F. R. WILLSON, Jr.

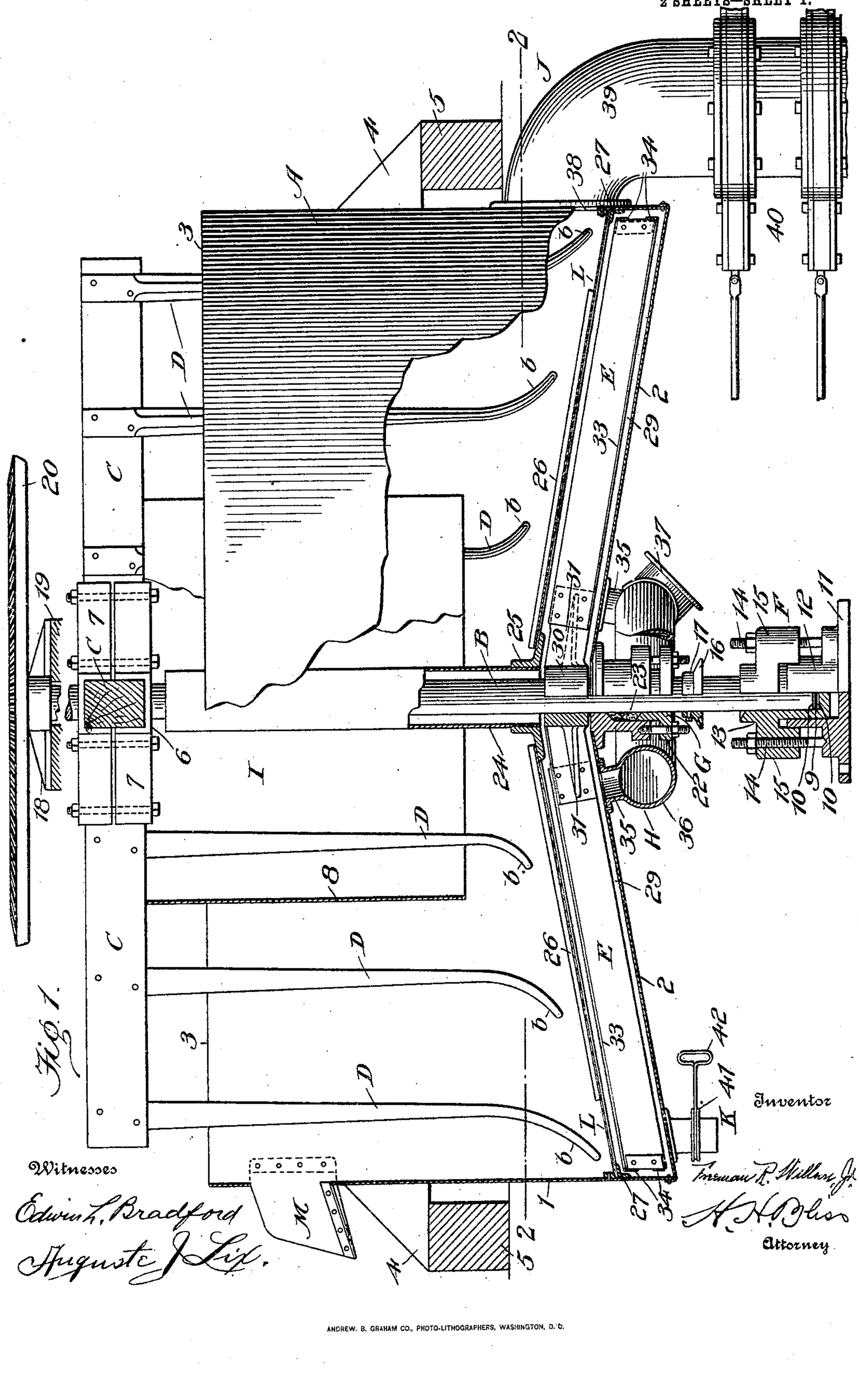
COAL WASHER.

