

F. D. BAKER.

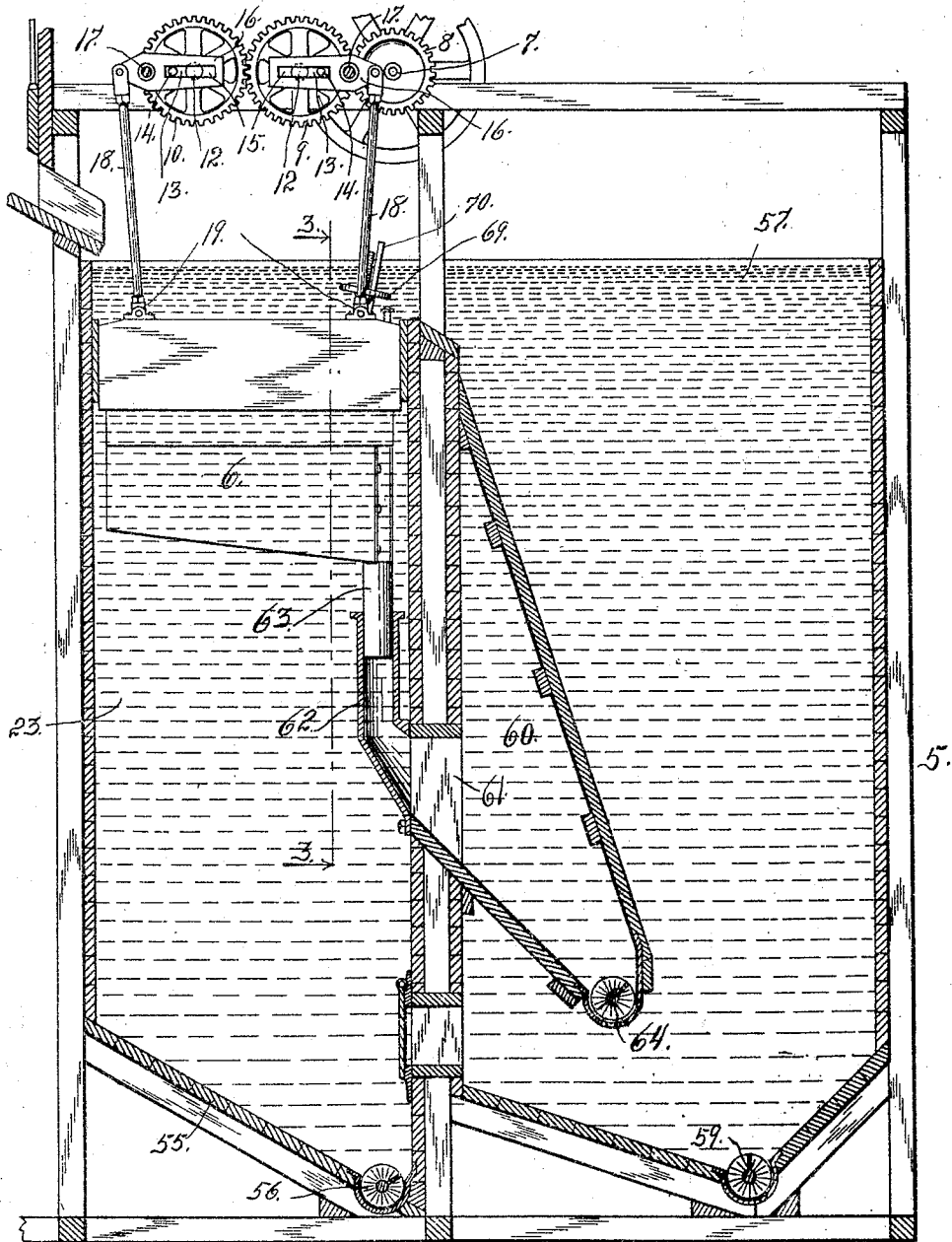
APPARATUS FOR WASHING, GRADING, AND CLASSIFYING COAL OR OTHER MATERIAL.

APPLICATION FILED DEC. 6, 1908.

976,425.

Patented Nov. 22, 1910.

