Sept. 29, 1953 E. KRUHMIN 2,653,755

EROSION RESISTING FAN WHEEL

Filed June 26, 1952

Fig. 1.

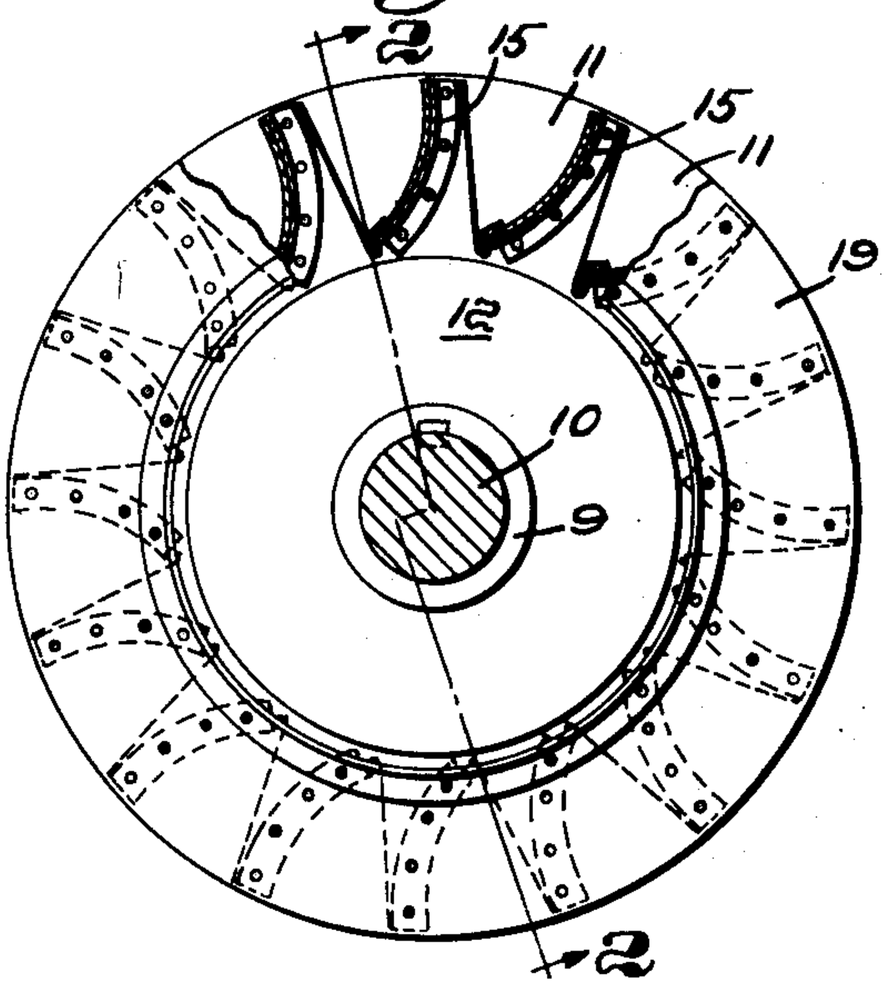


Fig. 2.

