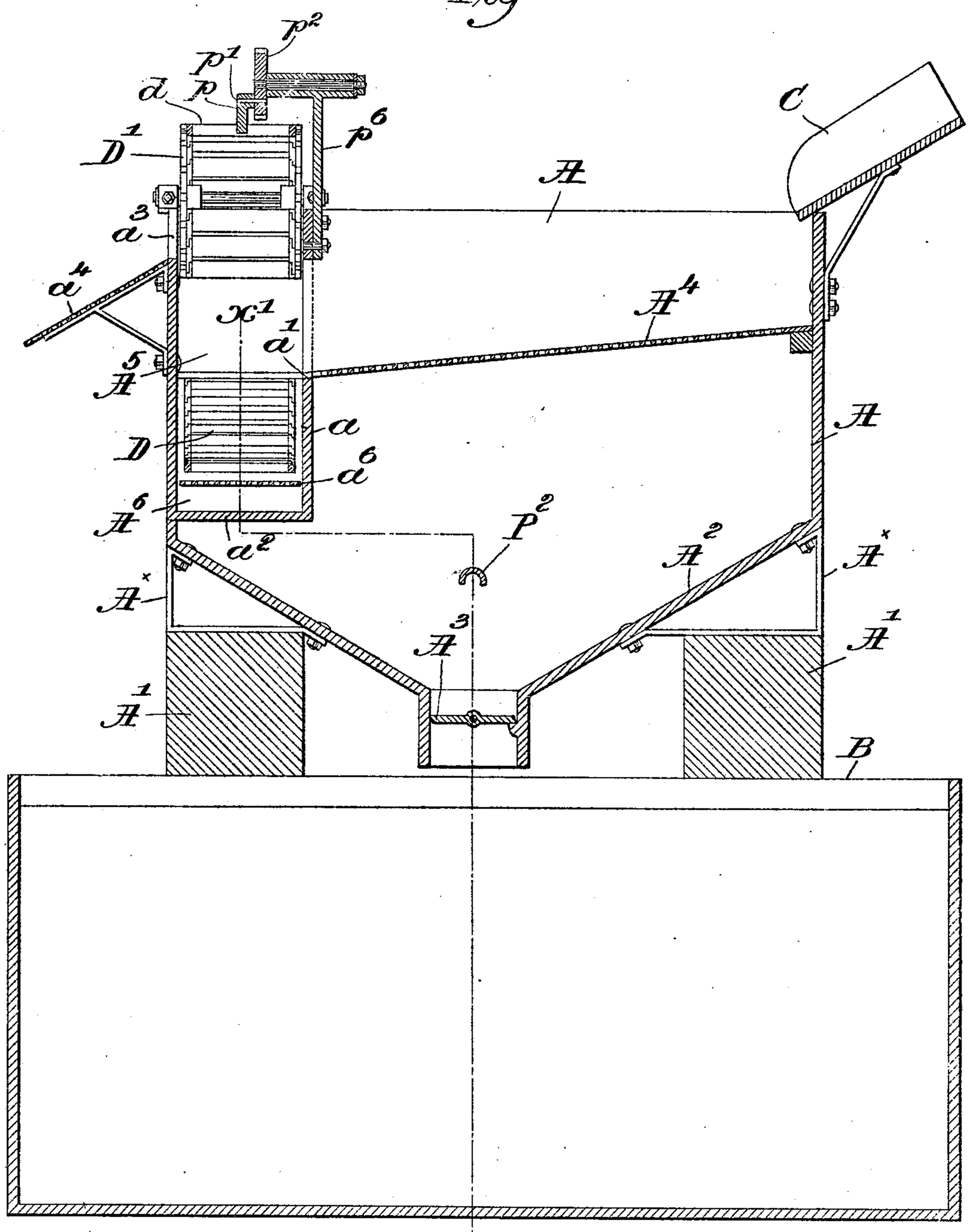
(No Model.) 2 Sheets—Sheet 1.

D. E. PHILLIPS.

JIG FOR SEPARATING SLATE AND ROCK FROM COAL.

No. 547,129. Patented Oct. 1, 1895.

Fig: 1.