4 SHEETS—SHEET 1.



Witnesses

J. D. Thornburgh.

Otto C. Hoddick.

Fig 1

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By A. H. D. Zuer Attorney

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4 SHEETS—SHEET 2.

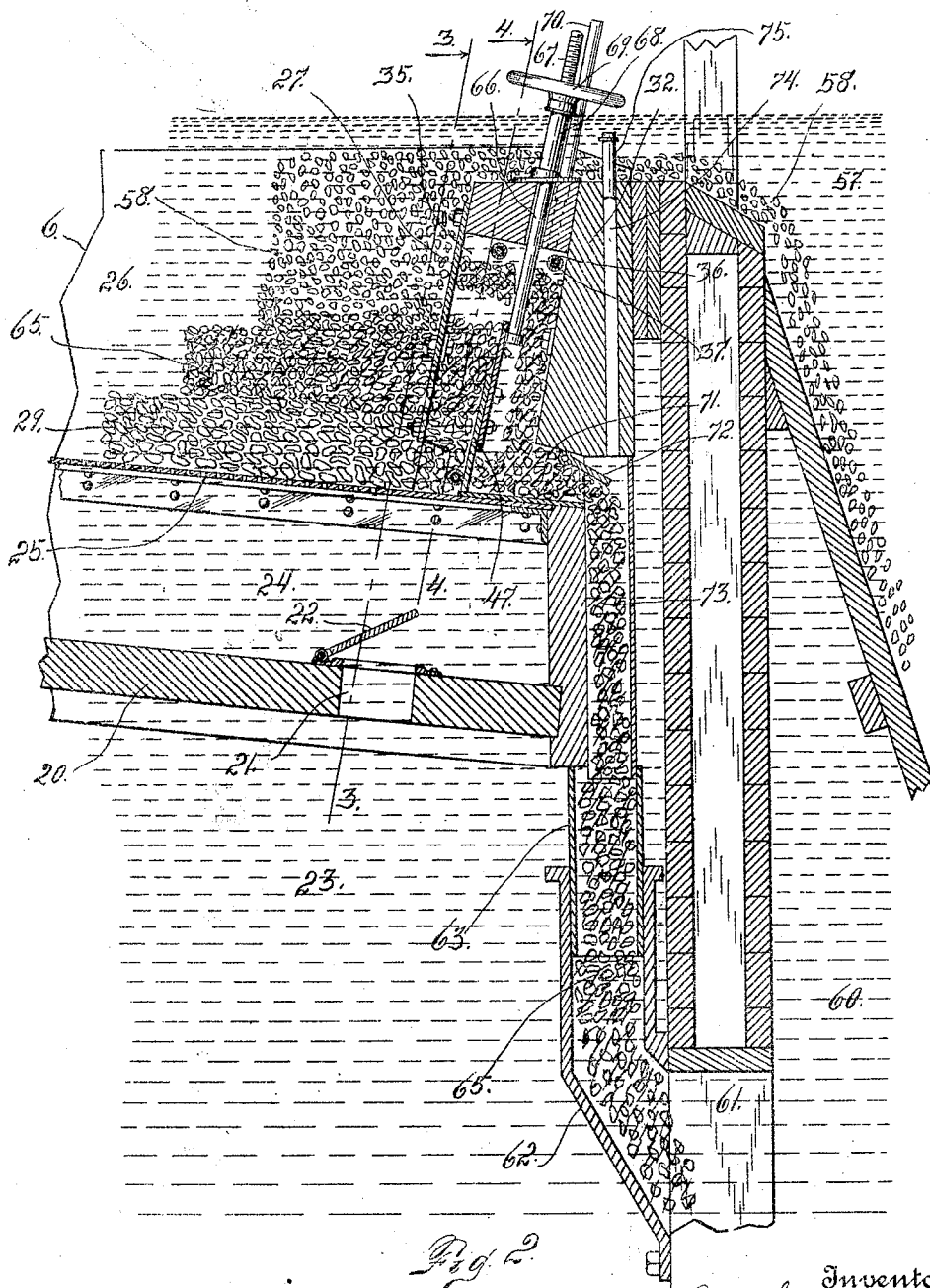


Fig. 2.

