

Aug. 20, 1940.

C. J. STEINBARGER
FILLER FOR JORDAN ENGINES

2,212,082

Filed Aug. 1, 1938

Fig. 1.

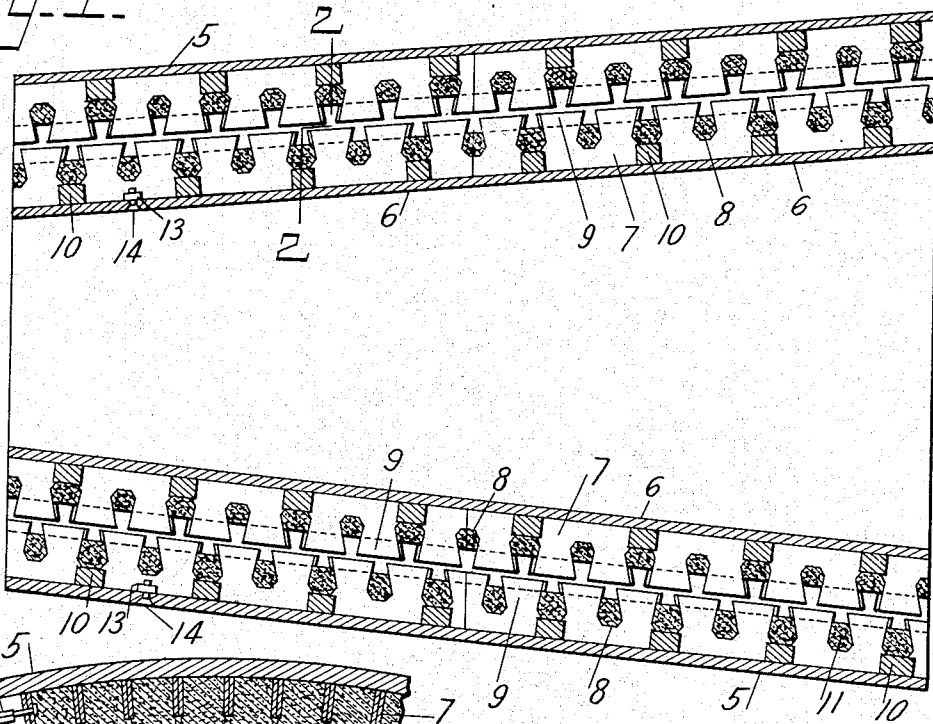


Fig. 2

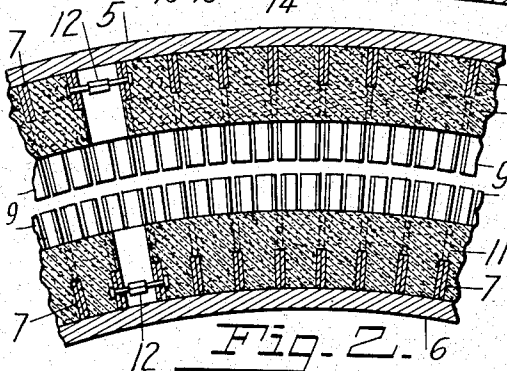


Fig. 3.

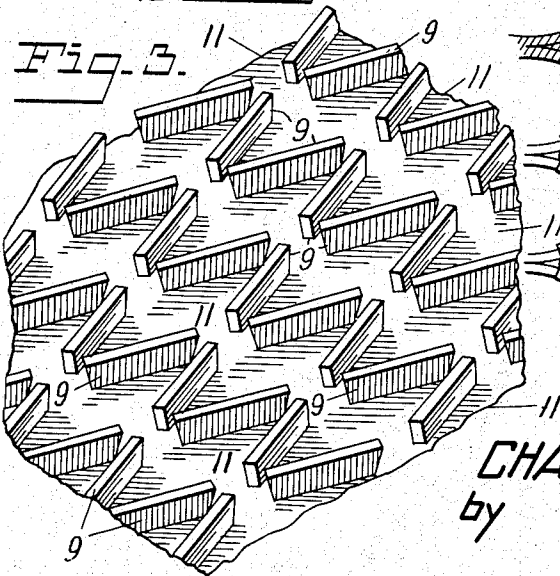
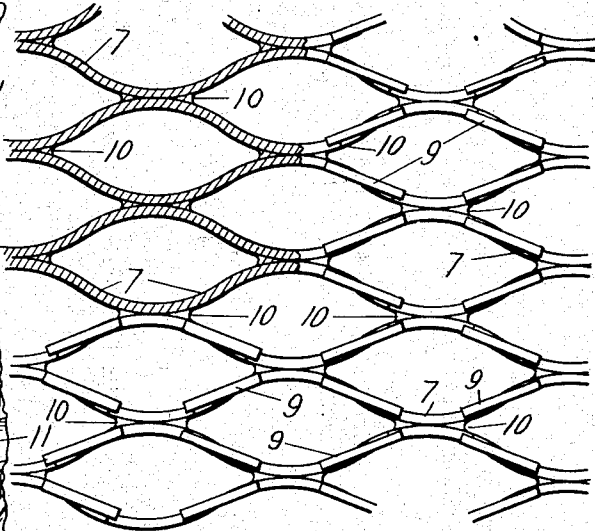


Fig. 4



INVENTOR
CHARLES J. STEINBARGER

by

James Reid.

his ATTORNEY.