Witnesses
Fred S. Gunnell.
A. C. Harmon

Inventor:
David E. Phillips.
By Crosby & Gregory,
Attys.

(No Model.) 2 Sheets—Sheet 2.

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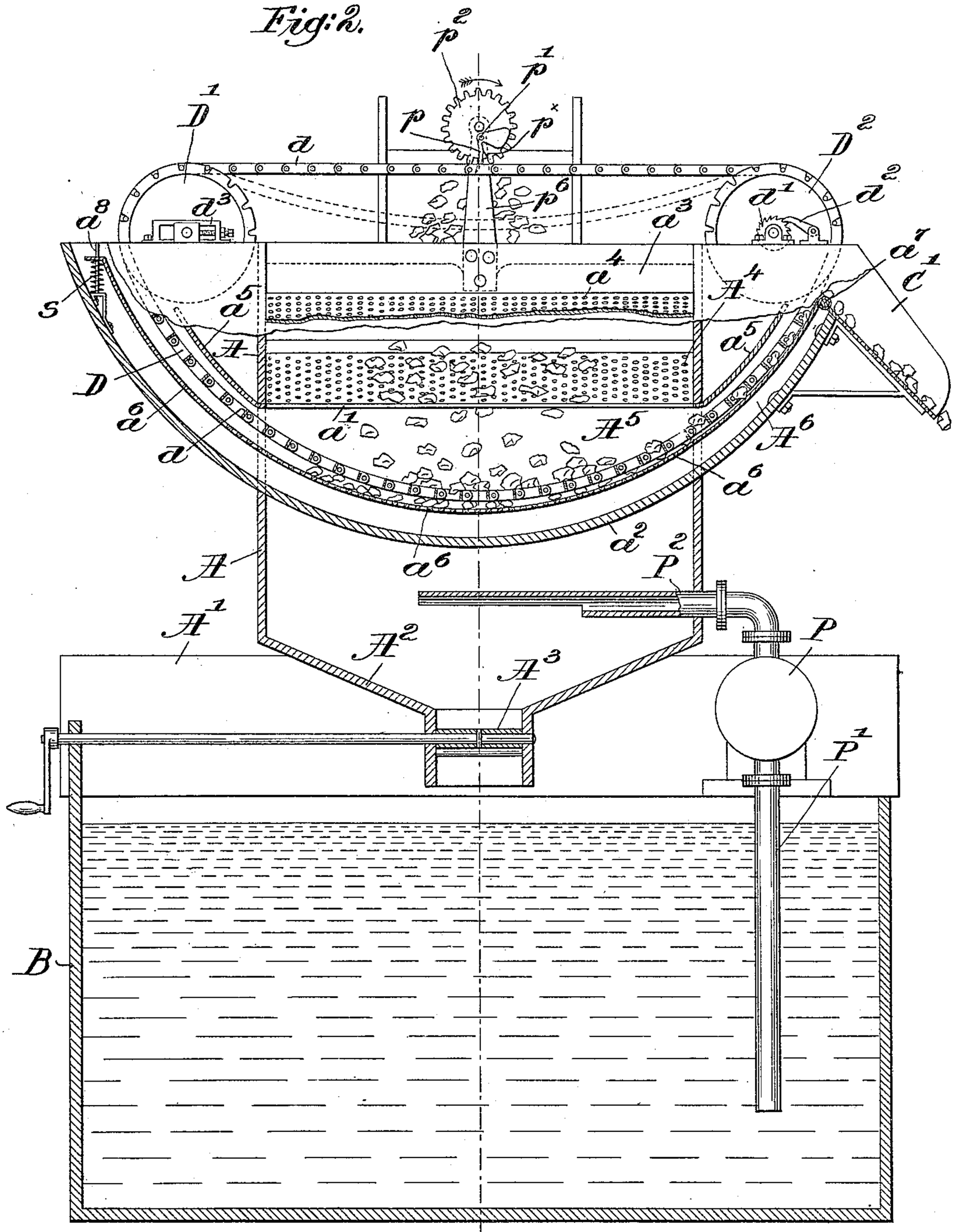
Fig: 2.



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A. C. Harmon
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UNITED STATES PATENT OFFICE.

