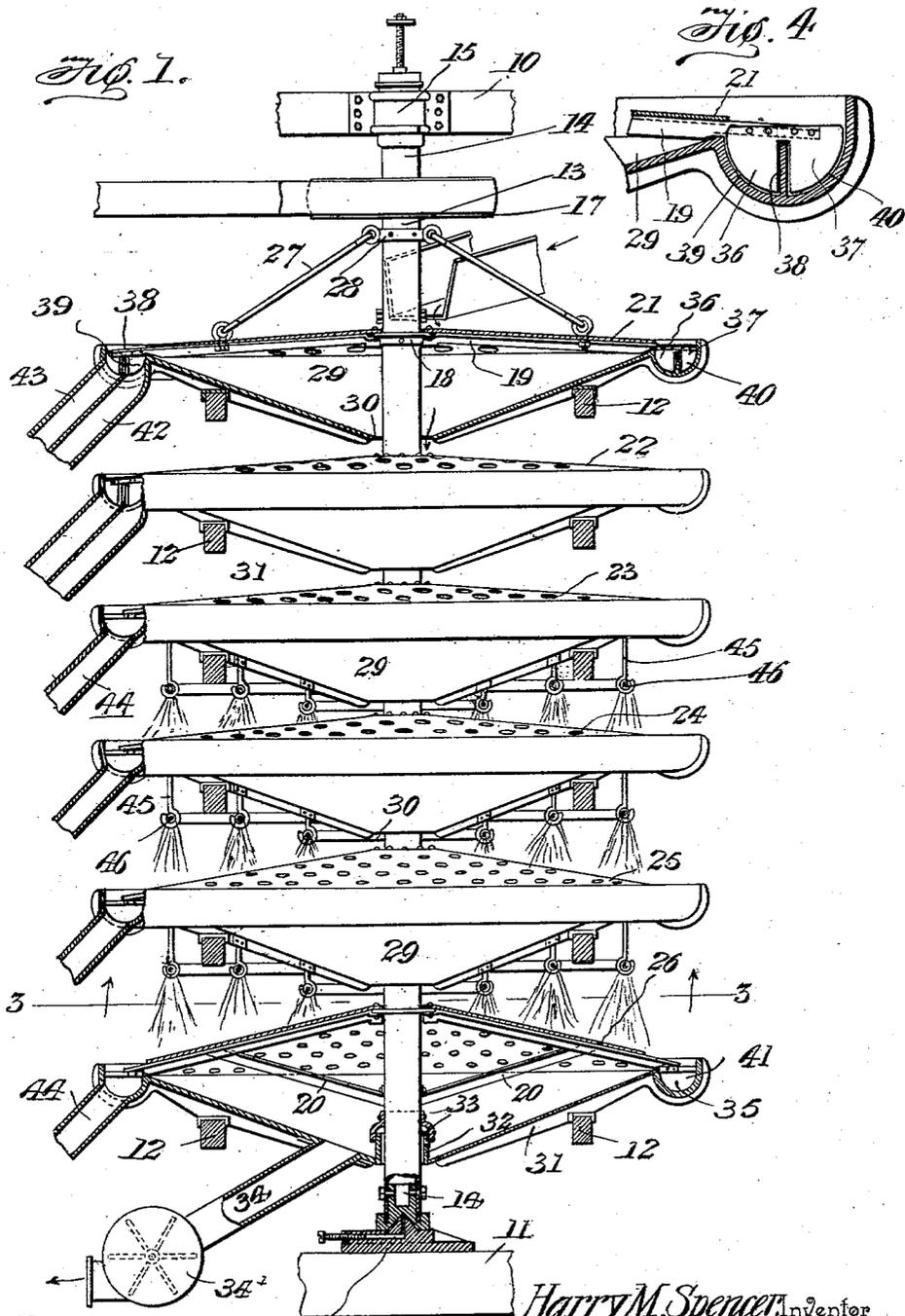


H. M. SPENCER.
COAL SEPARATOR AND WASHER.

APPLICATION FILED FEB. 6, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses
E. Stewart
J. H. Jochem, Jr.

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 Attorneys

No. 753,440.