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By *A. J. Downing* ^{Frank S.}

Attorney

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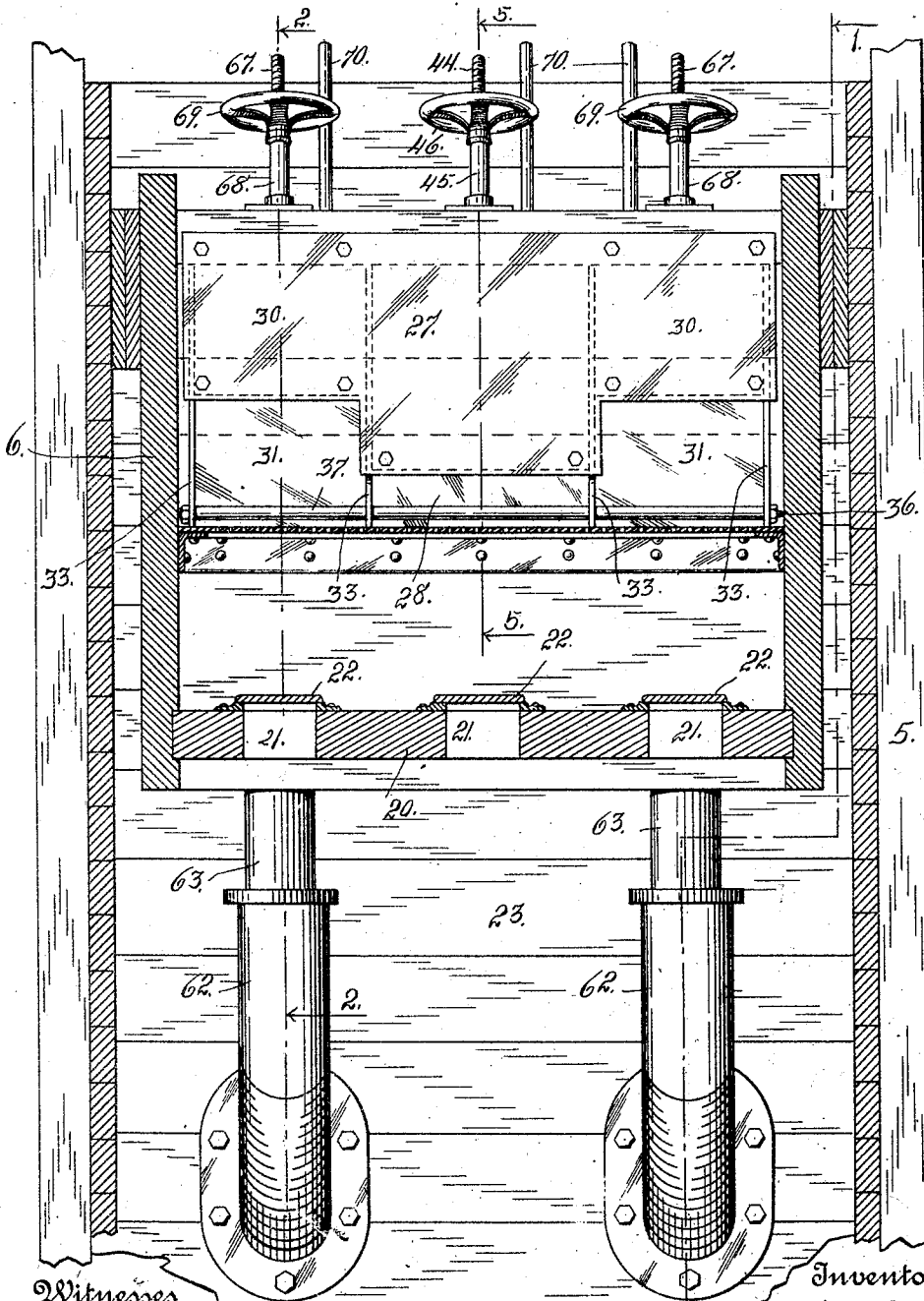
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4 SHEETS-SHEET 3.

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Witnesses

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Otto C. Hoaldick.

Inventor

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Fig. 3.

