

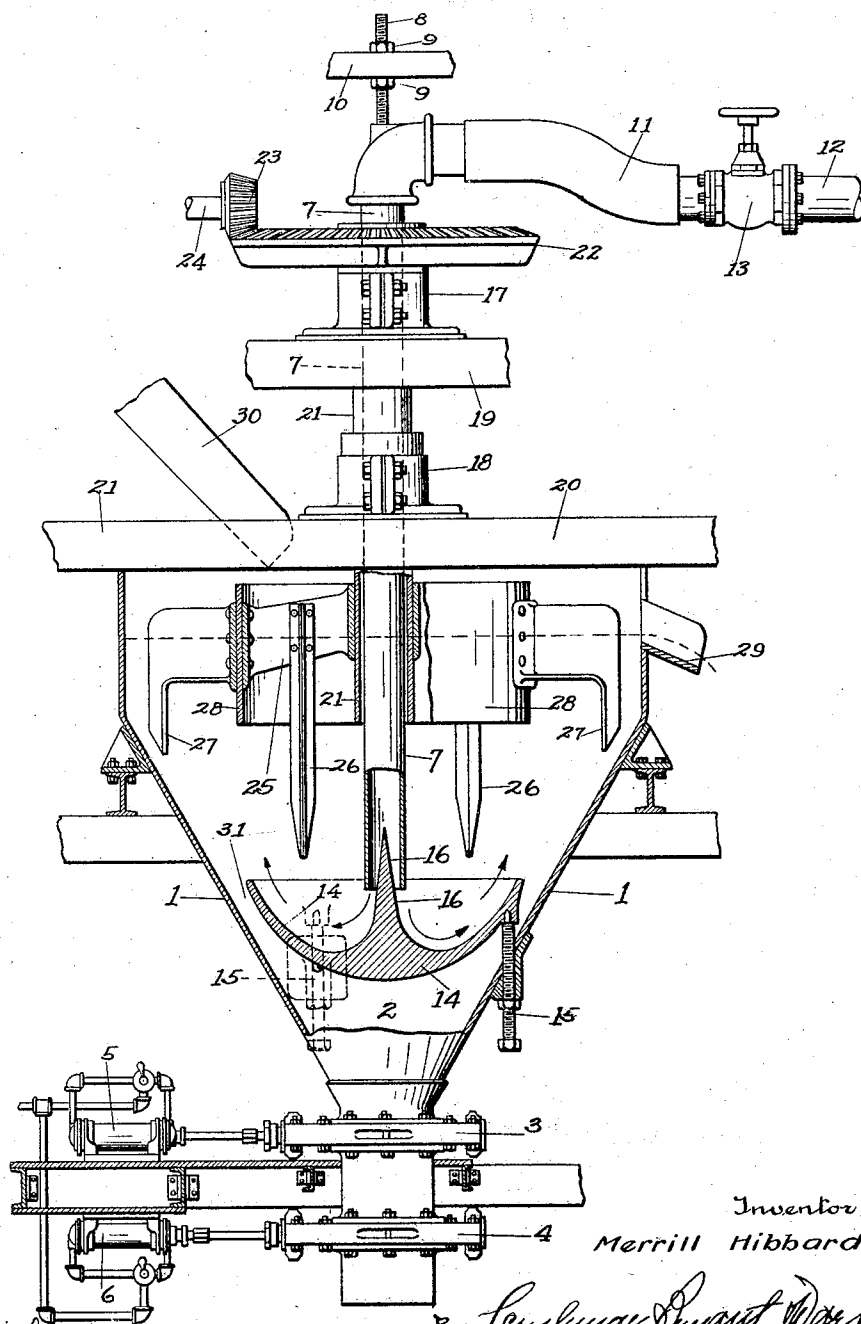
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COAL WASHING APPARATUS

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COAL-WASHING APPARATUS

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The present invention relates to certain new and useful improvements in coal washing apparatus and method, and particularly to coal washing apparatus of the type wherein the coal is separated from the heavier impurities and carried upwardly by the action of upwardly flowing currents of water, heavier impurities meanwhile settling to the lower part of the apparatus.

The especial object of this invention is to provide improved devices for the admission and control of the washing water to the apparatus whereby is secured increased efficiency and economy of operation.