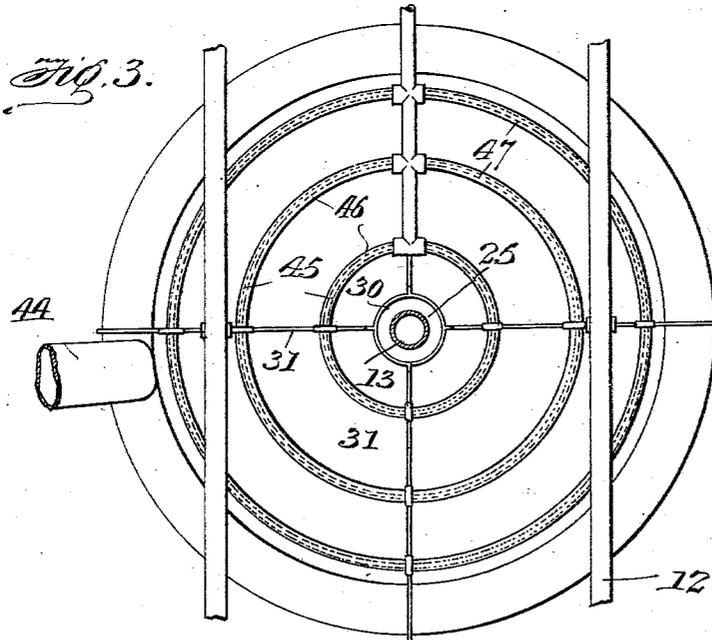
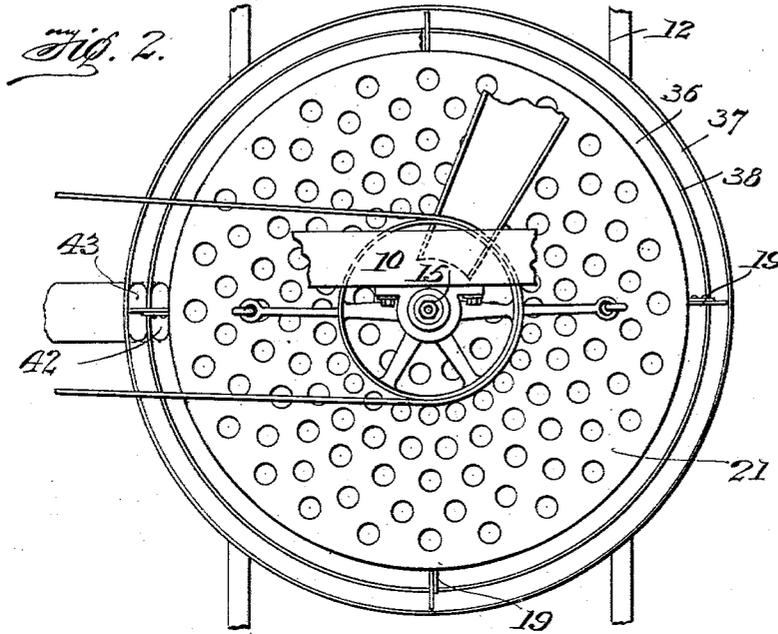
PATENTED MAR. 1, 1904.

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UNITED STATES PATENT OFFICE.

HARRY MARVIN SPENCER, OF DUNMORE, PENNSYLVANIA.

COAL SEPARATOR AND WASHER.

SPECIFICATION forming part of Letters Patent No. 753,440, dated March 1, 1904.

Application filed February 6, 1903. Serial No. 142,145. (No model.)

To all whom it may concern:

Be it known that I, HARRY MARVIN SPENCER, a citizen of the United States, residing at Dunmore, in the county of Lackawanna and State of Pennsylvania, have invented a new and useful Coal Separator and Washer, of which the following is a specification.

My invention relates to separators, and more particularly to those in which coal and the like may be separated from impurities and graded by centrifugal force and screens and be at the same time washed.

In the accompanying drawings, Figure 1 is a sectional elevation of one embodiment of my invention. Fig. 2 is a top plan view thereof. Fig. 3 is a horizontal section on the line 3 3 of Fig. 1, taken in the direction indicated by the arrows; and Fig. 4 is an enlarged vertical sectional detail through one of the divided troughs.

Like characters indicate similar parts throughout the several figures of the drawings.

