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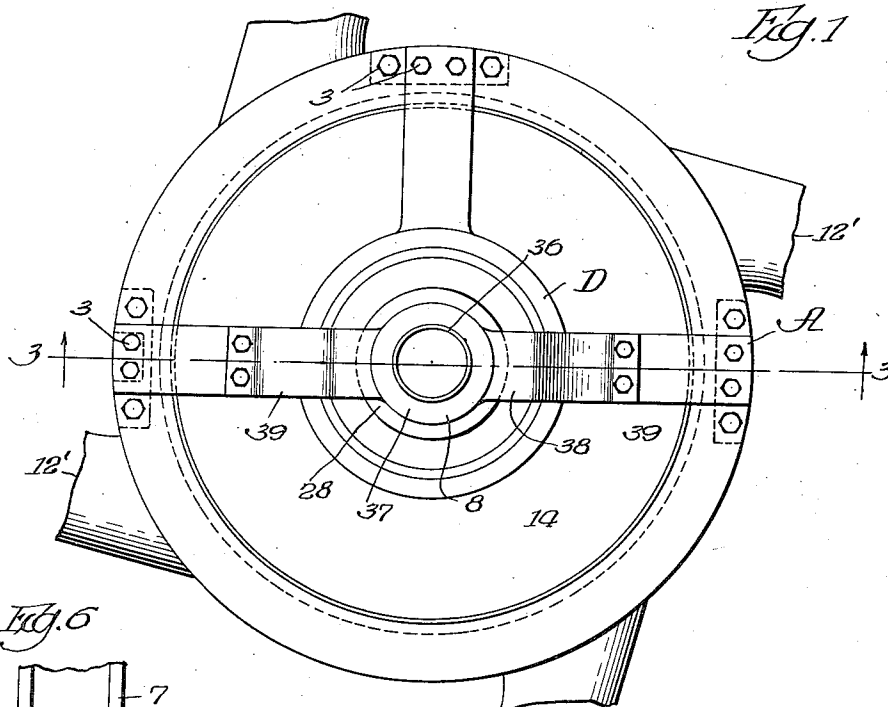
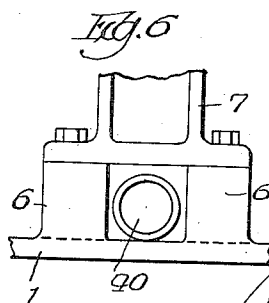
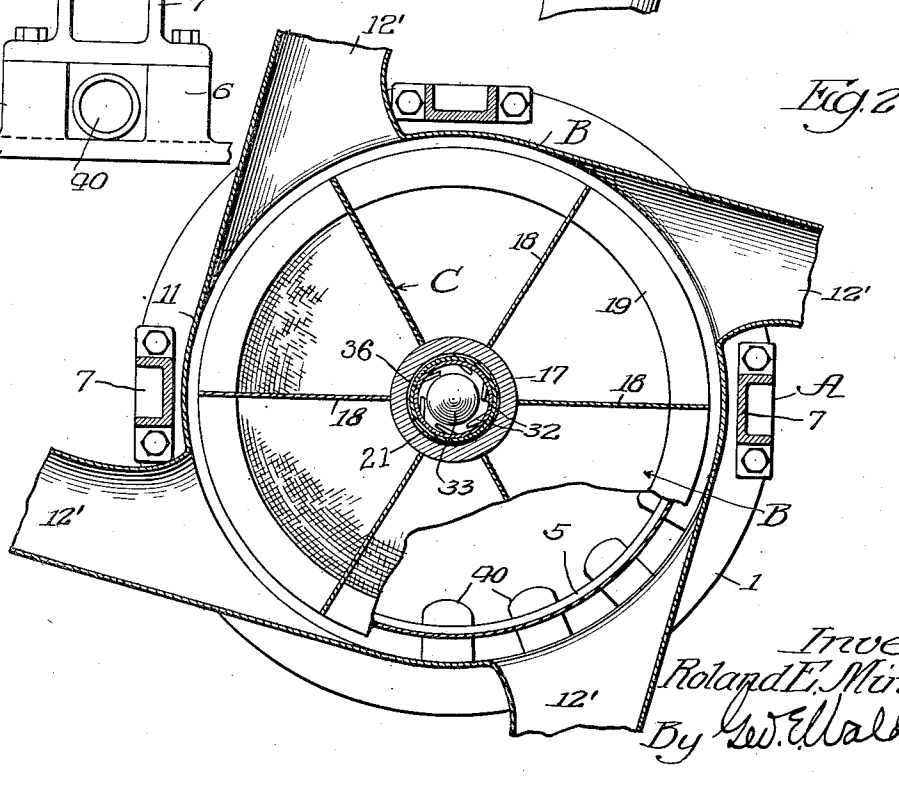
R. E. MINOGUE

