

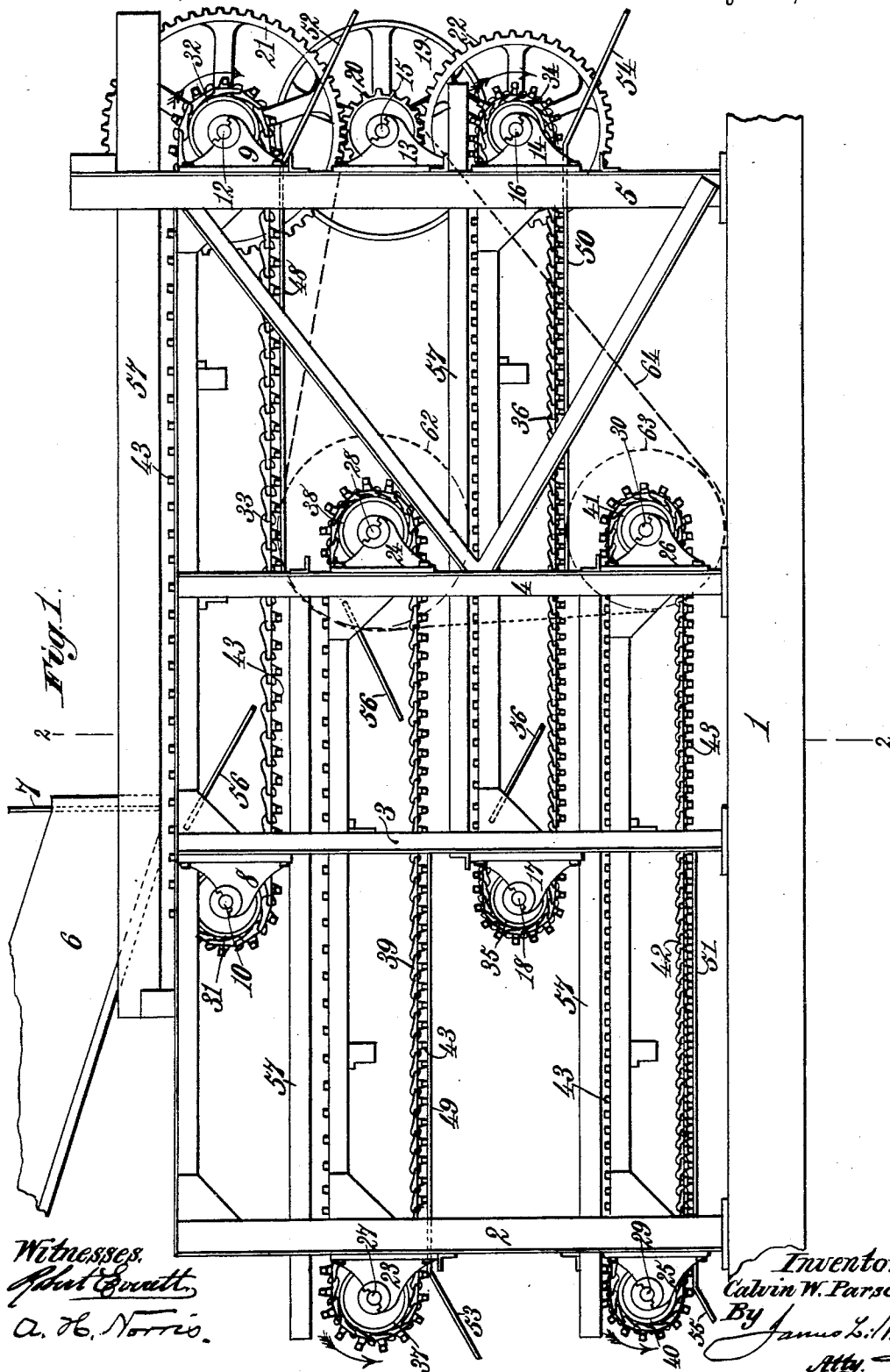
(No Model.)

3 Sheets—Sheet 1.

C. W. PARSONS.
COAL GRADING MACHINE.

No. 586,510.

Patented July 13, 1897.



Witnesses.
Robert Everett
A. H. Norris.

Inventor.
Calvin W. Parsons.
By *James L. Norris.*
Atty.