UNITED STATES PATENT OFFICE

2,212,082

FILLER FOR JORDAN ENGINES

Charles J. Steinbarger, Dayton, Ohio, assignor to
Simonds Worden White Company, Dayton,
Ohio, a corporation of Ohio

Application August 1, 1938, Serial No. 222,379

12 Claims. (Cl. 92—27)

This invention relates to a filler for a Jordan engine, such as is commonly used for refining pulp in paper making operations. As is well known the Jordan engine comprises a frusto-conical shell which is usually stationary and within which is mounted a rotatable frusto-conical core or plug. The shell and plug have cooperating surfaces which act on and refine the pulp or "stuff", which is introduced between the two members at the smaller ends thereof and travels lengthwise through the engine. The working surface of one or both members of the Jordan may be provided by an element or elements which are separate from and removably attached to the shell or plug as the case may be, thus enabling either of said elements to be readily removed from its supporting member and to be replaced or to have substituted therefor another element having a different type of surface. Such removable elements are known as fillers and may be provided with operating surfaces of different kinds depending upon the character of the stuff to be operated upon and the extent to which the stuff is to be refined or further reduced.

One object of the invention is to provide a filler which will produce finished stuff of a fine quality.

A further object of the invention is to provide a filler of such a character that the Jordan may be operated at a higher speed than is usual, without requiring additional power; and that the time required to reduce the stuff to the desired degree of fineness will be materially reduced.

A further object of the invention is to provide a filler of such a character that the stuff will be subjected to an abrasive action as well as to the cutting or drawing and brushing action of the blades.

A further object of the invention is to provide a filler which will be simple in construction and which can be manufactured at a relatively low cost.

Other objects of the invention may appear as the device is described in detail.

In the accompanying drawing Fig. 1 is a section taken longitudinally through the shell and plug of a Jordan engine equipped with my improved filler; Fig. 2 is a transverse section of portions of the fillers for the shell and plug, taken on the line 2—2 of Fig. 1; Fig. 3 is a perspective detail of a portion of one of the fillers, which for the purpose of illustration is shown as flat in form; and Fig. 4 is a plan view of a portion of a filler with a part of the blades broken away.

In the drawing I have illustrated the filler as applied to a Jordan engine of conventional type and inasmuch as the invention resides wholly in the filler itself it is unnecessary to illustrate or described the Jordan in detail. Suffice it to say that the Jordan comprises a frusto-conical shell 5 mounted on suitable supports and usually fixed against rotation. Rotatably mounted within the shell is a frusto-conical plug 6 which may be supported in any suitable manner, as by means of a central shaft journaled in bearings arranged beyond the respective ends of the shell. The ends of the shell are provided with suitable closures having openings for the plug shaft and provided respectively with an inlet and an outlet for the stuff. The shell and plug are here shown as of such relative diameters as to provide between the same an annular space of a size sufficient to receive two fillers secured respectively to the shell and to the plug. One or both elements of the Jordan, and usually the plug, is made longitudinally adjustable so as to bring the cooperating surfaces of the two fillers into, and maintain the same in, proper operating relation one to the other. For the purpose of illustration Fig. 3 shows a portion of one of the fillers as flat but it will be understood that in practice the filler will be arcuate in form, as shown in the other figures.

My improved filler comprises a body of hard material shaped to conform to the contour of that member of the Jordan to which it is to be attached, and mounted in this body are a plurality of metallic members having relatively short parts projecting beyond the working face of the body, which is herein referred to as the outer face thereof, to provide relatively short elongate blades which are arranged to cooperate with corresponding blades of the filler on the other member of the Jordan. Preferably the outer or working surface of the body is of an abrasive character and the blades are so arranged as to provide tortuous passageways through which the stuff will travel over this abrasive surface, and to cause relatively large portions of the stuff to pass between the edges of the cooperating blades. Each filler may be formed in a single piece or unit but when the shell and plug are of substantial length it is customary to divide the filler transversely into a plurality of sections and, if desired, each section may, for convenience in manufacturing and handling, be divided longitudinally into two or more parts, segmental in cross section.

