D. E. PHILLIPS.

SEPARATOR FOR COAL, SLATE, &c.

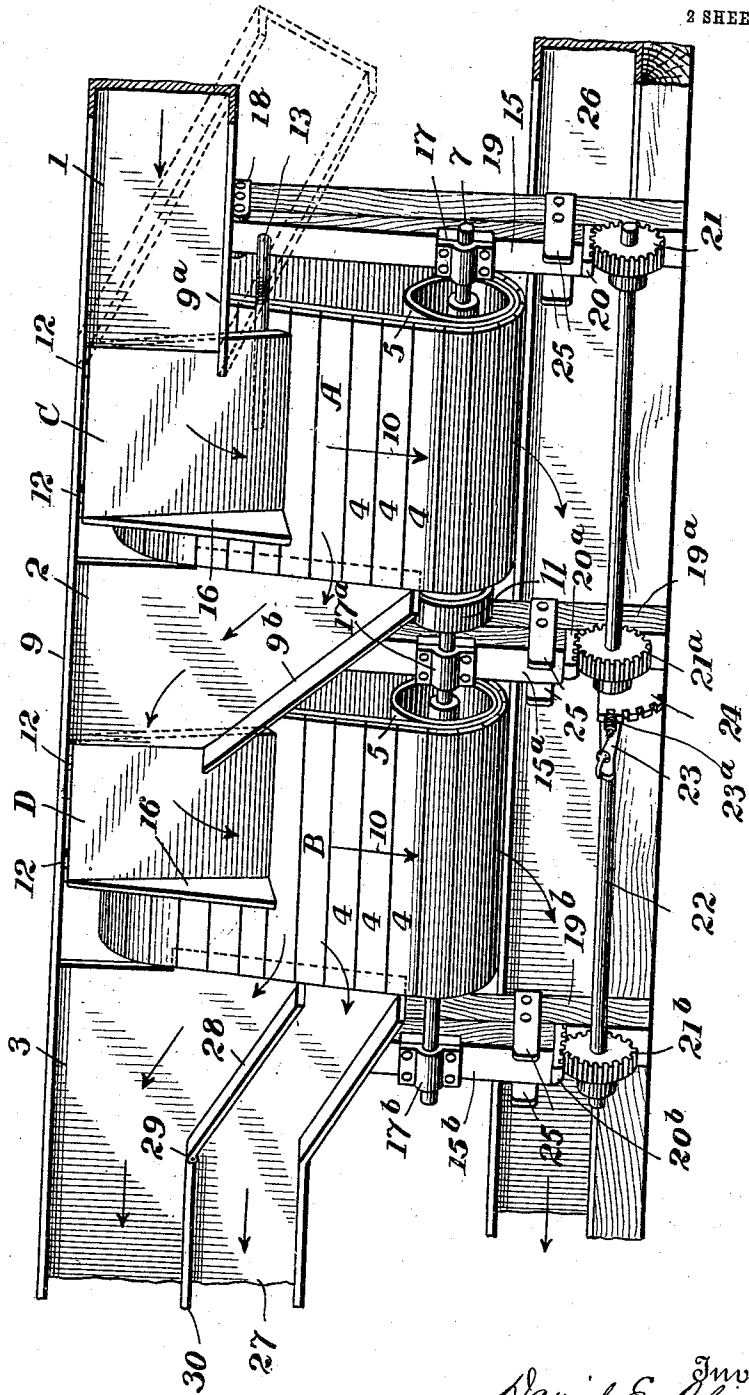
APPLICATION FILED MAY 13, 1908.

906,280.

