June 7, 1932. W. V. PHENICE 1,862,495

BEATER ROLL

Filed Oct. 13, 1930 3 Sheets-Sheet 1

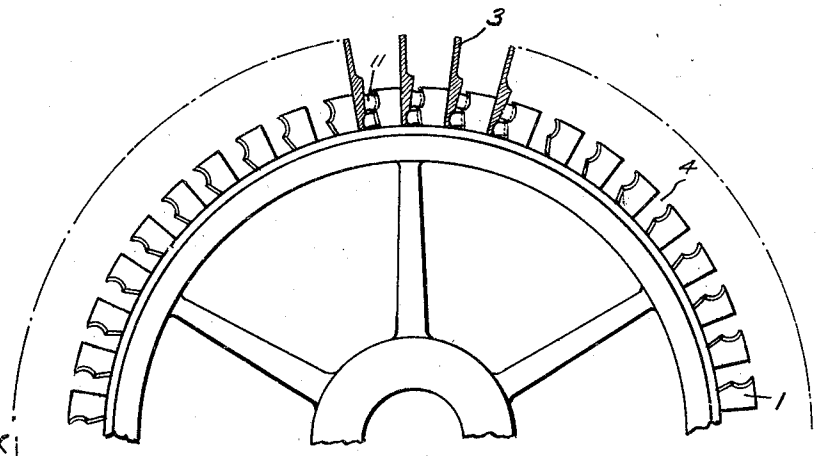


Fig. 1.

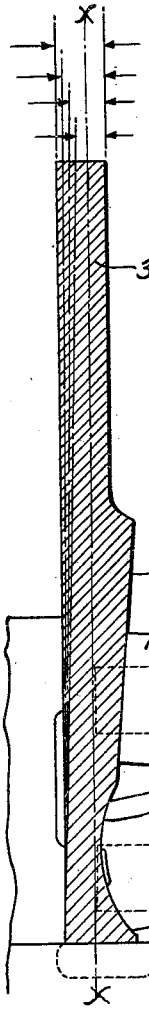


Fig. 2.

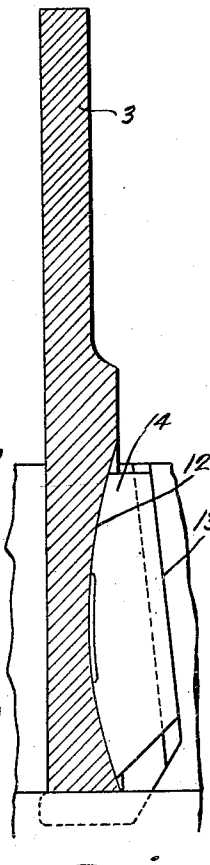


Fig. 7.

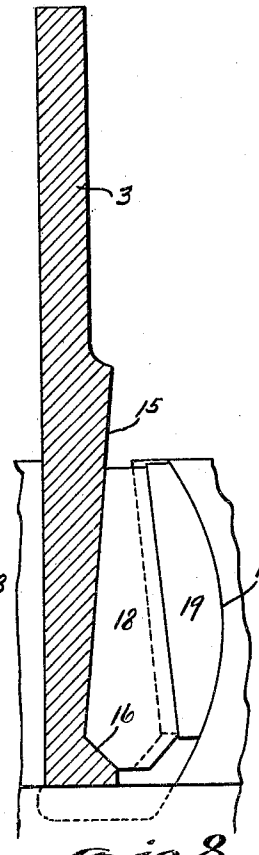


Fig. 8.

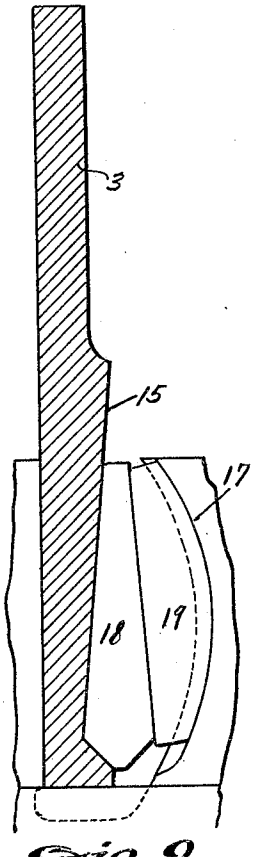


Fig. 9.

