(No Model.)

2 Sheets—Sheet 1.

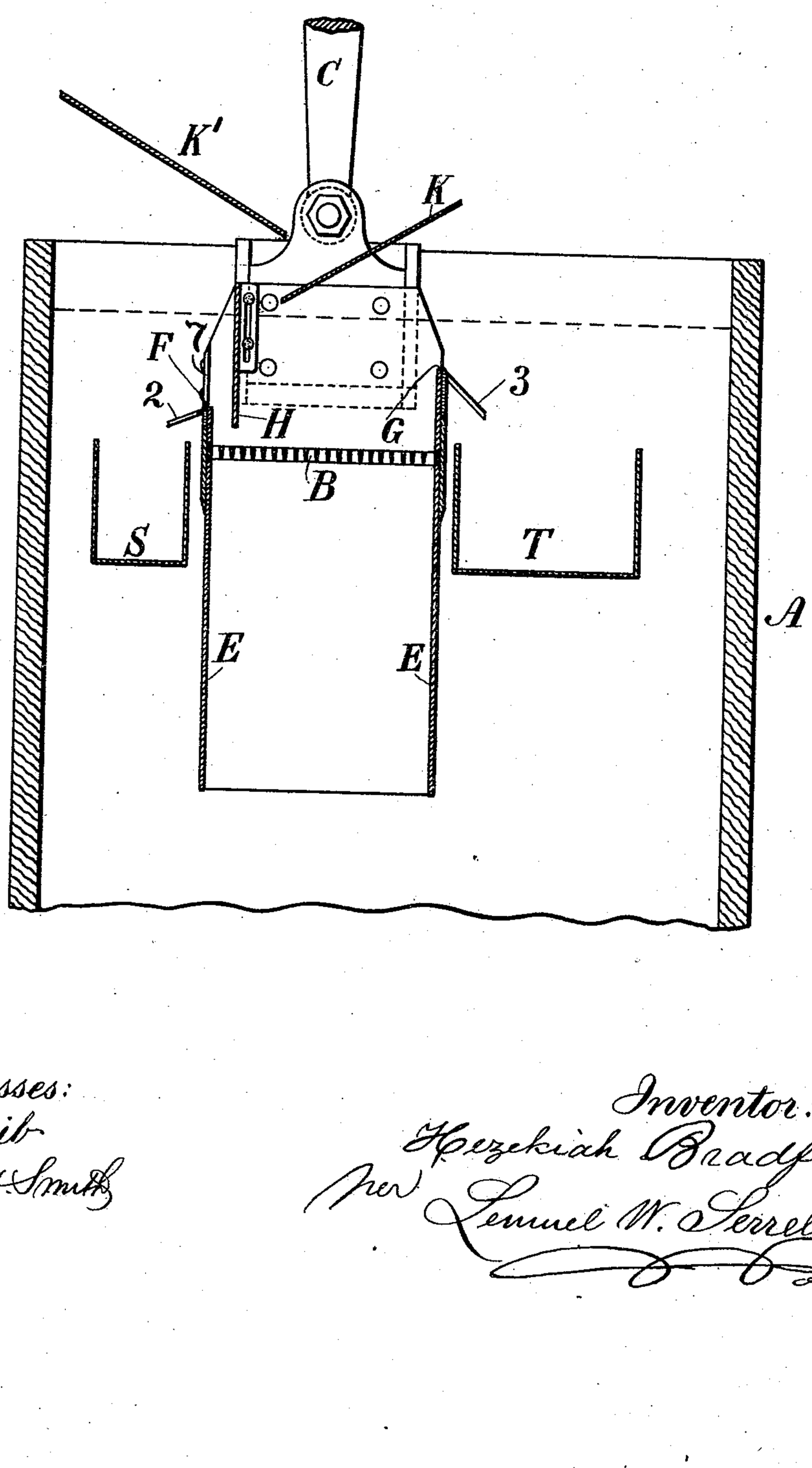
H. BRADFORD, Dec'd.

S. I. WILLINGALE & R. W. FINLETTER, Administrators.

SEPARATOR FOR COAL, &c.

No. 501,673. Patented July 18, 1893.

Fig. 1.



