

June 4, 1929.

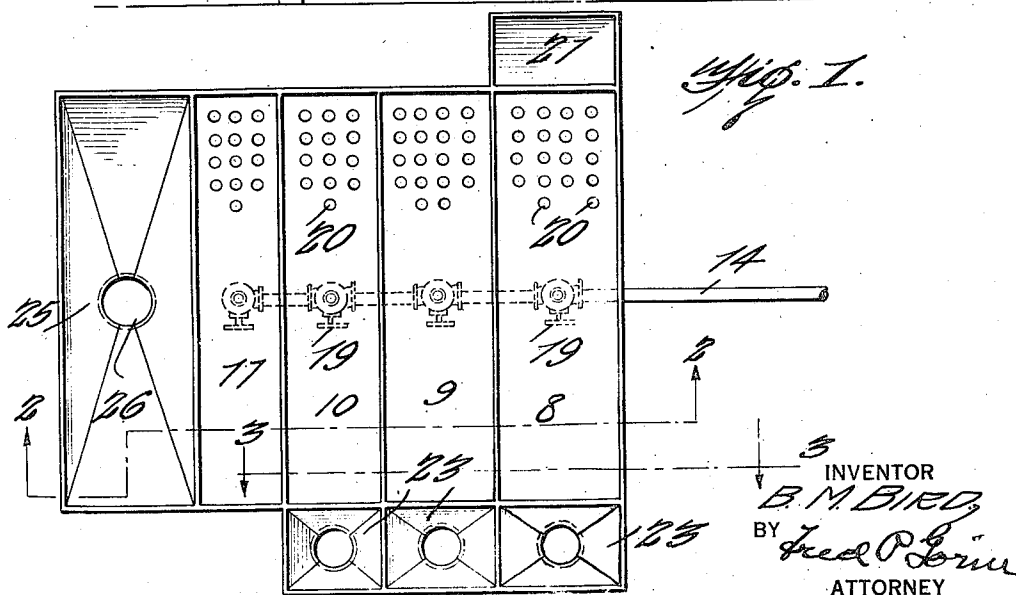
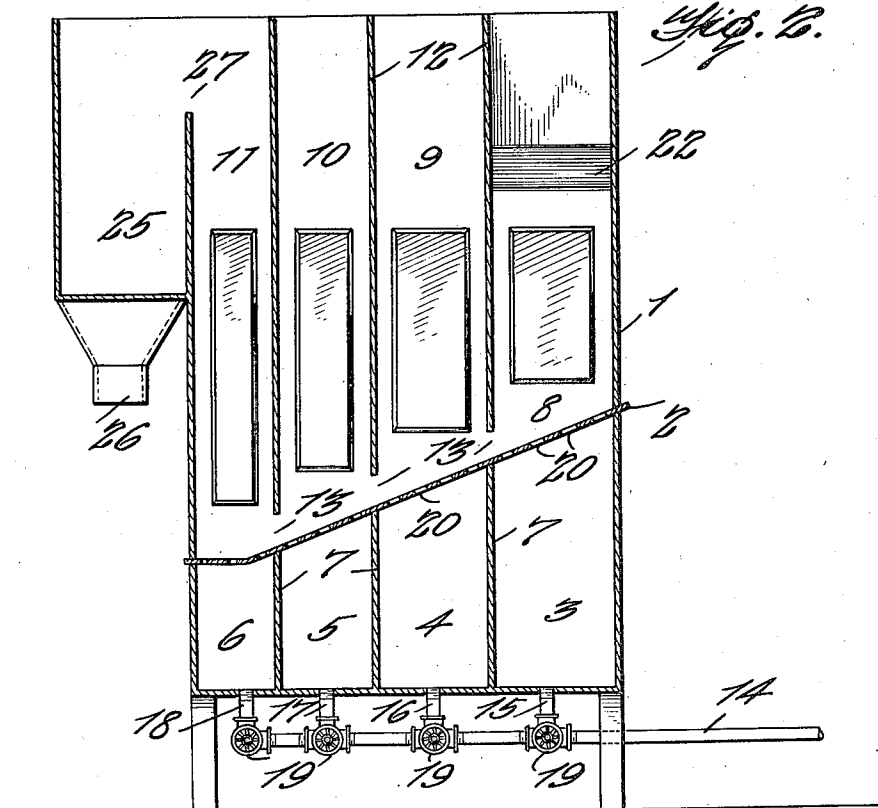
B. M. BIRD

1,715,693

ORE CLASSIFIER

Filed Feb. 25, 1927

2 Sheets-Sheet 1



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Fig. 4.

