

July 12, 1932.

J. JOHNSON

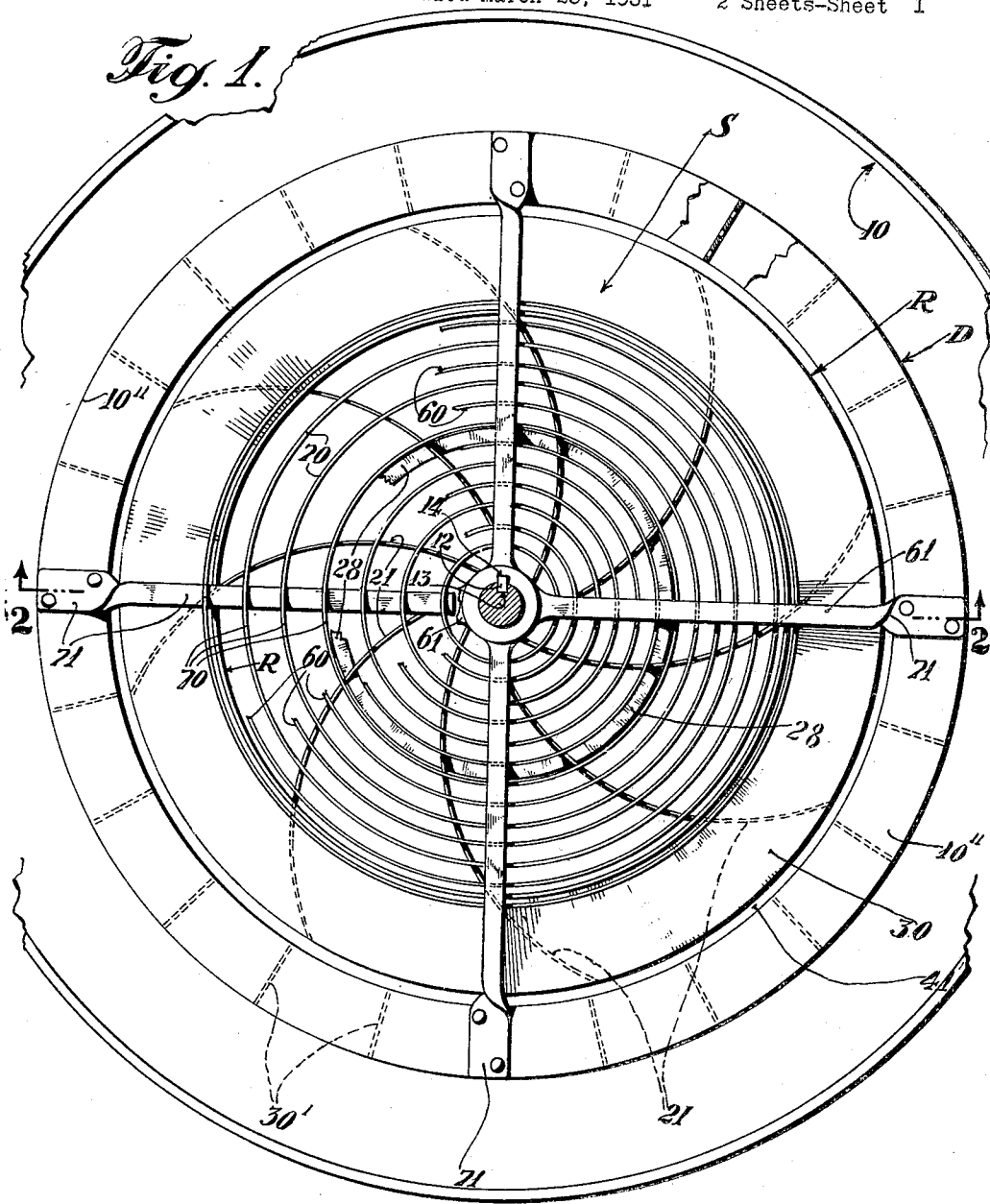
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TURBINE BLENDER AND THE LIKE

Filed March 23, 1931

2 Sheets-Sheet 1

Fig. 1.



