No. 688,279. Patented Dec. 10, 1901.

A. A. ALLEN.

ORE SEPARATOR.

(Application filed Aug. 9, 1900.)

(No Model.)

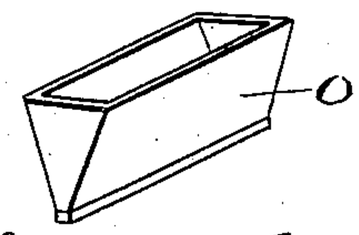


Fig. 1.

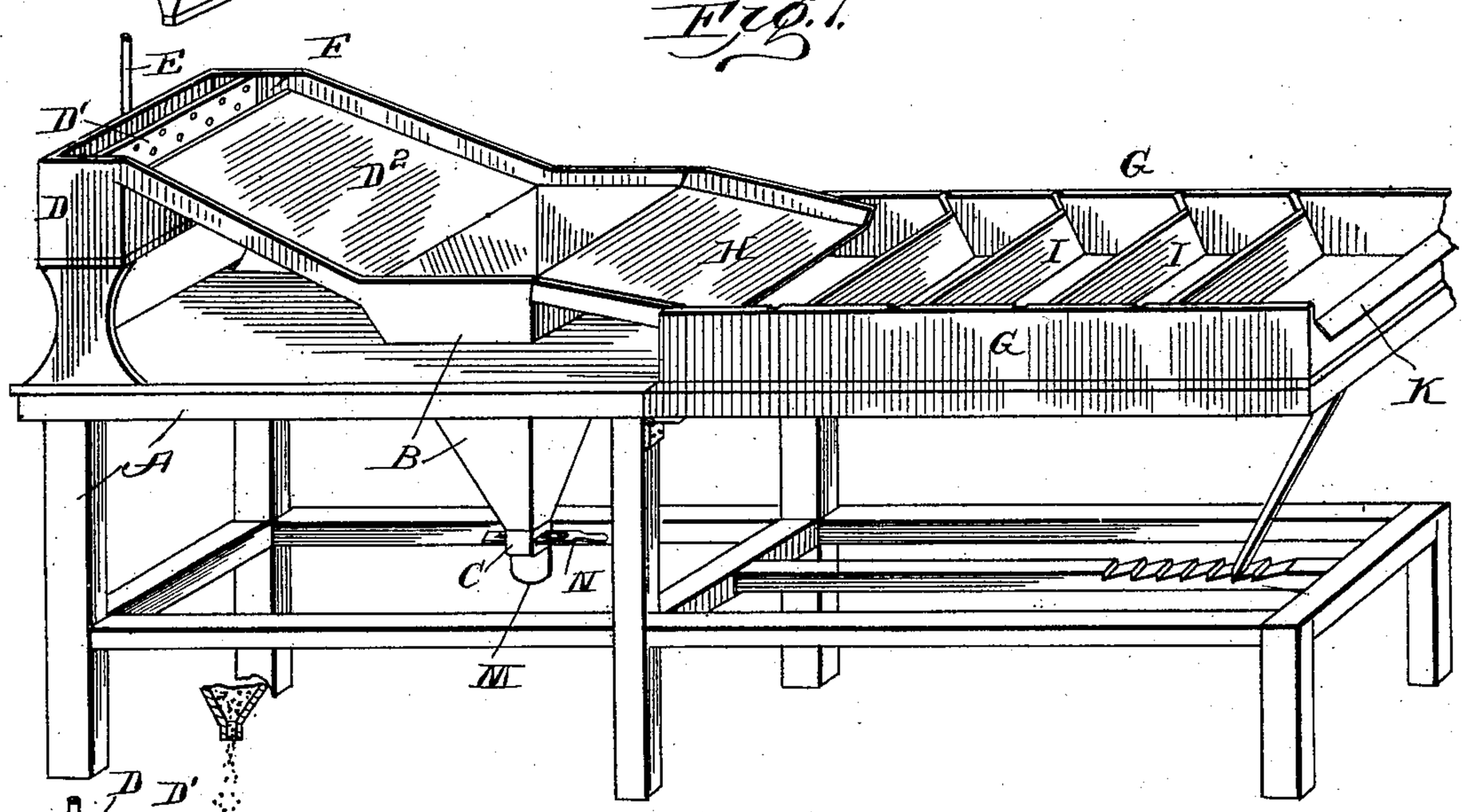


Fig. 2

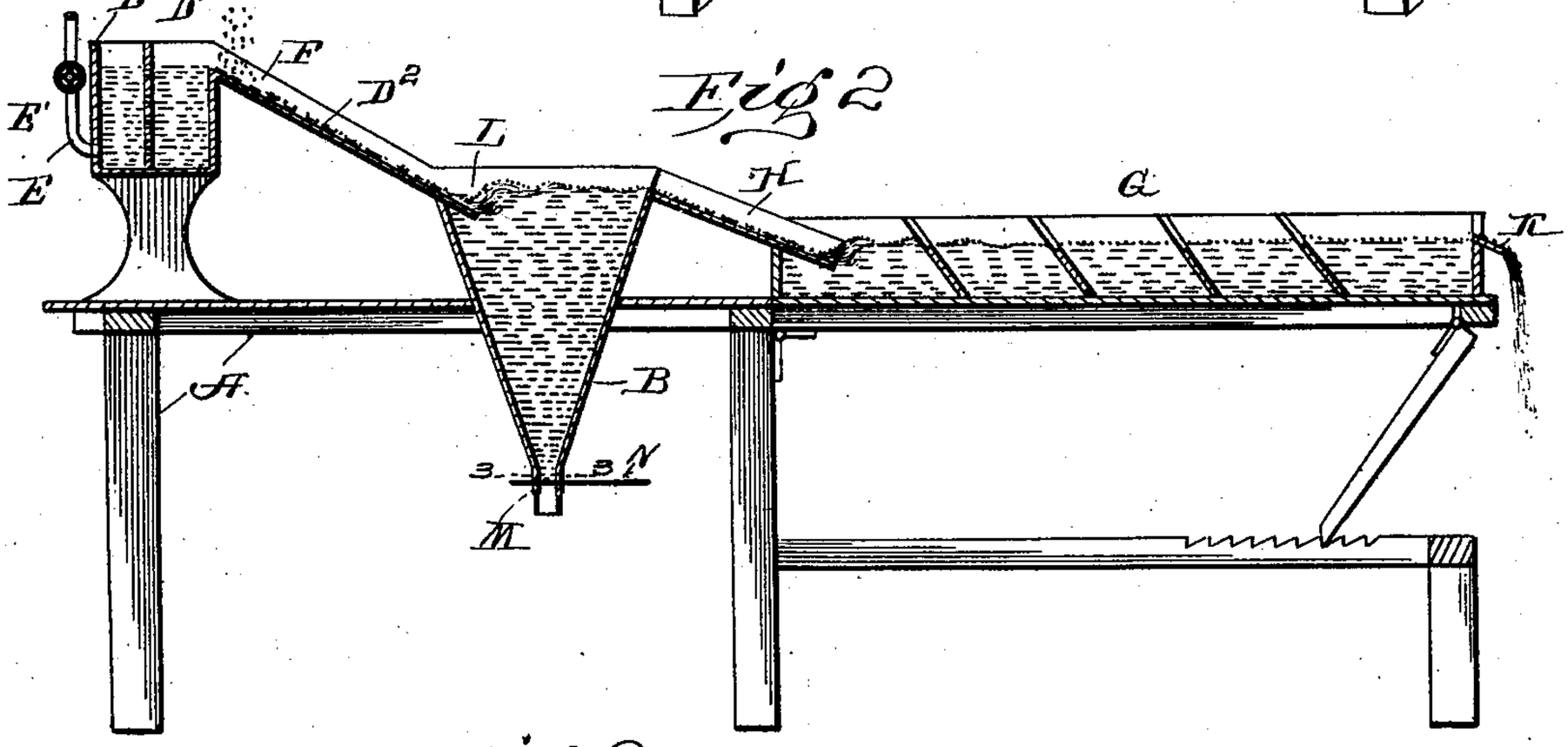


Fig. 3.

