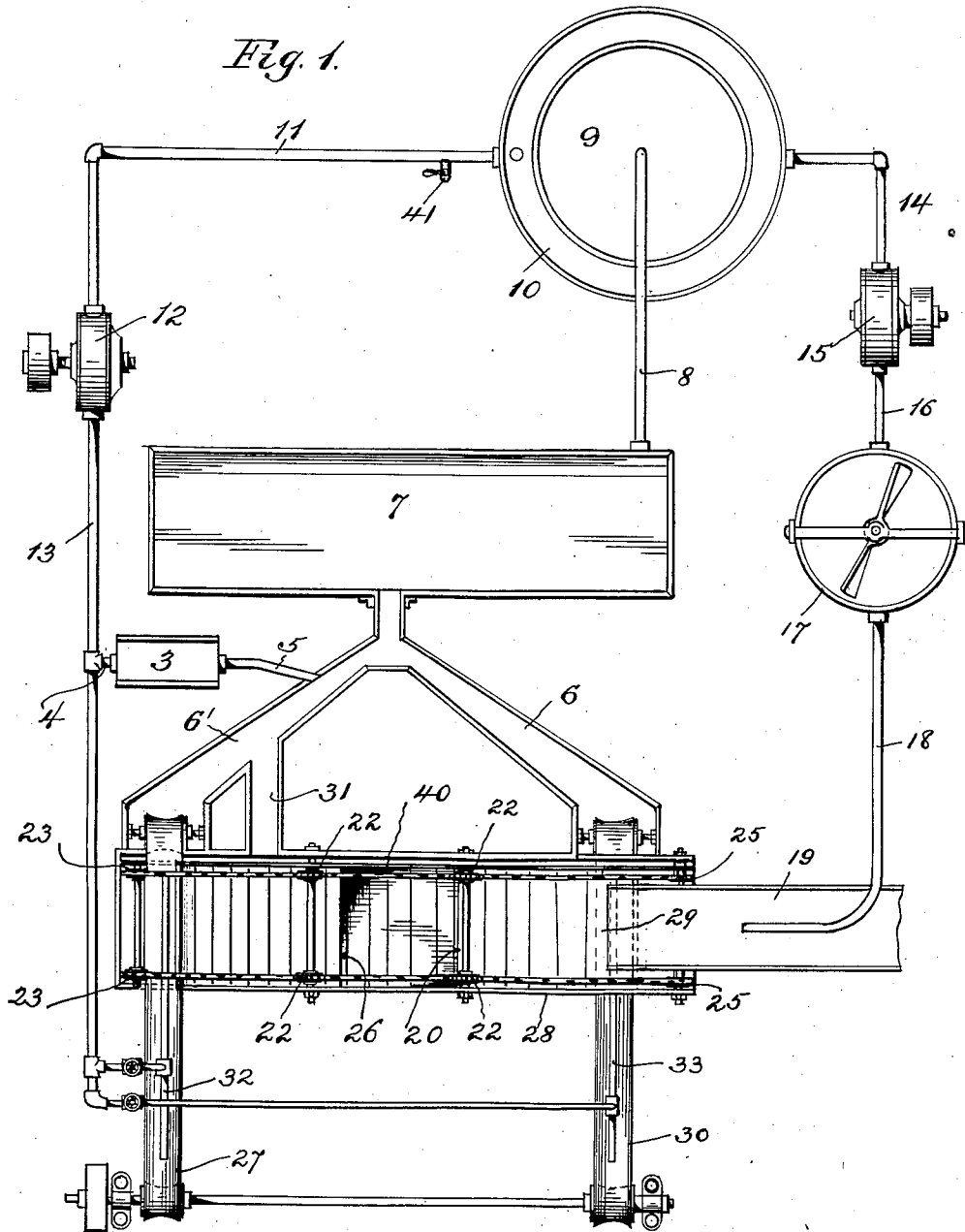


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 METHOD OF CLEANING COAL AND THE LIKE.
 APPLICATION FILED AUG. 5, 1918.

1,290,516.

Patented Jan. 7, 1919.