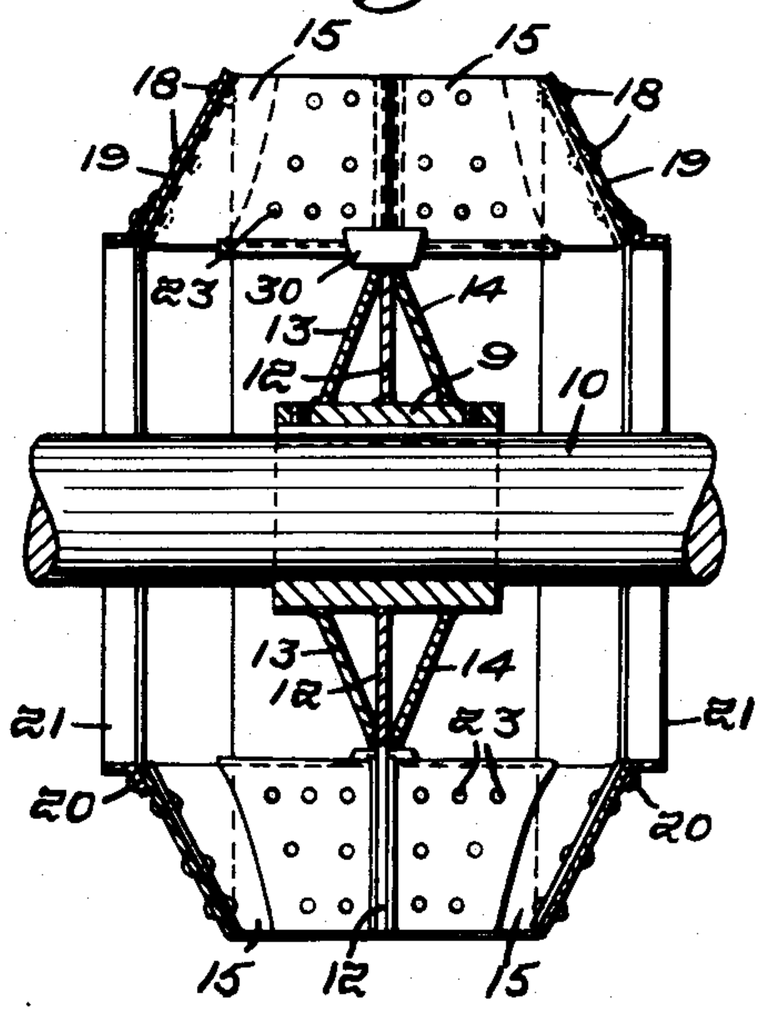


Fig. 3.

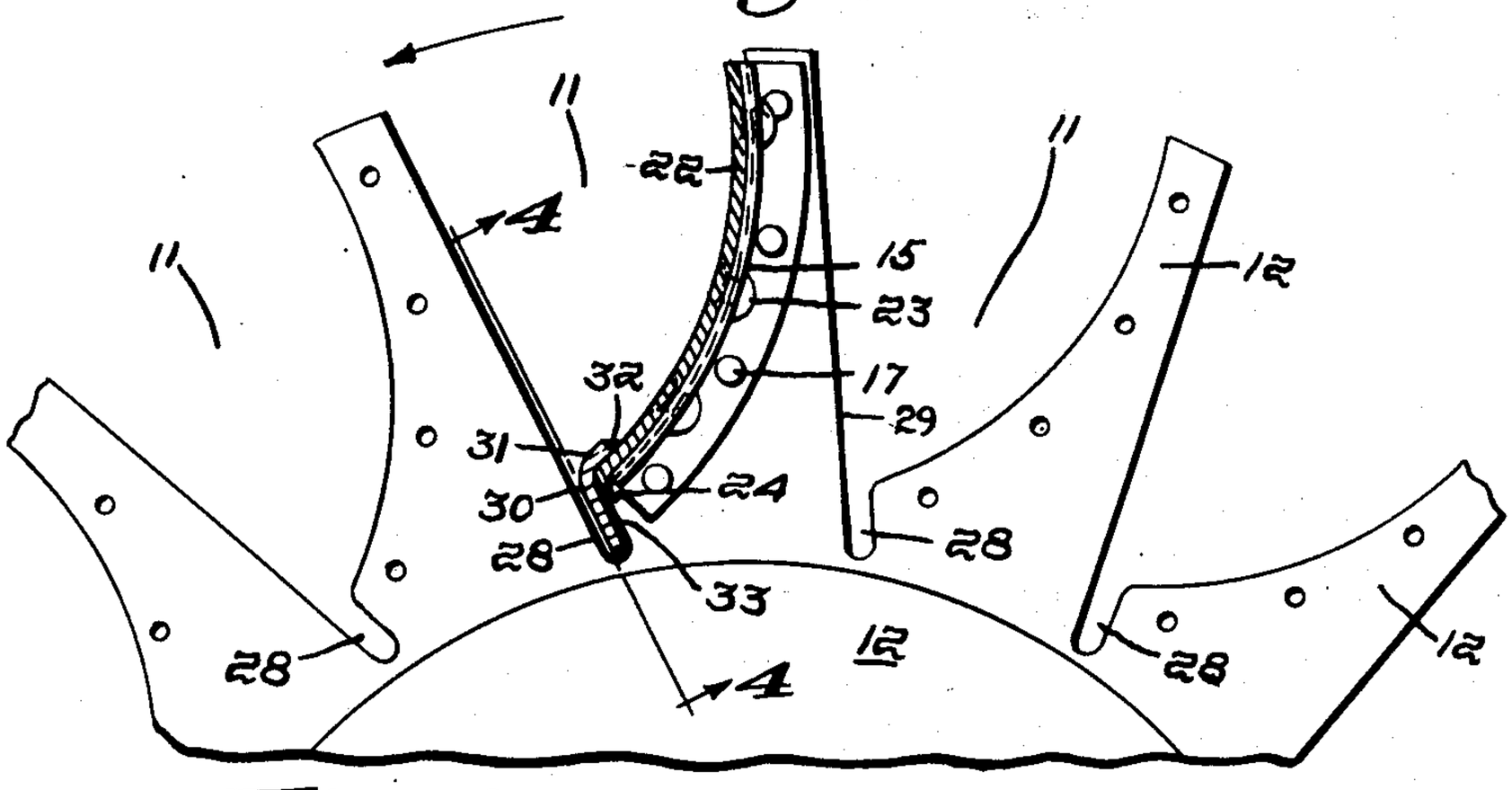
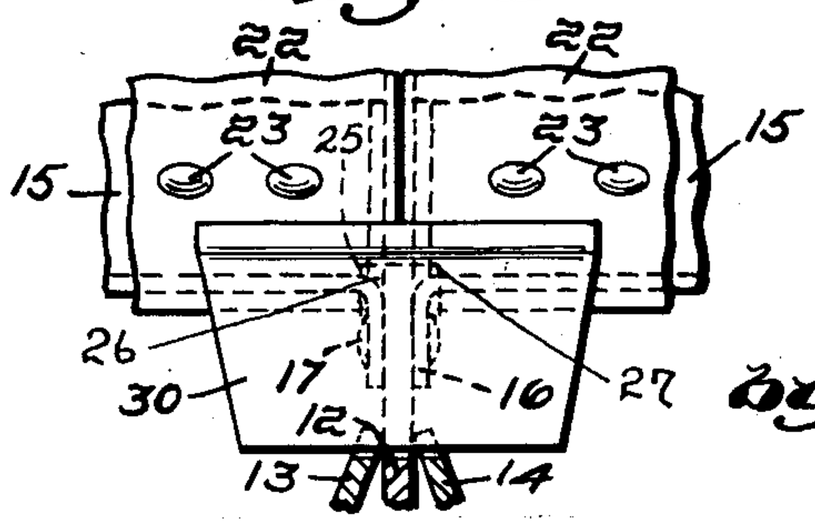