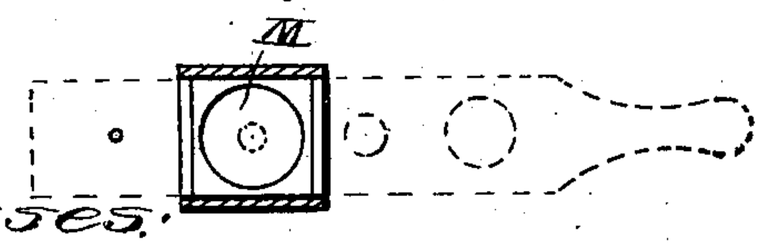
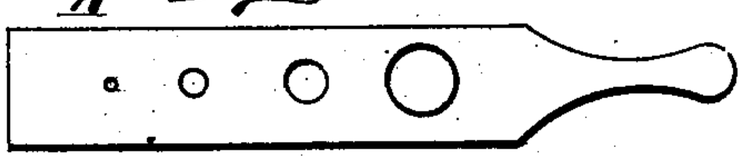


Fig. 4.



Witnesses.

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SPECIFICATION forming part of Letters Patent No. 688,279, dated December 10, 1901.

Application filed August 9, 1900. Serial No. 26,401. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER A. ALLEN, a citizen of the United States, residing at Birmingham, in the county of Jefferson and State of Alabama, have invented certain new and useful Improvements in Ore-Separators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of this invention is to provide devices whereby ore material which will float upon the surface of a liquid may be separated from that which floats less readily or not at all—graphite, for example, representing the first or floating material and the other minerals with which graphite occurs being an example of the second material. The materials to be separated are first comminuted or pulverized unless they naturally occur in a finely-divided state, and are then fed to my novel apparatus, which separates the two kinds of material almost perfectly and delivers them at different points, so that whichever is a waste product the loss of the other is almost inappreciable.

Referring to the accompanying drawings, Figure 1 is a perspective view of the entire apparatus. Fig. 2 is a vertical section on the line 2 2, Fig. 1. Figs. 3 and 4 show details hereinafter mentioned.

In the drawings, A represents a suitable table or frame, and B an upwardly-open funnel-like receptacle partly upon the table, but extending downward through the table-top and having at its lower end a closure C.

D is a box to which water is brought from any convenient source of supply by a pipe E, having a regulating-valve E′, and delivered within the box upon one side of a perforated partition D′, the office of which is to prevent local currents in the box and to secure an even supply along a discharge-way F, formed by making one side of the box lower than the other side. The box may be of any suitable depth; but its top is in any case considerably higher than the top of the receptacle B. From the discharge-way just mentioned a broad plane-bottomed chute D^2 extends over one edge of the receptacle and projects obliquely into the space therein. Upon the opposite side of the receptacle from the box D is a riffle box or trough G, into which water discharges from the receptacle B, precisely as it is discharged into that receptacle from the box D, except that the chute H is in this case less inclined, so that the flow of water over its bottom is slower. This chute, like the other, projects obliquely into the riffle-trough. The trough is preferably so arranged that its end opposite the chute H may be adjusted in height, and the transverse partitions I are inclined downwardly from the chute H. The water being admitted through the pipe, the box D, the receptacle B, and the trough G are all filled and water discharges constantly from the latter at K. Under such conditions a thin uniform sheet of water passes rapidly over the bottom of the chute D^2 and strikes obliquely into the body of water in the receptacle, creating first a line of depression L across the surface and just across the depression a raised line or riffle, from which the surface falls to the normal level of the stream passing from the receptacle to the chute H. The same thing occurs as the water passes down the latter chute into the trough; but the depression and ridge or riffle are less marked.