2 SHEETS—SHEET 1.



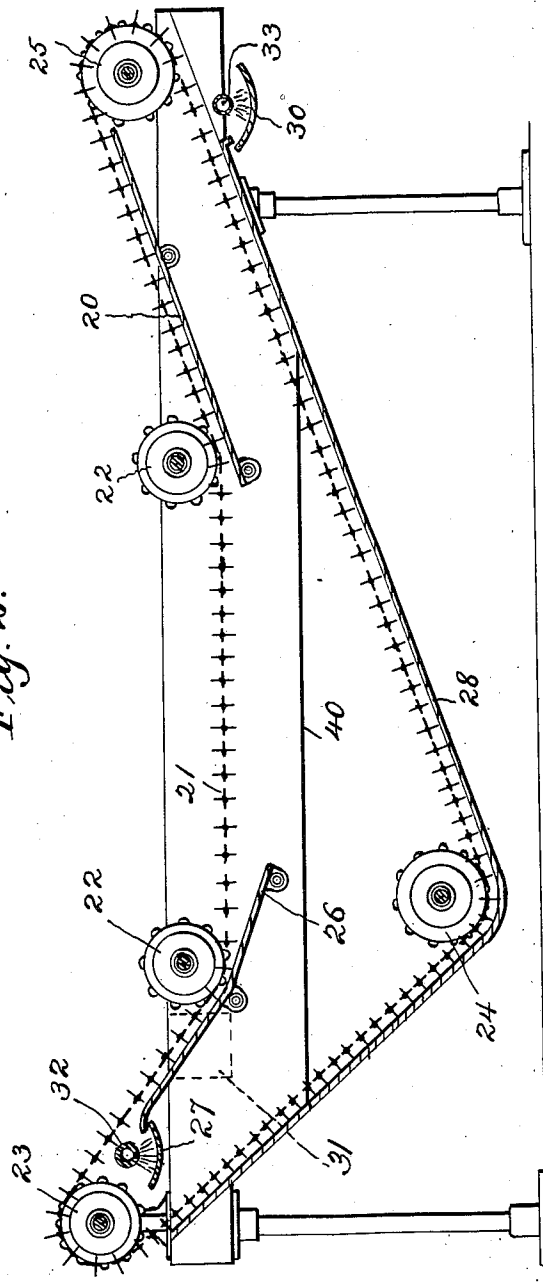
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Fig. 2.



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UNITED STATES PATENT OFFICE.

HARRY R. CONKLIN, OF JOPLIN, MISSOURI.

METHOD OF CLEANING COAL AND THE LIKE.

1,290,516.

Specification of Letters Patent.

Patented Jan. 7, 1919.

Application filed August 5, 1918. Serial No. 248,492.

To all whom it may concern:

Be it known that I, HARRY R. CONKLIN, a citizen of the United States of America, residing at Joplin, Jasper county, Missouri, United States of America, have invented certain new and useful Improvements in Methods of Cleaning Coal and the like; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the separation of coal from its impurities, such as slate, bone, pyrites, and like matters occurring in coal and lignites, and the invention consists in providing a substantially quiescent suspension in water, of a very finely ground sand, rock, or like material, substantially free from clay or other argillaceous material of colloidal or flocculent nature.

I am aware that it has been proposed heretofore to use a suspension of loam or clay of a specific gravity sufficient to float coal, but this suspension was utilized in an upward current separator, in which the action of the current assisted in the suspension.

It is impossible to make a suspension of clay of sufficient density to float the heavy coals, such as anthracite, without agitation, for if the suspension were made of such a density it would not be fluid enough to allow the waste to sink through it. It is true that this can be done by the addition of a soluble salt, as sodium chlorid, but this is too expensive and unsuitable for practical operations.

I am also aware that it has been proposed to use an agitated mixture of sand and water, the sand being of appreciable dimensions, but in this case upward agitation is necessary to maintain the sand in suspension, and the upward currents during separation tend to carry the smaller particles of impurities to the top along with the coal.

It is generally acknowledged that if it were possible to effect a separation of coal by a quiescent or substantially quiescent body of liquid that was inexpensive and readily removed from the coal, so as not to impair its selling qualities, that would be the ideal method of separation.

Many have tried to accomplish this and

have failed, but I believe that I have discovered a way of accomplishing this separation that complies with all the requirements of a coal separator. The body of liquid is quiescent, or substantially so, is free from all upward currents, is readily washed off the coal, is free from colloids, or substantially so, and is inexpensive to manufacture.

I make a suspension of very fine sand, so fine as to be flour-like, or of any other rock not containing a large percentage of minerals of a colloidal nature.

The quartz, or rock, or sand, is ground so fine that all of it will pass through a screen having 100 meshes to the inch, and a great deal of it will pass through a screen having 200 meshes to the inch.

It will be found that when silica, sand or other rocks are ground to such a fineness, a fluid suspension can be made of a density equal to or greater than that of the densest coal, and that this suspension will maintain itself substantially unaltered for a time sufficient to act like a solution for the gravity separation of the impurities from coal without agitation or any upward current, and that such a mixture can be readily washed from the coal and the impurities by means of water. It can then be re-classified by suitable means and returned into the cycle of operations.

The mine-run coal is delivered to a tank containing the suspension, and the slate and other heavier impurities settle to the bottom together with much of the finely ground rock, silica or the like, of the suspension, and are removed by a conveyer. The coal is scraped off the surface of the body of the suspension at a suitable point.

The suspension and coal are fed to the body of the suspension in the separating tank simultaneously; and the suspension is fed in sufficient quantity to maintain a liquid overflow, which overflow is taken from below the separating level.

It is imperative that the suspension be supplied to the top of the tank with the coal. This maintains the suspension at the separating level of the proper density or specific gravity unaltered and uncontaminated with impurities of the coal, and eliminates any upward currents, which would prevent small particles of waste from sinking.