Fig. 4



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EROSION RESISTING FAN WHEEL

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3 Claims. (Cl. 230—134)

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This invention relates to centrifugal fans of the induced draft type which handle gases containing abrasive particles.

In steam power plants, induced draft fans handle large volumes of flue gases travelling at high velocities. Such flue gases contain cinders and fly ash which are abrasives and which erode the fan blades. For limiting such erosion it has been the practice to cut out portions of the center plates of the wheels of double inlet fans adjacent the advancing sides of the fan blades, and to provide liners on the fan blades which can be removed after a period of use, as disclosed in the T. B. Allardice Patent No. 2,287,853.

Such a construction has been successful in protecting the main surfaces of the fan blades, but experience has shown that severe erosion occurs in the fan blades where they are attached to the center plates, and in the liners adjacent the same areas. The blades have flanges, sections of which extend perpendicular to corresponding sections of the main blade portions, and which are riveted to the center plates. Small crevices occur between the center plates and the flanges where the latter extend outwardly from the center plates, along the total length of the flanges. Such crevices extend throughout their lengths in the same general direction as the abrasive laden gas passing through the fan wheels so that the abrasives enter the crevices and progressively widen them by eroding the adjacent portions of the center plates and the blade flanges, until the blades have to be replaced. This same action occurs where the liners pass over the center plates and the blade flanges since there are small clearance spaces between the liners, the center plates and the blade flanges, into which the abrasive material can enter. The heads of the rivets which attach the blade flanges to the center plate are also eroded.

This invention prevents such erosion by providing slots in the center plates inwardly of the inner ends of the blade flanges, and by providing in such slots wearing plates which extend across the path of the gas which would otherwise enter such crevices and clearance spaces, and which otherwise would pass over the heads of the rivets which attach the blade flanges to the center plate.

An object of this invention is to prevent abrasive particles carried by a gas through a double inlet fan wheel having a center plate, from eroding the wheel adjacent the center plate.

Another object of the invention is to prevent abrasive particles carried by a gas through a

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double inlet fan having a center plate to which the fan blades are attached, from eroding the blades and the center plate at the center plate.

Another object of the invention is to prevent in a double inlet fan wheel having a center plate to which the fan blades are attached, and having protective liners on the blades which pass across the center plate, abrasive particles carried by a gas through the wheel, from eroding the center plate, the blades and the liners adjacent where the blades are attached to the center plate.

The invention will now be described with reference to the drawing, of which:

Fig. 1 is a side elevation, with a portion broken away, of a fan wheel embodying the invention;

Fig. 2 is a sectional view along the lines 2—2 of Fig. 1;

Fig. 3 is an enlarged fragmental view of the center plate of Figs. 1 and 2, with one blade, one liner and one protective plate shown, and

Fig. 4 is a sectional view along the lines 4—4 of Fig. 3.