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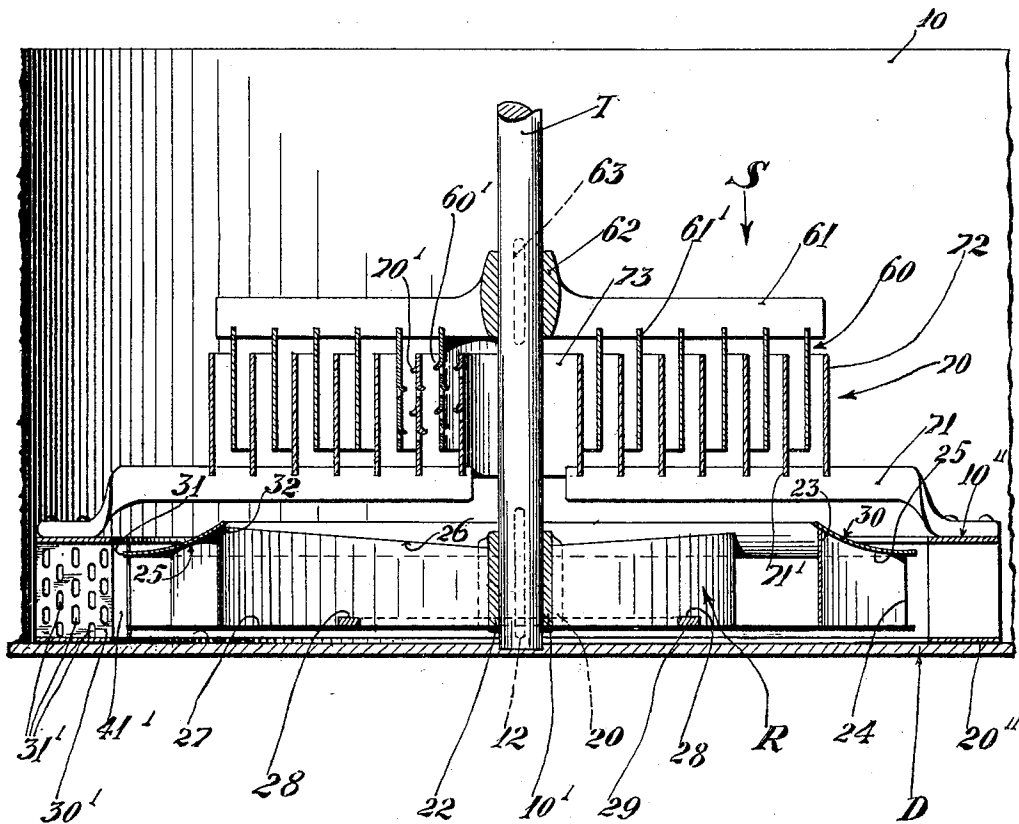
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2 Sheets-Sheet 2

Fig. 2.



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TURBINE BLENDER AND THE LIKE

Application filed March 23, 1931. Serial No. 524,631.

My present invention relates to apparatus for blending solid substances with liquids, particularly in the presence of liquids intended to dissolve the same more conveniently in a shredded or disintegrated condition and aims to devise apparatus of the general character specified which is simple in construction, which may be readily and economically fabricated and assembled, and which conducts the desired shredding and blending action and the subsequent solvent action in a highly efficient and satisfactory manner. Other objects and advantages of the present invention, particularly as exemplified in the aforesaid illustrative embodiment of the same, will in part be pointed out in detail hereinafter and will in part be obvious to those skilled in the art to which the present invention relates.

In the accompanying specification I shall describe and in the annexed drawings show an illustrative embodiment of the present invention. It is, however, to be clearly understood that my invention is not limited to the specific embodiment thereof herein shown and described for purposes of illustration only.

Referring to the drawings, in which I have shown the aforesaid illustrative embodiment of the present invention:

Fig. 1 is a top plan view of such embodiment;

Fig. 2 is a cross sectional view of the same taken along line 2—2 of Fig. 1 of the drawings.

Referring now to the aforesaid illustrative embodiment of the present invention, and with particular reference to the drawings illustrating the same, 10 indicates a tank or other suitable container in which the operative parts of the aforesaid illustrative embodiment of the present invention may be conveniently contained for their successful operation. The tank 10 contains the operative apparatus which may be broadly designated as comprising the rotor R, the deflector D and the shredding means generally designated by reference character S.

The rotor R, which is carried by the shaft T which is in turn driven by a suitable motor

or other source of power, not here deemed necessary to be shown, is preferably of a construction which adapts it readily to receive the shredded or disintegrated material coming from the shredder or disintegrator S so as to initiate the dissolving action in a most efficient manner, the solvent action being further facilitated by the functional relation between the rotor R and the deflector D.

