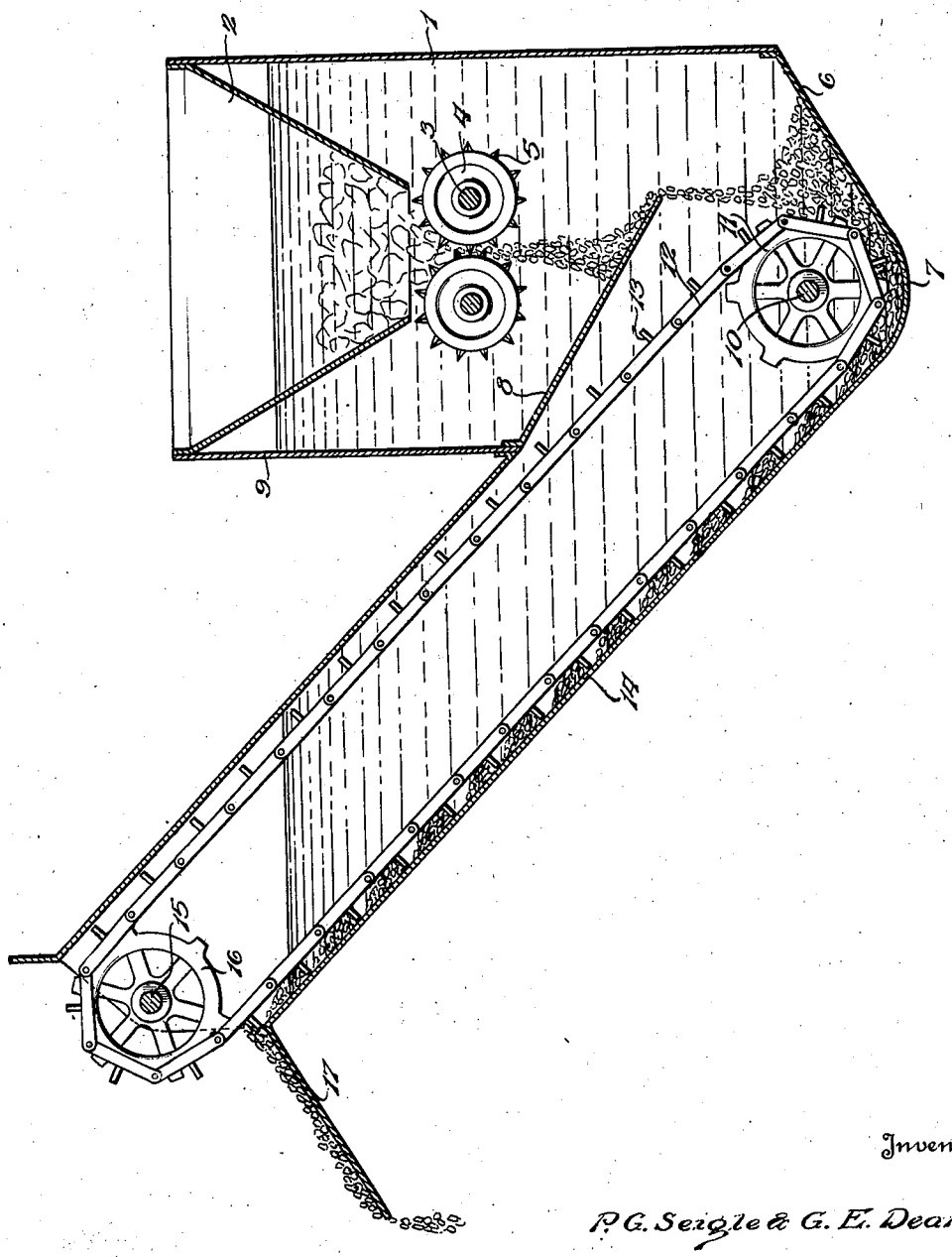
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METHOD OF AND APPARATUS FOR BREAKING COAL

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METHOD OF AND APPARATUS FOR BREAKING COAL.