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Hezekiah Bradford
per Lemuel W. Serrell
Atty

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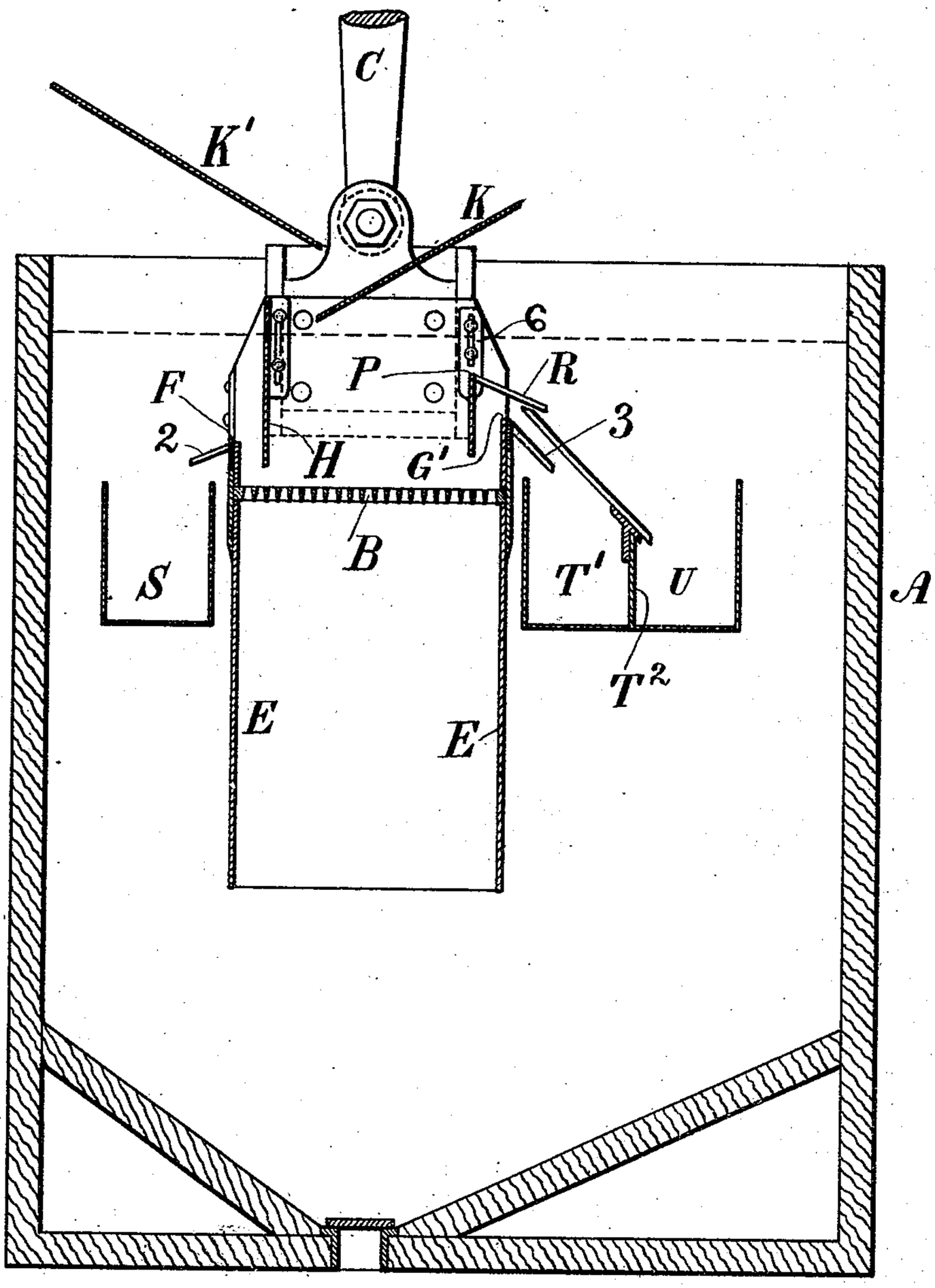
Fig. 2.



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UNITED STATES PATENT OFFICE.

HEZEKIAH BRADFORD, OF PHILADELPHIA, PENNSYLVANIA; SAMUEL ISAAC WILLINGALE AND ROBT. W. FINLETTER ADMINISTRATORS OF SAID BRADFORD, DECEASED.

SEPARATOR FOR COAL, &c.