The hub 9 on the shaft 10 has attached thereto by spot welding, the center plate 12 and its braces 13 and 14. The center plate is cut away in front of the advancing side of each blade for providing the substantially V-shaped openings 11 which permit the oppositely directed streams of gas from the two inlets of the wheel, to impinge upon each other except where the blades are attached to the center plate. The blades 15 have the flanges 16 which are riveted at 17 to portions of the center plate between the openings 11, and which are riveted at 18 to the inlet plates 19, the latter being welded at 20 to the inlet rings 21.

The wheel illustrated is designed to rotate in a counterclockwise direction with reference to Figs. 1 and 3 of the drawings, the blades 15 being of the backwardly inclined, forwardly curved type. The liners 22 are riveted at 23 to the advancing sides of the blades, and are shown at the center of the wheel where erosion of the main working surfaces of the blades is most severe, but could be used to cover all of the main working surfaces. The liners 22 have the portions 24 which are bent over across the inner edges of the blades 15 which aid in supporting the blades against the strains developed by centrifugal force. The liner portions 24 are notched at 25 to clear the center plate and the blade flanges 16.

The construction described so far with reference to the drawings, is conventional and is essentially that disclosed in said Allardice patent.

It will be noted with reference to Fig. 4 of the drawings, that there are crevices 26 between the

flanges 16 and the center plate 12 where the blades are bent outwardly perpendicular to these flanges, such crevices being unavoidable in quantity production because of the tendency of bent sheet metal to have rounded bends. It will also be noted that there are clearances 27 between the liner 22 and the center plate where the liner is notched. Such crevices and clearances are in the path of abrasives in the gas moved by the blades, which abrasives work their way into the crevices and clearance spaces and by erosion, enlarge the crevices until sufficient of the blades and center plate is eroded away to require replacement. The heads of the rivets 17 are in the gas stream and are subject to erosion.

This invention prevents such erosion by providing the slots 28 in the center plate 12 at the apices of the V-shaped openings 11, one side of each slot being a continuation of a straight back edge 29 of an opening 11, and the other side of the slot being parallel to said one side thereof, at the inlet edge of the associated fan blade. A wearing plate 30 having an outer portion 31 turned over the follow the outline of, and to lie against, the inner portion of a liner 22 is placed in each of the slots 28. Each plate is welded at 32 to a liner 22, and at 33 to an edge of a slot 28.

Such wearing plates extend across the inner or inlet ends of the crevices 27 and 26 and provide barriers preventing entry of any abrasive material into the crevices and clearance spaces, and from contacting the heads of the rivets 17.

By eliminating the erosion of the center plates of fan wheels, of the fan blades where they are attached to the center plates and of the rivets which attach the blades to the center plates, the lives of fan wheels handling gases containing brasive particles, are greatly extended.

While one embodiment of the invention has been described for the purpose of illustration, it should be understood that the invention is not limited to the exact apparatus and arrangement of apparatus described, since modifications thereof may be suggested by those skilled in the art without departure from the essence of the invention.

What I claim as my invention, is:

1. A fan wheel for a double inlet centrifugal fan comprising a center plate; said wheel having gas inlet passages on opposite sides of the center plate, a plurality of fan blades around said inlet passages; each blade having two sections with main working portions extending in alignment axially outwardly from opposite sides of

said center plate, and with flanged inner portions attached to said center plate behind the main working portions; said center plate having portions removed at the front sides of said blades for providing openings for permitting the oppositely flowing streams of gas moved by said blades to impinge, said center plate having slots extending from said openings past the edges of said blades nearest said passages, and protective plates having portions in said slots and having portions extending from said slots into said openings past said blade edges for preventing abrasive particles in the gas from said passages from entering the spaces between said center plate and said blades where said main working portions join said flanged portions.

2. A fan wheel for a double inlet centrifugal fan comprising a center plate; said wheel having gas inlet passages on opposite sides of the center plate, a plurality of fan blades around said inlet passages; such blade having two sections with main working portions extending in alignment axially outwardly from opposite sides of said center plate, and with flanged inner portions attached to said center plate behind the main working portions; said center plate having portions removed at the front sides of said blades for providing openings for permitting the oppositely flowing streams of gas moved by said blades to impinge; protective liners on the front sides of said blades common to both blade sections and extending across said center plate adjacent where said flanged blade portions are attached to said center plate; said center plate having slots extending from said openings past the edges of said blades nearest said passages, and protective plates having portions in said slots and having portions extending from said slots into said openings past said blade edges and said liners for preventing abrasive particles in the gas from said passages from entering the spaces between said center plate and said blades where said main working portions join said flanged portions, and from entering the spaces between said center plate and said liners where said liners cross said center plate.

3. A fan wheel as claimed in claim 2 in which the portions of said protective plates extending from said slots into said openings past said blade edges and said liners, have portions bent over against said liners.

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No references cited.