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BEATER ROLL

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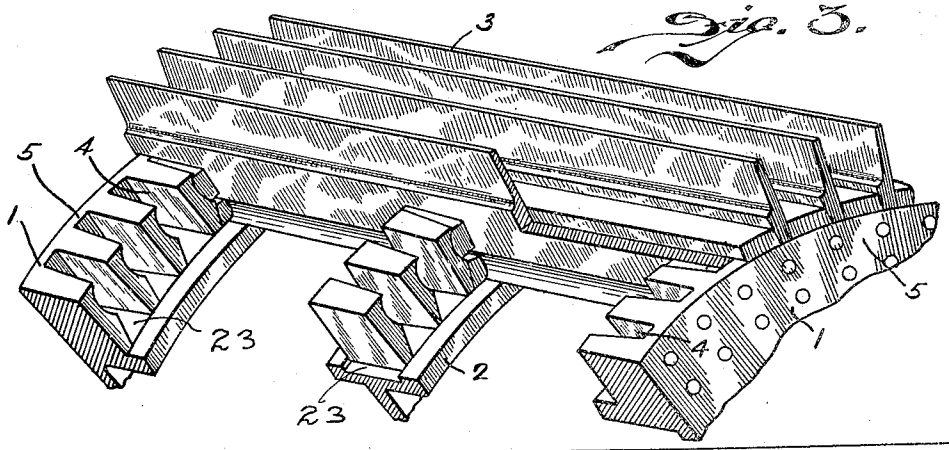


Fig. 3.

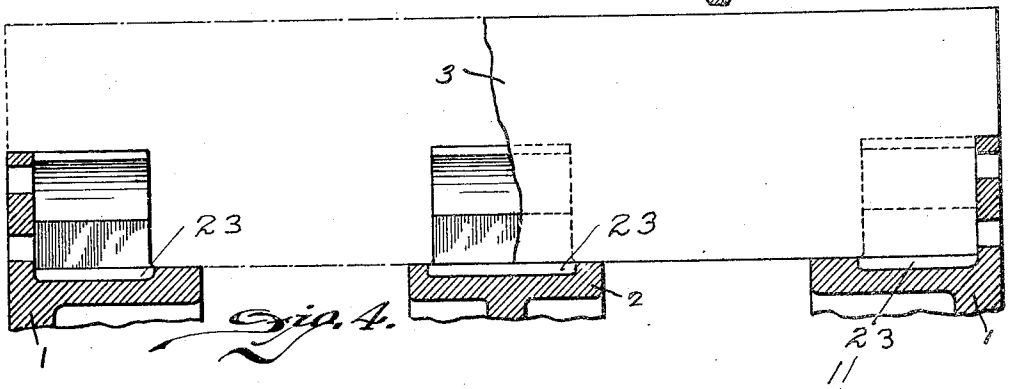


Fig. 4.

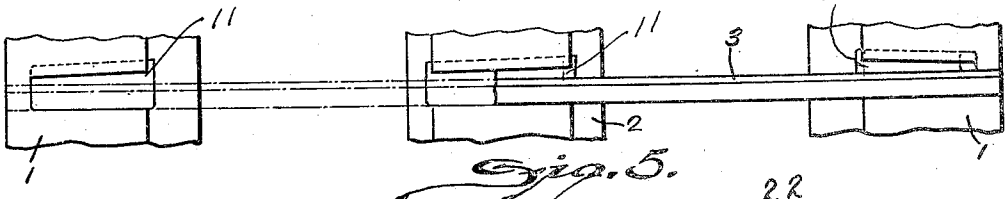


Fig. 5.

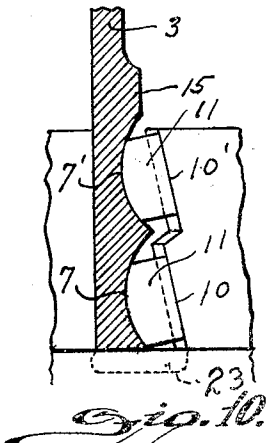


Fig. 10.