SPECIFICATION forming part of Letters Patent No. 501,673, dated July 18, 1893.

Application filed October 12, 1892. Serial No. 448,622. (No model.)

To all whom it may concern:

Be it known that I, HEZEKIAH BRADFORD, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented an Improvement in Separators for Coal, &c., of which the following is a specification.

In separating devices which have heretofore been constructed for separating slate from anthracite coal, a jig has been employed into which the coal and slate have been supplied, and this jig has been reciprocated vertically within a tank containing water, in order that the slate and other substances heavier than the coal might fall the most rapidly and the anthracite coal come to the surface, but difficulty has been experienced in causing the materials to pass with regularity through the apparatus, because the coal and the slate moved or progressed in the same direction across the jig and the jigging action tended to mix the coal and slate to a certain extent as they moved across the jig. Hence such separators have been comparatively slow in their action and a perfect separation could not be relied upon.

My present invention is intended for obviating the difficulties that have heretofore existed, and it relates to a jig in which the slate and heavy materials pass off in one direction from the point of supply, while the coal and lighter materials pass off in the opposite direction; for this reason the separation is continuous and progressive and the risk of slate reaching the point at which the coal is delivered is reduced to a minimum, and the delivery for the slate is so constructed that it is almost impossible for coal to pass through the slate delivery.

In the drawings, Figure 1 is a vertical section of the apparatus adapted to separate coal and bone coal from slate making two distinct separations, and Fig. 2 is a similar view of the apparatus adapted to make three distinct separations, viz. the coal, the bone coal and the slate, delivering each separation into separate receptacles.

The vat or water holding vessel A is of any suitable size, and into this vat water is supplied and maintained at the proper level, and provision is made as usual for drawing off or removing any fine dust or particles of coal that may subside to the bottom of the vat or tank. The grate B is level or nearly so and it has openings that are smaller than the smallest sized coal, bone coal or slate that is to be acted upon. This grate bottom may be of any desired character or construction, but I prefer cast iron where there is not much acid in the water; where the acid is considerable brass or phosphor bronze answers better. The bars of this grate should be widest at the top and the openings should be uniform or nearly so, but with some characters of coal it is preferable to employ a grate in which the openings near the place of delivery of the slate are slightly the largest so that the upward current of water may have increased force in discharging the slate.

The jig box is connected with any suitable jigging mechanism, such for instance as rods C at the ends of the jig box that are connected with revolving eccentrics or cranks of the proper throw and upon a revolving shaft, so that the jig box is moved up and down with the proper speed for acting upon the coal, slate or other materials that are to be separated, and the extent of motion is to be in proportion to the size of the material to be acted upon.

The sides of the jig box below the grate form an inertia box, that is to say, this portion of the jig incloses a body of water which by its inertia tends to raise the coal above the grate and partially support the same in the water. This is effected in consequence of the slate upon the grate acting the same as valves to close the openings in the grate as the jig is elevated, and the body of water that is lifted thereby continues to flow upwardly by its inertia, while the jig itself is forced downwardly, and the inertia of the water buoys up the coal above the grate and the rapidity of the fall depends upon the specific gravity of the material.

I find it of great importance to have the inertia box extending down sufficiently far to inclose the required body of water, and the interior of the jig box and inertia box, above and below the grate should be in line and

should be as smooth and free from projections as possible, in order that there may not be anything to interfere with the uniform upward movement of the water.

The inertia box is preferably of cast iron so as to possess the requisite stiffness, and the area of the grate surface should correspond to the area of the jig box and inertia box, the edges of the grate being received into recesses in the jig box as shown.

The openings in the grate are to be as large as possible but smaller than the pieces of slate or coal, so that the material will not drop through; and it is advantageous to have different grates and jig boxes for different sizes of coal, and in addition to this it is of importance that the coal or other material be properly screened, so that the material operated upon is of nearly uniform size.

I find it advantageous to employ perforated screens, the first one of which allows all the material to pass through except the largest size, and the second screen with smaller perforations allows all the material to pass through except the second size, and so on, because by screening the material in this manner there is less breakage of the pieces, and all the chips that correspond to the smaller sizes of coal pass off with such sizes, and only the dust is taken off by the last screen. The more uniform in size the material operated upon may be, the more perfect will be the separation in my apparatus.