2,012,726

SCREEN

Filed June 15, 1931

2 Sheets-Sheet 1



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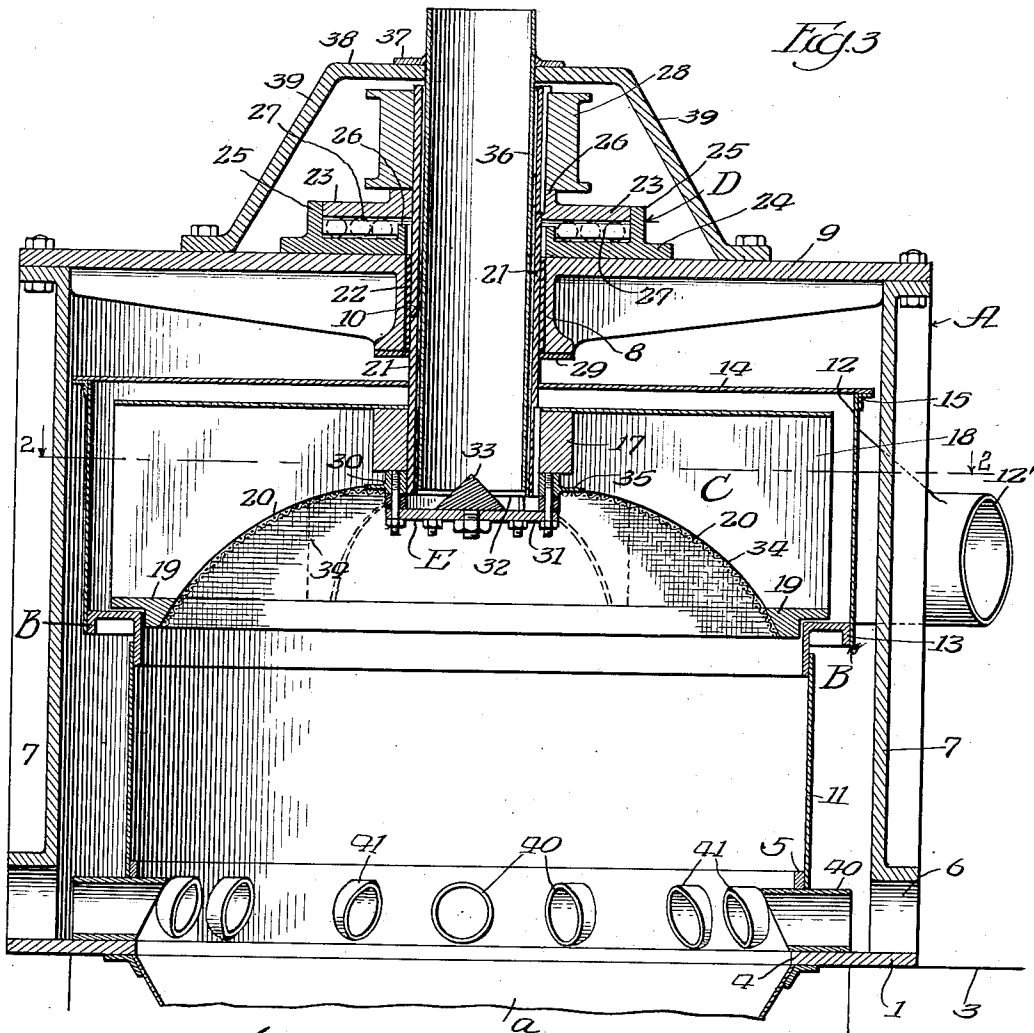
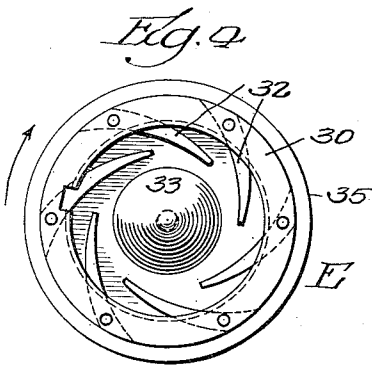
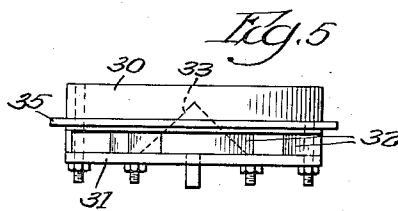
R. E. MINOGUE

2,012,726

SCREEN

Filed June 15, 1931

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,012,726

SCREEN

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ware

Application June 15, 1931, Serial No. 544,378

9 Claims. (Cl. 209—279)

This invention relates to improvements in screens particularly designed and adapted for grading crushed cement clinker and similar products, either wet or dry.