Patented Dec. 8, 1908

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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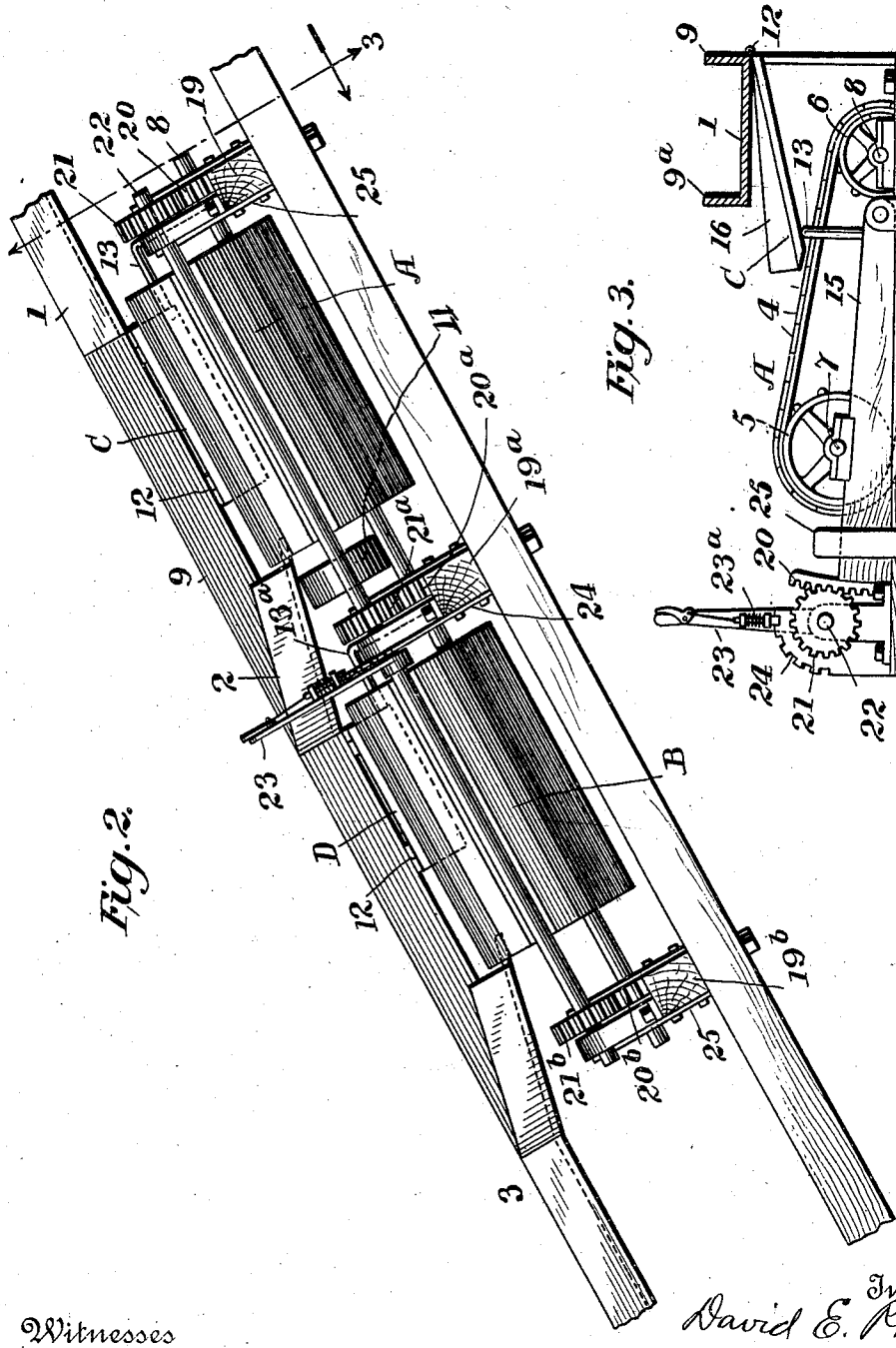


Fig. 2.

Fig. 3.

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SEPARATOR FOR COAL, SLATE, &c.

No. 906,280. Specification of Letters Patent. Patented Dec. 8, 1908.

Application filed May 13, 1908. Serial No. 432,608.

To all whom it may concern:

Be it known that I, DAVID E. PHILLIPS, a citizen of the United States, residing at Mahanoy City, in the county of Schuylkill and State of Pennsylvania, have invented certain new and useful Improvements in Separators for Coal, Slate, &c., of which the following is a specification.

This invention relates to improvements in the type of separators illustrated and described in my prior patent No. 572,661, dated December 8th, 1896. In the patent referred to the mixed coal, slate, bone, etc., as it comes from the screens in the coal breaker passes down an inclined way in which is interposed, at suitable points, one or more endless traveling retarding surfaces which move at an angle to the general direction of the way. The slaty material, owing to its gritty nature, its generally flat form of fracture, and its greater specific gravity than the coal, slides less freely over the retarding surface than the coal, which is lighter, smoother and generally of a different shape from the slate. The coal, therefore, passes down over the traveling retarding surface, while the slaty material is conducted by said surface to one side of the course taken by the coal and dropped into a chute arranged to receive it.