Attorney

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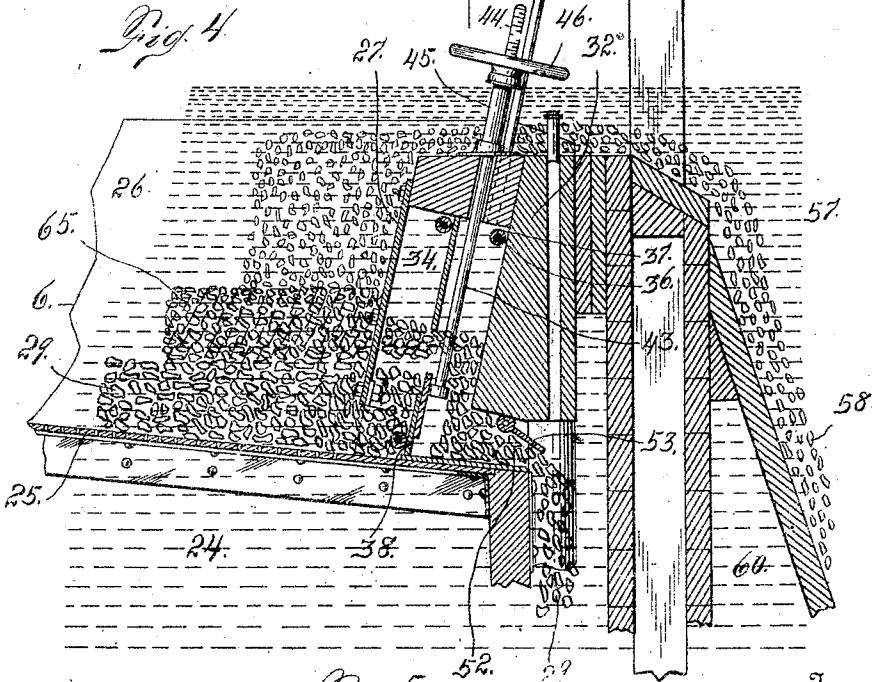
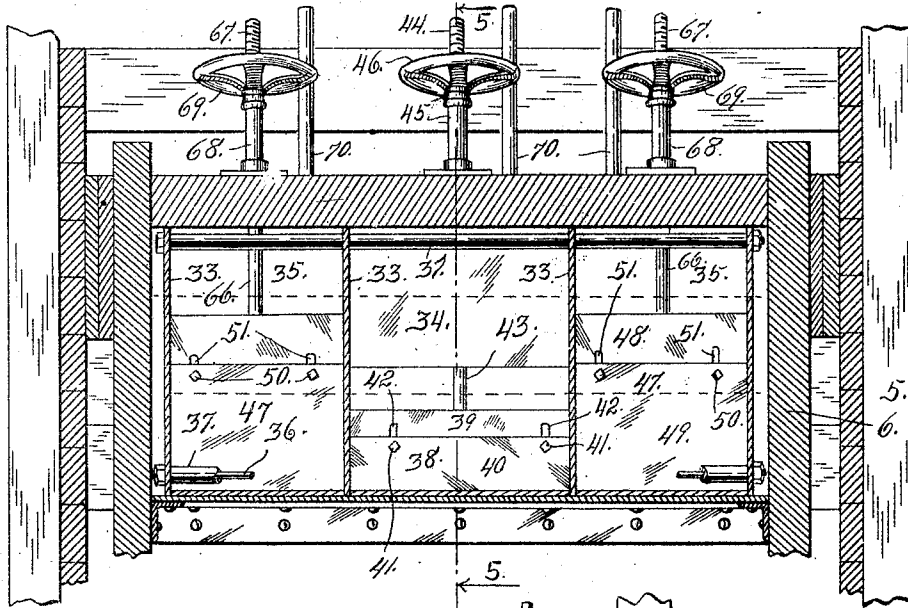
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4 SHEETS—SHEET 4.



Witnesses

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Fig. 5.

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UNITED STATES PATENT OFFICE.

FRANK D. BAKER, OF DENVER, COLORADO.

APPARATUS FOR WASHING, GRADING, AND CLASSIFYING COAL OR OTHER MATERIAL.

976,425.

Specification of Letters Patent.