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This invention relates to a method of and apparatus for breaking coal.

In breaking coal by the ordinary method, the coal is subjected to considerable vibration during the breaking operation and there is considerable attrition between the broken particles, with the result that a considerable portion of the coal is reduced to pieces of unnecessarily small sizes such as pea coal, buckwheat coal, etc., so that the value of the product is greatly decreased, some of the particles being reduced to such minute sizes that this portion of the product constitutes an actual waste. It is, therefore, the primary object of the present invention to evolve a method of breaking coal, by the carrying out of which undue vibration, during the breaking operation, will be avoided and attrition between the broken particles of coal will be greatly reduced, with the result that a larger percentage of the more desirable sizes of coal is obtained and a higher percentage of merchantable coal is obtained, thereby enhancing the value of the product. Thus, the invention contemplates a method of crushing coal by the carrying out of which the percentage of smaller and cheaper sizes of coal is greatly reduced as well as the percentage of particles so small as to constitute an absolute waste.

Another object of the invention is to evolve a method of crushing coal by the carrying out of which the speed of passage of the broken particles from the breaking means to the point where they are finally deposited, is retarded, thereby avoiding losses which would otherwise result through attrition and impact.

Another object of the invention is to provide a novel and highly efficient apparatus for the carrying out of this method.

The figure of the accompanying drawing represents a vertical longitudinal sectional view through the apparatus embodying the invention and likewise represents the manner in which the method of the invention is carried out.

The apparatus embodying the invention and by the employment of which the method of the invention is carried out, preferably comprises a tank indicated by the numeral 1, in the upper end of which is arranged a hopper indicated by the numeral 2. Shafts 3 are journaled in the opposite walls of the tank 1 below the discharge end of the hopper 2, and breaking rolls 4 are fixed upon the shaft and are provided, upon their circumferential surfaces, with breaking teeth indicated by the numeral 5, rotary motion being imparted to the shafts by any suitable mechanical means (not shown), so as to effect rotation of the rolls 4 in opposite directions, the rolls being suitably spaced in parallel relation to each other so that the teeth 5 will act upon and break the lumps of coal delivered between the rolls from the hopper 2.

The bottom of the tank 1 is indicated by the numeral 6, and the said bottom has its rear portion inclined downwardly and its lowermost portion curved upwardly and forwardly so as to provide a curvilinear bottom portion 7 defining a pocket into which the broken particles of coal will eventually lodge after delivery from the breaking rolls 4. The numeral 8 indicates a baffle plate which is arranged within the lower portion of the tank 1 and this baffle extends between the opposite side walls of the tank and is inclined downwardly and rearwardly from the lower part of the front wall 9 of the tank, the rear or lower edge of the baffle plate being approximately in a vertical plane with the axis of the rear one of the shafts 3 and the plate, of course, extending beneath the rolls 4 at a suitable distance below the under sides of said rolls.

A shaft 10 is rotatably journaled in the lower portion of the tank 1, concentric to the curved portion 7 of the bottom of the tank, and sprocket gears 11 are fixed upon the shaft and have trained about them the chains 12 of a conveyer flight, the flight also including transverse blades 13 which extend between the chains.

The lower portions of the side walls of the tank 1 and the bottom of the said tank, constitute the boot of a conveyer casing which is indicated by the numeral 14 and which extends upwardly and forwardly to a point in or adjacent the plane of the top of the tank 1. A shaft 15 is rotatably journaled in

the upper end of the casing 14 and has fixed upon it sprocket gears 16 about which the chains 12 are likewise trained, suitable means (not shown) being provided for imparting rotary motion to the said shaft 15 whereby to operate the conveyer and to cause the blades 13, at the lower stretch of the conveyer flight, to travel upwardly along the bottom wall of the casing 14. Extending downwardly and forwardly from the upper end of the said bottom of the casing 14 is a delivery plate 17 over which the particles of broken coal may slide by gravity after delivery from the upper end of the conveyer casing. It will be observed by reference to the drawing, that the rear or lower end of the plate 8 projects rearwardly a short distance beyond the rear side of the sprocket gears 11 so that particles of coal delivered over the end of the plate will reach the bottom 6 of the tank at a point slightly in rear of the said sprockets and the portion of the conveyer flight passing therearound.