In the particular embodiment of the invention here illustrated each filler includes a plurality of

bars 7 which extend lengthwise of the filler and are preferably of a length equal to the length of the filler, or to a transverse section of the filler when the latter is divided into sections. These bars are arranged in circular series and each bar has its longitudinal edges in the plane which is substantially radial to the axis of the plug. Each bar is provided in its outer or working edge with a series of notches 8 which divide the edge portion of the bar into a series of projections or blades 9 spaced apart lengthwise of the bar, and in the form illustrated the side walls of each notch converge outwardly. The notches preferably extend inwardly beyond the longitudinal center line of the bar but have their inner ends spaced such distances from the inner edge of the bar as will provide the latter with a continuous inner edge portion of substantial width. This continuous inner edge portion of each bar has adjacent longitudinal portions thereof offset laterally in opposite directions. In the preferred construction the adjacent notched portions of the bar are bent laterally in opposite directions to impart to the continuous portion of the bar a series of curves with the notches at the centers of the respective curves and the projections or blades extending obliquely to the length of the bar. Little or no curvature is imparted to the blades and the outer edge of each blade preferably extends in substantially a straight line at an acute angle to the length of the filler. In the assembled structure the adjacent bars are arranged with oppositely bent portions in transverse alignment, so that those portions of each bar which are bent in one direction will lie close to or in contact with oppositely bent portions of a second bar on one side thereof, and those portions of the first mentioned bar which are bent in the other direction will lie close to or in contact with oppositely bent portions of a third bar on the other side of the first mentioned bar, thus forming between adjacent bars a series of recesses or cells which, in the present arrangement, are substantially rhomboidal in shape. As a result of this arrangement the blades at the forward end of each recess converge forwardly and have their forward ends spaced one from the other, and the blades at the other end of the recess, which converge rearwardly, have their rear ends spaced one from the other, thus providing restricted passageways through which stuff may enter and leave the recess. The bars may be rigidly connected one to the other in any suitable manner, as by spot welding a part or all of the contacting portions of adjacent blades, as shown at 10.

The inner portions of the bars are firmly seated in an arcuate mass of hard material 11 which is preferably introduced into the spaces between adjacent bars in a loose or plastic form and then hardened to provide a solid body for the filler. This mass of material is of such thickness that it completely embeds the continuous inner edge portions of the bars and extends through the inner portions of the notches, and due to the tapered shape of the notches the body and bars are firmly interlocked and positively held against relative movement. The outer surface of this body or mass of material is spaced inwardly from the outer edges of the projections 9 so that these projections extend beyond the working surface of the mass of material and provide relatively short elongate blades spaced one from the other, the blades on each filler being arranged to cooperate with the corresponding blades on the other filler so as to reduce the stuff with a cutting action or

with a drawing and brushing action, as may be desired. The body of the filler preferably has an abrasive surface, which may be provided by forming the body of a suitable cement and, if desired, including therein a hard granular abrasive substance.

The filler may be secured to the supporting member, within the shell or about the plug as the case may be, in any suitable manner. Preferably one or more of the longitudinal spaces between adjacent bars is left open, that is, it is not filled with the plastic material and these bars are provided with means whereby they may be moved toward or from each other to contract the filler about the plug or to expand the same into firm engagement with the shell. In the present instance the connecting means are in the form of turnbuckles 12 but obviously they may be of any suitable character. It is also desirable to rigidly secure each filler to its supporting member and this may be conveniently accomplished by welding or otherwise securing a plurality of apertured lugs 13 to a part of the bars 7 and connecting these lugs to the supporting member by means of screws or bolts 14 extending through the supporting member.

In operation the plug rotates about its longitudinal axis within the shell and the stuff to be reduced is introduced between the fillers at the smaller ends thereof and is forced under pressure lengthwise of the fillers and during its travel between the fillers the cooperating blades act on the stuff to refine the same. By the use of relatively short blades spaced one from the other the resistance offered to the rotation of the plug by the material which is engaged between the blades is materially reduced, thus permitting the plug to be rotated at a relatively high speed and this higher speed of operation compensates for the reduced length of the working surface of the blades. As the stuff moves between the forwardly converging blades it is crowded over the edges of those blades so that a relatively large amount of the stuff is engaged and acted upon by the blades, thus materially expediting the reduction of the stuff. Further, as the material is forced between the fillers under pressure it travels in direct contact with the abrasive surfaces of the fillers and the tortuous character of the passageways through which the stuff must move causes the same to move over relatively large parts of those surfaces and the abrasive action of these surfaces on the stuff serves to further reduce and refine the same, so that the finished product discharged from the Jordan is of a fine quality and is produced at a relatively high speed.