Above the grate B and at one side of the jig is the slate dam F and the coal dam G at the other side, and it is advantageous to construct these dams so that they can be raised or lowered, the parts being connected by bolts passing through slots or by slides in recesses that allow for this movement.

The guard plate H is supported with its lower edge at the proper distance above the grate B for the slate to pass beneath this guard plate, and the coil or other material to be separated is supplied by a suitable chute K so as to be spread with reasonable uniformity upon the jig and along the length thereof, and it is advantageous for the slope of this chute to be toward the guard plate H, so that the material falls between the end of the chute and the guard plate.

In commencing to separate coal and bone coal from slate, as shown in Fig. 1, making only two separate deliveries the guard plate should be lowered to the grate and the slate dam should be raised temporarily above the height to which it will be placed after the jig is regulated. The jig should then be set in operation; the crude coal should then be supplied by the chute k' to the feed board K so as to be equally distributed the whole length of the jig box. After the coal and bone coal have commenced to be freely delivered from the coal dam G and when a proper layer of slate has accumulated on the grate, then the guard plate H should be raised about one third higher than the diameter of the largest pieces of slate in the jig box and the slate will pass under the guard plate and deliver over the slate dam F and the coal or lighter materials remain above the heavy materials and they move gradually toward the side of the jig forming the coal dam G and finally pass over the edge of the same into any suitable receptacle, and the slate or heavier materials pass beneath the guard plate H and rise up between the same and the slate dam F, and in consequence of the materials being supplied adjacent to the guard plate H, and in consequence of the slate being much heavier than the coal, such slate will descend vertically or nearly so and pass through the coal, and the tendency of the coal will be to work across the jig toward the dam G, and the mass of coal in its turn tends to press the slate below it toward the guard plate H, the consequence of which is that the slate will be discharged in one direction and the coal in the other direction and the height of the slate dam F in relation to the coal dam G and the space between the lower end of the guard plate H and the grate B are to be so proportioned, adjusted or regulated, that the slate will pass over the dam F with the proper rapidity in proportion to the coal as it passes over the dam G, and because the coal is so much lighter than the slate the top edge of the dam G must be higher than the top edge of the dam F, and by regulating the relative heights of these dams and the space below the guard plate, so that the respective deliveries will be varied, and the coal can be entirely relieved from slate, or the coal can pass over the dam G with any desired proportion of bone coal with it.

In most anthracite coal mines the pure coal exists together with a substantially non-combustible slate and an intermediate quality of coal known as bone coal. This intermediate quality of coal is combustible and with a strong draft produces a very intense fire. Hence this bone coal is well adapted to steam boilers and manufacturing purposes, but it is not well adapted to domestic purposes. To separate this bone coal from the pure coal and also from the slate, I add to the devices before described a secondary dam P which intervenes between the dam G and the guard plate H, and this secondary dam P has its lower edge at the proper distance above the grate B and its upper edge higher than the dam G′, and there are inclined bars R extending from the outer edge of the secondary dam P over the dam G′, so that the coal passing over the secondary dam P slides down the bars R and is delivered separately from the bone coal passing over the dam G′, and it is advantageous to make this dam P with two plates so that the lower plate can be raised or lowered and its lower edge brought nearer to or farther from the grate B, and the upper edge is adjusted to the desired height above the grate B. This secondary damp P serves to separate the pure coal

from the bone coal. The pure coal being the lightest will pass over the top of this secondary dam P and the bone coal being heavier will pass below the edge of the dam P and over the dam G′. By varying the relative heights of the top edges of the dams P and G′, the proportion of materials delivered over the top edges of the respective dams will be varied; thus by lowering the secondary dam a greater proportion of material will pass over the same and the reverse.

Any suitable delivery devices may be made use of for the slate and coal. I have represented a stationary receptacle S for the slate, a stationary receptacle T′ for the bone coal, and a stationary receptacle U Fig. 2. for the pure coal; and T Fig. 1. for coal including bone coal. These receptacles may be in the form of inclined troughs extending down into the water within the tank and passing out of the vat at one end, and scrapers or elevators connected to endless chains may be provided in the respective troughs for drawing up out of such troughs the materials discharged into the troughs and delivering such materials into suitable receptacles above the water line, and in order to prevent the bone coal and pure coal becoming mixed, a partition T^2 may be employed between the troughs T′ and U; and I remark that these troughs may be of any desired or well known character, and there should be lips or projecting bars 2 and 3 adjacent to the respective dams F and G to give direction to the materials that are discharged over such dams to cause the same to fall properly into the respective troughs.