APPLICATION FILED MAR. 24, 1905. RENEWED FEB. 3, 1909.

933,808.

Patented Sept. 14, 1909.

2 SHEETS—SHEET 1.



F. R. WILLSON, Jr.

COAL WASHER.

APPLICATION FILED MAR. 24, 1905. RENEWED FEB. 3, 1909.

933,808. Patented Sept. 14, 1909.

2 SHEETS—SHEET 2.

Fig. 2.

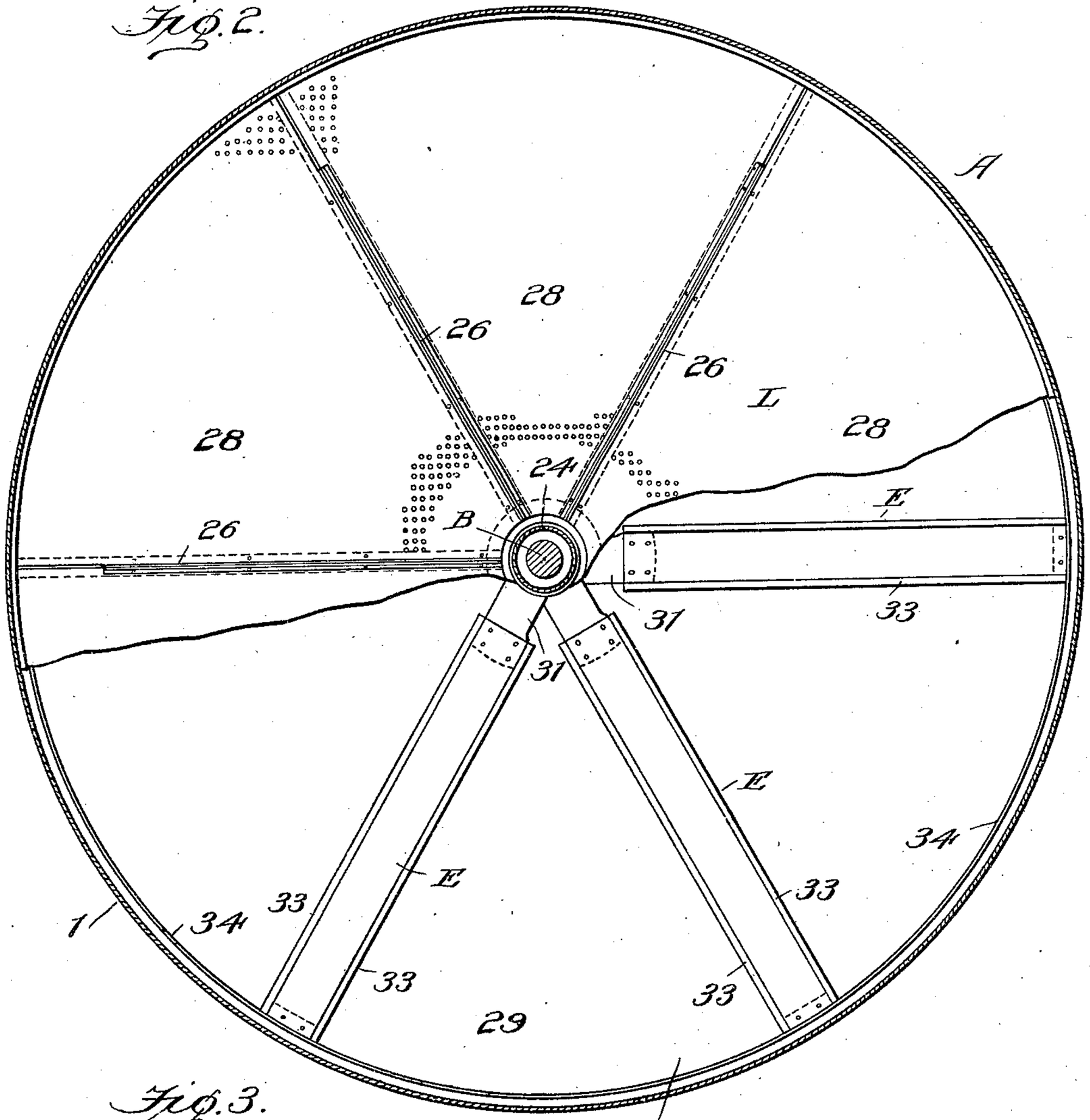
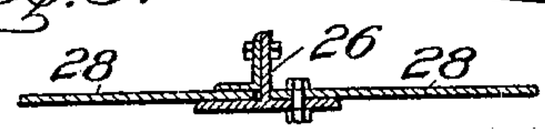
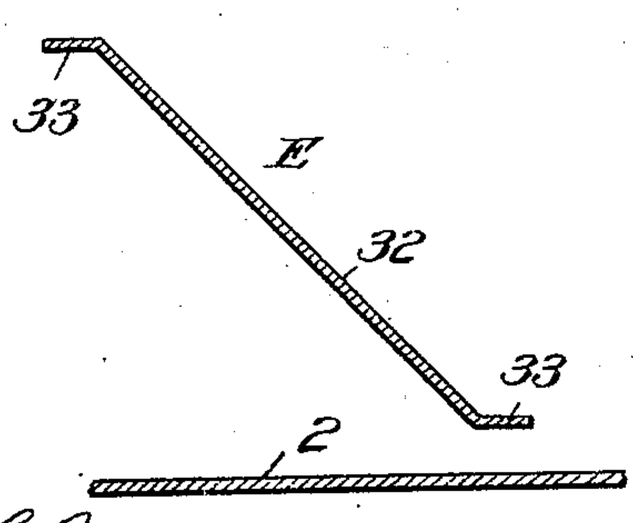