The object of the invention is to provide a screen for the purpose specified, which will be simple in construction, strong and durable, in which parts subject to wear will be readily accessible for repair or replacement, and which will be highly effective in operation.

To effect the objects of the invention, my improved screen comprises the various features, combinations of features and details of construction hereinafter described and claimed.

In the accompanying drawings, in which the invention is fully illustrated,

Figure 1 is a top-plan view of a screen embodying my invention and improvements.

Figure 2 is a sectional plan view substantially on the line 2—2 of Fig. 3.

Figure 3 is a sectional elevation substantially on the line 3—3 of Fig. 1.

Figures 4 and 5 are detached top-plan and side views, respectively, on an enlarged scale, of the impeller; and

Figure 6 is a fragmentary view illustrating a structural detail.

Describing the invention with particular reference to the drawings, the operative parts of the machine are mounted upon a suitable frame designated as a whole A, which comprises an annular base plate 1 adapted to rest on a suitable foundation, the line of which is indicated at 3, and which is provided with a central hole or opening 4, surrounding which is an upstanding flange 5.

Supported in upright position on lugs 6, preferably cast integral with said base ring 1 are columns 7 made, as shown, in the form of channels, the upper ends of which are connected by a spider comprising a hollow hub portion 8, and arms 9, which diverge radially from said hub portion. For reasons presently apparent, the hub 8 is provided with a bearing 10.

As shown, there are three spider arms 9 spaced approximately ninety degrees apart and arranged in such relation that the front of the apparatus will be unobstructed and freely accessible.

The screen also comprises a casing designated as a whole B, comprising a lower section 11 secured to the upper end of the flange 5 on the base plate 1, and an upper section 12 connected to and supported upon the lower casing section 11 by means of what, for purposes of convenient reference, may be designated a casing ring 13.

The casing sections 11 and 12 will preferably be formed from suitable sheet metal and the casing ring will be a steel casting.

To provide access to the interior of the casing B, both casing sections 11 and 12 comprise separate, removable portions at their front sides, thus providing access to the interior of said casing for purposes of installation, repair and replacement, when necessary.

The top of the upper casing section 12 is closed by a plate 14, also made of sheet metal, which is secured to the upper edge of said casing section by means of an annular member 15 of angular cross-section rigidly connected to both the side and top walls of said casing section by riveting, spot-welding or otherwise.

Rotatably mounted in the upper casing section 12, is a fan designated as a whole C, said fan comprising a hollow hub portion 17, secured to and extending substantially radially from which are vanes 18, which are rigidly connected adjacent their lower, outer edges by a ring 19 to which they are rigidly secured in any suitable manner.

For reasons presently apparent, the lower edges of the fan vanes 18 are upwardly curved, as shown at 20. As shown, also, the top of the fan C is closed by a sheet metal plate, while the bottom of the fan is in open communication with the lower casing section 11.

The upper casing section 12 is provided with discharge connections 12', shown as arranged substantially tangentially to the side walls of said casing section, and which are adapted for making pipe connections to said fan casing for delivering screened material therefrom to storage bins, neither said delivery pipes nor bins being shown. As shown, also, a hopper a is secured in the opening 4 in the base plate 1, with its upper end in open communication with the interior of the lower casing section 11.

The fan C is secured to the lower end of a hollow shaft 21 rotatably mounted in the bearing 10, which, as shown, is formed directly in a bronze bushing 22 removably secured in the spider hub 8, thus providing for renewing said bushing when it becomes worn.

The weight of the hollow shaft 21 and parts carried thereby, including the fan C, is supported by a thrust collar 23 which, preferably, is threaded and keyed to said hollow shaft and which, as shown, forms part of an anti-friction bearing, designated as a whole D. As shown, said bearing is indicated diagrammatically only, as my invention contemplates the use of any suit-

able form of bearing such as may be purchased commercially or supplied by skilled mechanics without the exercise of invention. In order to increase the life of the bearing D, the base member 24 thereof comprises upstanding spaced flanges 25 and 26 which define an annular space 27 designed and adapted to contain oil or grease, in which the anti-friction member of the bearing is positioned, the top of said space 27 being closed by the thrust collar 23 which, as shown, forms part of said bearing.

