R. W. DULL.

GRAVEL WASHING AND SCREENING APPARATUS.

APPLICATION FILED AUG. 26, 1912.

1,177,309.

Patented Mar. 28, 1916

2 SHEETS—SHEET 1.

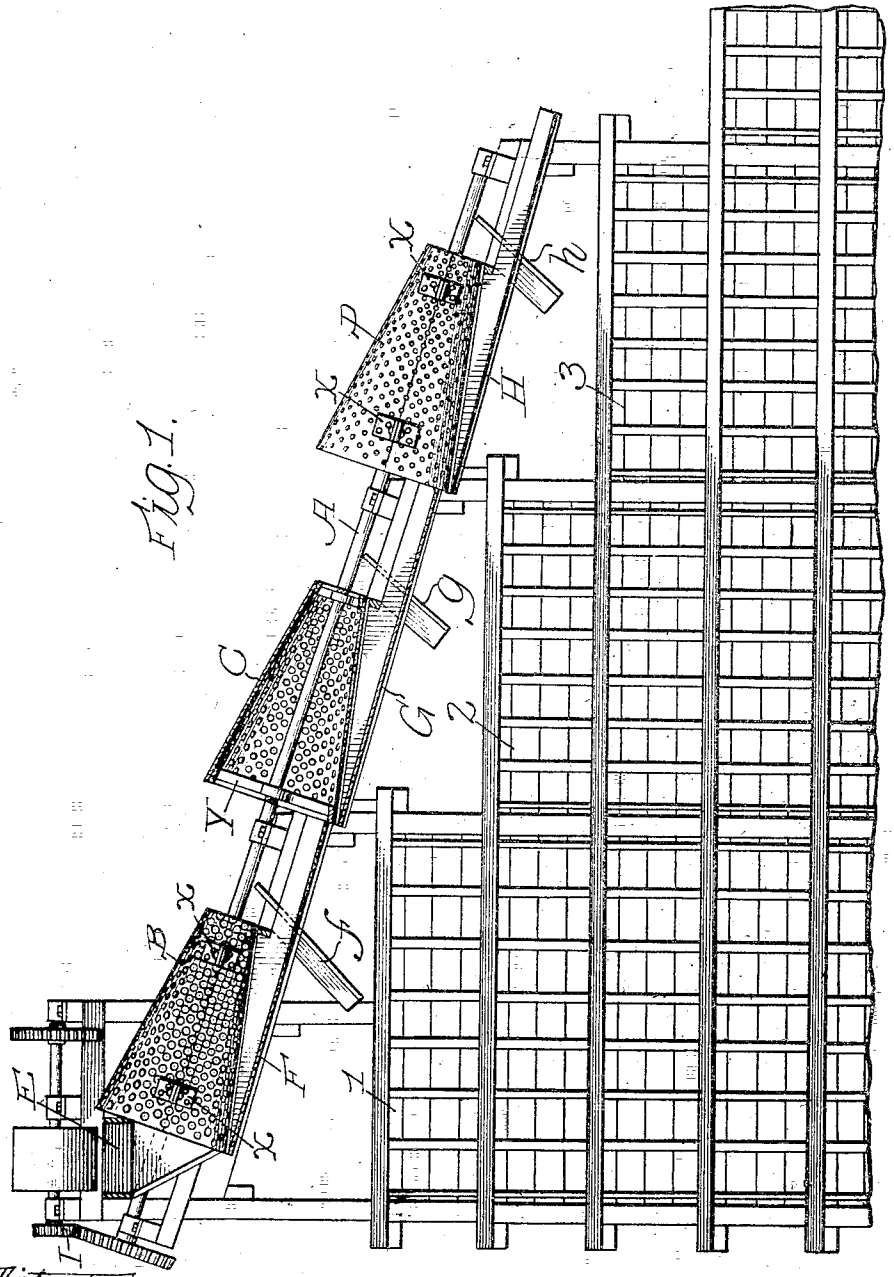


Fig. 1.