Fig. 3.





Witnesses

Edwin L. Bradford

Auguste J. Lix.

Inventor

Freeman R. Willson, Jr.

By

Attorney

UNITED STATES PATENT OFFICE.

FREEMAN R. WILLSON, JR., OF WORTHINGTON, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE JEFFREY MANUFACTURING COMPANY, A CORPORATION OF OHIO.

COAL-WASHER.

933,808. Specification of Letters Patent. Patented Sept. 14, 1909.

Application filed March 24, 1905, Serial No. 251,768. Renewed February 3, 1909. Serial No. 475,924.

To all whom it may concern:

Be it known that I, FREEMAN R. WILLSON, Jr., a citizen of the United States, residing at Worthington, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Coal-Washers, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to an improvement in coal washing machines, it being particularly adapted to coal washers of the tub type.

Figure 1 is a view partly in section, and partly in side elevation of a mechanism embodying my improvements. Fig. 2 is a section on the line 2, 2, Fig. 1, a portion of the screen being broken away to show the paddles beneath it. Fig. 3 is a detail view.

In the drawings A indicates the wash tank proper; B the shaft for carrying and operating the moving parts; C the carrying arms which support the stirring fingers D; E a series of rotary blades or arms in the bottom of the tank; F the step bearing for the shaft; G the box and packing or stuffing around the shaft to prevent the escape of water; H the bustle or water supply duct adjacent to the tank; I the region where the coal is introduced to the washer; J the duct or chamber where the refuse is withdrawn; K the duct or passage where the fine coal is withdrawn; L a screen or perforated floor, and M the overflow passage for water and coal.

The several parts of the apparatus above briefly referred to are constructed and arranged as follows:

The tank A has a cylindrical vertical outer wall 1 with a conical or sloped bottom wall 2, and is open at the top 3. At 4 it is provided with brackets or carriers by which it can be secured to and rested upon frame beams 5 or other suitable holders.