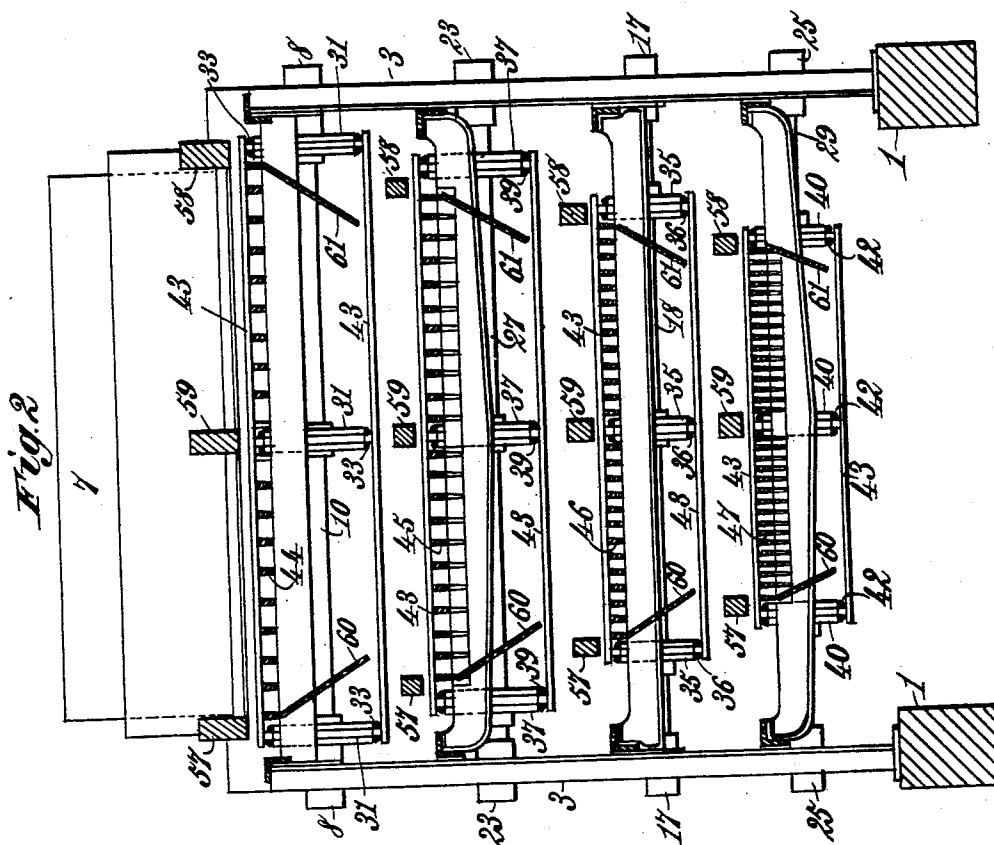
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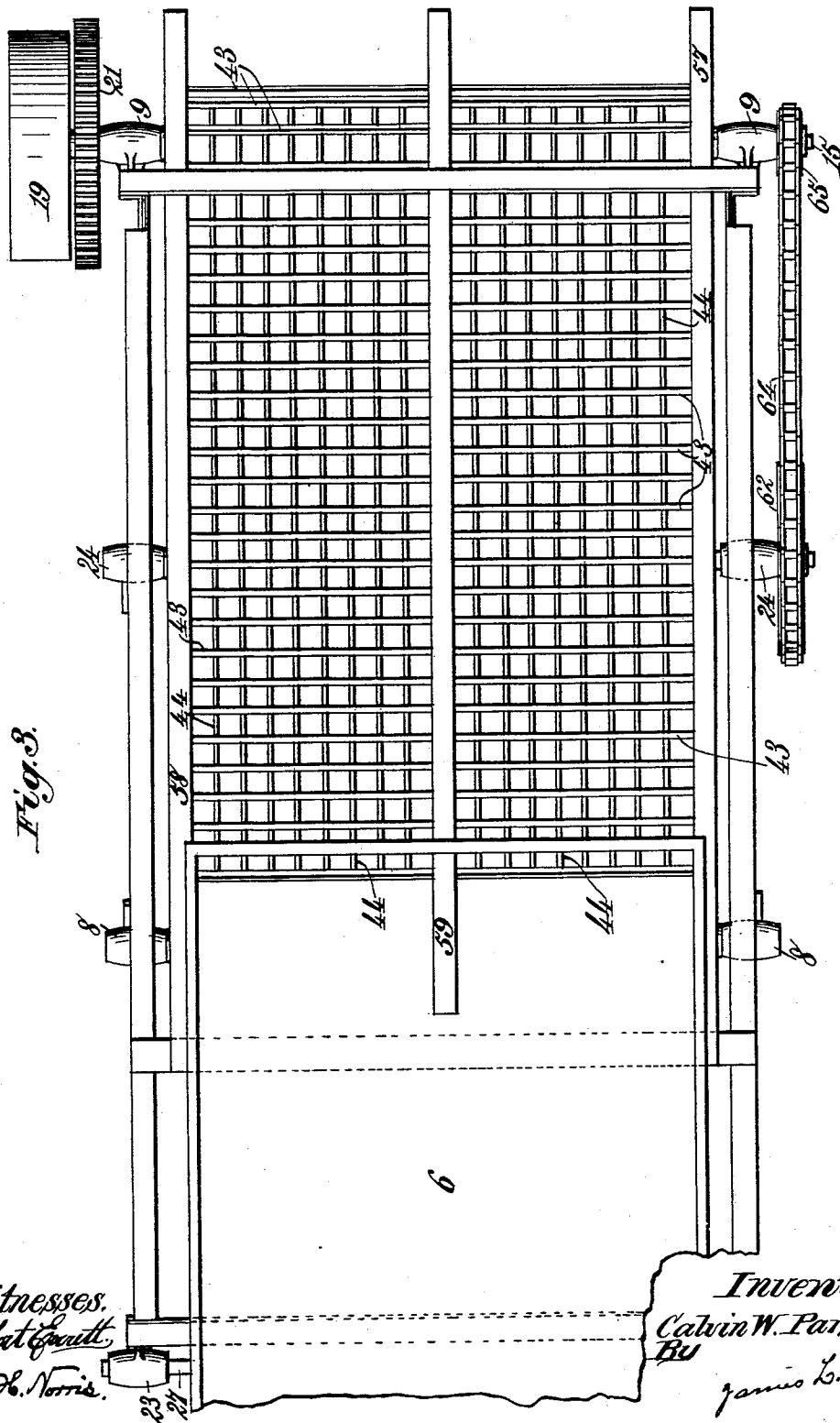
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A. J. Norris