The means whereby I attain this object are fully set forth in the following specification, and illustrated in the accompanying drawing wherein is shown a sectional view taken along the vertical central plane of my improved coal washing apparatus.

As shown in the drawing the numeral 1 indicates a conical tank having at its lower part a refuse chamber 2 from which the sediment may be discharged under the control of a pair of discharge valves 3 and 4 arranged to be opened and closed by pressure fluid acting in the cylinders 5 and 6 in the manner which is well understood in the art. Positioned concentrically, thereof, within the cone 1, and preferably, as here shown, is a vertically extending water supply pipe 7 adjustably supported by a screw 8 and nuts 9 which engage a cross beam 10 of the supporting structure. The upper end of the pipe 7 is connected by any suitable coupling, which will permit adjustment, as for example the flexible coupling 11 with a supply pipe 12 which may be connected with any suitable and convenient source of water supply. A valve 13 is usually provided for the control of the admission of water to the apparatus. Positioned in the lower portion of the conical tank 1, and preferably concentric therewith, is a concave circular deflector 14 which is supported for vertical adjustment upon the screws 15 which are here shown as mounted by being threaded through the sides of the tank 1. Formed at the center of the deflector 14 is a conical projection 16 extending up-

wardly into the nozzle of the supply pipe 7, to adjustably control the area of said nozzle.

Mounted concentric with the pipe 7 and supported in journal bearings 17 and 18 attached to the cross beams 19 and 20 of the supporting structure, is a sleeve shaft 21 to the upper end of which is fixed a bevel gear 22 engaged by a bevel pinion 23 attached to a power shaft 24. The power shaft 24 may be supported in any suitable manner and connected with any suitable and convenient source of rotative power to cause the revolution of the sleeve 21. Fixed to the lower end of the sleeve 21 is a spider 25 having depending stirring fingers 26 and 27 adapted, when the sleeve shaft 21 revolves, to stir the contents of the tank. A cylindrical partition 28 concentrically attached to the spider 25 is arranged to maintain the unwashed mixture of coal and refuse delivered to the apparatus, from the washed coal in the upper part of the tank, as will hereinafter appear.

During the washing operation water under pressure is discharged downwardly from the nozzle impinging upon the deflector 14 by which it is spread laterally and by the deflector 14, turned upwardly to flow along the sides of the tank to an outlet through the overflow weir 29. The mixture of coal and heavier refuse material is delivered through a suitable conductor 30 to the upper part of the tank inside of the cylindrical partition 28, and this material works downwardly through the action of the stirring fingers, until it passes beneath the lower edge of the partition 28 and encounters the outwardly and upwardly flowing currents of water. By the proper adjustment of the nozzle 17 relative to the projection 16 there is produced a sharply localized circular jet of water of high velocity, which spreads laterally over the concave surface of the reflector 14 and is turned upwardly along the sidewalls of the conical tank 1, producing a relatively thin circular stream of water of relatively high velocity adjacent the walls of the tank. The water in the central part of the tank remains quiescent except for the agitation produced by the stirring fingers 26, and the mixed material settling downwardly through this quite water

encounters the rapidly moving stream which picks up the lighter particles of coal and carries them to and upwardly along the side walls of the tank, allowing the heavier particles of refuse to fall through the circular aperture 31 between the deflector 14 and the side walls of the tank into the refuse chamber 2. The clean coal carried upwardly by the ascending water is discharged through the overflow weir 29 to be dehydrated and otherwise disposed of in any preferred manner. By adjusting the deflector 14 so close to the side walls of the tank 1 that the width of the annular aperture 31 is only sufficient to allow the passage of the largest fragments of refuse material occurring in the mixture, the action of separation will be closely localized, thereby reducing the amount of water necessary to produce such separation to the smallest possible limits.

It will be seen that the circular jet issuing from the pipe 7, and the volume and velocity of which is regulated by adjusting the deflector 14 with its projection 16 relative to the mouth of pipe 7, forms an inverted conical sheet of water which spans the entire area of the tank 1 from center to circumference. The material under treatment must, therefore, as it descends in the tank 1, meet at some point this upwardly flowing sheet and be subjected to its cleansing action.