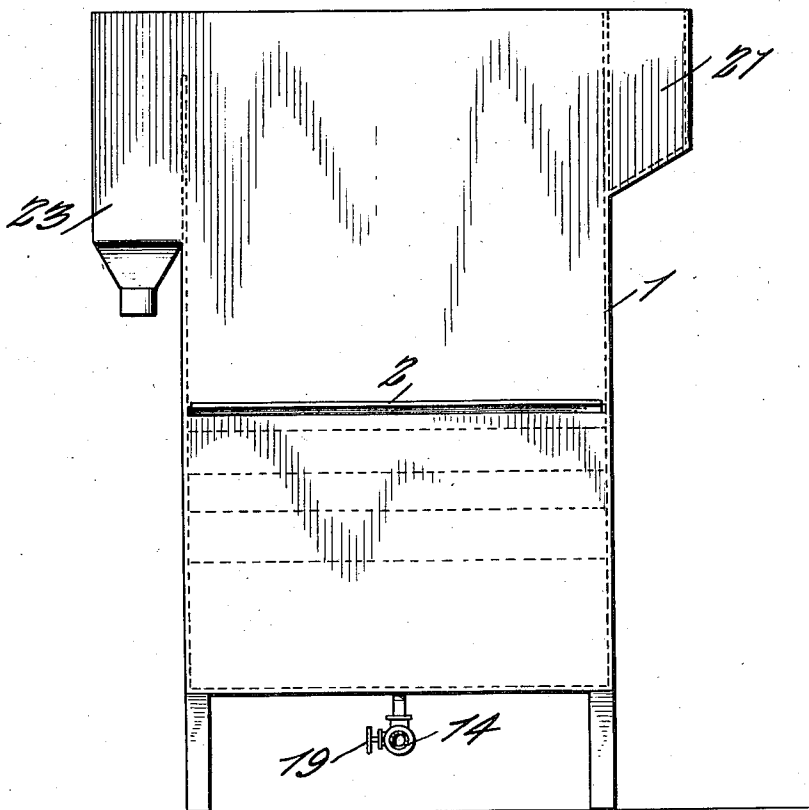
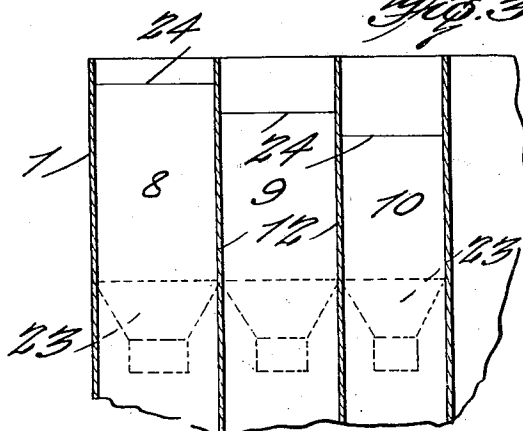


Fig. 3.



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UNITED STATES PATENT OFFICE.

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ORE CLASSIFIER.

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This invention relates to an improvement in ore classifiers constructed and arranged to subject the material to successive currents of water of increasing strengths to compel the desired separation.

In the present embodiment of my invention I will illustrate the invention in the classification of coal. The separation is effected between the coal and particles of impurities by a continuous uprising current of water according to established principles of ore dressing and coal washing, either in the separation of coal so as to fit it for a subsequent treatment on coal washing tables, or in the preparation of coal in final products, washed coal, middlings and refuse. In the former, unsized coal, usually smaller than would be retained by a three-quarter inch screen, is fed into the apparatus, which separates the coal into its products commonly known in the art as "classified". These classified products may be sufficiently free from impurities to suit the market requirements but usually they will require a further treatment on coal washing tables. In the latter application the feed usually has received, previously, some preliminary treatment such as screen-sizing in which the coal particles, which are of lower specific gravity than the impurities, are so prepared that they are not above a certain number of times the diameter of the refuse particles from which they must be separated. The relative size of coal and refuse particles which can be separated in the apparatus and prepare finished products depends upon "hindered-settling ratios" of the two materials which in turn depends chiefly on the relative specific gravity and shape of the particles.

The invention is illustrated in the accompanying drawings in which:

Figure 1 is a plan view of the improved classifier.

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

Figure 3 is a broken sectional view on the line 3—3 of Figure 1.

Figure 4 is an end elevation of the classifier.

The improved classifier comprises a box-like tank 1 of appropriate area divided transversely by a partition 2, hereinafter termed the floor, which is inclined downwardly in the direction of feed of the material, the tank below the partition being

divided into a plurality of chambers 3, 4, 5 and 6 by vertical partitions 7 which extend from the bottom of the receptacle to the floor.