For this purpose the rotor R may, for example, comprise the following construction. 10' indicates an inner supporting ring which is keyed or otherwise suitably attached to the shaft T which may be rotated from any suitable source of power not here deemed necessary to be shown. For this purpose I may, for example, employ the key 12 which lies between the keyway 13 of shaft T and the keyway 14 of the inner supporting ring 10'.

The inner supporting ring 10' is preferably slotted, as at 20 to receive the blades here generally designated by reference character 21. While the blades may have various shapes and may differ in minor details, while still remaining within the scope of the present invention, I prefer that they shall have somewhat the form shown in the drawings in which each blade 21 is of general curvilinear shape. The shape of the blank from which each of the blades may be made may readily be determined from the form of the blades, as illustrated in Figs. 1 and 2 of the drawings.

It will be noted that the blank, no less than the blade, increases more or less continuously and more or less rectilinearly in width from its inner edge 22 to a point 23 not far removed from its outer edge 24 where the width diminishes more or less curvilinearly until the outer edge 24 is reached. From the point 23 referred to towards the outer edge 24, the top edge 25 is convexly curved, while from the point 23 referred to towards the inner edge 22 the top edge 26 is substantially straight or rectilinear. I prefer also that the bottom edge 27 of each of the blades 21 shall be substantially straight or rectilinear and shall be provided with the slot or keyway 28 for the purpose of receiving a reinforcing ring 29

which may be soldered or otherwise secured to the slots or keyways 28 of the respective rings, thus binding the structure together in a unitary rigid manner. It may here also be stated that the inner edges 22 of each of the blades 21 may be soldered in the slots 20, additional strength being given to the blades by their union with the deflector ring 30 now to be described.

As stated, the blades 21 need not have the shape just described. They may have any suitable construction, the point to be clearly kept in mind being, that irrespective of the shape of the tank and blades, the latter must not be spaced too great a distance from the bottom of the former for the reason that the bottom of the tank plays a very important part in the mixing operations of the devices of the present invention.

So, too, the tops of the blades need not be straight and they may be perforated, if desired, to increase their mixing efficiency.

The deflector ring 30 is joined to the upper edge portions 25 of each of the blades 21 between the points 23 and the outer edges 24. For this purpose the deflector ring 30 is somewhat convexly curved and is upwardly curved from its outer edge 31 to its inner edge 32 which projects somewhat above the points 23 of each of the blades 21. It may here be stated that the deflector ring 30 may be soldered to the upper edge portions 25 of each of the blades 21 or may be welded thereto. In fact, soldering, welding or other suitable fastening means may be utilized for binding the various parts of the rotor into a unitary rigid unit of sufficient mechanical strength to accurately perform the operations for which it is intended. The deflector, like the blades, may, if desired, be perforated.

Surrounding the rotor R but suitably spaced therefrom so as to permit the same to rotate within it, is the deflector D. The purpose of the deflector D is to receive the stream of partially or completely dissolved material discharged laterally by the rotor R and to complete the solution or to render the same more uniform. For this purpose the deflector D may, for example, comprise the following construction. 10'' indicates the top ring which is of general circular or annular shape. 20'' indicates the bottom ring which is preferably shaped similarly to the top ring 10''.

Positioned between the top ring 10'' and the bottom 20'' are a series of blades generally designated by reference character 30'. These blades, which may be welded, soldered or otherwise secured to the top and bottom 10'' and 20'', respectively, are preferably substantially radially disposed between the top and bottom rings 10'' and 20'' with respect to the diametrical center of such rings. Each of the blades 30' is preferably rectilinear or square in form.

I have discovered that by arranging the

blades 30' in the manner described between the rings 10'' and 20'' and by perforating the same in the manner illustrated where the perforations are indicated by reference character 31', I may greatly increase the efficiency and the speed of the mixing or melting operation which is effected by cooperation of the deflector here generally designated by reference character D with the rotor which is intended to lie within the opening 41' in the deflector D.

Cooperating with the rotor R and the deflector D is the blender already referred to and preferably comprising a plurality of stationary elements, preferably of general cylindrical form and a plurality of cooperating rotary elements, preferably also of substantially cylindrical form and preferably nested in alternate relation with the stationary similarly formed disintegrating or shredding elements. For this purpose one group of the blending elements, here designated by reference character 60, may be carried so as to rotate with the rotor R. For this purpose the elements 60 may be carried by a plurality, such as four, cross arms 61 which may form a part of or be properly secured to a sleeve or thimble 62 keyed as by the means 63 to the shaft T.