Inventor.
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UNITED STATES PATENT OFFICE.

CALVIN W. PARSONS, OF SCRANTON, PENNSYLVANIA.

COAL-GRADING MACHINE.

SPECIFICATION forming part of Letters Patent No. 586,510, dated July 13, 1897.

Application filed February 19, 1896. Serial No. 579,898. (No model.)

To all whom it may concern:

Be it known that I, CALVIN W. PARSONS, a citizen of the United States, residing at Scranton, in the county of Lackawanna and State of Pennsylvania, have invented new and useful Improvements in Coal-Grading Machines, of which the following is a specification.

This invention has for its object to provide a new and improved machine particularly designed for screening and grading or sizing coal, but useful for many other purposes, such as sizing broken rock and other material or substance, the construction of the co-operating parts being such that the coal, rock, or other material is cleaned free from dirt, dust, and fine particles, and pieces of approximately the same size are separated from pieces of a substantially different size, thus assorting the coal, rock, or other material into graded or sized lots, free or nearly free from all dirt and dust and with the pieces in each lot of approximately the same size.

The invention also has for its object to successively separate one grade or size of coal from another in an organized structure possessing such characteristic construction of parts and mode of operation that the one machine separates the coal into grades or sizes commonly called "grate" or "furnace," "egg," "stove," and "chestnut."

The invention also has for its object to provide novel means whereby the coal after passing through a fixed grating is subjected to a beating or striking action and is subsequently separated to remove the fine stuff, so that there are at least two successive separations and grading of the coal.

These objects are accomplished in the manner and by the means hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a side elevation of a coal-grading machine embodying my invention. Fig. 2 is a vertical sectional view taken on the dotted line 2 2, Fig. 1; and Fig. 3 is a detail broken plan view for the purpose of showing a portion of one of the endless aprons and a portion of one of the gratings to more clearly illustrate the meshes formed by these parts.

In order to enable those skilled in the art

to make and use my invention, I will now describe the same in detail, referring to the drawings, wherein—

The numeral 1 indicates a base-frame, on which is mounted the main frame of the machine. This main frame, as well as the base-frame, may be of any construction suitable for the purpose in hand, but as here shown it comprises uprights or studs 2, 3, 4, and 5, which constitute supports for shaft-bearings and other parts, hereinafter explained.