My present invention embodies, among other things, improvements in the means for feeding the material on to the retarding surface whereby the slaty material is fed on to the slate retarding surface in the direction of movement of said surface and its inertia carries it forward in the direction it should go to separate from the coal, in passing on to the retarding surface. As there is no stoppage of the slaty material, nor any change in its course required while upon the retarding surface, the inertia of this material does not have to be overcome by friction with said surface and the material therefore moves along with the surface with very little, if any, slippage, and is promptly carried out of the path of the coal. This retarding surface has a lateral inclination, and also an upward inclination in the direction of its movement, both inclinations being preferably about at the angle of repose for slate, under normal conditions.

In the accompanying drawing, Figure 1 is a top plan view of the separator; Fig. 2 is a front elevation of the same; and, Fig. 3 is an end view, looking in the direction of the arrow, Fig. 2, the supporting timbers and chutes being shown in section on the line 3 of Fig. 2.

Referring to the drawing, 1, 2 and 3 indicate chute sections over which the coal passes by gravity, in succession, in its course from the screens to the storage pockets or cars. The mixed coal, slate and bone slides down over the chute section 1, and in order to separate the slate and bone from the coal, so that nothing but pure coal will pass into the chute section 3, two similarly constructed movable retarding surfaces, A and B are interposed between the chute sections and arranged to move in a direction transverse to the general downward slope of the chute sections. One, two or more of such retarding surfaces may be employed, according to the nicety of the separation required. The retarding surfaces consist of slabs or slats 4 of suitable material which will frictionally retard the movement of the slate more than the movement of the coal and these slats or slabs are arranged in the form of endless belts mounted on sprocket wheels 5 and 6 which are secured to shafts 7 and 8, respectively. These shafts are parallel with one another and with the side 9 of the chute, the shaft 8 being arranged beneath the chute sections and the shaft 7 at one side of the chute sections. The sprocket wheels 6 are preferably somewhat smaller than the sprocket wheels 5, and the shaft 8 is lower than the shaft 7, the arrangement being such that the top surfaces of the retarding belts have a lateral inclination, in the direction of the slope of the chute sections 1, 2 and 3, and also an upward inclination, in the direction of their travel, which is indicated by the arrows 10. A driving pulley 11 is placed on one of the shafts so that power can be transmitted to the belts to keep them continuously in motion, in the direction indicated by the arrows 10, while the apparatus is in use.

At the lower end of the chute section 1 is arranged an adjustable apron or slide C which is connected by hinges 12 to the side 9 of the chute. The hinged end of the apron is nearly in line with the plane of the chute section 1, or slightly below it, and the free end of the apron rests upon a support 13 which is secured to a lever upon which the shaft 7 is mounted. The apron C slopes downward from the side 9 of the chute to-

