

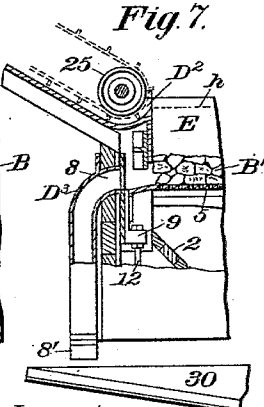
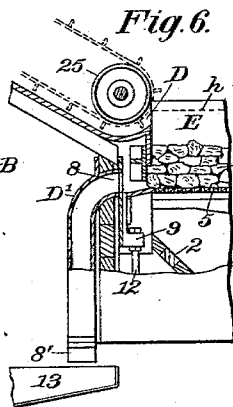
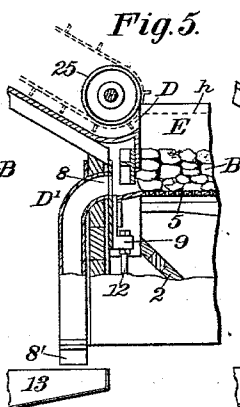
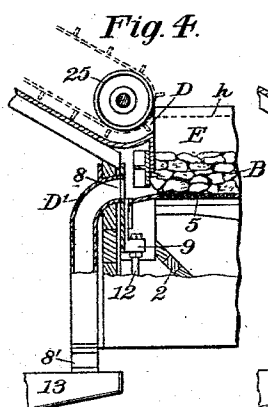
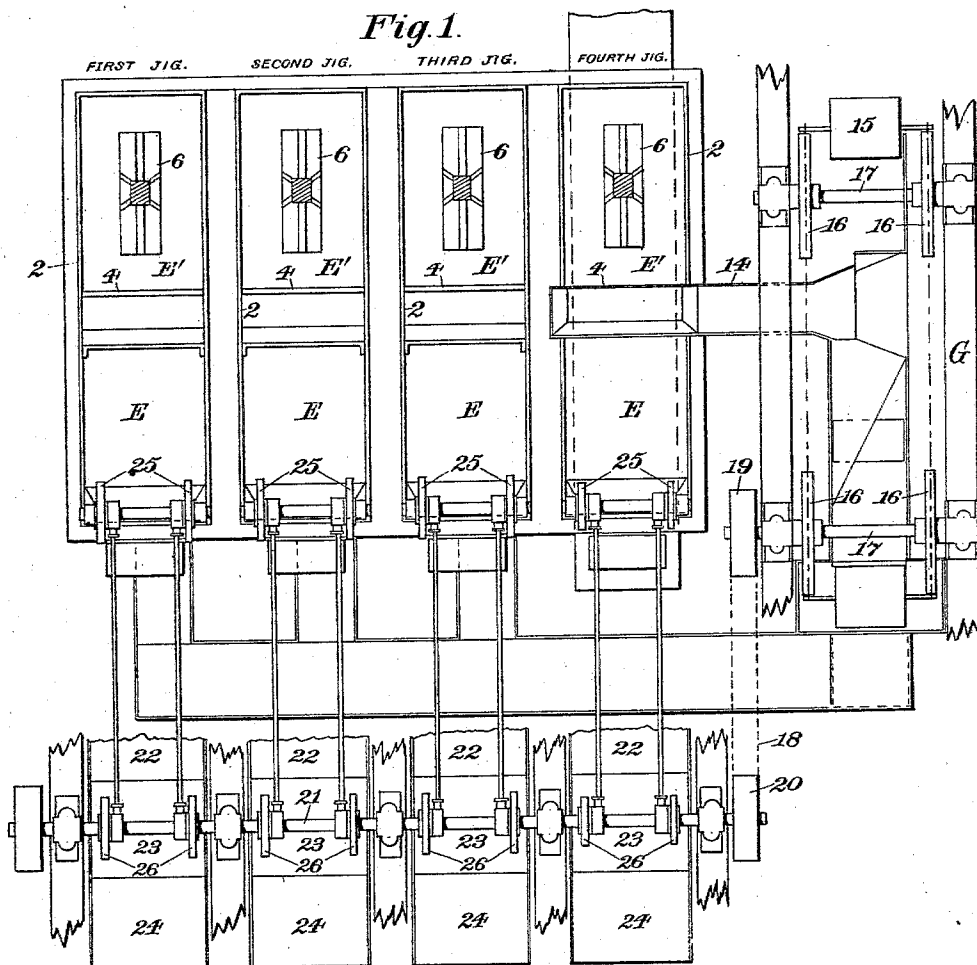
(No Model.)