Secured to the hollow shaft 21 above the thrust bearing D is a driving pulley 28, which also, preferably, is threaded and keyed to said hollow shaft and which, as installed for use, will bear against a centrally arranged hub portion of the thrust collar 23, thereby reinforcing and strengthening the engagement of said thrust collar 23 with said hollow shaft 22 to withstand the stresses to which it will be subjected in use.

As shown, a collar 29 is secured to the lower end of the spider hub 8, which will operate to confine the bearing bushing 22 in the hole or opening formed to receive it in said hub.

Secured to the lower end of the hollow shaft 21 is what, for purposes of convenient reference, may be designated an impeller, indicated as a whole E, said impeller comprising a collar 30 secured to the lower end of the hollow shaft 21, and a plate 31 supported below and in spaced relation to the collar 30 by means of vanes 32 which, as shown, are secured to said plate and collar by means of screws, studs or other suitable means. The vanes 32 are arranged in symmetrical series around the impeller, their inner ends terminating in sharp points, as shown, see Fig. 4, the relation being such that an unobstructed space will be defined at the center of the plate 31 by the inner ends of said vanes, and the advancing sides of said vanes being outwardly and rearwardly curved, as shown, relative to the direction of rotation of the shaft 21—and thus of the impeller E, in operation.

In what I now consider the preferable relation, the impeller comprises eight vanes 32, but the number thereof may be varied as may be desired, within the scope and contemplation of my invention.

Preferably, also, the impeller E comprises a conical projection 33 on the upper face of the plate 31 arranged centrally of the shaft 21 within the space defined by the inner ends of the impeller vanes 32.

The screen proper 34 is made of suitable screen material, preferably woven wire fabric of suitable mesh, and is shaped to conform to the curved lower edges of the fan vanes 18 to which it is secured, its peripheral edge being secured to the fan ring 19 and its inner edge to a collar 35 forming part of the impeller E.

In the preferable construction shown, crushed material to be screened is delivered to the impeller E through a feed pipe 36 supported in fixed position within the hollow shaft 21 in such relation that its lower end will terminate only slightly above the lower end of said hollow shaft, and its upper end extending somewhat above the upper end of said shaft. As shown, said feed pipe 36 is supported by means of a collar 37, brazed, welded or otherwise secured thereto and which is bolted or otherwise secured to a raised support 38, comprising supporting legs 39 bolted or otherwise secured to oppositely disposed spider arms 9.

In operation, rotation will be imparted to the

shaft 21 and with it to the fan C and the impeller E by means of a belt, not shown, applied to the pulley 28 which connects the same with a suitable source of power, not shown, what I now consider a preferable relation being such that said shaft 21 will be driven at a speed of approximately 600 to 1,000 R. P. M.

In operation, air is admitted to the casing B through holes formed in the wall of said casing, preferably adjacent its lower end, whence it passes upwards through the lower casing section 11 into the section 12, in which the fan C is mounted, through the screen proper 34 and is discharged through the discharge connections 12'. As shown, said air admission openings are formed by short pipe sections 40 secured in holes formed in the flange 5 on the base ring 1. To prevent relatively coarse, heavy material rejected by the screen 34 from passing into the open ends of said pipes, instead of downwards into the hopper α , the top sides of the pipe sections 40, preferably are extended inwardly as shown at 41.

The operation of the screen is as follows, the description being directed to its use for grading crushed cement clinker into fines and coarse material or rejects:—The power for driving the fan shaft 21, with the fan C and impeller E carried thereby, having been applied and said shaft having attained a normal rate of rotation, crushed material to be screened is delivered into the upper end of the feed pipe 36, through which it descends by gravity to the impeller E.

As the crushed material passes out the lower end of the feed pipe 36, the cone 33 on the impeller will operate, in an obvious manner, to cause said material to flow outwardly into the spaces between the inner ends of the impeller vanes 32, whereupon the centrifugal action of the impeller will discharge said material outwardly into the fan chamber 12 below and closely adjacent to the underside of the screen proper 34 at what may be described as the vertical apex of said screen, whereby the current of air created by the fan C, passing upwardly through the casing B and the screen proper 34, supplemented by the centrifugal action of the screen will operate to project said crushed material outwardly against the curved undersurface of said screen proper 34, the fines passing through said screen and being discharged from the casing B through the discharge connections 12' and thence to the storage bins, not shown, while the rejects, consisting of the relatively coarse material will fall or be thrown downwardly by gravity into the hopper α , from which it is returned to the crusher to be reground and again screened, this cycle continuing throughout the operation of the screen.