DAVID E. PHILLIPS, OF MAHANOY CITY, PENNSYLVANIA.

JIG FOR SEPARATING SLATE AND ROCK FROM COAL.

SPECIFICATION forming part of Letters Patent No. 547,129, dated October 1, 1895.

Application filed March 2, 1895. Serial No. 540,314. (No model.)

To all whom it may concern:

Be it known that I, DAVID E. PHILLIPS, of Mahanoy City, county of Schuylkill, State of Pennsylvania, have invented an Improvement in Jigs for Separating Slate and Rock from Coal, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

In the preparation of coal for market it is necessary to separate therefrom the pieces of slate and rock mixed therewith as it comes from the mine. This separation is usually accomplished by passing the coal and rock over the perforated bottom of a jig, which is placed in a tank containing water, and either the jig-pan is moved up and down in the tank or the water in the latter is agitated by a plunger, the object of the agitation in either case being to force the water up through the perforated bottom of the jig-pan. As the coal is lighter than the rock or slate, it is forced to the top of the mass and the rock and slate settle on the bottom of the pan. A gate is made in the pan-bottom, worked in suitable manner, usually by a lever controlled by an attendant, who opens the gate from time to time to allow the deposit of slate and rock to pass through and into the tank, from which it is removed by a suitable elevator. This construction is objectionable for many reasons. When the gate is opened, it is uncertain as to when it will be closed, as there is always liability of a piece of rock, slate, or coal getting wedged in such position that the gate cannot be shut; the attendant may be careless or some part of the gate or its opening mechanism may break, and the consequence is that coal also passes through the gate and into the tank, from which it passes to the slate-hopper. The jig is useless in the event of such an accident until repairs can be made, and much coal is also wasted.

As the jig-pan is usually submerged, or nearly so, in the water of the tank, it is necessary to draw off the water from the tank if any accident happens to the pan, causing great waste of water, which at times is a very valuable commodity in most coal-mining regions.

I have devised a jig particularly adapted for the separation of coal from slate and rock in an effective and rapid manner without any of the objectionable features hereinbefore mentioned.

In accordance with my invention the jig-pan is provided with a preferably hopper-like closed bottom, having a valve therein through which the water and sediment can be drawn, the water passing into the tank to be used over again. The jig-pan is provided with a perforated diaphragm or false bottom extending toward the front end of the pan, through which the water is forced to separate the coal from the rock or slate, which collects below the diaphragm at its outer end and is removed by means of a suitable conveyer. The pan is supported over the water-tank, and as the water is pulsated or forced through the mass of coal, rock, &c., on the perforated diaphragm it overflows and runs through a perforated apron or lip-plate back into the tank, while the jigged or separated coal is carried by the overflow water over the apron or lip-plate into the coal-pocket.

My invention accordingly consists in various details of construction and arrangement to be hereinafter fully described in the specification, and particularly pointed out in the claims.

Figure 1 is a vertical longitudinal sectional view on the line $x\,x$, Fig. 2, of a jig embodying my invention; and Fig. 2 is a transverse sectional view taken on the irregular line $x'\,x'$, Fig. 1, a part of the jig-pan and conveyer being shown in elevation.

Referring to the drawings, the jig-pan A is secured in suitable manner, as by brackets $A^{\times}$, to timber or other supports A' on the top of a water-tank B, the brackets being shown as secured to the preferably hopper-like closed bottom A^2 of the pan, said bottom having therein a valve or gate A^3, through which water or sediment may be discharged into the tank B. Above the bottom A^2 of the pan I place a perforated diaphragm or false bottom A^4, extending from one to the other side of the jig-pan A and preferably inclining slightly from the back of the pan to the lower edge a' of an opening in a vertical partition-wall a in and extending across the pan, the bottom of said wall being connected by a transverse portion a^2 to the front end of the jig-pan, forming a collecting-chamber A^5 for the sepa-