In the annexed drawings I have diagrammatically shown, in Figure 1, a plant for separating coal, and in Fig. 2 a section of the separating device.

5 Referring more particularly to Fig. 1, 3 is a grinder for silica or rock in which the comminution is carried to a fine degree, water being admitted through a branch pipe 4 to the grinder. The grinder discharges through a launder 5, which discharges to a classifier 7 of any well known hydraulic type, where all the coarse material is removed from the product resulting from the grinder 3, and only the fine suspended particles are carried through a launder 8 to a settler 9, from the launder 10 of which the clear water is delivered by pipe 11 to a pump 12 which supplies a pipe line 13, supplying the grinder and supply pipes hereinafter referred to. The settled fines taken from the bottom of the settling tank 9 pass by pipe 14 to a pump 15, whence they are delivered by pipe 16 to a mixer 17 provided with stirrer means, or equivalent means, for maintaining the suspension in a thoroughly mixed condition and of the proper specific gravity. If necessary, water may be added to the suspension in the mixer to bring said suspension to the proper specific gravity.

The mixer delivers by gravity through a pipe 18 suspension of the proper consistency to the supply chute 19 by which the dirty coal is delivered to the separator. This chute 19 delivers coal onto a downwardly inclined plate 20, (Fig. 2) and it is carried therealong by means of an endless scraper conveyer 12, passing guide sprockets 22, 23, 24 and 25.

40 Spaced from the end of the plate 20 is an upwardly inclined plate 26 along which the clean coal is carried by the scraper conveyer 21 onto an endless carrier apron or belt 27. The conveyer then passes over guide sprockets 23 above the belt 27 and down into the bottom of the tank 28, around guide sprockets 24, and thence up along the inclined bottom of the tank through the end thereof, carrying with it the slate that has sunken through the suspension, and discharging said slate at 29 onto an endless carrier or apron 30.

The guide sprockets 22 are so located as to maintain that portion of the carrier between them at about the level of the suspension in the tank.

Inasmuch as there is a constant supply of suspension with the coal, and in order to maintain a definite liquid level, there is provided at one side of the tank an overflow 31, discharging into the launder 6'.

Along both of the belts 27 and 30 are provided sprinkler pipes 32 and 33 respectively, which deliver water to the separated coal on belt 27 and to the slate on belt 30, in order

to wash them clean and return the usable fines adhering thereto into the cycle of operation.

The belts 27 and 30 are dished, or trough-shaped, in order to carry water, and they are inclined toward the launders 6 and 6' and discharge thereon. The launder 6' gathers suspension from the launder 5, suspension washed from the coal on belt 27, and suspension overflowing from the tank 28 at 31, and returns it all to the classifier 7, where it is freed from all material unsuitable for the suspension utilized in the process. The launder 6 discharges suspension washed from the slate on belt 30 also into the classifier 7.

It will thus be seen that in the separator tank 28 the suspension is maintained of sufficient specific gravity to float coal, but not to float any admixed heavier foreign material. The coal floats on the surface of the suspension in tank 28, while the slate, bone, and other heavy impurities sink through the suspension between the plates 20 and 26 onto the inclined bottom of the separating tank and are carried out of the tank by said conveyer and delivered to the slate conveyer belt 30, while the coal, which floats on the surface of the suspension, is carried along by the endless conveyer out of the tank along the plate 26 and is discharged onto the coal conveyer belt 27. The excess suspension passes under partition 40 to the constant level overflow 31.

From time to time the overflow water from the launder 10 carrying colloids unavoidably present in all rocks when finely ground, is tapped off from the system through valve or spigot indicated at 41.

Inasmuch as it is impracticable to sift the finely ground material through standardized screens to obtain a uniform fineness, water classification is resorted to. Samples from the settling tank 9 are taken at intervals, dried, and sifted through the usual laboratory testing screen set, and the grinder and classifier regulated in accordance with the check thus made.

I claim—

1. The method of separating coal from heavier impurities, which comprises introducing the raw coal into a substantially quiescent suspension of water and finely ground rock, ground to a fineness to remain in suspension, without agitation, during the period of separation of the coal; the suspension being substantially free from colloidal ingredients; and removing the coal from the surface of the suspension.

2. The method of separating coal from heavier impurities, which comprises delivering mine-run coal into a substantially quiescent suspension of water and rock, said rock substantially free from colloids and ground to pass through a screen of one hun-

dred meshes to the inch, and removing the coal from the surface of the suspension.

3. The method of separating coal from heavier impurities, which comprises delivering mine-run coal to a body of a suspension consisting of water and rock substantially free from colloids ground sufficiently fine to remain in suspension during the separating period, the coal and additional suspension

being supplied simultaneously to the body of 10 the suspension at its surface, thereby maintaining at the surface of said body the suspension of constant density.

In testimony that I claim the foregoing as my invention, I have signed my name 15 hereto.

HARRY R. CONKLIN.