Any convenient form of supporting-frame-work is designated by the letter F, said frame-work including top and bottom bars 10 11, respectively, and intermediate transverse bars 12. In the frame is mounted a substantially vertical shaft 13, here shown as hollow and provided with solid end pieces 14, rotatably mounted upon conical journals 15 16, fixed to the bottom and top bars, respectively. The former journal acts as a step, and the latter may be threaded through its support to permit adjustment and the taking up of wear. The shaft may be rotated by a pulley 17 and be provided with suitable lubricating devices. Along the shaft are fixed a series of flanged collars 18, to which are preferably bolted downwardly-inclined arms 19, each of which may be supported by a brace 20, bolted to it and to the shaft. These arms carry a series of conical screens preferably made of perforated sheet metal and here shown as six in number, 21, 22, 23, 24, 25, and 26. The screens gradually increase in steepness of inclination from the top to the bottom of the series, their supporting-arms lying successively at less angles thereto, and the openings are of gradu-

ally-decreasing diameter. The upper screen may have as additional supports stays 27, extending from a collar 28 on the shaft to its arms.

Below each screen is a preferably conical hopper 29, conveniently formed of sheet metal and having an annular opening 30 at its center about the shaft. These hoppers may be supported by inclined arms 31, fastened to the bars 12. The bottom hopper belonging to the screen 26 is closed at its center by an upwardly-extending flange 32, which may be guarded at its top by a skirt 33, carried by the shaft. A chute or conduit 34 opens from this hopper and may have connected with it a centrifugal pump 34'.

About each hopper extends an annular trough 35, the troughs of the upper two hoppers being shown as divided into inner and outer sections 36 37 by a central annular partition 38. The screen-arms 19 project over the troughs and carry scrapers or sweeps. Upon the screens 21 and 22 these are two in number, 39 and 40, operating in the inner and outer troughs, respectively, while in the undivided trough scrapers 41 work across the entire width. From the trough-sections 36 37 open chutes 42 43, respectively, and from the undivided troughs lead single chutes 44.

From the hopper-arms over a portion of the screens (here shown as the lower three) depend hangers 45, supporting three annular pipes 46, the inner of which is illustrated as nearer the screen-surface than its companions. These pipes are perforated at 47 and supplied with water which issues in a spray therefrom; that nearest the screen acting thereon with greatest force, because less resistance from the air is encountered by the water issuing from the perforations nearest the screen, as will be readily understood.

In operation the shaft and screens are rotated at a suitable speed to generate the desired degree of centrifugal force. Material is deposited at the center of the screen 21 and under the influence of said centrifugal force passes radially outward, the smaller pieces falling through the perforations into the hopper below. The pieces too large to pass

through the perforations are thrown off the edge of the screen into the surrounding trough. The slate and the like having the greatest specific gravity has the highest velocity imparted to it and falls in the outer section 37 of the trough and is carried by the sweep 40 to the chute 43, through which it passes to the waste-heap. The coal being lighter falls into the inner trough-section 46 and moved by the sweeps 49 escapes through the chute 42 to a suitable receptacle. The material falling upon the screen 22 is similarly treated to remove another grade of coal and, further, coarse impurities, which latter may now be considered to be all separated, so that the succeeding troughs receive coal only. The screens 23, 24, 25, and 26 act similarly, each separating a smaller grade and having a greater inclination to enable the finer material to move more readily over them. In traveling over the lower three screens the coal is sprayed with water from the pipes to wash off the dust and carry it through the perforations. The greatest intensity of the jets being nearest the center at the apex of the cone, where there is least danger of the dust passing into the troughs. Into the lowest hopper only the finest particles and dust pass mixed with water, and this mixture may be carried away by the pump 34'.

It will be seen that while my improved separator is simple, comparatively inexpensive, and easy to operate and repair it separates, grades, and washes the coal at a single operation and with the expenditure of but little power.

Having thus described my invention, I claim—

1. The combination with a substantially vertical shaft, of a series of superposed outwardly-sloping conical screens secured upon said shaft, said screens being disposed at gradually-increasing inclinations and having openings therein of gradually-decreasing diameter, and separate devices for receiving the material passing over the edges of the several screens.

2. The combination with an upper sloping rotatable screen, of an annular trough surrounding the screen and divided into outer and inner sections, means for separately removing the material from each section of the trough, a lower sloping rotatable screen to which the upper screen delivers, and a trough formed in a single section receiving all the material passing over the edge of the lower screen.

3. The combination with an upper sloping rotatable screen having openings therein, of a trough surrounding said screen, a lower sloping rotatable screen upon which the upper screen delivers also having openings therein, a trough surrounding said lower screen and separate means for washing dust from the surface of the materials discharged upon the several screens.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

HARRY MARVIN SPENCER.

Witnesses:

H. ELMER SPENCER,
CLARA H. SPENCER.