The shaft B is arranged centrally of the tank. At points above the tank it has secured to it a spider or hub 6 with outwardly extending arms 7 of suitable number. To each of these arms there is secured one of the bars C which extends outward to or nearly to the vertical wall 1 of the tank. To the arms C are fastened the downward projecting fingers D. Each arm carries a series of these fingers, the latter gradually increasing in length from the center outward to correspond to the slope of the bottom, and to the increasing depth of the tank from the center to the periphery. The arms C also carry the large tube or cylinder 8 which is concentric with the shaft and rotates therewith, this tube receiving the coal and serving to guide it downward toward the bottom of the tank at the central part and compel it to pass through the body of water from the bottom to the top.

The shaft B is shown supported as aforesaid in a step bearing at F. This is preferably constructed in the way illustrated so as to have anti-friction devices at 9 and thrust plates 10. The pedestal or base is indicated at 11, it having a plate adapted to be fastened to the frame, and an upwardly projecting tube at 12. Within this is fitted the adjustable step tube or bearing part 13. It can be adjusted as required by means of the vertical bolts 14 engaging with the ears 15. It is desirable to prevent the entrance of any water into the bearing and for this purpose I employ the hood 16 carried by the collar 17 secured to the shaft, the hood extending outward far enough to shed the water or throw it away from the vertical lines of the bearing parts.

At suitable points above the tank the shaft B has an upper bearing at 18 carried by frame beams 19. Near this bearing it has secured to it the power receiving wheel 20. To prevent the escape of water at the aperture in the bottom wall 2 of the tank where the shaft passes through I employ a stuffing box G heretofore referred to, and having the adjustable sleeve 22 adapted to compress stuffing material in the chamber 23. The shaft passes through a stationary tube 24 extending from a line near the bottom of the tank to a line above its top 3. This tube is fastened to a hub 25, the hub and the tube being concentric with the shaft. The hub is supported by means of a series of bars 26 which at their outer ends are secured to a flanged ring 27 which is fastened to the inner surface of the outer wall of the tank and extends around it in circular lines. The bars 26 are preferably T angle irons and they extend downward and outward on lines approximately parallel to the bottom wall 2. The screen or perforated floor L above referred to is supported upon these bars 26. It is formed in triangular sections 28, the outer ends of which rest upon the aforesaid

ring 27, the inner ends resting upon the hub 25 and the side edges upon the bars 26. The perforations or apertures in this screen are of such size that only small particles or masses of coal are permitted to pass through them. This screen or perforated floor L is supported some distance above the floor 2 so that there is a chamber or space between them which is shown at 29. In this space or chamber are arranged the paddles or blades E above referred to.

30 is a hub or spider secured to the shaft and carrying arms 31. To each arm there is secured one of the blades E. The web part of the blade is not in a vertical plane, but is inclined as shown at 32, there being preferably narrow horizontal lips at 33 at the bottom and at the top. Preferably use is made of peripheral rings 34 which are connected to the outer ends of the blades and brace them and form a unitary structure therewith.

The bustle or water supply H comprises the horizontal ring-like pipe or tube 36, which connects with the interior of the tank by means of short coupling ducts 35 that are secured to the bottom 2.

37 is the short tube or coupling section to which the water supply pipe is joined.

At 38 there is an orifice or passageway through the vertical wall 1 of the tank for the escape of the heavier foreign materials, such as slate or the like, which are separated from the coal.

39 is a vertical pipe coupling which is secured to the tank at points adjacent to the passage 38. At the lower end of this coupling there may be secured any suitable device for checking the escape of the contents of the tank and for permitting the withdrawal from time to time of the material which reaches and passes downward through the pipe 39.

At 40 I have shown a double valve collecting and discharging device such as shown in my earlier patent No. 702,897, which can be used if desired.

The arms D are preferably tapered and at their lower ends are curved slightly outward away from the axis of the shaft B, as indicated at *b*.

At K there is an escape duct for the finer or more reduced coal and other material which passes through the perforations in the floor or screen L. 41 is a valve for closing this passage, and 42 a handle for operating the valve.