The rotary blending elements 60 are preferably of general cylindrical form and may be either made up in a single sheet pointed until the desired form if the sheet has been stamped or otherwise manipulated to provide the shredding or disintegrating points 60' on one or both faces thereof, or else the substantially cylindrical rotary disintegrating or shredding element 60 may be formed in quadreds and in that form having already been provided with the teeth or projections 60' secured to the cross arms 61.

In whichever manner the substantially cylindrical blending elements 60 are constructed, they may be secured to the cross arm 61 in any suitable manner. For example, the cross arm 61 may be provided with the grooves 61' within which the elements 60 may be secured as by soldering or else the upper edges of the element 60 may be cast into the material of which the cross arms 61 are made.

The remaining or stationary set of blending elements, here generally designated by reference character 70, may be secured to the arms 71 which are in turn secured to the top portion of the deflector D. The stationary elements 70, like the rotary elements 60, are preferably of substantially cylindrical form and may be given such form either by banding a single sheet of metal of which the particular element 70 is to be made, preferably after the same has had struck up therefrom the teeth 70', into substantially cylindrical form, or such element may be constructed of a series of quadreds suitably banded, pref-

erably after they have been provided with the teeth 70'. Also like the stationary element 60, the rotary or movable element 70 may be secured in the arms 71 preferably within the grooves 71' with which such arms are provided and within which the lower edges of the stationary element 70 may be secured, as by soldering or such lower edges may be cast into the material of which the arms 71 had been made.

The teeth 60' with which the elements 60 are provided, as well as the teeth 70' with which the elements 70 are provided, are preferably arranged in diagonal lines or in staggered relation over the sheets of metal from which they are struck. Except in the case of the outermost and innermost of the stationary elements 70, here designated by reference characters 72 and 73, which have the teeth or projections 70' only on the inner face of the one and the outer face of the other, such teeth or projections are preferably provided on both sides of the nested elements 60 and 70.

This completes the description of the aforesaid illustrative embodiment of the present invention. The manner of constructing, and assembling the device constituting such embodiment will, it is believed, be clear from the foregoing description. Likewise the manner of operating the device will be similarly clear from the foregoing description but may be briefly summarized as follows:

Assuming that it is desired to make a solution of a difficultly soluble material, for example, a fibrous material, in a solvent, such material is discharged in lump or other suitable form into the tank 10 after the rotor carried by the shaft 10 has been started into operation by starting the motor, not here deemed necessary to be shown, or other device which is adapted to impart to the rotor R the desired speed of rotation.

The material discharged in lumps over the blending device S will be caught between the teeth 60' and 70' of the rotary and stationary elements 60 and 70, respectively. There such material will be thoroughly shredded or disintegrated and in such shredded or disintegrated form within the fluid of the tank 10 discharged downwardly between the blades of the rotor R. Here the disintegrated and fluid material will be thoroughly blended and the solvent action started in an efficient manner. The mixed partially or completely dissolved blended material and fluid will be laterally discharged from the rotor R through the deflector D. Here the solvent action will be completed or, if already completed, will be rendered more uniform by the action of the perforated blades with which the deflector D is provided. It will be observed that the deflector D receives the mixed solid and fluid material laterally from the

rotor R, thus facilitating and increasing the efficiency of the solvent action.

This operation may be continued as long as desired, depending upon the amount of material to be shredded and disintegrated and ultimately dissolved, and depending also upon the difficulty attending the solution of the disintegrated or shredded material in the particular solvent employed.

This completes the description of the mode of operation of the aforesaid illustrative embodiment of the present invention. It will be noted that the device is simple in construction and may be readily and conveniently fabricated and assembled and that it is highly efficient in operation. It will be noted that by means of the device the desired blending action to facilitate solution is rendered possible in an altogether simple and efficient manner and that the solvent action itself is greatly facilitated by reason of the functional arrangement of the three main parts of the device, namely, the blending means S, the rotary stirring means R and the stationary mixing means D.

Other superiorities and advantages of the devices of the present invention, particularly as exemplified in the foregoing illustrative embodiment of the same, will readily occur to those skilled in the art to which the present invention relates.