The uprights or studs, as well as all the longitudinal and transverse bars of the main frame, are preferably composed of angle-iron to secure a strong, durable, and light structure.

The top portion of the main frame is arranged in proper relation to a suitable coal-chute 6, having a vertically-movable gate 7, having its lower end arranged directly over the upper stretch of the primary endless apron, hereinafter explained. The top end portions of the uprights or studs 3 and 5 are provided with bearings 8 and 9, in which are mounted transverse shafts 10 and 12. The upright or stud 5 is also provided with bearings 13 and 14, in which are arranged transverse shafts 15 and 16, while the lower portion of the upright or stud 3 is provided with a bearing 17 for a transverse shaft 18. The shaft 15, as here shown, is the main drive-shaft, and is provided with a belt-pulley 19 or other suitable means whereby the drive-shaft may be driven through the medium of any motor suitable for the purpose. The drive-shaft 15 is also provided with a pinion 20, meshing into spur-gears 21 and 22 of different diameter, mounted, respectively, on the shafts 12 and 16, whereby these shafts are rotated at different speed.

The uprights or studs 2 and 4 are provided, respectively, with upper bearings 23 and 24 and lower bearings 25 and 26. The bearings 23 and 24 serve to support the transverse shafts 27 and 28, while the bearings 25 and 26 serve to support the transverse shafts 29 and 30.

The shafts 10 and 12 are provided, respectively, with sprocket-wheels 31 and 32, around which pass endless chain belts 33.

The shafts 16 and 18 are provided, respectively, with sprocket-wheels 34 and 35, around which pass endless chain belts 36.

The shafts 27 and 28 are provided, respectively, with sprocket-wheels 37 and 38, around which pass the endless chain belts 39.

The shafts 29 and 30 are provided with similar sprocket-wheels 40 and 41, around which pass the endless chain belts 42.

As here shown, each transverse shaft, except the drive-shaft 15, is provided with three sprocket-wheels arranged to operate in connection with three endless chain belts, one of the sprocket-wheels and one of the chain belts being approximately at the longitudinal center of the structure. This construction is preferable in that it secures a longitudinal central support for the transverse equidistant bars forming parts of the aprons. It will be obvious, however, that the central sprocket-wheels and chain belts can be omitted, or additional sprocket-wheels and chain belts employed to meet the conditions required, according to the width of the aprons and gratings. The sprocket-wheels on the end portions of the uppermost transverse shafts are arranged at a greater distance apart than the sprocket-wheels on the transverse shafts immediately below the same, and this order of decreasing distance between the end sprocket-wheels is carried out to the lowermost set of transverse shafts, as will be best seen by reference to Fig. 2.

The endless chain belts are all provided with transverse bars, as at 43, having their ends and central portions properly connected with the links of the chain belts. The endless chain belts and the transverse bars constitute what I will term "endless aprons," the upper stretches of which are adapted to travel, respectively, over the gratings 44, 45, 46, and 47. These gratings are each composed of a series of longitudinal bars separated a suitable distance apart, so that the longitudinal bars of each grating, in combination with the transverse bars of each endless apron, cooperate to produce rectangular meshes, (best seen in Fig. 3,) which are suitable for grading or sizing coal, as well as screening the same from dirt, dust, and the like.

In the example of my invention illustrated in the drawings the endless aprons are all arranged in an alternating manner, one above another, so that the inner end portion of one endless apron overlaps or projects slightly past the inner end portion of the adjacent apron.

The framework of the machine is constructed or provided with a series of platforms or tables 48, 49, 50, and 51, arranged in an alternating manner, so that the outer end portions of the lower stretches of the endless aprons are adapted to traverse or move over these platforms or tables.

The ends of the main frame are provided

with attached chute-boards 52, 53, 54, and 55, Fig. 1, which are inclined in a downwardly direction from the frame for the purpose of delivering, conducting, or deflecting to the points desired the pieces of coal which pass over the outer ends of the endless aprons. These chute-boards extend substantially the full width of the main frame and they are arranged, respectively, under the outer ends of the four endless aprons.