Among important advantages inherent to screens embodying my invention and improvements are the following:

1. Due to the curvature of the screen proper and to the fact that the material is discharged tangentially outwardly from the impeller onto the concave side of the screen, the material impinges upon said screen with a minimum of impact, thus reducing wear on the screen proper to a minimum.

2. Due to the high velocity of the screen proper, larger and heavier particles of material striking said screen will be thrown downwards thereby into the lower casing section and will strike said screen proper but once, thus greatly reducing its abrading action and the wear on the screen.

3. Material discharged from the impeller against the screen proper is immediately spread out and opened up, thus permitting the most effi-

cient conjoint action of the screen proper and air current in separating the fines.

4. The fact that the material is discharged across the openings in the screen proper renders it practicable to produce effective separation of the fines by the use of a screen proper of coarser and heavier fabric than otherwise would be possible.

5. Freedom from clogging and large capacity; and

6. Adaptability for screening either wet or dry materials.

I claim:

1. In screening apparatus, the combination of a frame, a hollow shaft mounted in a bearing therein with its axis disposed substantially vertical, a fan secured to said shaft, means for rotating said shaft and said fan, a screen secured to the lower edges of the vanes of the fan, a casing which encloses said fan and said screen provided with a discharge connection, said screen being positioned in an opening defined by the fan casing and fitting the same with operating clearance, an impeller secured to the shaft below the inner portion of the screen and above the outer portion of the screen for projecting material delivered into the fan casing through the hollow fan shaft, outwardly across and at a sharply acute angle against the underside of the screen proper.

2. Screening apparatus as specified in claim 1, the impeller of which comprises a plate supported in spaced relation to the lower end of said shaft, and vanes the leading sides of which are outwardly and rearwardly curved.

3. Screening apparatus as specified in claim 1, the impeller of which comprises a plate supported in spaced relation to the lower end of said shaft, and vanes the leading sides of which are outwardly and rearwardly curved and the inner ends of which terminate at a distance from the axis of said plate.

4. Screening apparatus as specified in claim 1, the impeller of which comprises a plate supported in spaced relation to the lower end of said shaft, and vanes the leading sides of which are outwardly and rearwardly curved and the inner ends of which are sharp and terminate at a distance from the axis of said plate.

5. Screening apparatus as specified in claim 1, the impeller of which comprises a plate supported in spaced relation to the lower end of said shaft, vanes the leading sides of which are outwardly and rearwardly curved and the inner ends of which terminate short of the axis of the plate, and a cone on the inner surface of said plate.

6. Screening apparatus as specified in claim 1, the impeller of which is arranged to discharge material to be screened into the fan casing by centrifugal action, the screen proper being substantially umbrella-shaped and the edges of the

fan vanes to which said screen proper is secured being curved to conform to the curvature of said screen proper, the relation being such that the discharge opening of the impeller is positioned approximately at the apex of the screen.

7. Screening apparatus as specified in claim 1, the frame of which comprises an annular base plate, an upright flange which surrounds the opening therein, columns supported on said base plate, a spider comprising divergent arms secured to and which rigidly connect said columns, a casing secured to the flange of the base plate comprising a lower section provided with air admission openings adjacent its lower end, and an upper section in which the fan is rotatably mounted provided with a discharge connection, a plate which closes the top of said casing, and a reject hopper secured to the base plate of the machine with its receiving end in open communication with the opening in said base plate.

8. Screening apparatus as specified in claim 1, the frame of which comprises an annular base plate, an upright flange which surrounds the opening therein, columns supported on said base plate, a spider comprising divergent arms secured to and which rigidly connect said columns, a casing secured to the flange of the base plate comprising a lower section provided with air admission openings adjacent its lower end, and an upper section in which the fan is rotatably mounted provided with a discharge connection, a plate which closes the top of said casing, and a reject hopper secured to the base plate of the machine with its receiving end in open communication with the opening in said base plate, the area in horizontal section of the lower casing section being much greater than the aggregate areas of the air admission and the discharge connection, respectively, thereby correspondingly reducing the air velocity in said lower casing section and its sustaining force as a vehicle.

9. Screening apparatus as specified in claim 1, the frame of which comprises an annular base plate, an upright flange which surrounds the opening therein, columns supported on said base plate, a spider comprising divergent arms secured to and which rigidly connect said columns, a casing secured to the flange of the base plate comprising a lower section provided with air admission openings adjacent its lower end, and an upper section in which the fan is rotatably mounted provided with a discharge connection, the columns and spider arms of the frame being arranged on a segment of the base approximating 180 degrees, the remaining segment of the machine being unobstructed and the corresponding portion of the casing being detachable to provide access to the interior thereof.

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