ward the retarding surface A, so that the material sliding down over the chute section 1 and dropping on to the apron C will be delivered by the apron on to the retarding surface in a direction which corresponds with the direction of movement of such surface. The apron also preferably inclines from side to side, or in the same direction as the chute section 1, and it has at its lower side an upright flange 16 which prevents any material from passing over the side of the apron in a downward direction. The free end of the apron extends close to the traveling retarding surface, but is held out of actual engagement with said surface by the support 13, which is secured to the lever 15 as before mentioned. An apron D, in all respects the same as the apron C, is similarly arranged with respect to the chute section 2 and the retarding surface B. The free end of the apron D is held out of engagement with the retarding surface by the support 13^a, secured to the lever 15^a, this support and lever being similar to the support 13 and lever 15, respectively. The lever 15, which carries the bearing 17 for the shaft 7 and the support 13 for the apron C, is pivoted in a bearing 18 located on a cross timber 19 near the axis of the shaft 8, and the forward end of said lever is provided with a segmental rack 20 which is engaged by a gear 21 upon a shaft 22. Levers 15^a and 15^b, having bearings 17^a and 17^b for the shaft 7 are similarly mounted upon cross timbers 19^a and 19^b and provided with racks 20^a and 20^b engaging gears 21^a and 21^b, respectively, upon the shaft 22. A hand lever 23 is secured to the central portion of the shaft 22. By moving the lever 23 the shaft 22 may be rocked and by reason of the engagement of the gears 21, 21^a and 21^b with the racks 20, 20^a and 20^b, the levers 15, 15^a and 15^b may be simultaneously raised or lowered to change the pitch or slope of the retarding surfaces, as will be obvious. As the supports 13 and 13^a for the aprons are secured to the levers, the lower ends of the aprons will be adjusted simultaneously with the adjustment of the retarding surface to keep the ends of the aprons out of engagement with the retarding surfaces. The hand lever 23 has a suitable pawl 23^a for engaging a stationary segmental rack 24, so that the retarding surfaces may be locked in any position of adjustment. Suitable guides 25 secured to the cross timbers 19, 19^a and 19^b are arranged to guide the levers 15, 15^a and 15^b. A chute 26 is arranged at the forward ends of the traveling retarding surfaces to receive the slate which is carried outward by said surfaces from the path of the coal. A chute 27 is arranged adjacent to the chute 3, and an adjustable partition 28, between the upper ends of the chutes 3 and 27 serves to divide the stream of material passing laterally off of the retarding surface B. This adjustable partition is hinged at 29 to the stationary partition 30 between the chutes.

In operation, the material to be separated slides by gravity down the inclined chute section 1 and as the coal usually slides somewhat faster than the slate the coal, upon reaching the apron C jumps on to said apron and takes a curved course nearer to the side 16 of the apron than the slate. The slaty material which travels slower down the chute section 1 than the coal drops off of said chute section on to the apron C near the end of said chute section and as it has not the impetus of the coal, it slides down upon the apron C toward the retarding surface without going as near to the side 16 of the apron as the coal. The slate which drops on to the apron C from the chute section 1 is below the plane of said chute section while traveling down on to the apron C, and the coal, sliding down on to the chute section 1 can thus jump over the slate which slides down on the apron adjacent to the end of said chute section. The slaty material, therefore, travels down the apron C on an inclined plane below the plane of the chute section 1, to the retarding surface, while the coal, in moving from the chute section 1 to the apron, may cross the course of the slate without interfering with the slate. This does not effect a complete separation of the coal and slaty material, but it permits such pieces of slate as slide down the chute section 1 near the side 9 to pass downward on the apron to the retarding surface in a direction transversely of the chute 1 without being diverted from their course by the coal passing down the chute section 1 nearer the side 9^a of said section. When the material reaches the retarding surface A, the pure coal rolls or slides off of the edge of the belt on to the section 2 of the chute, along with the greater part of the bone, while the slate which slides less freely on the retarding surface is carried forward by said surface and dropped into the chute 26 which carries the slate away.

In passing on to the retarding surface from the apron the slate does not stop, nor is its course changed except by the lateral inclination of the retarding surface, which causes it to take a curved course toward the slate chute 26 unless the frictional resistance of the slate on said retarding surface is so great as to prevent the material from sliding laterally, in which event, it will travel in a straight course with the belt to the slate chute 26.

The retarding surface A is upwardly inclined so that the coal, which rolls or slides freely on said surface will not pass over into the slate chute but will be checked by this upward inclination and roll off of the lower edge of the belt into the chute section 2. As

the material passing through the machine is sometimes dry and sometimes moist or wet according to the different veins of the mine from which it comes or according to different conditions of the weather, and as the wet or moist material slides more freely than the dry material, the pitch of the retarding surfaces and also the pitch of the aprons may be varied by the attendant who operates the lever 23 to suit the kind or condition of material passing through the separator.