Above the floor, the tank is divided into a series of separating or classifying chambers 8, 9, 10 and 11 by partitions 12. These partitions extend to and are secured to the side walls of the tank but terminate above the floor, leaving communicating passages 13 between the respective chambers. A supply pipe 14 leads beneath the tank and has outlets 15, 16, 17 and 18 communicating with the respective chambers 3, 4, 5 and 6, each outlet being controlled by a valve 19. The floor is perforated at 20 to permit the water rising in the chambers below the floor to reach the classifying chambers above the floor.

The classifying chamber 8 is the initial receiving chamber and arranged on one side of the tank at the upper end is a feeder 21 into which material to be classified is placed, this feeder communicating at its lower end, as at 22, with the classifying chamber 8. In the side wall opposite the feeder 21 each classifying chamber is provided with a launder indicated at 23, and the side wall defining the particular classifying chamber is of reduced height to permit the overflow to reach the launder. Preferably, the side walls of the respective classifying chambers terminate at successively increasing heights in the direction of feed of the material, as indicated at 24 in Figure 3.

A receiver 25 is secured to the end wall of the tank beyond the final classifying chamber 11 and formed with a discharge 26 for the delivery of the material. The end wall of the tank between the final chamber 11 and the receiver 25 is of reduced height to provide a passage 27 in which the material from the final chamber can reach the receiver.

In operating the device, coal or such other ore as may be used is delivered into the feeder 21 and gravitates into the initial classifying chamber 8, finally resting upon the perforated bottom 2 of that chamber. The valves 19 controlling the outlets 15, 16, 17 and 18 have been opened to a degree to permit currents of water of increasing intensity to flow through the respective chambers 3, 4, 5 and 6. The water rising through the perforated floor of the initial classifying chamber 8 separates such lighter particles

as may be elevated by a current of the particular force, and delivers the same to the launder 23 connected with that chamber. The heavier particles gravitate along the floor to the next classifying chamber where they are met by a heavier current of water and particles of greater weight than those separated in chamber 8, are lifted to the co-operating launder. This operation continues, the mass being caused to travel along the floor and intercepted in each classifying chamber with water currents of increasing strength to continue separation of relatively heavier particles during the separating process. In the final classifying chamber, the current is sufficient to lift all of the particles of material therein and deliver the same to the receiver for conveyance to any desired point.

Obviously, the pressure of water in each of the classifying chambers may be adjusted by manipulation of the respective valves to gain that force required for the particular separation.

The number and size of the perforations 20 in the floor are determined by the well established principles of hydraulics. The volume of water required to maintain in a condition of teeter, the material in any given compartment may be determined by experiment.

As the most desirable, effective head of water has been determined to be about 0.5 foot, the total area of the orifices under any given subchamber, is calculated to deliver the required quantity of water under that head, and the size and number of orifices selected to suit the convenience of the operator, uniformly spaced apart in the screen. If the apparatus be large, it is preferred to graduate the size of orifices to compensate for the greater head toward the left half of any subchamber, as viewed in Figure 2.

The different products and water are discharged into dewatering boxes in any approved manner, the excess of water over-

flowing the upper edge of the dewatering boxes. Excess water above that required for the subsequent disposition of the products of the apparatus may be removed in dewatering boxes, dewatering elevators or any other suitable apparatus common to the industry.

What I claim to be new is:

In a classifier, the combination of a fixed container, a perforated partition arranged transversely and obliquely of the container and which divides the container into an upper and lower chamber, a plurality of vertically arranged partitions which divide the uppermost part of the container into a plurality of upper sub-chambers, each sub-chamber being comparatively long transversely of the container and comparatively short longitudinally thereof, means for feeding the material to the first sub-chamber at one end thereof adjacent a corner of the container, the said vertical partitions being spaced away from the perforated partition, thus leaving a transverse sub-chamber having an oblique floor, the end wall of the container forming one wall of the last vertical chamber terminating short of the top edge of said container to form an overflow passage for the material, a separate receiving chamber with which the overflow passage connects, a side refuse chamber communicating with each vertical chamber at different distances from the top of the container, an additional group of vertically arranged partitions beneath the transverse partition which divide the lowermost part of the container into a plurality of lower sub-chambers, and which partitions extend upwardly from the floor of the container to and against the transverse partition, means for supplying water under constant pressure and a valve for each lower sub-chamber whereby streams of water of varying intensity are conducted into the lower sub-chambers.

In testimony whereof I affix my signature.
BYRON M. BIRD.