3 Sheets—Sheet 1.

E. B. COXE, Dec'd.
A. B. & H. B. COXE, Executors.
APPARATUS FOR JIGGING COAL.

No. 556,739.

Patented Mar. 24, 1896.



Witnesses:
J. L. Edwards Jr.
Fred. J. Dole.

Inventor:
Eckley B. Cox. By his Attorney,
F. H. Richards.

(No Model.)

3 Sheets—Sheet 2.

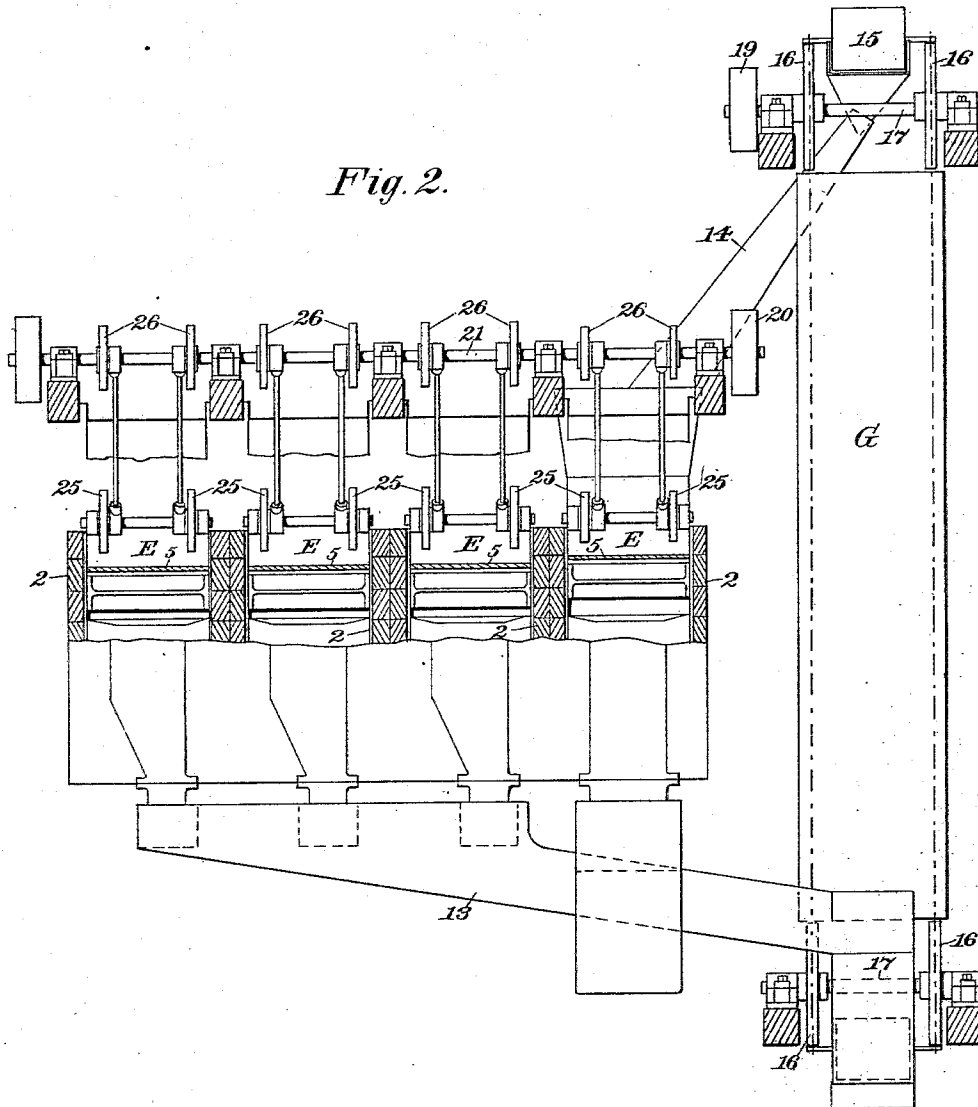
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Fig. 2.