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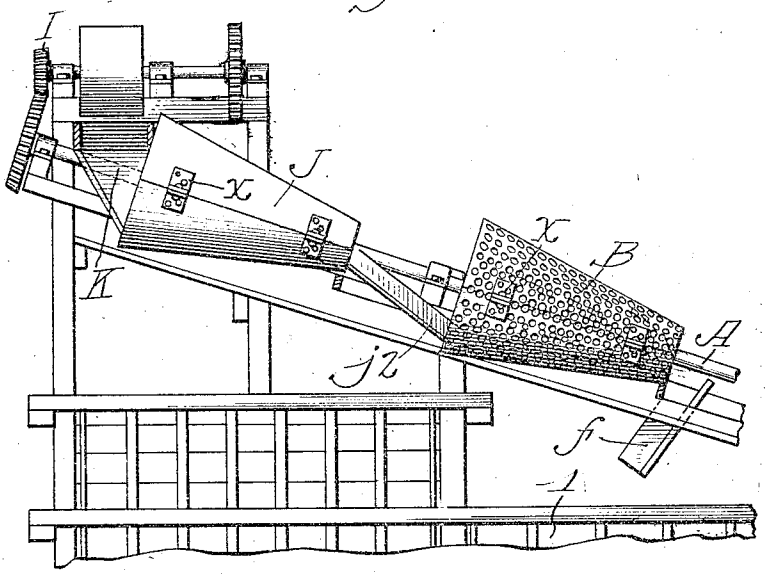
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2 SHEETS—SHEET 2.

Fig. 2.



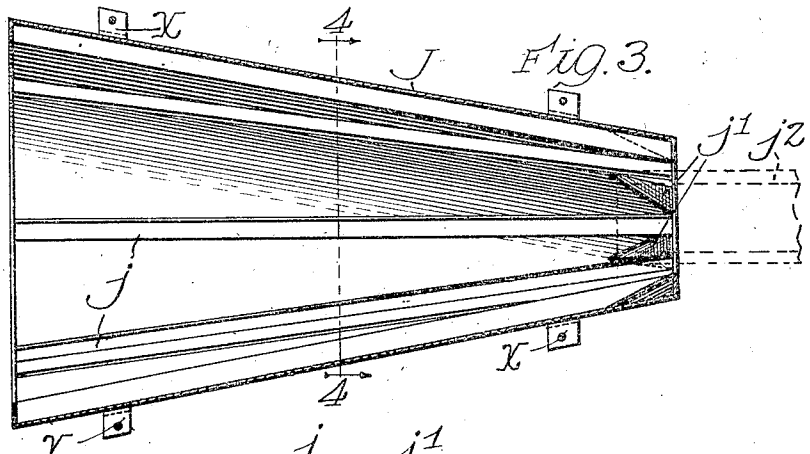
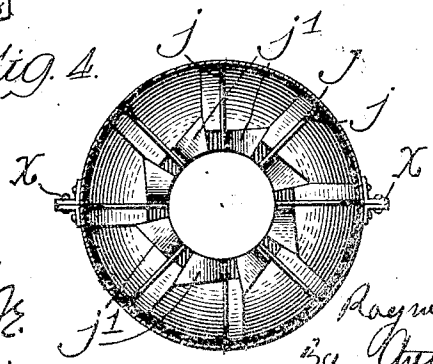


Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

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GRAVEL WASHING AND SCREENING APPARATUS.

1,177,309. Specification of Letters Patent. **Patented Mar. 28, 1916.**

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To all whom it may concern:

Be it known that I, RAYMOND W. DULL, a citizen of the United States of America, and resident of Aurora, Kane county, Illinois, have invented a certain new and useful Improvement in Gravel Washing and Screening Apparatus, of which the following is a specification.