In the carrying out of the method embodying the invention, the tank 1 and conveyer casing 14 are filled with water or any other suitable liquid to a level above the lower end of the hopper 2, and the apparatus is set in operation. Coal is then delivered into the hopper 2 and, being delivered from the discharge end of the hopper to the rolls 4, will be broken by means of the rolls and will settle down through the water in the tank onto the baffle plate 8, it being understood that the descent of the broken particles of coal is somewhat retarded by the resistance offered by the water so that the particles do not reach the plate 8 with any appreciable impactive force but fall lightly upon the plate from which they are delivered to the boot of the conveyer casing or bottom of the tank 1. Likewise, in passing from the baffle plate to the bottom of the casing or boot, the particles settle more or less gradually through the water, their speed of descent being retarded, as before.

It will be evident from the foregoing, that inasmuch as the lumps of coal are broken under water or while submerged, the breaking operation is attended by less vibration than is the case where the lumps are broken in the atmosphere, and, therefore, the broken particles will be of more uniform size and there will be fewer minute particles than where vibration is present. Likewise, the cleavages will be cleaner and more liable to occur along the natural lines of cleavage or fracture than along other lines. It will also be evident that as the broken particles are retarded in their passage from the breaking rolls to the baffle and finally to the boot of the conveyer, there is less attrition between the particles and the particles do not strike the baffle nor do they strike the bottom of the tank or boot with an impactive force such as would tend to cause further fracture of the particles. Consequently, the particles retain the shape and size which they acquire at the time of breaking of the lumps of which they originally formed a part and there is, therefore, obtained a product more readily marketable and of higher grade and value than can be obtained by the carrying out of the ordinary breaking methods.

It is to be understood that the present invention is not in any way concerned with crushing of coal or its disintegration into fine particles, but that it is directly concerned with the breaking of lumps of coal into particles of a marketable size. Likewise, the invention is not concerned with the washing of the coal but with the idea of breaking the coal while submerged and delivering it without appreciable attrition and undue impact.

Having thus described the invention, what we claim is:

1. Coal breaking apparatus comprising a tank, submerged breaking elements therein, a conveyer operating in the tank below the said breaking elements, and a retarding baffle plate arranged within the tank below the breaking elements and above the lower part of the conveyer.

2. Apparatus for reducing the size of lump coal comprising a tank, means within the tank for breaking the lumps of coal, means for directing and confining the lumps to the breaking means, a conveyer operating in the lower portion of the tank for continuously removing the broken coal therefrom, a baffle disposed over the lower portion of the conveyer and between it and the breaking means, and deflecting means receiving the broken coal from the baffle and directing it to the said conveyer.

3. The method of breaking coal which comprises subjecting lumps thereof to breaking force while submerged, retarding the fall of the broken pieces and particles thereof by allowing them to drop through a liquid and then at any point delivering them to any subsequent operation of separation.

4. Coal breaking apparatus comprising a tank, a hopper within the upper portion of the tank, coacting rotating breaking rolls within the tank beneath the discharge end thereof, a conveyer casing extending upwardly from the bottom of the tank and having its bottom wall merging with the bottom wall of the tank, a portion of the bottom wall of the tank being inclined downwardly to the approximate juncture of the bottom of the tank and bottom of the conveyer casing, an endless conveyer traveling within the said casing and including a rotary conveyer chain sprocket located substantially in the lowermost portion of the tank and conveyer casing, and a baffle extending downwardly at an angle of inclina-

tion from that wall of the tank from which the conveyer casing extends and having its delivery end located below the breaking rolls and above the said sprocket of the conveyer whereby to retard the descent of broken particles of coal delivered from the rolls and deliver the same to the bottom of the tank rearwardly of the said conveyer sprocket and onto the inclined bottom of the said tank.

In testimony whereof we affix our signatures.

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