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(No Model.)

3 Sheets—Sheet 3.

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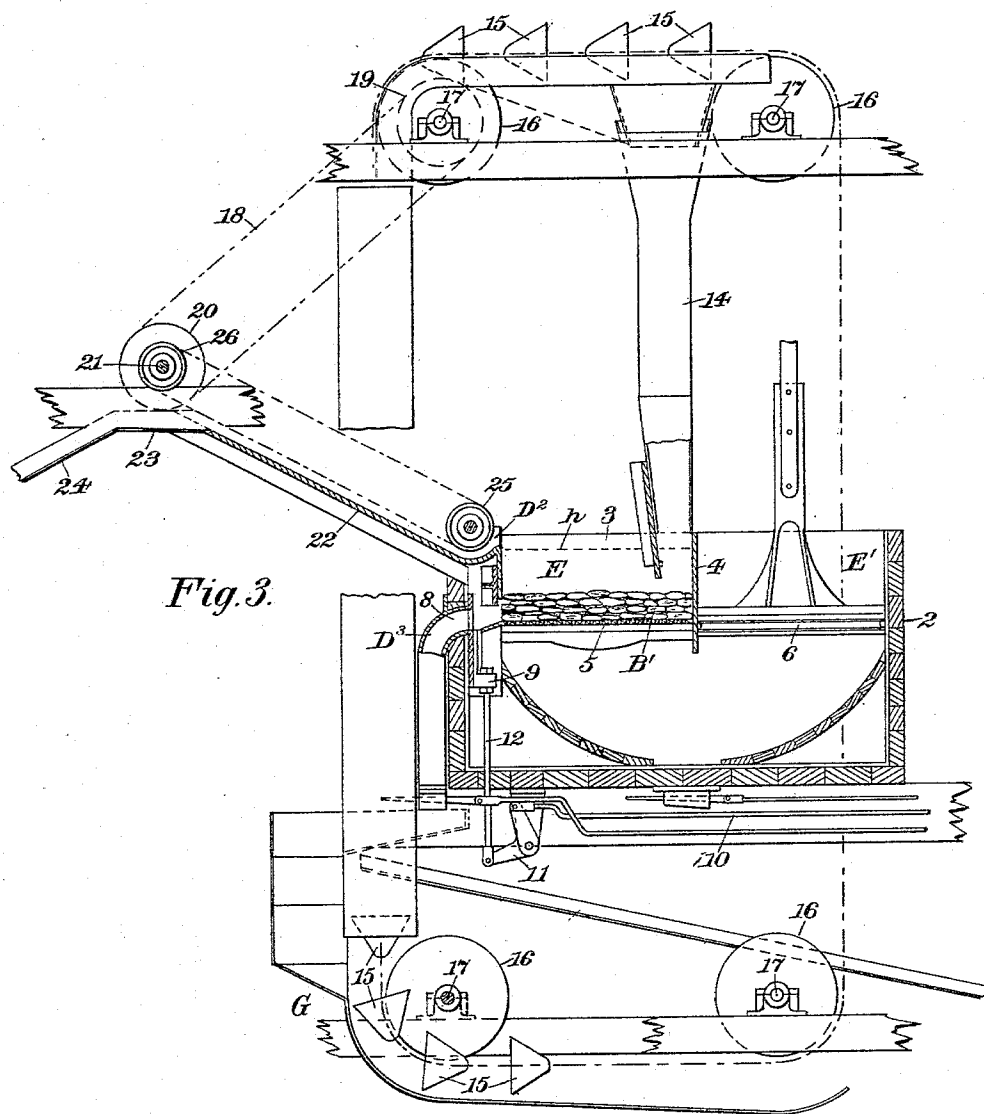


Fig. 3.

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UNITED STATES PATENT OFFICE.

ECKLEY B. COXE, OF DRIFTON, PENNSYLVANIA; ALEXANDER B. COXE AND
HENRY B. COXE EXECUTORS OF SAID ECKLEY B. COXE, DECEASED.

APPARATUS FOR JIGGING COAL.