What I claim as my invention is:

1. In an apparatus for shredding or disintegrating solid substances in the presence of a liquid, mixing means comprising a rotary mixing element and a spaced surrounding stationary mixing element, a plurality of closely spaced substantially cylindrical disintegrating elements carried by said rotary mixing element, and a plurality of cooperating substantially cylindrical disintegrating elements each interposed between a pair of said closely spaced disintegrating elements, said cooperating disintegrating elements being carried by said stationary mixing element, each of said disintegrating elements and of said cooperating disintegrating elements being provided with a plurality of teeth struck up from the material of which such disintegrating elements are formed so that each tooth is provided with an associated perforation, the teeth on one surface of the disintegrating element of one set of disintegrating elements being staggered with relation to the teeth on the opposed surface on the opposed disintegrating element of the other set of disintegrating elements.

2. In an apparatus for shredding or disintegrating solid substances in the presence of a liquid, mixing means comprising a rotary mixing element and a spaced surrounding stationary mixing element, a plurality of closely spaced disintegrating elements carried by said rotary mixing element, and a plurality of cooperating disintegrating elements each

interposed between a pair of said closely spaced disintegrating elements, each of said disintegrating elements and of said cooperating disintegrating elements being provided with a plurality of teeth struck up from the material of which such disintegrating elements are formed so that each tooth is provided with an associated perforation, the teeth on one surface of the disintegrating element of one set of disintegrating elements being staggered with relation to the teeth on the opposed surface on the opposed disintegrating element of the other set of disintegrating elements.

3. In an apparatus for shredding or disintegrating solid substances in the presence of a liquid, mixing means comprising a rotary mixing element and a spaced surrounding stationary mixing element, a plurality of closely spaced nested disintegrating elements carried by said rotary mixing element, and a plurality of cooperating nested disintegrating elements each interposed between a pair of said closely spaced disintegrating elements, said cooperating disintegrating elements being carried by said stationary mixing element, each of said disintegrating elements and of said cooperating disintegrating elements being provided with a plurality of teeth struck up from the material of which such disintegrating elements are formed so that each tooth is provided with an associated perforation, the teeth on one surface of the disintegrating element of one set of disintegrating elements being staggered with relation to the teeth on the opposed surface on the opposed disintegrating element of the other set of disintegrating elements.

4. In an apparatus for shredding or disintegrating solid substances in the presence of a liquid, mixing means comprising a rotary mixing element and a spaced surrounding stationary mixing element, a plurality of closely spaced substantially cylindrical disintegrating elements carried by said rotary mixing element, and a plurality of cooperating substantially cylindrical disintegrating elements each interposed between a pair of said closely spaced disintegrating elements, each of said disintegrating elements and of said cooperating disintegrating elements being provided with a plurality of teeth struck up from the material of which such disintegrating elements are formed so that each tooth is provided with an associated perforation, the teeth on one surface of the disintegrating element of one set of disintegrating elements being staggered with relation to the teeth on the opposed surface on the opposed disintegrating element of the other set of disintegrating elements.

5. In an apparatus for shredding or disintegrating solid substances in the presence of a liquid, mixing means comprising a rotary mixing element and a spaced surrounding sta-

tionary mixing element, a plurality of closely spaced disintegrating elements carried by said rotary mixing element, and a plurality of cooperating disintegrating elements each interposed between a pair of said closely spaced disintegrating elements, said cooperating disintegrating elements being carried by said stationary mixing element, each of said disintegrating elements and of said cooperating disintegrating elements being provided with a plurality of teeth struck up from the material of which such disintegrating elements are formed so that each tooth is provided with an associated perforation, the teeth on one surface of the disintegrating element of one set of disintegrating elements being staggered with relation to the teeth on the opposed surface on the opposed disintegrating element of the other set of disintegrating elements.

6. In an apparatus for shredding or disintegrating solid substances in the presence of a liquid, mixing means comprising a rotary mixing element and a spaced surrounding stationary mixing element, a plurality of closely spaced nested disintegrating elements carried by said rotary mixing element, and a plurality of cooperating nested disintegrating elements each interposed between a pair of said closely spaced disintegrating elements, each of said disintegrating elements and of said cooperating disintegrating elements being provided with a plurality of teeth struck up from the material of which such disintegrating elements are formed so that each tooth is provided with an associated perforation, the teeth on one surface of the disintegrating element of one set of disintegrating elements being staggered with relation to the teeth on the opposed surface on the opposed disintegrating element of the other set of disintegrating elements.

In testimony, whereof, I have signed my name to this specification this 21st day of March, 1931.

JOHN JOHNSON.