rated slate or rock. The front end of the pan is cut away at a^3 to form a delivery-gate for the coal, a perforated apron or lip a^4, inclined downwardly and outwardly from the bottom of the gate a^3, serving to drain the coal as it passes thereover into a suitable pocket, the escaping water running through the lip-plate and back into the tank B. A chute or trough C delivers the coal intermixed with slate and rock upon the upper rear end of the diaphragm, and when water is forced up from below through said diaphragm the pulsations loosen up the mass, and the coal, which is lighter, will be lifted to the top of the mass, the heavier impurities, as slate and rock, remaining below. Successive impulses or pulsations gradually carry the underlying mass of slate and rock and the superposed layer of coal toward the front of the pan, and the water as it escapes through the gate a^3 carries the coal with it over the lip-plate a^4 and discharges it. The refuse settles into the collecting-chamber A^5, whence it is removed by suitable mechanism, to be described. The bottom a^2 of the collecting-chamber is preferably curved, as shown in Fig. 2, and preferably extends up beyond the sides of the pan, forming, with cover-plates a^5, runways for an endless conveyer D. Sprocket-wheels D′ and D^2 are mounted above the runways and the conveyer D is passed around them, the series of links d composing the conveyer being preferably made as open links hinged together, the bight of the conveyer swinging below the peripheries of the sprockets D′ D^2 and movable over a perforated bottom a^6 in the collecting-chamber. This bottom a^6 is preferably made of bronze or some other durable sheet metal, hinged at a^7, adjacent the delivery-chute C′ of the conveyer, and at its other end mounted on supports a^8, surrounded by preferably spiral springs s, Fig. 2, whereby the bottom may sink when the force of the springs is overcome. Viewing Fig. 2, it will be seen that the conveyer D is of such length that when its upper side between the sprockets is taut the lower part or bight will hang lower than when the upper part hangs loose, as shown in dotted lines. When the accumulating slate or rock in the chamber A^5 is of sufficient weight to depress the bottom a^6, the bight of the conveyer D is also drawn down and the upper part tightened until the links are brought into the path of movement of an actuator, shown as a pawl p, pivoted at p' on a pawl-carrier p^2, rotated at a slow speed by any suitable mechanism. (Not shown.) A projection $p^\times$ on the pawl-carrier acts as a detent or abutment for the pawl when it is engaged with one of the links d, and rotation of the pawl-carrier in the direction of the arrow, Fig. 2, moves the conveyer along slowly step by step. The links of the bight, resting on and moving over the bottom a^6, engage the pieces of rock or slate and gradually draw them up from the chamber A^5 through the runway A^6 and discharge them into the delivery-chute C′. This operation continues until the accumulation of refuse is removed from the chamber A^5, the bottom a^6 gradually being raised by the action of the springs s, lifting the bight of the conveyer. As the weight is thus taken off from the sprocket D′, the weight of the top part of the conveyer will cause it to turn said sprocket in the opposite direction, it curving down toward the dotted-line position, Fig. 2, out of range of the constantly-rotating pawl p, and the movement of the conveyer ceases. A fresh accumulation of refuse takes up the slack in the conveyer and again brings it into engagement with the pawl, so that the movement of the conveyer is intermittent and governed by the accumulation of refuse.

When in operation the ascending side of the conveyer is loaded and heavy, and the sprocket D^2 must be prevented from backlash when the pawl leaves one link till it rotates and engages another, and I accomplish this by securing a ratchet-wheel d' to the shaft $d^\times$ of the sprocket D^2, to be engaged by a detent-pawl d^2, the pawl and ratchet permitting forward rotation of the sprocket and conveyer, but preventing retrograde movement at the end adjacent the discharge-outlet. It is to be understood that the pawl-carrier p^2 rotates in bearings in a fixed support p^6, and the sprocket D′ may be adjusted in its bearings by means of an adjusting-screw d^3, Fig. 2, to take up wear, &c. Any suitable form of link may be used for the conveyer, and my invention is not restricted to any particular form.

A pump P, of any suitable construction adapted to deliver water in successive impulses or pulsations, is shown as located at the top of the tank B, the inlet-pipe P′ extending down into the tank, and its outlet P^2 is conducted into the jig-pan A between its closed bottom and the perforated diaphragm A^4. Preferably the under side of the discharge-pipe is cut away within the pan in order that the water discharged will surge against the bottom A^2 and then up through the diaphragm A^4, a better movement of the water being thus obtained. As the water is used over and over again, it will be seen that a great saving therein is obtained by the use of my invention, a small supply from time to time making up for the inevitable loss which occurs.