SPECIFICATION forming part of Letters Patent No. 556,739, dated March 24, 1896.

Application filed September 24, 1894. Serial No. 523,892. (No model.)

To all whom it may concern:

Be it known that I, ECKLEY B. COXE, a citizen of the United States, residing at Drifton, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Jigging Coal, of which the following is a specification.

This invention relates to apparatus for jigging coal and other minerals, the object of my present invention being, primarily, to furnish an improved jigging plant or apparatus adapted for automatically carrying on successive jigging operations, and by means of which a proportion of coal of extra purity and of the highest marketable value, but of relatively small quantity as compared with the entire amount in the mass, may be first separated out from a mixed mass of mined material, comprising pure coal, medium-grade or partially-pure coal, and slate and bony coal, then to separate out the medium-grade or partially-pure coal or the entire amount of marketable coal remaining in the material after the first separating operation, and finally discharging the slate and bony coal, or the residuum of the preceding separating operations, practically free from marketable coal, to thereby not only secure a larger output of marketable coal from a given quantity of coal, but also effect a better assortment of the coal according to grade and purity.

In the drawings accompanying and forming a part of this specification, Figure 1 is a plan view of a coal-jigging plant embodying my present invention, parts thereof being broken away. Fig. 2 is a front elevation, practically in sections, of said jigging plant as seen from the hand in Fig. 3. Fig. 3 is a sectional side elevation of the same as seen from the right hand in Fig. 2. Figs. 4, 5, 6, and 7 are sectional side views of the discharge end of the four successive jigs, which in this instance comprise the total number of jigs in the jigging plant and are designated as "first jig," "second jig," "third jig," and "fourth jig," respectively, said four views illustrating the construction and arrangement of the relatively large and small dischargers for the marketable coal and resid-

uum resulting from the jigging operation in the several jigs comprising the plant.

Similar characters designate like parts in all of the figures.

In the preferred embodiment of my invention herein shown and described the jigging plant or apparatus comprises a plurality of two or more successive non-communicating jigs having feldspar or analogous beds of successively-increased thicknesses or resistances, respectively, adapted for supporting a mass of material to be treated, and each of which jigs has an upper and lower discharger of relatively different discharging capacities, the upper one of which is located above the feldspar bed, and the lower one of which is located below the supporting-surface of said feldspar bed; means embodying a reciprocating plunger in connection with each jig and adapted for forcing water through and agitating the mass of material to separate the marketable coal from the slate and bony coal; an elevator or conveyer in connection with each upper discharger, and a conveyer apparatus in connection with the lower dischargers of the several jigs and adapted for collecting and carrying the residuum discharged from the entire series of jigs to one jig to be re-treated, as will be hereinafter more fully described.

The several jigs comprising the plant, which are herein shown as four in number and are designated by "first jig," "second jig," "third jig" and "fourth jig," respectively, consist each of a water-tank 2 open at its upper side, as shown at 3, and transversely divided for a portion of its depth, at or near the center thereof, by a vertical partition 4 to thereby form two principal chambers or compartments in communication with one another and designated by E and E', respectively, the one, E, constituting a receiving-chamber for the material to be jigged, which material will in practice be supported upon a feldspar bed, as B or B', which in turn is supported upon a perforated floor 5, which is secured to the sides of the chamber E, while the other chamber, E', constitutes a pressure-chamber in which a reciprocating plunger 6 works to force the water

contained in said chamber and below the feldspar bed upward through said bed and the material supported thereon, which plunger will be actuated in any usual or suitable manner.

The several jigs comprising the plant will each, in a general way, coincide substantially in construction with the jigs now employed for separating broken mine-coal by the old method and will be provided with the usual means (not shown) for supplying thereto the material to be treated, which is generally supplied direct from the coal-screens.

In the present organization I employ a plurality of successive co-operative but preferably non-communicating jigs, two or more of which have relatively different separative capacities and one of which jigs is so related in its operative connection with the other jigs of the series as to automatically receive and retreat the entire residue, consisting of the partially-pure coal and slate and bony coal discharged from the other jigs of the series, as will be hereinafter more fully set forth.