My invention relates to apparatus for washing and separating sand and gravel, and more particularly to that kind of apparatus in which the tapered screens are arranged on the same shaft, said shaft being inclined, and each screen being tapered toward the lower end of the shaft, whereby the sand and gravel are subjected to a series of screening operations, and the result being that the gravel is graded into different sizes, while the sand is discharged separately from the lower end of the apparatus.

The object of my invention is to provide an improved construction and arrangement whereby the said screens are spaced apart to afford access to both ends thereof, and for certain other purposes, as will hereinafter more fully appear, and to thereby increase the general efficiency and desirability of a screening apparatus of this particular character.

In the accompanying drawings: Figure 1 is a side elevation of a screening apparatus embodying the principles of my invention, showing one of the screens thereof, and some of the chutes or spouts, in section. Fig. 2 is a similar view of the upper portion of said apparatus, showing the same equipped with a frusto conical member for churning or agitating the wet and muddy materials before the same are delivered to the first screen. Fig. 3 is an enlarged longitudinal section of the said agitating member. Fig. 4 is a cross section on line 4—4 in Fig. 3.

As thus illustrated, and referring to Fig. 1, it will be seen that my invention comprises a series of bins 1, 2 and 3, providing an upper framework upon which the inclined shaft A is mounted for rotation in suitable bearings. The frusto-conical or tapered screens B, C and D are secured upon said shaft in any suitable manner, the opposite ends of each screen being left open. A hopper E delivers the materials to the first screen B, the latter being of relatively coarse mesh—that is to say, being provided with relatively large openings. The screen C is provided with relatively small openings, and the screen D is provided with still smaller openings. A chute F takes the materials which pass through the openings of screen B to the mouth or larger end of the screen C, and a spout *f* takes the materials which are discharged from the smaller end of the screen B into the bin 1, whereby the coarse materials are all discharged into this bin. The materials which pass through the openings of the screen C are received by the chute G, and thereby conducted to the mouth or larger end of the screen D. The spout *g* receives the materials which pass out of the lower or smaller end of the screen C and discharges the same into the bin 2, whereby this bin receives and contains the next smaller grade of materials. The materials which pass through the openings of the screen D are received by the chute H and are by the latter discharged into any suitable receptacle or upon the ground, depending upon the requirements of any particular case. The spout *h* receives the materials which pass out of the smaller end of the screen D and discharges the same into the bin 3, whereby this bin contains the next smaller grade of materials. Thus the materials are graded from coarse to fine, and the materials eliminated from the mass by each screen pass in at one end thereof and out at the other end of the screen. In each case the body or mass of the materials passes through the openings and then is received by the next screen, except in case of the last screen. As the screens are all mounted on the one shaft, the single driving connection I is sufficient for all of them, and thus a separate driving connection for each screen is not necessary. Furthermore, each screen is divided longitudinally into sections, each of which is perforated to their contacting edges, and opposing angle clips X, secured upon the outside of said sections adjacent their contacting edges, are employed for removably clamping the sections about the spiders Y by which the screens are secured on the shaft. In this way the screens can be easily removed without in any way disturbing the center shaft upon which they are mounted, and consequently repairs and substitution of new parts are rendered easier and more convenient and practical than heretofore.

In Figs. 2–4 a feeding arrangement is

shown for churning or agitating the materials, especially in case of wet and muddy gravel, or gravel with clay, etc., adhering thereto, before the same are delivered to the first screen. For this purpose, the frusto-conical and hollow member J is provided, being similar in shape to the said screens and disposed in position to receive the materials from the spout or hopper K in the manner shown more clearly in Fig. 2. The interior of said member J is provided with longitudinally disposed ribs of angle iron j, and the smaller end of said member is provided internally with elevating paddles or blades j^1, which latter elevate the materials and drop the same into the discharge spout j^2, which extends into the smaller end of said member. The wet and muddy materials are churned or agitated by the said member J to thoroughly pulverize and mix the finer particles thereof, to grind the same up and leave the gravel free and clear, whereby the clay or other substance is separated from the gravel. Then the entire mass is discharged by the spout j^2 into the first screen B, and from this on the operation is the same as that previously described. During the operation the member J is flushed with water, and the gravel is thus washed clear. Thus the member J serves as a scrubber. Of course water is used throughout the process, in any suitable manner and it is to afford full opportunity for such use that the screens are spaced apart.