At a point between the upper and lower stretches of each of the first three belts, at the inner end portion thereof, is arranged an inclined chute-board 56, Fig. 1, designed for directing the coal and other matter passing through the inner end portions of the upper stretches of the aprons and gratings in a direction toward the platforms or tables 48, 49, 50, and 51, over which the lower stretches of said aprons travel.

In the construction of the machine I prefer to employ longitudinal guard-rails 57 and 58, arranged along the longitudinal side edges of each apron, as best seen in Fig. 2, for the purpose of preventing the coal from passing off laterally from the aprons. If I employ a central sprocket-wheel and central chain belt in connection with each apron, I prefer to employ a guard-rail 59, arranged centrally of the machine and extending longitudinally thereof directly above each central chain belt, so that the coal and other material will not pass through the aprons and gratings at the points where the longitudinal grating-bars are a little more widely separated to accommodate the sprocket-wheels and the endless chains, as will be clearly understood by reference to Fig. 2. The main frame is also provided with longitudinal boards or plates 60 and 61, located between the upper and lower stretches of each belt and converging in a direction toward the longitudinal center of the machine in such manner that the coal and other material passing between the longitudinal bars of the several gratings will be properly directed upon the lower stretches of the belts and thus prevented from laterally escaping or passing to or off at the sides of the belts, which might likely obstruct the action of the working parts.

The transverse bars forming parts of the endless belts are equidistant apart in each belt; but in the machine illustrated in the drawings, which is designed to screen and grade, beginning with the largest size down to the smallest size, the distance between the transverse bars of the several aprons decreases from the uppermost to the lowermost apron, and likewise the distance between the longitudinal bars of the several gratings decreases from the uppermost to the lowermost gratings. Where this arrangement of parts is employed, the largest or coarsest coal will be first separated, then the next largest or coarsest size, and so on throughout the machine. I do not, however, wish to be under-

stood as confining myself to this arrangement of the parts, for obviously the reverse arrangement can be employed, in which event the primary separation will be the fine coal, or chestnut coal, and the larger or coarser grades subsequently separated. This is not, however, so desirable as the plan shown in the drawings, because where the fine or chestnut coal is first separated the operation is more difficult, as the uppermost and fine screen necessarily requires to handle the entire mass of coal which enters the machine, and as parts of the fine apron are necessarily small the wear is likely to be excessive, and therefore objectionable. Further, it is more difficult to separate the fine from the larger stuff which is mixed through it and to discharge it freely than it is to separate the larger lumps out from the mass of smaller stuff. I find that the operation of grading is more conveniently and easily accomplished by separating the largest size first, each succeeding separation being of large from small in order of succession.

The transverse shafts 28 and 30 are provided, respectively, with pulleys or sprocket-wheels 62 and 63 of different diameter, which are geared through the medium of a belt or sprocket-chain 64, Fig. 2, with a pulley or sprocket-wheel 65 on the main shaft 15. In Fig. 3 the belt or sprocket-chain 64 is indicated by full lines, while in Fig. 1 the belt or sprocket-chain and the pulleys or sprocket-wheels 62 and 63 are merely indicated by lines. This is done for the purposes of better illustration of the parts, &c., appearing in Fig. 1.

The gearing described and shown causes the endless aprons to alternately move in opposite directions and imparts to the two upper aprons a speed less than the speed imparted to the two lower aprons.

In the practical operation of my improved coal-grading machine the mass of coal is delivered by the coal-chute 6 under the gate 7 and is fed forward by the action of the upper stretch of the primary endless apron. The flow of the coal is determined by the height of the gate above the apron and by the rate of movement or speed of such apron. The gate is movable to and from the primary apron and coöperates with the latter to constitute an automatic feed, whereby the quantity of material received by the upper stretch of the primary apron is determined, chiefly, by the movement of said apron. The larger lumps or pieces of coal, commonly grate or furnace coal, cannot pass through the meshes formed by the transverse equidistant bars 43 and the longitudinal grating-bars 44, and consequently these larger lumps or pieces are carried off at the outer end of the primary apron and delivered to the chute-board 52 or other suitable contrivance, by which the coal first separated is conducted to the point desired. The mass of material susceptible of passing through the meshes formed by the

bars 43 and 44 falls toward the lowermost stretch of the primary apron, the greater portion passing to the primary platform or table 48 and the remainder onto the chute 56 and between the bars 43 of the lowermost stretch of the apron to the inner end portion of the secondary apron. The primary apron travels in the direction of the arrow, and the transverse bars 43 of the lowermost stretch of the apron sweep the mass of material along the platform or table 48 onto the inner end portion of the secondary apron. The same mode of operation now takes place with respect to the secondary apron, and the second grade of coal is separated in much the same manner as the first grade, and the order of successive operations follows throughout the machine in such manner that the second or egg size of coal passes off at the chute-board 53, the third or stove size passes off at the chute 54, and the fourth or chestnut size passes off at the chute 55, while the dust and dirt in the fourth grade passes through the inner end portion of the lower stretch of the fourth separating-apron.