Patented Nov. 22, 1910.

Application filed December 5, 1908. Serial No. 466,185.

To all whom it may concern:

Be it known that I, FRANK D. BAKER, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Apparatus for Washing, Grading, and Classifying Coal or other Material; and I do 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, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in means for washing, grading or classifying coal or other materials, according to their specific gravity.

In this application the use of the apparatus for coal washing and grading purposes will be described, though it must be understood that the invention may be employed for washing and grading other materials.

My invention relates to improvements in apparatus for the aforesaid purpose in which the sorting action of a body of water, in motion relative to the material to be sorted, is employed. It must be understood that the aforesaid relative motion may be continuous, or pulsating in character, and that the pulsation may be uni- or multi-directional in the sense that the pulsation afforded by the ordinary plunger-type jig may be considered to be bi-directional.

In this description the improvements are considered as being installed in conjunction with coal washing machinery in which a jig-tank and a jig mounted to reciprocate therein are employed. The jig is reciprocated through the instrumentality of mechanism for imparting a differential movement thereto of such character that the downward stroke of the jig is relatively rapid while its upward movement is comparatively slow. During the downward movement of the jig, whose bottom is open to permit the entrance of water, the buoyancy of the water has a tendency to raise the lighter and better quality of the coal to the top and as the operation goes on, the top stratum of coal is caused to pass over the top of the jig.

In my improved construction provision is made for further classifying the coal by removing therefrom a medium grade which

is separated from the highest quality which passes over the top of the jig as aforesaid.

Further provision is made for separating the rock or heavy worthless material, more or less of which is taken from the mine with the coal.

An important feature of my improvement is that the function of the apparatus is continuously carried on, the different grades of coal or other materials being automatically separated from each other and separately discharged from the jig while the rock or worthless material is also automatically discharged and kept separate from the coal.

Having briefly outlined my invention, as well as the function it is intended to perform, I will proceed to describe the same, reference being made to the accompanying drawing in which is illustrated an embodiment thereof.

In this drawing, Figure 1 is a vertical section taken through the apparatus. This section may be said to be taken on the line 1-1 Fig. 3. Fig. 2 is a fragmentary vertical section taken on the line 2-2 Fig. 3 in order to illustrate the discharge of the middlings grade of coal from the jig. Fig. 3 is a section taken on the line 3-3 Fig. 2 viewed in the direction of arrow 3 in said figure. Fig. 4 is a section taken on the line 4-4 Fig. 2 viewed in the direction of arrow 4. Fig. 5 is a section similar to Fig. 2 but taken on the line 5-5 Fig. 3 in order to illustrate the discharge of the rock from the jig.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate a tank in which a jig 6 is mounted to reciprocate vertically through the instrumentality of suitable operating mechanism mounted to impart a differential reciprocating movement to the jig in which the downward stroke is relatively rapid while the upward stroke is slow in comparison, as heretofore indicated.

As shown in the drawing, power is transmitted from an operating shaft 7 to which power is communicated from any suitable motor. Upon this shaft is mounted a gear 8 meshing with a gear 9, the latter in turn meshing with a gear 10. These gears 9 and 10 are mounted on crank shafts 12 having cranks 13 whose crank pins 14 engage slots 15 formed in levers 16 fulcrumed at 17. Connected with the short arm of each lever

is a pitman 18. The lower extremities of these pitmen are pivotally connected with the jig as shown at 19. When this mechanism is in operation the differential reciprocating movement heretofore described will be imparted to the jig. However, as nothing is claimed upon the operating mechanism in this application since it is substantially the same as set forth in Patent No. 816,672, to Robert L. Martin, dated April 3rd 1906, it will not be further described in detail.

The body of the jig is provided with a bottom 20 having relatively large openings 21 controlled by valves 22 which are adapted to open during the downward movement of the jig for the purpose of allowing the water in the jig-tank 23 to enter the lower compartment 24 of the jig. A perforated bottom 25 separates the compartment 24 from the upper compartment 26 of the jig.