While I have shown and described one embodiment of my invention I wish it to be understood that I do not desire to be limited to the details thereof as various modifications may occur to a person skilled in the art.

Having now fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A filler for a Jordan engine comprising an arcuate mass of hardened material having an abrasive surface, and a plurality of relatively short thin blades mounted in and projecting beyond the surface of said material, said blades being spaced one from the other and each blade being angularly displaced with relation to adjacent blades to form tortuous passageways through which the stuff may flow in contact with said abrasive surface.

2. A filler for a Jordan engine comprising an

arcuate mass of hard material and a plurality of relatively short blades mounted in and projecting beyond the surface of said material and arranged in rows extending lengthwise of the axis of said arcuate mass, each blade of each row being arranged at an angle to and spaced from the adjacent blades of that row.

3. A filler for a Jordan engine comprising an arcuate mass of hardened material and a plurality of relatively short blades mounted in and projecting beyond the surface of said material, each blade extending obliquely to the length of said filler and the several blades being spaced one from the other and arranged to form tortuous passageways for the stuff over said material.

4. A filler for a Jordan engine comprising an arcuate mass of hard material and a plurality of relatively short blades mounted in and projecting beyond the surface of said material and arranged in rows extending lengthwise of the axis of said arcuate mass, each blade of each row being arranged at an angle to and spaced from the adjacent blades of that row, the corresponding blades in the several rows being arranged in lines transverse to said axis and each blade having its ends spaced from the adjacent blades.

5. A filler for a Jordan engine comprising an arcuate mass of hard material and a plurality of relatively short blades mounted in and projecting beyond the surface of said material, said blades being arranged to form a plurality of pairs of converging baffles in the path of the stuff through said engine, each pair of baffles having at that end toward which they converge an opening through which stuff may flow in contact with said mass of material.

6. A filler for a Jordan engine comprising an arcuate mass of hard material and a plurality of relatively short blades mounted in and projecting beyond the surface of said material and spaced apart both lengthwise of and transverse to the axis of said arcuate mass, said blades being arranged in pairs and the blades of each pair converging in the direction of flow of the stuff in said engine.

7. A filler for a Jordan engine comprising an arcuate mass of hardened plastic material and a plurality of metallic members embedded in said mass of material and each having a plurality of relatively short parts extending lengthwise of said filler, spaced one from the other and projecting beyond the surface of said material, the corresponding parts of adjacent members converging one toward the other and being spaced apart throughout their length.

8. A filler for a Jordan engine comprising a plurality of bars arranged side by side in circular series, each bar having adjacent portions bent laterally in opposite directions, the laterally bent portions of each bar being arranged in transverse alignment with oppositely bent portions of the adjacent bars, means for rigidly connecting

said bars one to the other, and a mass of hard material partially filling the spaces between said bars, each bar having a plurality of relatively short longitudinal parts spaced one from the other and projecting beyond the surface of said material.

9. A filler for a Jordan engine comprising a plurality of bars arranged side by side in circular series, adjacent bars having parts bent laterally into contact one with the other and having adjacent parts bent laterally in directions opposite the first mentioned parts to provide a space between them, the walls of said space extending obliquely to the length of said filler, means for rigidly connecting the contacting parts one with the other, and a mass of hard material partially filling the spaces between said bars, the oblique portions of each bar having parts projecting beyond the surface of said material to form blades and said blades being spaced one from the other lengthwise of said bar.

10. A filler for a Jordan engine comprising a plurality of bars arranged side by side in circular series, each bar having one longitudinal edge continuous and having its other longitudinal edge notched to divide the same into a series of blades, said continuous edge portion having those parts thereof at the ends of adjacent notches laterally offset in opposite directions to cause the blade between said notches to extend obliquely to the length of said bar and to space said bars one from the other, and a mass of hard material filling the spaces between the continuous edge portions of said bars, extending through the inner portions of said notches and having its outer surface spaced inwardly from the outer edges of said blades.

11. In a Jordan engine comprising a shell and a plug, cooperating fillers secured respectively to said shell and said plug and having opposed surfaces of abrasive material, each filler having a plurality of relatively short metallic projections extending beyond the surface thereof into cooperating relation to projections on the other filler, said projections being spaced one from the other and each projection extending at an angle to adjacent projections to form tortuous passageways between said abrasive surfaces.

12. A filler for a Jordan engine comprising a body of abrasive material and a plurality of relatively short blades mounted in said material with their outer edges projecting beyond the surface thereof into the path of the stuff through said engine and having at their inner ends parts underlying said material, the projecting portions of said blades being spaced apart and each projecting portion extending at an angle to the projecting portions of adjacent blades to form tortuous passageways over the surface of said abrasive material.

CHARLES J. STEINBARGER.