F. COURTOY.

COAL WASHER.

APPLICATION FILED JUNE 24, 1919.

1,430,216.

Patented Sept. 26, 1922.

2 SHEETS—SHEET 1.

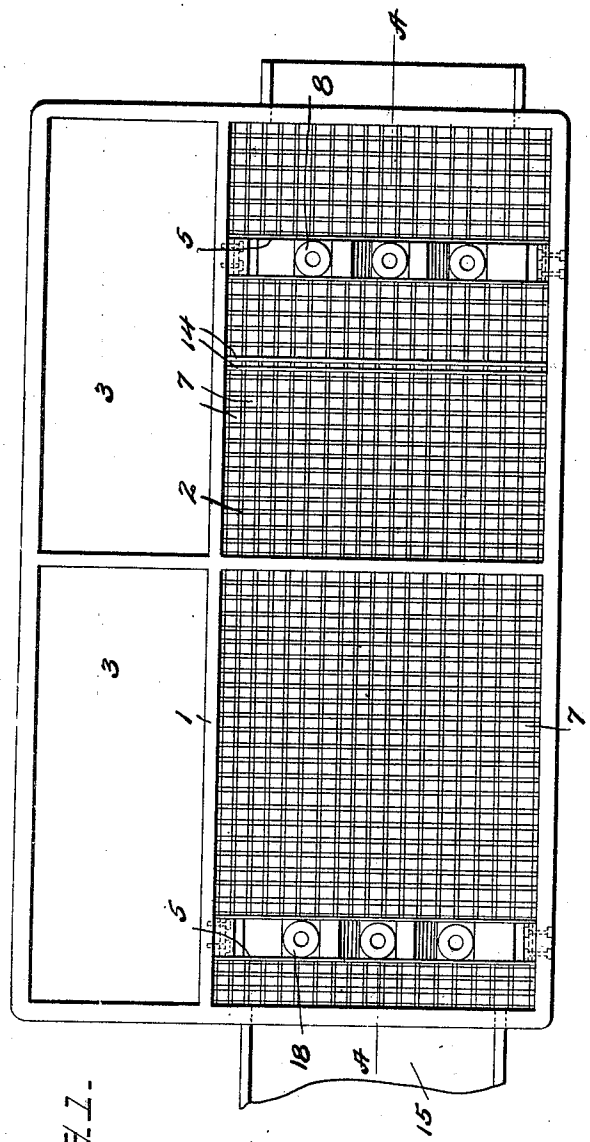


FIG. 1.

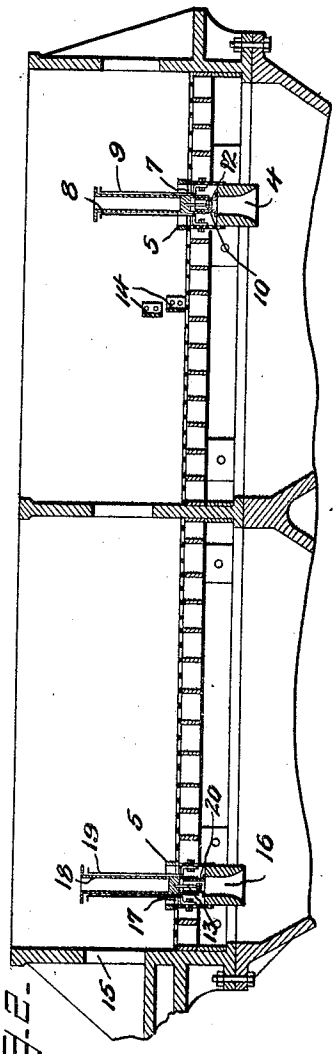


FIG. 2.

Inventor

Fernand Courtoy,

By Foster, Freeman, Watson & Coit,

Attorneys.

F. COURTOY.

COAL WASHER.

APPLICATION FILED JUNE 24, 1919.

1,430,216.

Patented Sept. 26, 1922.

2 SHEETS—SHEET 2.

Fig. 4.