My invention obviates mechanism for reciprocating the jig-pan up and down in the tank, and my invention is not restricted to the exact construction and arrangement shown, as obviously changes and modifications may be made without departing from the spirit and scope of my invention.

Inasmuch as by far the greater portion of water at each impulse flows off through the outlet with the coal, there is little or no back or counter current to settle the mass of material above the diaphragm. A strong back current, whether the back rush of the water or induced by suction, would practically force

the great majority of loosened coal back again to its original position above the diaphragm and but little separating effect would be obtainable.

I claim—

1. In a jigging apparatus for the treatment of coal, a jig pan having a perforated diaphragm therein to receive the coal to be treated and extended toward the front of the pan, means to force water upward therethrough in successive pulsations, to separate and raise the coal from and to the top of the heavier slate and rock, a coal discharge outlet, a compartment below said outlet and at the outer end of the diaphragm, to receive the substratum of slate and rock, an auxiliary normally elevated bottom therefor, an endless conveyer movable over said bottom and normally maintained slack thereby, and conveyer actuating means to operatively engage therewith when the adjacent portion of the conveyer is tightened, substantially as described.

2. In an apparatus for the treatment of coal, a jig pan having a closed bottom and a perforated diaphragm above it to receive the coal to be treated, a water inlet to force water in successive impulses upward through the diaphragm, to separate the coal from the slate and rock, an outlet for the coal, a receiving compartment below it for the slate and rock, an intermittently operated endless conveyer movable through said compartment, a vertically movable bottom for said receiving compartment, and means including a rotating pawl to at times engage the conveyer controlled by the quantity of slate and rock upon said movable bottom to cause longitudinal movement of the conveyer, substantially as described.

3. In an apparatus for the treatment of coal, a water tank, a jig-pan rigidly mounted above it and having a closed bottom, a perforated stationary diaphragm in the pan above its closed bottom and inclined toward the front thereof, to receive the coal to be treated, a pump beyond the tank and pan, its inlet extended into the tank, an outlet for the pump extended into the pan between the diaphragm and bottom thereof and open along its lower side, each stroke of the pump forcing a quantity of water into the pan against its bottom and thence upward through the diaphragm, to thereby separate the coal from the slate and rock, a transverse slate and rock receiving compartment in the outer end of the pan below the diaphragm, an outlet above said compartment and diaphragm for the water and the coal carried along therewith at each pulsation, and a strainer at the lower end of said outlet, and projecting over the open top of the water tank, to permit the return of the water to the tank, substantially as described.

4. In an apparatus for the treatment of coal, a jig-pan having a transverse slate and rock receiving compartment at its outer end, a fixed bottom therefor, an auxiliary normally elevated bottom, an endless conveyer movable thereover and normally maintained slack thereby, and means to operatively engage with and to actuate the conveyer when the adjacent portion thereof is tightened by depression of the normally elevated bottom, substantially as described.

5. In an apparatus for the treatment of coal, a jig pan having a transverse slate and rock receiving compartment at its outer end, sprocket wheels mounted above the ends of said compartment, an endless conveyer mounted thereon, a detent to prevent retrograde movement of the wheel at the lifting side of the conveyer, and a rotatable pawl adapted to engage the conveyer between said sprocket wheels when tightly stretched therebetween to actuate the conveyer, substantially as described.

6. In an apparatus for the treatment of coal, a jig pan having a transverse slate and rock receiving compartment at its outer end, a normally lifted bottom therefor pivotally supported at one end and yieldingly supported at its other end, sprocket wheels mounted above the compartment, an endless conveyer in engagement therewith, its depending portion resting on the bottom of the compartment, to normally maintain slack the portion between the sprocket wheels, actuating means for the conveyer located adjacent said normally slack portion, and out of engagement therewith, the weight of the slate and rock depressing the bottom to tighten the normally slack portion of the conveyer, and thereby bring it into the path of and to be moved by said actuating means, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

DAVID E. PHILLIPS.

Witnesses:

FRANKLIN MYERS,

WM. T. PATTERSON.