It is to be understood that I do not limit myself to the precise construction shown and described as the devices may be subject to wide variations as to detail without departure from the spirit of my invention.

By the devices above described I have produced a coal washing apparatus of extreme simplicity, durability, and efficiency by which is attained the highest economy in the use of water.

While I have shown and described the apparatus as a coal washer, it will be appreciated that primarily it is a separation apparatus, and may, of course, be used for handling and separating of other materials.

What I claim is:—

1. In an apparatus of the class described, the combination with a conical tank, of a cylindrical partition extending downwardly into the tank, means to introduce mixed materials of different specific gravities inside of said cylindrical partition, an overflow weir outside of said partition, a water supply pipe extending downwardly along the axis of the tank, a concave deflector plate positioned beneath said supply pipe adapted to direct the flow of water horizontally and upwardly to carry the lighter materials beneath said partition and over said weir, means to vertically adjust said deflector plate as and for the purpose set forth.

2. In a device of the class described, a separating tank, a vertical liquid supply pipe adapted to discharge adjacent the tank bot-

tom, a rotatable sleeve surrounding said pipe, a vertical open ended substantially cylindrical member in connection with said sleeve and rotatable therewith, a concave baffle plate below said pipe and adapted to deflect the supplied liquid upwardly in said tank to the outside of said cylindrical member, and means for supplying the material to be separated to the inside of said member.

3. In a device of the class described, a separating tank, a vertical liquid supply pipe adapted to discharge adjacent the tank bottom, a rotatable sleeve surrounding said pipe, a vertical open ended substantially cylindrical member in connection with said sleeve and rotatable therewith, a concave baffle plate below said pipe and adapted to deflect the supplied liquid upwardly in said tank to the outside of said cylindrical member, means for supplying the material to be separated to the inside of said member, and means for vertically adjusting said baffle plate relative to said pipe.

4. In a device of the class described, a separating tank, a vertical liquid supply pipe adapted to discharge adjacent the tank bottom, a rotatable sleeve surrounding said pipe, a vertical open ended substantially cylindrical member in connection with said sleeve and rotatable therewith, a concave baffle plate below said pipe and adapted to deflect the supplied liquid upwardly in said tank to the outside of said cylindrical member, means for supplying the material to be separated to the inside of said member, and means for vertically adjusting said baffle plate and said pipe relative to each other and to the tank.

5. In a coal washer, a tank, a rotating annular partition element in the upper portion of said tank dividing the interior of the latter into a central feeding zone and a surrounding separating zone, a water supply pipe extending downwardly through said central zone and terminating below said partition element, a plate below the end of said pipe for deflecting the water upwardly into said separating zone, a conical projection at the center of said deflecting plate extending into the discharge opening of said pipe, and means to adjust said projection relative to said pipe as and for the purpose set forth.

6. In a coal washer, a tank, a rotating annular partition element in the upper portion of said tank dividing the interior of the latter into a central feeding zone and a surrounding separating zone, a water supply pipe extending downwardly through said central zone and terminating below said partition element, a plate below the end of said pipe, a conical projection on said plate extending into the discharge opening of said pipe, said plate and projection serving to deflect the water from said pipe upwardly into said separating zone, and means to adjust said plate and projection relative to said pipe.

5 7. In a coal washer, a tank, a rotating an-
nular partition element in the upper portion
of said tank dividing the interior of the latter
into a central feeding zone and a surround-
ing separating zone, a water supply pipe ex-
tending downwardly through said central
zone and terminating below said partition
element, a concave deflector plate beneath the
discharge opening of said pipe for deflecting
10 the water upwardly into said separating zone,
and means to adjust said pipe vertically rela-
tive to said deflector plate.

15 8. In a coal washer, a tank, a rotating an-
nular partition element in the upper portion
of the tank dividing the interior of the latter
into a central feeding zone and a surround-
ing separating zone, a water supply pipe ex-
tending downwardly through said central
zone and terminating below said partition
20 element, a concave plate below the end of said
pipe for deflecting the water upwardly into
said separating zone, and means to adjust
said plate and pipe vertically relative to the
tank.

25 In testimony whereof I have hereunto set
my hand.

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