As before stated, the drawings represent the aprons designed to travel alternately in opposite directions, as indicated by the arrows, Fig. 1, and the transverse bars and longitudinal grating-bars are so arranged that the largest size of coal is first separated, each succeeding operation being of large lumps or large size from small lumps or small size; but I wish it understood that the arrangement of the endless aprons and grating illustrated in the drawings is only typical of many arrangements that may be employed, and, further, that the direction of movements of the several aprons and the speed thereof may be varied and the driving mechanism may be altered or changed without affecting the spirit of my invention, as I believe myself to be the first to produce an organized coal screening and grading machine wherein a plurality of movable endless aprons having transverse equidistant bars coöperate with gratings composed of longitudinal separated bars with mechanism geared with and imparting suitable motion to all of the aprons.

The alternating arrangement of the aprons illustrated in the drawings is preferable in that it affords ample room for access to the machine between the aprons, while permitting them to be arranged comparatively close together for the purpose of securing a compact structure.

The number of aprons and gratings can be increased, if desired, but ordinarily a gang of four aprons and four gratings is sufficient to obtain the usual grades of coal commonly termed "grate" or "furnace," "egg," "stove," and "chestnut."

A feature of my invention which is important and valuable in cleaning or grading coal resides in the fact that the coal which passes through the upper stretch of the apron has a horizontal movement of the same kind and velocity as the upper stretch of the apron—

say two hundred feet per minute to the right. The lower stretch of the apron moves, say, two hundred feet per minute to the left, and when the coal falls upon the lower stretch the transverse bars strike it with a virtual velocity of, say, four hundred feet per minute. The blow is sufficient to dislodge and detach all the fine stuff which may adhere to the coal, which fine stuff is particularly troublesome in working "wet" coal. This beating action may be increased, if necessary, by causing the successive aprons to run in the same direction. Then the coal which drops through the lower stretch of the first apron will receive a similar blow in the opposite direction when it encounters the bars in the upper stretch of the second apron. Ordinarily coal is not so sticky as to require the increased beating last above mentioned, but if it should be required the machine can be readily adapted to secure the necessary beating.

The endless apron, comprising transverse bars, will of itself separate coal as well, if not better, than a simple series of inclined gratings composed of longitudinal bars and as has heretofore been proposed.

The endless grating, composed of transverse bars, possesses the advantage that the height and length of room required to operate such machine is considerably less than is necessary with a grader composed solely of longitudinal bars.

The endless grating, composed of transverse bars, is also advantageous in that it is self-feeding and regulating, because the amount of material which can pass under the gate 7, Fig. 1, is governed by the speed of the apron.

Having thus described my invention, what I claim is—

1. A coal-grading machine, combining in its structure a plurality of independent gratings, each composed of a series of longitudinal separated bars, a plurality of movable endless aprons arranged respectively in operative connection with and traveling over said gratings, and each comprising a series of transverse bars coöperating with the longitudinal grating-bars to form meshes, the dimensions or size of which vary in the several aprons, and gratings, a series of platforms or tables arranged respectively under the lower stretches of the several aprons and over and along which the transverse bars thereof sweep the material from one apron to another, and mechanism for imparting motion to all the aprons.

2. The combination in a coal-grading machine, of a plurality of alternately-arranged independent gratings, each composed of a series of longitudinal separated bars, a plurality of alternating endless aprons traveling alternately in opposite directions and each comprising a series of transverse bars coöperating with the longitudinal grating-bars to form meshes, the dimensions or size of which vary in the several aprons and gratings, transverse shafts supporting and serving to move the aprons, a single main drive-shaft, and gearing between said drive-shaft and a shaft of each apron for simultaneously moving all of the aprons.

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

CALVIN W. PARSONS.

Witnesses:

WM. F. BOYLE,
CHAS. E. OLVER.