The mode of operation of a mechanism such as I have described will be readily understood from the drawings and the description presented above. Coal is delivered in charges, or continuously to the region within the tank inside of the tube 8. It tends to cumulate therein to a more or less extent and the superincumbent part forces downward the part of the coal mass at the bottom. The lower end of the tube 8 is considerably above the perforated floor or diaphragm L, and the solid material gradually moves through the opening that is thus provided and outward in the tank toward the outer wall 1. The shaft B being in rotation and water supplied to the tank through the pipe 37, the bustle 36 and the ports at 35, the rotary blades or paddles E will exert a pressure in an upward direction upon the body of water and the latter, in turn, will tend to lift the masses of solid material that are, as aforesaid, moving outward from the shaft toward the peripheral wall 1 and downward along the floor or screen L. This pressure of water will tend to lift the solid materials and move them forward in ratio with their specific gravity. But coal being relatively light will be gradually raised to the top while the particles, lumps or masses of slate and other rock material being considerably heavier will gradually settle to the bottom. While the water is thus acting upon the solid materials the stirring fingers or arms D are agitating them, acting to carry them around the axis of the shaft. The inclination of the floor or screen L insures that as the masses of solid material are thus being moved by the water and simultaneously moved by the stirring fingers they shall take a resulting path of such nature that they are gradually carried downward and outward toward the outer wall. Finally the heavier masses reach the orifice or passage at 38 and are there discharged into the coupling 39. The vertical flanges of the radial bars 26 are preferably terminated some distance in from the wall 1, and consequently no obstructions are presented in the path of the masses of slate and other similar bodies and they are readily carried around in the lowest part of their path to the discharge orifice. These vertical flanges of the bars 26 at points nearer the shaft insure that the masses just referred to shall not be carried around the axis too rapidly. The coal, also forced outward by the sloping floor and by the action of the stirring fingers, but lifted to higher points by the water stream, reaches the overflow spout at M and is there discharged with the water. It is separated from the water after leaving the tank by any well known apparatus or any mechanism suitable for the purpose. The perforated floor or screen L being above the water propelling blades E, the latter are freed from the weight of the solid masses of material and can freely rotate in the lower part of the body of water. The perforations in the screen of floor permit the free transmission of the upward pressure which the propelling blades generate. The water being delivered at points relatively near the axis of rotation of these blades it is caused

to circulate advantageously, not only in paths extending from the axis toward the wall 1, but also upward toward the horizontal planes of the overflow spout, the construction in this respect being superior to the one in which the water is supplied at points near the periphery, in which case the upward pressure of water is experienced only on vertical lines near the wall 1.

The blades E operate both to distribute the water to all portions of the chamber formed between the bottom wall 2 and the perforated floor L, and also to produce a substantially uniform pressure and flow of water through all parts of the said floor, thus rendering available the entire floor surface and consequently the entire tank. The arrangement of the bottom wall 2 and the floor L substantially parallel with each other renders the action just referred to possible by a simple mechanism such as I have shown. It is of advantage to employ mechanism like the revolving inclined blades E for producing the upward flow and pressure of the water, not only because it secures a very uniform flow and pressure throughout all parts of the perforated floor, but also because the apparatus thus equipped, can be used where the head or hydro-static pressure of the supply of water available is not sufficient to cause the needful flow through the tank.

It will be noted that during the operation of my washer a substantially continuous upward pressure is maintained within the tank A by the continuous action of the paddles upon the water, forcing it up through the screen. And in this particular of maintaining a constant upward pressure my device is considerably more efficient in the washing and saving of relatively fine particles of coal than are the now well known types of washer in which the pressure on the wash water is intermittently supplied by either reciprocating or oscillating bodies; for on the return or back stroke of these bodies sufficient suction is created within the tub or tank to draw large quantities of the fine coal downward through the perforated floor or screen.