The coal and bone and such pieces of slate as may not be separated on the surface A pass into the chute section 2 and thence on to the apron D and from there on to the retarding surface B. The chute section 2 may have a slight inclination toward the side 9 of the chute to prevent the material from all banking against the side 9^b of the chute section and to permit it to spread out on said section before passing on to the apron D. As the chute section 2, apron D and retarding surface B all have substantially the same relation to one another as the chute section 1, apron C and retarding surface A, the separating action is the same as on said latter elements of the structure, the slate which travels on to the surface B, being carried over into the slate chute 26, while the bone and coal fall off of the lower edge of the belt B. As the bone is an intimate mixture of slate and coal, this material has a slower movement on the retarding surface than the coal and is therefore carried upwardly and outwardly by the retarding surface B and drops into the chute 27, while the coal drops into the chute 3. The hinged partition 28 is adjustable, so that it can be set at the proper point to divide the coal from the bone as these materials pass from the lower edge of the belt B.

If desired, instead of having the chute section 1 at a right angle to the apron C, as shown in full lines in the drawing, said chute section may be arranged at something less than a right angle with respect to the apron, as shown in dotted lines in Fig. 1. The chute section 1 may be adjustable for this purpose if desired. The adjustment shown in dotted lines would cause the delivery of the material on to the apron in a direction slightly opposed to its downward or forward inclination, which would have the effect of checking the slow moving pieces of slate but would allow the faster moving pieces of coal to follow a curved path, of greater length, across and down the apron, and thus travel nearer to the side 16 of the apron.

What I claim is:—

1. In a separator for coal, slate, etc., a traveling slate-retarding floor inclined laterally, a hinged apron or slide sloping towards said floor and arranged to deliver the material on to said floor in the direction of movement of the floor, and means for adjustably supporting the free end of said apron or slide.

2. In a separator for coal, slate, etc., a traveling slate-retarding floor inclined laterally and also inclined upwardly in the direction of movement of the floor, and an apron or slide arranged to deliver the material on to said floor in the direction of its movement.

3. In a separator for coal, slate, etc., a traveling retarding floor inclined laterally, an apron inclined forwardly toward said floor and arranged to deliver the material on to said floor in the direction of movement of the floor, and a chute arranged to deliver the material on to the apron in a direction transverse to the forward slope of the apron.

4. In a separator for coal, slate, etc., a traveling retarding floor inclined laterally, and also inclined upwardly in the direction of movement of the floor, an apron inclined forwardly toward said floor and arranged to deliver the material on to said floor in the direction of movement of the floor, and a chute arranged to deliver the material on to the apron in a direction transverse to the forward slope of the apron.

5. In a separator for coal, slate, etc., a traveling retarding floor inclined laterally and also inclined upwardly in the direction of movement of the floor, an apron inclined forwardly toward said floor and also inclined laterally and arranged to deliver the material on to said floor in the direction of movement of the floor, and a chute arranged to deliver the material on to the apron in a direction transverse to the forward slope of the apron.

6. In a separator for coal, slate, etc., a traveling slate-retarding floor, inclined laterally and also inclined upwardly in the direction of its movement, and means for delivering the material on to said floor in the direction of its movement.

7. In a separator for coal, slate, etc., a traveling retarding floor, inclined laterally and also upwardly inclined in the direction of its movement, means for adjusting said floor to vary said upward inclination, and an apron for delivering the material on to said floor in the direction of its travel, said apron being adjustable by said means.

8. In a separator for coal, slate, etc., a traveling retarding belt, two inclined shafts having means thereon for supporting and turning said belt, levers having bearings for one of said shafts, means for adjusting said levers, an apron for delivering material on to said belt, and a support for said apron carried by one of said levers.

9. In a separator for coal, slate, etc., a chute comprising several sections, retarding belts interposed between the several sections and movable transversely with respect thereto, shafts for rotating said belts, levers hav-

ing bearings for one of said shafts, and means for moving said levers simultaneously to adjust the pitch of the belts.

10. In a separator for coal, slate, etc., a feed chute, an inclined apron or slide extending across the lower end of said chute and below the bottom of said chute and a traveling retarding surface inclined upwardly in the direction of its movement from the lower end of said apron or slide, said retarding surface having also a lateral inclination.

11. In a separator for coal, slate, etc., a feed chute, an inclined apron or slide extending across the lower end of said chute and below the bottom of said chute, said apron or slide having a flange at the side opposite the end of said chute, and a traveling retarding surface inclined upwardly from the lower end of said apron or slide, said retarding surface having also a lateral inclination.

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

DAVID E. PHILLIPS.

Witnesses:

JOHN HERSKER,

ROBERT MARTIN.