The trough may be set in various ways according to the nature of the material to be separated. For example, the discharge end may be materially below the other end, and in such case each riffle-board is lower than the preceding, so that the water breaks over the first one, passes down a short incline to the lower level of the second, and so on to the end. If the discharge end be only slightly depressed, there is no running down inclines; but the body of water passing over the riffle-board edges is merely broken slightly. If there be no depression, the riffle-boards merely serve to insure a surface current with a body of still water below. In addition to adjusting the trough I prefer to have each riffle-board adjustable in its own plane or movable in grooves in the sides of the trough, so that the boards may be arranged at different distances from the surface of the water.

If the material to be separated—*e. g.*, graphite and the sand and dust mixed therewith—be sifted from a chute O upon the very thin sheet of water passing down the first chute, they pass on with the water, the heavier sand sinking and rolling along the bottom. Mo-

mentum and gravity prevent this heavier part from rising from the depression and passing over the riffle; but the lighter graphite easily follows this surface-curve. The short turn serves to free heavy particles that would otherwise be carried on with the graphite, and it is probably the formation of this riffle that most largely contributes to the practical success of the apparatus. Having thus lost practically all the sand or coarse heavy matters, the material floats on and descends the second chute, and by a simple but gentler process loses much of the finer heavy material which by this time has been more fully freed from the graphite and has largely become wet, so that it no longer floats by repelling the water. There will, however, still remain some very fine impurities and occasional grains held between flakes of graphite in spite of the breaking up due to the sudden changes of the direction in the riffles. The trough, whichever one of the mentioned adjustments may be adopted, aids in removing the residual impurities, for if the floating mass be merely carried on by the surface current material other than graphite will become saturated and sink, while if the moving mass be broken in passing over the slightly-submerged riffles or, still more surely, if it be compelled to break over each riffle edge and pass down an incline, as must be the case when the trough is materially inclined, the extraneous material will be almost entirely eliminated. Practically nearly pure graphite is obtained, and yet we have the unusual advantage of losing practically no graphite with the crushed rock or sand and dust.

The sand sinking in the receptacle B is discharged through a nozzle M. The aperture may be adjustable in any convenient way—as, for example, by having a transverse cut-off plate N, sliding in ways in the nozzle and provided with apertures of different sizes, any one of which may be made the discharge-opening by sliding the plate. By this means the operator may regulate the escape of water with the sand.

When the apparatus is properly adjusted for the kind of material to be used, provision being made for feeding uniformly the material to be separated and preventing the feeding therewith of pieces too large to pass through the sand-discharge opening, the devices are entirely automatic in action and run indefinitely without any attention whatever.

What I claim is—

1. The combination with a vessel arranged to discharge by overflow a broad unbroken sheet of liquid, a receptacle arranged at a lower level to contain a body of approximately still water and to discharge by overflow at one side, a broad inclined chute extending from said vessel to a point in said receptacle below the plane of discharge of the latter and arranged to receive the sheet discharged by said vessel and deliver it substantially unbroken in said receptacle, and means for placing upon the moving sheet discharged from said vessel a thin layer of material to be separated.

2. The combination with a vessel, a receptacle at a lower level and a riffle-box provided with forwardly and downwardly inclined transverse partitions and placed at a still lower level, all normally filled with liquid and discharging by overflow, of means for supplying liquid to said vessel and causing an unbroken sheet to overflow therefrom, an inclined chute arranged to receive such sheet and deliver it substantially unbroken in said receptacle, a second chute arranged to receive the overflow from the receptacle and deliver it in like manner in said riffle-box, and means whereby the riffle-box may be kept horizontal or given any desired degree of inclination.

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

ALEXANDER A. ALLEN.

Witnesses:
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W. A. REDDING.