From the foregoing it will be seen that the screens are spaced apart or separated a substantial distance, to provide a free and unobstructed space between the adjacent ends thereof to afford ready access to the small ends should clogging occur, and also that both ends of the screens are open and unobstructed, especially the small ends, so that any portion of the material which does not pass through the screen-perforations will be discharged from the open end as freely as when passing through the screen. It will also be observed that the upper ends of the discharge spouts g are flared or inclined away from the screens, which also facilitates a free discharge from the screens and avoids any tendency of clogging at this point. By thus providing means for allowing a free flow of the material through the screens, the full advantage of tapered type of screen is secured, that is, every portion of the screens from the large to the small end does its proportionate screening. In other words, when the charge is delivered into the large end, there is a greater proportion of fine material; consequently the large end furnishes the greatest screening surface, and as the material gradually travels toward the small end, the proportion of fine material becomes smaller and the screening surface also decreases. It will be further observed that when the screens are divided longitudinally to form removable sections, the perforations in each section extend entirely to their contacting edges, so that the full screening capacity of the entire circumference of the screen is obtained excepting only at the small portions where the small clips x are secured.

By my invention the cost of construction and maintenance is greatly reduced, and considerable saving is accomplished in this respect. Furthermore, it will be seen that the materials are not required to pass out of the screens at the same ends to which they are delivered—that is to say, the entire mass or bulk of the materials is delivered at the large end of the screen, and by reason of the construction and mode of operation those portions or sizes of the materials which do not pass through the openings of the screen are not required to flow back and pass out of the said larger end thereof. To the contrary, and as explained, the materials which do not pass through the openings of the screen are permitted to flow freely out and onward through the small end of the screen, and consequently the work is expedited and the desired results are obtained in a practical manner and with an apparatus having a novel and more satisfactory construction. The materials, it will be seen, are delivered to the large end of the screen, and are not delivered by the spout to the small end of the screen, which latter was the practice with apparatus of this kind in which frusto-conical screens are employed having their forward or small ends closed. Consequently, and with my improved construction and arrangement, the chute by which the bulk of the materials is delivered to the screen does not necessarily extend into the screen, but simply to the mouth or larger end thereof in the manner explained. In this way, and by this method, I increase the capacity and efficiency of a screening apparatus of this character. Thus the lower ends of the screens are all free and clear and unobstructed and the screens are spaced apart in a manner that facilitates the general screening and washing operation, and especially the use of water wherever desired; for, as previously stated, water is used throughout the process in any suitable or well known manner, to wash the gravel, as it is highly important that the sand and mud be prevented from discharging from the ends of the screens with the gravel or other oversized material which is too large to pass through the perforations. An important object of my invention is, therefore, to provide a single shaft apparatus which will obviate the necessity of a separate shaft for each screen without interfering with the

use of water and the handling of the gravel in the desired manner, as will be readily understood by those familiar with the commercial methods of screening and washing gravel.

What I claim as my invention is:

1. An apparatus for washing and separating sand and gravel, comprising a frame, an inclined shaft mounted thereon, a plurality of tapered screens mounted on said shaft in alinement with each other, each screen being positioned on said shaft with its lower side inclining downwardly toward said small end which is free and open and also unobstructed from the exterior, whereby the oversized material in said screens is caused to travel continuously by gravitation in one direction only toward and through said free and open small ends, means for delivering material to the upper screen, a chute beneath each screen so arranged that a chute extends from the large end of one screen to the large end of the screen next below, a discharge spout at the small end of each screen, and means for driving said shaft.