The devices made use of in adjusting the dams may be of any desired character. I have shown straps or flanges connected with the dam P. and the guard plate H. in which straps or flanges there are slots for bolts that attach the parts to the end frames of the jig; the dams F., G. and G′. may be similarly attached to allow for adjustment. The straps and bolts for the dam P. are shown at 6. and the bolts for the slots in the straps of the dam F. are shown at 7.

I claim as my invention—

1. The combination in a hydraulic separating jig, of a grate, an inertia box below the grate, two delivery dams above and near the opposite edges of the grate, a supply chute over the grate and a guard plate between the supply chute and one of the dams, whereby the materials supplied to the jig are separated according to gravity in opposite directions, the heavier portions passing under the guard plate and over one dam, while the lighter portions rise and pass toward and over the edge of the other dam, substantially as set forth.

2. The combination in a hydraulic separating jig, of a grate, an inertia box below the grate, two delivery dams above and near the opposite edges of the grate, a supply chute over the grate and a guard plate between the supply chute and one of the dams, whereby the materials supplied to the jig are separated according to gravity in opposite directions, the heavier portions passing under the guard plate and over one dam, while the lighter portions rise and pass toward and over the edge of the other dam, and a secondary dam near the delivery for the lightest materials, the lower edge of which secondary dam is above the grate, and the upper edge is sufficiently high to form a second separation for the removal of the lightest materials, substantially as set forth.

3. The combination in a hydraulic separating apparatus, of a jig having a grate, an inertia box below the grate, two dams above and near the edges of the grate, one or both of which dams are adjustable in their height in relation to the other, a supply chute over the jig and a guard plate with its lower edge above the grate leaving an intermediate space for the heavier materials to pass beneath such guard plate, substantially as set forth.

4. The combination in a hydraulic separating apparatus, of a jig having a grate, an inertia box below the grate, two dams above and near the edges of the grate, one or both of which dams are adjustable in their height in relation to the other, a supply chute over the jig and a vertically adjustable guard plate with its lower edge above the grate leaving an intermediate space for the heavier materials to pass beneath such guard plate, substantially as set forth.

5. The combination in a hydraulic separating apparatus, of a jig having a grate, two dams above and near the edges of the grate, one of which is higher than the other, a supply chute for the material, a guard plate above the grate with an opening between the lower edge and the grate for the passage of the heavier materials, a secondary dam above the grate, the upper edge of which is variable in height so as to effect a second separation of the pure coal or lightest material from the bone coal or heavier material that passes beneath the secondary dam, substantially as set forth.

6. The combination in a hydraulic separating jig, of a grate, an inertia box below the grate, two delivery dams above and near the opposite edges of the grate, a supply chute over the grate and a guard plate between the supply chute and one of the dams, whereby the materials supplied to the jig are separated according to gravity in opposite directions, the heavier portions passing under the guard plate and over one dam, while the lighter portions rise and pass toward and over the edge of the other dam, and stationary receiving troughs at opposite sides of the jig, substantially as set forth.

7. The combination in a hydraulic separating jig, of a grate, an inertia box below the screen, two delivery dams above and near the opposite edges of the grate, a supply chute over the grate and a guard plate between the supply chute and one of the dams, whereby the materials supplied to the jig are sepa-

rated according to gravity in opposite directions, the heaviest portions passing under the guard plate and over one dam, while the lighter portions rise and pass toward and over the edge of the other dam, and a secondary dam near the delivery for the lighter materials, the lower edge of which secondary dam is above the grate, and the upper edge is sufficiently high to form a second separation for the removal of the lightest materials, bars extending from the upper edge of the secondary dam over the coal dam, and three troughs within the water holding tank, one of which troughs receives the heavier material at one side of the jig and the other two troughs receive the pure coal and bone coal respectively from the coal and auxiliary dam, substantially as set forth.

Signed by me, this 11th day of October, 1892.

HEZEKIAH BRADFORD.

Witnesses:

GEO. T. PINCKNEY,

WILLIAM G. MOTT.