The coal to be separated may be constantly delivered to the compartment 26 of the jig. This compartment is subdivided by a partition 27 whose central portion extends farthest downwardly leaving a space 28 below, into which the rock 29 passes. The partition 27 on opposite sides of this central portion is composed of short portions 30 leaving spaces 31 below their lower edges under which the middlings or second grade of coal passes. The compartment between the partition 27 and the front wall 32 of the jig, forms a sort of trap and is subdivided into three distinct compartments by partitions 33. The rock passes to the central compartment 34 (see Fig. 5) while the middlings quality of coal passes to the compartments 35 on opposite sides of the central compartment. The partitions 33 are connected by a number of transversely arranged rods 36 upon which are mounted spacing sleeves 37 interposed between the partitions.

The central compartment 34 is provided with a gate 38 which is composed of two over-lapping parts 39 and 40 (the latter being fixed) which are adjustably connected by means of bolts 41 passing through slots 42 formed in one of the members, whereby the gate is extensible. To the upper edge of this gate is attached a rod 43 having an upper threaded extremity 44 upon which is mounted a nut 45 which is an integral part of a hand wheel 46 by which the position of the movable gate 39 may be regulated. In each compartment 35 is located a similar gate 47 composed of members 48 and 49 (the latter being fixed) connected by bolts 50 passing through slots 51 formed in one of the members. The upper edges of these gates are relatively high, since the middlings quality of coal in order to escape from these trap compartments must pass over the upper edges of the gates.

At the bottom of the central trap com-

partment 34 is formed an outlet 52 controlled by a forwardly swinging gate 53 through which the rock 29 passes into the jig-tank 23 below the jig. The bottom of this tank is inclined, as shown at 55 and its lower portion is provided with a screw conveyor 56 adapted to remove the rock from the tank. Located adjacent the jig-tank is a settling-tank 57 adapted to receive the best quality of coal which may be designated as 58, and which passes over the top of the jig. In the bottom of this compartment is a screw conveyor 59.

Within the tank 57 is formed a compartment 60 which is in communication with the trap compartments 35 of the jig by means of openings 61 from which pipes 62 project upwardly and are open to receive hollow members 63 connected with the bottom of the jig and telescoping in the pipes 62.

The middlings quality of coal passes through the members 63 and 62 and enters the compartment 60, in the bottom of which is located a screw conveyor 64.

When the apparatus is in use a vertically reciprocating movement is imparted to the jig within the jig-tank and under the influence of this movement the material fed to the jig rapidly stratifies, the heavier or rock or slat portion of the material 29 assuming the lowermost position, the middlings quality 65 the position next above, and the highest grade 58 assuming the uppermost position. This separation is brought about largely through the buoyancy of the water during the relatively rapid downward movement of the jig. During this operation the highest quality of coal is carried over the top of the jig and discharged into the tank 57, while the middlings quality first enters the trap compartments 35, passing under the portions 30 of the partition 27 and finally passes over the tops of the gates 47 and thence downwardly, escaping through the openings 71 controlled by the outwardly swinging gates 72 into passages 73, thence to the hollow members 63, thence to the pipes 62, thence through the opening 61 to the compartment 60 whence it is removed by the screw conveyor 64. Finally the rock passes from the jig compartment 26, under the central portion of the partition 27 through the space 28 and into the central trap compartment 34, and thence over the relatively short gate 38 and thence downwardly through an opening 52 controlled by a gate 53 into a tank 23 whence it is removed by the screw conveyor 56.

In explanation of the illustration of the action of the material in Figs. 2 and 5, it may be stated that as the jig moves rapidly downward, in accordance with the differential principle heretofore explained, the water will have a tendency to hold the uppermost layer of material in any trap compartment

in suspension, whereby the said material is given an opportunity to pass over the top of the adjacent gate whether it be the rock, as shown in Fig. 5, or the medium grade of coal, as shown in Fig. 2. During the upward motion of the jig after the downward motion outlined above, the weight of good coal and of middlings coal above the rock is sufficient to cause a flow of rock through the opening 28, below the partition 27, and thence into compartment 34 and to cause the rock to rise in compartment 34 approximately to the top of gate 38. For a similar reason the middlings grade of coal in compartment 35 rises approximately to the top of gates 47. Thus at the end of the upward motion of the jig the materials in compartments 34 and 35 are in condition to pass over the tops of gates 38 and 47 respectively on the succeeding downward motion of the jig as already outlined. It is the combination of these two principles which causes a practically continuous discharge of the material from the jig whereby the run-of-mines product is separated into three grades, as heretofore explained, the separated material being discharged from the jig into separate compartments simultaneously with the feeding of the material into the main compartment of the jig.