As a means for securing relatively different separative capacities in the successive jigs, so as to separate out a predetermined portion of the mass of material at each successive separative operation, and thereby effect an assortment according to quality or grade, I have provided each of the successive jigs with an upper and lower discharger of relatively different capacities, and have so constructed the upper and lower dischargers of the successive jigs that the capacities of the upper and lower dischargers of one jig are different from the capacity of the upper and lower dischargers of the other jig or jigs, and I have also provided the successive jigs with feldspar beds of successively-reduced thicknesses, respectively, so that the successive feldspar beds of the successive jigs permit, respectively, a successively-increased quantity of material to pass through the same, all of which will be hereinafter more fully described.

In the drawings I have shown the plant comprising four successive jigs, (designated by "first jig," "second jig," "third jig," and "fourth jig," respectively,) the three first jigs of which will each have an upper and a lower discharger, (designated by D and D', respectively,) the upper one, D, of which is of relatively large capacity as compared with the lower one, D', and the fourth jig will have an upper and a lower discharger, (designated by D² and D³,) the upper one, D², of which is of relatively small capacity as compared with the lower one, D³. In this organization the upper dischargers of the first three jigs will have substantially the same capacity relatively to each other, and the lower dischargers thereof will have the same capacity relatively to each other, and the upper discharger of the fourth jig will have a relatively small capacity as compared with the capacities of the dischargers of the three preceding jigs, and the lower discharger of the fourth jig will

have a relatively larger capacity as compared with the lower dischargers of the first three jigs, for purposes hereinafter more fully set forth.

The first three jigs each have a relatively thick feldspar bed B, adapted for supporting the material to be treated and adapted for permitting in a given length of time but a relatively small quantity of the mass of material, or that part of the material comprising the partially pure coal and slate and bony coal, to pass through the same, whereas the fourth jig, which is adapted for treating the entire residuum of the first three jigging operations, has a relatively thin feldspar bed B', adapted for permitting in the same length of time a relatively large quantity of the mass being treated in said jig to pass through the same.

As will be seen by reference to Figs. 3, 4, 5, 6, and 7, the upper dischargers, which are adapted for carrying off the marketable coal separated from the mass of broken mine-coal supported upon the feldspar beds, are located with their receiving ends considerably above the upper surface of the feldspar beds, and will in practice be located somewhat above the normal surface line (designated by *h*) of the material being jigged, and the lower dischargers are located with their receiving ends below the upper surface of the feldspar bed, they being herein shown on a level with the floors supporting said beds. These lower dischargers will usually consist of pipes having their receiving ends 8 terminated within the chambers E, and their discharge ends 8' terminating outside of and near the bottom of the jigs proper, the inlet-openings to said dischargers being opened or closed more or less to increase or decrease the discharging capacity of the dischargers by means of a cut-off or gate 9, which may be operated from the outside of the jig in any suitable manner through the medium of the operating-rod 10, bell-crank 11, and gate-connecting rod 12, as will be understood by reference to Fig. 3 of the drawings.

The lower dischargers of the first three jigs lead to a common carrier-trough or conduit 13, which receives and directs the residuum of the first three jigging operations to an elevator, (designated in a general way by G,) which receives the said residuum from the first three jigs, carries it upward and discharges it through a chute 14 into the receiving-chamber E of the fourth jig, as will be readily understood by reference to Figs. 1, 2, and 3 of the drawings. This elevator may be of any suitable construction and organization for carrying out this operation, it being herein shown as comprising endless chains (shown in dotted lines) having a series of carrying-buckets 15, which chains are carried over sprocket-wheels 16 carried by shafts 17 and driven through the medium of the belt 18 (shown in dotted lines) extending over pulleys 19 and 20, the one, 20, of which is car-

ried by the discharger-actuating shaft 21, which shaft is driven from any suitable source of power (not shown) through the medium of the driving-pulley at the opposite end thereof. It is desired to state in this connection that any suitable means for carrying the aggregate residuum of the first three jigs to the fourth jig to be re-treated may be employed in lieu of that shown in the drawings.

