the manner described is remarkably free from the internal fractures that characterize coal that has been reduced in a crusher. The sudden violent blow imparted to the lumps of coal by the breaking face against which they are hurled shatters them into fragments or pieces but in large measure leaves the broken pieces free from these internal fractures and structurally strong. This coal may, therefore, be handled and shipped without suffering any such degradation of size and loss as is suffered by crusher reduced coal under like circumstances.

Moreover, in reducing coal in accordance with the present invention there is a very noticeable absence of flatness in the steam sizes as compared with coal of corresponding sizes produced in a crusher, so that in the former the voids are increased some three and one-half per cent. This is an important advantage because it substantially facilitates the passage of air through the bed of such coal in the furnace and obviates or reduces the need of forced draft.

Furthermore, in operating the apparatus of the present invention it is possible to control to a substantial degree the production of the smaller sizes. This may be done by increasing or decreasing the force with which the coal is hurled against the breaking face. The greater this force is, within limits, the greater is the proportion of the smaller sizes produced. One convenient way of bringing about the desired result is to increase or decrease the speed of the centrifugal table employed as the projector to hurl the coal against the breaking face. The breaking face is preferably provided with a multiplicity of pins or studs against which the lumps of coal impinge. Reducing the number of these studs also reduces the proportion of the smaller sizes of coal produced.

In the drawing is shown a central sectional elevation of the apparatus in its preferred form.

Referring now more particularly to the structure as shown in the drawing, 1 is a rotating or centrifugal table carried on a vertical shaft 2 which is supported in suitable bearings. This shaft is driven by convenient means such as the electric motor 3 suitably connected with the shaft 2 as through the belt 4 and bevel gear wheels 5 and 6, the wheel 6 being fixed on the shaft 2 and the wheel 5 being fixed on a transverse shaft driven by the belt 4. The upper face of the table is shown as conical in form and is provided with a plurality of radial wings 7. The coal to be operated upon is delivered centrally to the table through the hopper 8.

Spaced apart from the table 1 and surrounding the table is a breaking face 9 for shattering or breaking the coal. In the

present instance this breaking face comprises a series of anvils which rest upon a suitable base 10. In the inner side of the breaking face 9 are fixed a series of pins or studs 11. These are shown in the drawing as being threaded so as to screw into place and be separately removable either for repair or for varying the number of studs in the breaking face. Beneath the breaking face and suitably supported is an inverted conical screen 12 which is made up of a series of rods connected together. This screen may be variously constructed but its purpose is to receive the broken coal as it travels from the breaking face, carrying the largest broken pieces to a central hopper 13 and permitting the smaller broken pieces to pass through the screen and thereby immediately separate from these largest broken pieces. 14 and 15 are guides which partly surround the screen 12 on one side and extend outward and downward therefrom. 16 and 17 are similar guides arranged on the opposite side of the screen 12 so that all of the broken coal passing through the screen falls upon the guides described.

The breaking face is provided with a multiplicity of apertures 18 in close juxtaposition to the pins 11. 19, 20 and 21 are a series of guides which partly surround the breaking face on one side and extend outward and downward therefrom. These guides receive the broken coal as it passes through the apertures in the breaking face. A similar set of guides 22, 23 and 24 is arranged on the opposite side of the breaking face. These guides and the guides leading from the screen 12 may vary in number but it is preferable to use several in order to divide the coal into several streams as it passes through the breaking face and through the screen 12, thereby reducing attrition between the broken pieces of coal. The guides on one side deliver the broken coal to the conveyer belts 25, 26, and 27 to carry the broken coal from the guides to the shaking separator 28.

The shaking separator 28 may be actuated by any suitable means as, for example, the cam 29 and belt 30 driven by the electric motor 3, as indicated in the drawing. The coal is separated by means of the shaking separator 28, the fines and dust passing through the separator for delivery to the culm bank. The coal in its separated sizes is preferably delivered from the separator 28 to a gravity picker of any well known type whereby the heavier impurities, such as slate, bone and rock, are removed from the coal.

31 is a cover for the breaking face. 32 is a controller for the motor 3 by means of which the speed of the table 1 may be regulated. 33 is a conveyer to receive from the hopper 13 the coal delivered thereto.

In the operation of the apparatus the coal in lump or smaller size is delivered from the hopper 8 upon the rotating table 1 where it is caught by the wings 7 and carried around with the table. The centrifugal force thus imparted to the coal throws it outward with great force against the breaking face whereby it is broken into smaller pieces of varying sizes. A substantial proportion of these smaller broken pieces pass through the apertures of the breaking face, part of such broken pieces being delivered by the guides 19, 20 and 21 and conveyers 25, 26 and 27 to the shaking separator 28, and the rest of the broken pieces being delivered by the guides 22, 23 and 24 to the shaking separator. Such of the pieces broken on the breaking face that do not pass through the apertures 18 fall upon the screen 12, the largest of such pieces traveling down the screen to the hopper 13 which delivers them to the conveyer 43. The smaller broken pieces that reach the screen 12 pass through the same on to the guides 14, 15, 16 and 17 from which they are delivered to the shaking separator 28. Guides 14 and 15 deliver the material which they carry upon the conveyers. Guides 16 and 17 deliver the material which they carry directly to the shaking separator. If the coal delivered to the conveyer 33 requires further reduction, it may be fed to another apparatus and reduced to smaller sizes in a manner similar to that described.

In reducing the coal in the manner described in the foregoing, the large pieces of coal fly with great force against the breaking face and a substantial proportion of the broken pieces travels speedily through the apertures of the breaking face and the rest of it travels to the screen 12 through which or down which it passes. In this movement the coal is substantially free from pulverizing and breaking concussion and attrition between the largest and the smaller broken pieces and waste is reduced to a minimum.

While the centrifugal table, as shown, is preferred as the best type of projector for imparting movement to the coal in its travel against the breaking face, other types of projector may be employed.

By varying the speed of the centrifugal table, the impact of the coal against the breaking face may be regulated. This controls the amount of smaller sizes produced. The amount of the smaller sizes produced may be diminished by removing some of the studs in the breaking face.

What I claim is:—

1. In an apparatus for reducing coal to commercial sizes, the combination of an anvil; a pointed stud projecting from said anvil; means for throwing lumps of coal against the point of said stud whereby said lumps are broken to pieces, said anvil be-

ing provided with passages on both sides of said stud, through which said pieces may directly pass centrifugally.

2. In an apparatus for reducing coal to commercial sizes, the combination with a rotary horizontal centrifugal throw-table; and an annular-anvil surrounding said table comprising upwardly outwardly inclined walls having grading perforations and adjustable breaking-studs.

3. In an apparatus for reducing coal to commercial sizes, the combination of a rotary-table; an annular-anvil disposed around said table approximately vertical

thereto and spaced a distance therefrom sufficient for the passage downward by gravity of large pieces of coal between the peripheral edge of the table and the annular-anvil; and inwardly projecting adjustable pointed studs fixed in said annular anvil; said anvil being provided with passages on both sides of each of said studs through which broken pieces of coal may directly pass centrifugally.

This specification signed this 18th day of 25 September, A. D., 1915.

HENRY ADAMS.