2. An apparatus for washing and separating sand and gravel, comprising a frame, an inclined shaft mounted thereon, a plurality of tapered screens mounted on said shaft in alinement with each other, each screen being positioned on said shaft with its lower side inclining downwardly toward said small end which is free and open, whereby the oversized material in said screens is caused to travel continuously by gravitation in one direction only toward and through said free and open small ends, said screens being spaced apart a considerable distance and unobstructed between their adjacent ends to afford a ready access to the entire circumference of said small ends, means for delivering material to the upper screen, a chute beneath each screen so arranged that a chute extends from the large end of one screen to the large end of the screen next below, a discharge spout at the small end of each screen, and means for driving said shaft.

3. An apparatus for washing and separating sand and gravel, comprising a frame, an inclined shaft mounted thereon, a plurality of tapered screens mounted on said shaft in alinement with each other, each screen being positioned on said shaft with its lower side inclining downwardly toward said small end which is free and open, whereby the oversized material in said screens is caused to travel continuously by gravitation in one direction only toward and through said free and open small ends, said screens being spaced apart a considerable distance and unobstructed between their adjacent ends to afford a ready access to the entire circumference of said small ends and also demountable independently of each other and the mountings of said inclined shaft, means for delivering material to the upper screen, a chute beneath each screen so arranged that a chute extends from the large end of one screen to the large end of the screen next below, a discharge spout at the small end of each screen, and means for driving said shaft.

4. In an apparatus of the character described, a shaft, spiders mounted on said shaft, and a tapered screen circular in cross-section divided longitudinally into sections and supported on said spiders, each of said sections being perforated to its longitudinal edges to provide screening portions over the entire area of said sections including margins adjacent the meeting edges thereof, and clips for securing the meeting edges of the sections together and retaining said sections in assembled position, said clips being secured to the outside of said sections adjacent said longitudinal edges, whereby the clips of one section will register and coöperate with the like clips on the adjacent section.

5. In an apparatus of the character described, a shaft, spiders mounted on said shaft, and a tapered screen circular in cross-section and divided longitudinally into sections supported by said spiders, each of said sections being perforated to its longitudinal edges to provide screening portions over the entire area of said sections including the margins adjacent the meeting edges thereof, and means secured upon the outside of said sections adjacent said meeting edges for securing said sections together around said spiders.

6. In an apparatus of the character described, a shaft, spiders mounted on said shaft, and a tapered screen circular in cross-section supported by said spiders and divided longitudinally to facilitate their removal from said spiders, said screen being perforated to its longitudinal edges to provide screening portions over its entire area including the margins adjacent the meeting edges thereof, and means for securing said meeting edges together and the screen around said spiders.

7. An apparatus for washing and separating sand and gravel, comprising a frame, an inclined shaft mounted thereon, a screen circular in cross-section mounted on said shaft to discharge over-sized material from its small end, and means for delivering material to said screen embodying a conical member mounted on said inclined shaft in alinement with and spaced from said screen and which discharges directly from its small end a regulated quantity of material into the screen.

8. An apparatus for washing and separating sand and gravel, comprising a frame,

an inclined shaft mounted thereon, a screen circular in cross-section mounted on said shaft to discharge oversized material from its small end, and means for delivering material to said screen embodying a conical, imperforate member mounted on said inclined shaft in alinement with and spaced from said screen and which discharges directly from its small end a regulated quantity of material into the screen.

9. An apparatus for washing and separating sand and gravel, comprising a frame, an inclined shaft mounted thereon, a screen circular in cross-section mounted on said shaft to discharge oversized material from its small end, and means for delivering material to said screen embodying a conical, imperforate member mounted on said inclined shaft in alinement with and spaced from said screen and which discharges directly from its small end a regulated quantity of material into the screen, said screen and conical member being divided longitudinally to facilitate their removal from said shaft independently of each other and of the shaft mountings.

Signed by me at Chicago, Cook county, Illinois, this 19th day of August, 1912.

RAYMOND W. DULL.

Witnesses:
J. NORBY,
GEO. F. SCHMIDT.