The upper dischargers for the several successive jigs will, in the preferred form thereof herein shown, each comprise an inclined receiving-trough 22, the lower receiving end of which terminates within and near the upper end of the agitating-chamber E of the jig, and the upper end thereof extends outward practically in a horizontal plane, as shown at 23, to form a platform upon which the successively-elevated portions of the separated coal may temporarily rest to allow the water therein to drain back into the agitating-chamber E and until the next succeeding portion of coal is elevated, which will force the same outward and down the downwardly-inclined portion 24 of said discharging-trough, whence it will pass to a place of deposit, an endless drag or carrier-belt extending over two sets of wheels 25 and 26, respectively, the one set, 25, of which is located contiguous to the receiving end of the discharge-trough and the other set, 26, of which is adjacent to the discharging end of said trough, said belt having strips extending transversely of the trough and adapted for engaging the coal as it drops into the trough and for carrying the same upward with a rapidity sufficient to remove the coal as fast as it is separated from the mass contained in the chamber E, and means for imparting a traveling movement to said belt of a velocity corresponding with the separate capacity of the jig with which it is connected. This belt, it will be obvious, may be of any suitable construction for performing the functions set forth, although in practice two Ewart link-belt chains having a series of flat metallic strips secured thereto will be employed.

The upper dischargers of the first three jigs will each have a relatively large capacity and will, by relatively increasing the speed of the drag-belts thereof, be operated so as to carry off the relatively large quantity of material separated by the first three jigging operations, and the upper discharger of the fourth jig will have a relatively small capacity and will be operated by reducing the speed of the drag-belt, so as to carry off the relatively small quantity of the material consequent to this last jigging operation. As illustrated in the drawings most clearly in Fig. 7, the lower discharger of the fourth jig conducts the residuum of the last jigging operation, which comprises the slate and bony coal, to an inclined chute 30, which carries off said slate and bony coal to a suitable place of deposit.

The operation of jigging broken mine-coal

by my improved apparatus and method is as follows: The mass of broken mine-coal is substantially uniformly distributed through the feldspar beds of the first three jigs and is therein subjected to agitation by means of a water-blast through the medium of the reciprocating plungers, which causes a large percentage of the marketable coal to separate itself from the residuum or the slate and bony coal, and the purest coal, being of lighter specific gravity, will be raised to a point in the plane of the receiving ends of the upper dischargers, and, dropping upon the receiving end of the discharge-troughs, will be carried by the drag-belts thereof up the inclined troughs to the platforms at the upper ends thereof, where the coal will form a pile, the water draining back down the inclined troughs into the jigs. As each successive quantity of coal is brought up by the discharger, it pushes the corresponding quantity, which has been drained off and which rests upon the platforms 23, off the other side of said platforms, whence it slides to a suitable place of deposit. During this operation the partially pure coal, bony coal, and slate have been passing through the successive feldspar beds and are being discharged by the lower dischargers in successively-increased quantities, respectively, into the common carrier or chute 14, whence they are carried to and upon the relatively thin feldspar bed of the fourth jig, which has a separative capacity of relatively-reduced ratio as compared with the capacities of the three first-mentioned jigs, owing to the relatively-reduced capacity of the upper discharger and relatively-increased capacity of the lower discharger thereof. In this jig the residuum of the first three jigging operations is re-treated in a manner similar, but in a different ratio relatively, to the jigging operations first described which separate practically all of the marketable coal from the mass, which is relatively small as compared with the coal drawn off from the first jigging operations, said coal being discharged through the upper discharger, which is of relatively small capacity, and the slate and bony coal during the separating operation passing with rapidity through the relatively thin feldspar bed and being discharged through the lower discharger of relatively large capacity, whence it is carried off, practically free of marketable coal, to any suitable place of deposit.

By the term "broken mine-coal" is meant the mine product after this has passed through the breakers and is made ready for jigging, and by the terms "pure coal" and "partially-pure coal" are meant, respectively, coal which is practically free from slate lumps and bony-coal, with a minimum amount of ash, and coal that has a medium proportion of slate and bony-coal and usually has a larger proportion of ash.

Having thus described my invention, I claim—

1. In a coal-jigging plant, one or more first jigs having permeable beds of substantially the same thickness and resistance, and each of said first jigs having an upper discharger of relatively small capacity, and a lower discharger of relatively large capacity, located, respectively, above and below the supporting-surface of the permeable bed thereof; in combination with a second jig having a permeable bed of reduced thickness and resistance, as compared with the thickness and resistance of the first jig or jigs, and also having an upper discharger of relatively small capacity, and a lower discharger of relatively large capacity, located, respectively, above and below this permeable bed; and the upper and lower dischargers of the second jig being of different capacities from the upper and lower dischargers, respectively, of the first jig or jigs, substantially as described.