Each gate 49 is provided with an upwardly projecting stem 66 having its upper extremity threaded as shown at 67 and engaged by a nut 68 integral with a hand wheel 69 for regulating the position of the gate.

The various subdivisions 34, 35 and 35 are vented by the use of open-ended tubes or pipes 70 connected with the respective compartments and having their upper extremities located above the level of the water in the apparatus. In this manner provision is made for producing an upward current or circulation within the trap compartment of the jig, whereby the buoyancy of the water is caused to act upon the material in the said compartment for the purpose set forth.

Each subdivision 35 of the trap compartment is provided with an outlet 71 controlled by an outwardly swinging gate or valve 72 which allows the middlings grade of coal to enter a downwardly extending passage 73 which communicates with the discharge member 63 connected with the jig and telescoping within the member 62 as heretofore explained.

In the event that the passage 73 should become stopped, access may be gained thereto for the purpose of removing the difficulty, through a passage 74 formed in the front wall 32 of the jig and normally closed by a plug 75.

Having thus described my invention what I claim is:

1. In an apparatus for washing, grading

and classifying coal or other materials, according to their specific gravities, the combination of a jig provided with suitable means for causing a jiggling action in the material to be treated, a partition having its lower edge varying in height from the bottom of the jig, said partition dividing the jig into a main compartment and a trap compartment, the trap compartment having a number of partitions forming the said compartment into a number of subdivisions, the said subdivisions having gates located therein and over which the varying grades of ore are to pass relative to the varying height of the said gates, each of said gates consisting of two members, one of said members adapted to be adjusted in relation to the other, and to vary in height relative to the variation in height of the first named partition, from the bottom of the jig, whereby the heavier stratum of material is caused to enter one subdivision of the trap compartment, while the lighter grade of material occupying an upper stratum, is allowed to enter another division and conduits communicating with the said subdivisions for conveying the separated material therefrom, substantially as described.

2. An apparatus for washing and grading or classifying coal or other materials according to their specific gravities, consisting of a jig having a transverse partition separating the jig into a main compartment and a trap compartment, the said partition extending to a predetermined distance from the bottom of the jig and provided with a central depending portion extending nearer the bottom of the jig than the ends of the partition, the trap compartment formed by the said partition having a number of partitions abutting at one of their ends against the first named partition, the said partitions forming the trap compartment into a number of subdivisions, the said subdivisions having gates located in the respective subdivisions over which the varying grades of ore are to pass through said subdivisions, each of the said gates consisting of two members, one of said members adapted to be adjusted in relation to the other, and means for imparting a suitable action to the jig to cause the material of varying grades to pass over the respective gates, substantially as described.

3. In apparatus for washing, grading or classifying coal or other materials according to their specific gravities, the combination of a jig provided with suitable means for producing a jiggling action in the material to be treated, said jig being provided with a screen upon which the material rests, and a partition separating the jig into a main compartment and a trap compartment, the said partition varying in height from the bottom of the jig to its lower edge, the trap compartment formed by the said

partition having a plurality of partitions
separating the same into a number of subdivi-
sions, vertically adjustable gates located
within the subdivisions, the said gates adapt-
5 ed to be adjusted to vary in height relative
to the variations in height of the first named
partition from the bottom of the jig, where-
by the heavier stratum of material is caused
to enter one subdivision of the trap compart-
10 ment, while the lighter grades of material
occupying an upper stratum is allowed to
enter another subdivision, the said gates be-
ing located at a point in the rear of the first

named partition, thereby forming a vertical
passage between the first partition and the 15
gates through which the material is to pass
to be discharged over the gates, and conduits
communicating with the said subdivisions
for conveying the material therefrom.

In testimony whereof I affix my signature 20
in presence of two witnesses.

FRANK D. BAKER.

Witnesses:

W. C. KUNEY,
H. H. STEM.