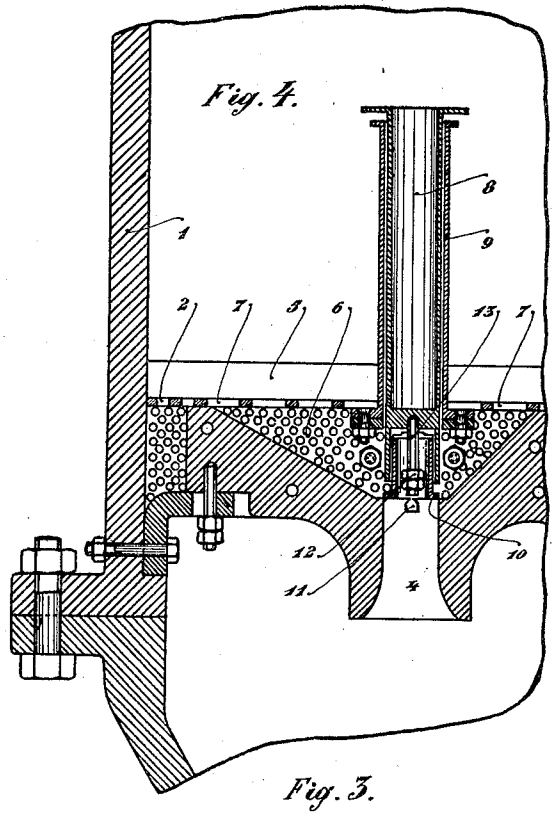
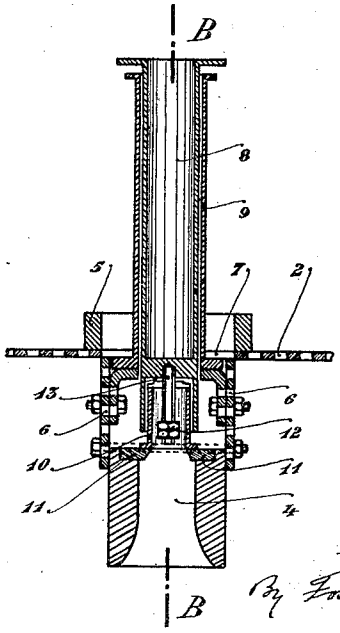


Fig. 3.



Inventor.
Fernand Courtoy,
By Foster, Freeman, Watson & Coit.
Attorneys.

Patented Sept. 26, 1922. 1,430,216

UNITED STATES PATENT OFFICE.

FERNAND COURTOY, OF BRUSSELS, BELGIUM.

COAL WASHER.

Application filed June 24, 1919. Serial No. 306,460.

To all whom it may concern:

Be it known that I, FERNAND COURTOY, engineer, subject of the King of Belgium, residing at 34 Rue Bosquet, St. Gilles, Brussels, Belgium, have invented certain new and useful Improvements in Coal Washers (for which patents have been granted to me in Belgium, May 29, 1920; England, January 20, 1921; France, Dec. 9, 1919; and Germany, Dec. 13, 1919), of which the following is a specification.

The subject of this invention is a coal washer comprising a trough, one of the compartments of which receives the coal to be washed whilst the other compartment contains the pistons working with a reciprocating motion and producing the suction which causes the elimination of the stones and shale.

This coal washer is so arranged as to solve the following double problem, viz:—

1. To separate the clean shale, that is to say the stones mixed with the coal, from the clean coal, by means of the suction produced by the piston, this being done automatically (that is to say without the intervention of any hand control) according to the nature of the coal to be dealt with (i. e., according as it contains a greater or lesser proportion of shale) and according to the quantity of coal to be washed which is fed on to the sieve in the trough.

2. To remix with the clean coal a certain quantity of mixed coal, the less stony portion, so as to obtain a commercial coal from which the most stony coal is eliminated by suction, such elimination being also regulated automatically, according to the presence, in a greater or lesser percentage, of such shale in the raw mixture and according to the charge of raw mixture.

The accompanying drawing represents such a washer.

Fig. 1 is a plan view of an apparatus constructed according to my invention;

Fig. 2 is a section on the line A—A of Figure 1.

Figure 3 is a section on the line A—A through one of the discharging devices drawn to a large scale.

Figure 4 is a section through B—B (Figure 3).

The washer consists of the double trough 1 having a false bottom formed by a grate 2, and the neighboring compartments 3 which latter contain the pistons which impart to the washing water a reciprocating motion upwards and downwards. In the example shown, the raw coal is fed in from the right side (Figures 1 and 2) and the separation of the clean from the mixed coal is effected on the left side of the trough.

In order to realize the first condition, that is to say the separation of the clean shale, the apparatus presents, at a point where the three layers (coal, mixed, and shale) begin to form, openings 4 for the discharge of the shale which is taken from the shale layer and drawn by freely acting suction, i. e., without the intermediary of the filtering bed which covers the grate 2 and which is generally formed of felspar mixed with shale.