2. In a jigging plant, two co-operatively-connected jigs having permeable feldspar beds of different thicknesses and resistances, and each jig having an upper discharger of relatively small capacity, and a lower discharger of relatively large capacity, located, respectively, above and below the normal supporting-surface of the bed of said jig; and the upper discharger of the second jig being of relatively small capacity, as compared with the capacity of the upper discharger of the first jig, and the lower discharger of said second jig being of relatively large capacity, as compared with the capacity of the lower discharger of the first jig; in combination with means, substantially as described, for carrying the lower discharge of the first jig and depositing it upon the supporting-bed of the second jig, substantially as described, and for the purpose set forth.

3. In a jigging plant, a series of successive co-operating jigs having comparative, separate capacities of a predetermined ratio, and adapted for automatically separating successively reduced and predetermined quantities of pure and semipure coal from a mass of intermixed mined material, and said jigs having permeable beds of successively-reduced thicknesses and resistances; and each jig also having dischargers above and below the normal supporting-surface of said bed; in combination with means for forcing water through the beds of the successive jigs; and a carrier in direct connection with the lower dischargers of, and adapted for conveying, the lower discharge of one or more of said jigs to, and discharging the same upon, the permeable bed of another jig, to be re-treated, substantially as described, and for the purpose set forth.

4. In a jigging plant, a series of successive co-operating jigs having comparative, separate capacities of a predetermined ratio; and having means for successively and automatically separating successively reduced and predetermined quantities of pure and semi-

pure coal from a mass of intermixed or broken coal; and each jig having a permeable bed, and also having an upper discharger of relatively small capacity, and a lower discharger of relatively large capacity, located, respectively, above and below said bed; in combination with a conveyer connecting two or more of said jigs, and adapted for automatically transferring the residuum from the lower discharger of one or more of the successive jigs to, and depositing it upon, the permeable bed of another jig, to be re-treated, substantially as described, and for the purpose set forth.

5. In a coal-jigging plant, a first jig having a relatively thick feldspar or analogous coal-supporting bed, and having two dischargers of relatively different capacities, one located above, and one located below, the normal supporting-surface of said bed; and means for forcing water through the bed and the coal supported thereon; in combination with a second jig, having a relatively thin supporting-bed, and having two dischargers of relatively different capacities, one located above, and the other below, the normal supporting-surface of said bed; and means, substantially as described, for carrying the discharge from the lower discharger of the first jig to, and depositing it upon, the supporting-surface of the bed of the second jig, substantially as described, and for the purpose set forth.

6. In a coal-jigging plant, in combination, two successive co-operating jigs having comparative, separate passages of a predetermined ratio, and having permeable material-supporting feldspar beds of successively-reduced thicknesses and resistances, respectively; two dischargers of varying capacities in connection with each jig, and located, one above, and the other below, the normal surface-line of the supporting-bed, and the upper discharger of one jig being of small capacity relatively to the other discharger of the other jig, and the lower discharger of the first-mentioned jig being of larger capacity, relatively to the lower discharger of the secondly-mentioned jig; a conveyer having its receiving end in communication with the lower discharger of one jig, and having its discharging end located at the point above the material-supporting bed of the other jig; means for operating said conveyer; and means for actuating said jig, substantially as described, and for the purpose set forth.

7. In a coal-jigging plant, in combination, two co-operatively-connected jigs having feldspar beds of different thicknesses, respectively, and each jig having an upper and a lower discharger of relatively different capacities, located, respectively, above and below the supporting-surface of the bed; means for forcing water through the supporting-bed of the two jigs, to separate and elevate, the lighter constituents of the material supported upon said bed; a conveyer in operative con-

nection with the upper discharger of each jig;
means for actuating the two conveyers at
relatively different velocities; and means,
substantially as described, in position and
5 adapted for conveying the lower discharge of
one jig to, and depositing it upon, the sup-
porting-surface of the bed of the other jig,

substantially as described, and for the pur-
pose set forth.

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