What I claim is:—

1. In a washer for coal or similar material, the combination of the tank adapted to have coal fed vertically to the central part thereof, means for supplying water to the tank, means for agitating the solid material in the tank, the perforated floor or screen upon the top of which the material is delivered, and means arranged between the tank bottom and the said screen and operatively connected to the agitating means for causing an upward pressure of the water through the said floor or screen, substantially as set forth.

2. In a washer for coal or the like, the combination of the tank, the means for supplying water thereto, the duct in the tank for guiding the solid material to be washed toward the bottom thereof, the means for agitating the solid material in the tank, the screen or perforated floor above which the said duct delivers, dividing the tank interior as a whole into the upper and lower chamber, and means mounted between the tank bottom and the said screen for causing the upward pressure of water therethrough operatively connected to the agitating means, substantially as set forth.

3. In a washer for coal or similar material, the combination of the tank arranged to receive the material to be washed, a screen within the tank upon which the material is delivered, means for supplying water to the tank below the screen, and a rotary water-propelling device arranged in close proximity to the screen for causing a distribution of the water and an upward flow and pressure thereof through the said screen, substantially as set forth.

4. In a washer for coal or similar material, the combination of the tank adapted to receive the coal, the screen within the tank upon which the material is delivered, means for supplying water to the tank, and means for causing a substantially continuous upward pressure of the water through the said floor or screen, said last-named means being co-extensive with and equidistant in all its parts from said screen, substantially as set forth.

5. In a washer for coal or similar material, the combination of the tank adapted to receive the coal, the perforated floor or screen within said tank, means for supplying water to the said tank, the shaft centrally disposed within said tank, means for agitating the solid material in the tank carried by said shaft, and arranged above the floor or screen, means for causing an upward pressure of the water through said floor or screen carried by said shaft and arranged between the said floor or screen and the tank bottom, and means for rotating said shaft.

6. In a washer for coal or similar material, the combination of the tank adapted to receive the coal, and having a conical bottom wall, the perforated floor or screen arranged within said tank, and substantially parallel with said bottom wall, means for supplying water to said tank and a series of water propelling blades arranged within said tank between said floor or screen and said bottom wall, and adapted to cause an upward pressure of the water through said floor or screen.

7. In a washer for coal and similar material, the combination of the tank adapted to receive the coal, and having an outlet for the coal and wash water near the upper end thereof, and an outlet for the refuse near the bottom wall thereof, the perforated floor or screen having its periphery arranged be-

neath the said outlet for refuse, means for supplying water to the tank, and means arranged between the said floor or screen and the tank bottom and co-extensive with the screen for causing an upward pressure of the water.

8. In a washer for coal or similar material, the combination of the tank adapted to receive the coal, and having a concavo-convex bottom wall, the perforated floor or screen within said tank and parallel to said bottom wall, the water propelling blades arranged within said tank between its bottom wall and the said perforated floor or screen, and having their top and bottom edges parallel to the said floor or screen and their web part arranged at an angle to both the vertical and the horizontal, and means for supplying water to the said tank.

9. In a washer for coal or similar material, the combination of a tank adapted to receive the coal, the perforated floor or screen upon top of which the coal is received, there being an outlet for the coal and water above said floor or screen, water propelling blades mounted concentrically beneath said screen and an imperforate bottom for the tank below said propelling blades, outlets for the fine coal being arranged around the circumference of said tank bottom.

10. In a washer for coal or similar material, the combination of a tank adapted to receive the coal and having an imperforate bottom wall, the perforate floor or screen within said tank and dividing its interior as a whole into an upper and lower chamber, water propelling blades mounted in said lower chamber and concentrically with the tank, a bustle pipe arranged concentrically beneath the tank and communicating with the tank through this bottom wall by a plurality of coupling ducts, the tank having a coal and water outlet above the screen, and a fine coal outlet below the screen.

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

FREEMAN R. WILLSON, Jr.

Witnesses:

J. Webster,

R. A. McMullin.