The automatic regulation of the suction of the shale is effected by means of devices placed above the openings 4 and inside a box formed by the cross partitions 5 above the sieve 2 and by the perforated walls 6 under the same sieve. Between the cross partitions 5, the bottom 2 of trough 1 presents large openings 7 through which the stones to be eliminated must pass. The size of these openings 7 is regulated once for all at the beginning of the installation, according to the average ash contents found in the raw coal.

In the example shown, the discharging openings 4 consist of three holes of circular horizontal section and of bell-mouthed vertical section. In the axis of the said bell-mouthed openings are placed movable cylindrical pipes or tubes 8, which can slide smoothly inside cylinders 9 fixed at the upper part of the box 5—6. These movable pipes 8 are so constructed that they will float when the water around them reaches a predetermined level.

The lower part of these pipes 8 is placed in the plane of the smallest section of the bell-mouthed openings 4; their upper parts are above the highest level of the water.

The washing water, penetrating under the thrust of the piston placed in compartment 3, through the bell-mouthed openings 4, lifts the pipes 8; these are thus reciprocated vertically synchronously with the piston strokes. When these pipes 8 rise, they uncover a circular section of the openings 4 through which the shale which entered box 5—6 through openings 7 can escape.

If the quantity of shale to be evacuated increases, either in consequence of greater ash contents in the coal being dealt with, or in consequence of a greater charge per hour being fed into the washing trough, the mass lying on the sieve becomes heavier, the resistance to the passage of the water in that part is therefore greater, and the amount of water passing through the bell-mouthed openings 4 which form a by-pass, increases.

In consequence of such increase in the amount of water, the movable pipe 8 rises higher, but it always falls back to the same point, which is determined by the top flange of the pipe acting as a stop; the stroke, whatever its length, will always be effected in the same period of time, which is a function of the duration of one complete pulsation of the water, and this has for effect:

a. To increase, at each pulsation, the communication between the discharging medium of the residue in the trough and the points at which the shale discharging slots are situated, and to create stronger suction at these points, to an extent which increases with the presence of greater or lesser quantities of shale to be eliminated.

b. Acting, so to speak, as a valve, the lift of the pipe increases and consequently enables the shale to be discharged in larger quantity.

The weight of the movable pipes 8 can easily be regulated to vary their lift, to regulate their working in the same manner, or vice versa to discharge more shale at the points where it has a tendency to accumulate in greater quantity.

Such movements being automatic, the discharge of the shale is also automatic, and consequently the trough discharges the shale automatically according to the charge in the trough or the ash contents of the raw coal. By this arrangement, any great or sudden variations in the composition of the raw coal fed into the washer need not give any fear, and this frequently happens in central installations receiving coals from different colliery centers.

In order to permit of a more accurate regulation of the working of the apparatus and its application to the treatment of widely varying qualities of raw stuff, the lower part of the movable pipe 8 is provided with a pipe or sleeve 10 telescoping either inside or outside pipe 8 and which rests on seats 11 and is only raised by the nuts 12 on rod 13 fixed in the bottom of pipe 8 when the latter has risen a fraction of its stroke. The extent of the displacement of sleeve 10 relative to main pipe 8 can be regulated by means of nut 12.

In order to compel the shale to discharge partly in the rear, there is placed at some distance from the entrance to the trough 1 a baffle 14 formed by two cross bars in the example shown, and which creates an obstacle to the progress of the materials to be washed by compelling them to arrange themselves in the shape of a sloping heap. Under the action of the water pulsations, the heavier elements (the shale and mixed coal) pass through the interval existing between the two cross bars and thus continue to progress at a low height above sieve 2, whilst the lighter elements (the clean coal), are rejected towards the top. This arrangement therefore facilitates the separation between the different elements passing through the apparatus.

The realization of the second part of the programme, i. e., the selection of the mixed stuff to be reincorporated in the clean coal, is obtained as follows:

The side of the heap produced by the baffle 14 and turned towards the outlet 15 of trough 1, arranges itself in a gentle slope along a space in which clear coal, mixed coal and a certain quantity of shale are progressing. This shale, which is useful in forming the filtering bed with the felspar, is enabled to remain there in sufficient quantity owing to the regulation of the discharge by the above described apparatus. The disappearance of the shale at first leaves only in the current running through the trough a raw material to be washed, the constituents of which being less differentiated no longer present such great variations in specific gravity. This fact facilitates the second condition of the careful selection of the mixed stuff, which, if required, may be mixed again with the washed coal to form a commercial mixture.

If it is necessary to obtain a special grade of mixed coal, the selection may be so regulated as to obtain the mixed material direct without having to submit same to any subsequent special washing.

It is also known that one is often led to impart too great a velocity to the washing water (pistoning) in order to overcome by the speed of the carrying water, the resistance which is opposed to its progress. The arrangement of the raw coal in the shape of a sloping heap and the previous elimination of part of the shale suppress this drawback. Indeed, part of the shale having disappeared, the materials going through the trough forms a layer of less thickness, so that they are no longer compelled to be partly washed by the current of carrying water which is in the upper part of the trough; the piston pulsations may therefore be less powerful. It is the continual crumbling of the sloping heap that, to a great extent, produces the progress towards the outlet.

The remainder of the shale is eliminated along the trough 1 through the sieve 2 at its

bottom; near the outlet, the coal is found to be in the upper layer of the bed, and the mixed material above the felspar.

The proper selection must be made from this layer of mixed material. For this purpose, a similar device to the one previously described is fitted at the end of trough 1, near the coal outlet 15. The mixed stuff richest in ashes is attracted to the openings 16 made in the bottom of trough 1, towards a passage the section of which is automatically regulated by means of movable tubes or pipes 18 (three in the example shown), guided in the axis of the vertical bell-mouthed openings 16 by fixed tubes 19 carried by trough 1. This second set of discharging devices is also arranged between two cross partitions 5, between which the sieve 2 presents wide openings 17.

The weight of the movable tubes 18, the bottom part of which is provided with telescoping sleeves 20, can be regulated, as in the case of the movable tubes 8, so that their lift, produced by the pulsations of the water, is adapted to the final ash contents which it is desired to obtain.

Figs. 3 and 4 show more particularly the details of the arrangement of the movable tubes or pipes 8 and 18; these parts, however, could eventually be replaced by others working in a similar manner.

Having fully described my invention, what I desire to claim and secure by Letters Patent is:—

1. In a coal washer, in combination, a screen for supporting coal and heavier impurities to be separated therefrom and having an aperture therein for the passage of such impurities, means for forcing a liquid through the meshes of the screen, and means responsive to the height of liquid over the screen for controlling the passage of impurities through said aperture.

2. In a coal washer, in combination, a screen for supporting coal and heavier impurities to be separated therefrom and having an aperture therein for the passage of said impurities, means for intermittently forcing a liquid upwardly through said screen and aperture, and means supported on the screen above the aperture therein for controlling the passage of impurities therethrough, said means comprising a member adapted to be moved upwardly by pressure of the fluid over the screen through a distance proportional to the fluid pressure exerted thereon.

3. In a coal washer, in combination, a screen for supporting coal and heavier impurities to be separated therefrom and having an aperture therein for the passage of said impurities, means for intermittently forcing a liquid upwardly through said screen and aperture, and means supported on the screen above the aperture therein for controlling the passage of impurities therethrough, said means comprising a valve member normally closing said opening and adapted to be moved vertically upwardly at each impulse of the fluid forcing means by the pressure of the fluid, through a distance proportional to the amount of fluid pressure exerted thereon, for the purpose set forth.

4. In a coal washer, in combination, a screen for supporting coal and heavier impurities to be separated therefrom and having an aperture therein for the passage of said impurities, means for intermittently forcing a liquid upwardly through said screen and aperture, and means supported on the screen above the aperture therein for controlling the passage of impurities therethrough, said means comprising a valve which includes two relatively movable portions, one of said portions normally closing said opening and adapted to be moved to uncover the said opening under the influence of fluid pressure exerted on both portions and after the other portion has been moved through a predetermined distance, the upward movement of the valve being proportional to the fluid pressure exerted thereon, for the purpose set forth.

5. In a coal washer, in combination, a screen, means for feeding mixed coal and impurities onto one end of said screen, and a plurality of separating devices supported on the screen between the inlet and outlet of the washer, said devices being operable by pressure of a fluid forced through the screen and adjusted to separate impurities of different weights from the coal, so that the latter is progressively purified as it passes from the inlet to the outlet end of the washer.

6. In a coal washer, in combination, a screen for supporting coal and heavier impurities to be separated therefrom and having an aperture therein for the passage of such impurities, means for forcing a liquid through the meshes of the screen and through the aperture, and means responsive to the difference in flow of liquid through the screen and through the aperture for controlling the passage of impurities through the aperture.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FERNAND COURTOY.

Witnesses:
ARMAND DEPREZ,
LEON HAASS.