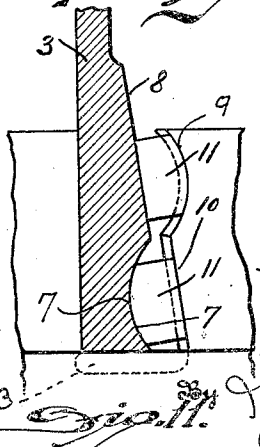


Fig. 11.

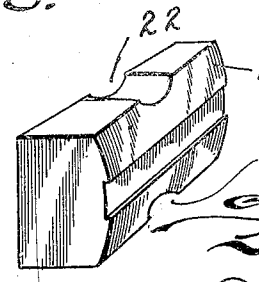


Fig. 6.

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BEATER ROLL

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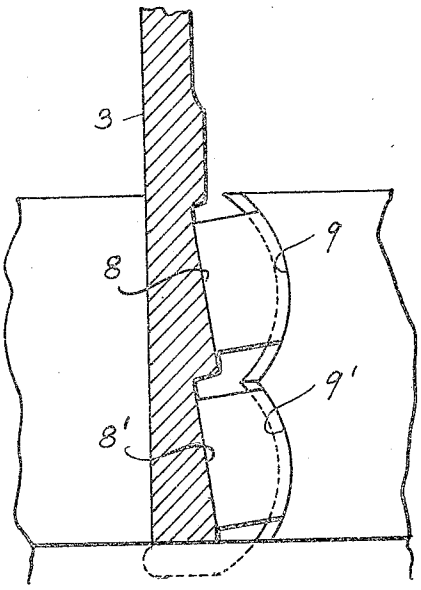


Fig. 12.

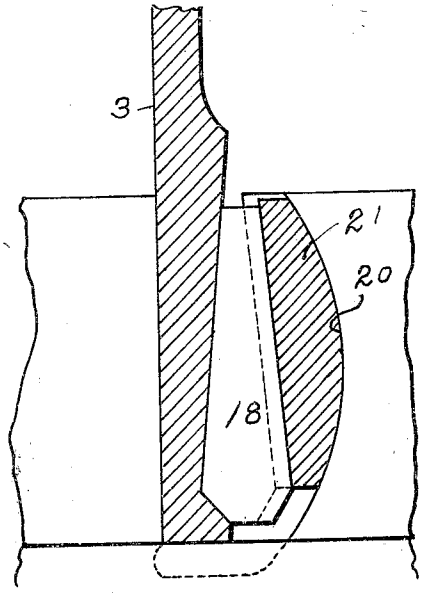


Fig. 13.

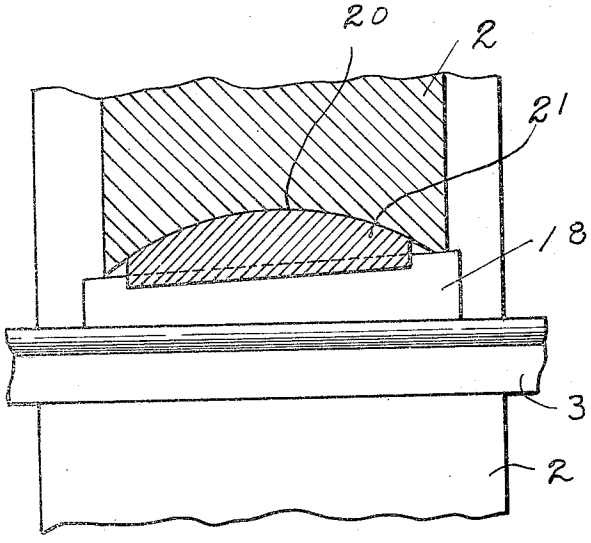


Fig. 14.

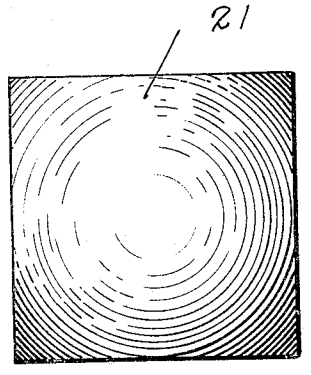


Fig. 15.

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Patented June 7, 1932 1,862,495

UNITED STATES PATENT OFFICE

WILLIAM V. PHENICE, OF DAYTON, OHIO, ASSIGNOR TO MIDWEST-FULTON MACHINE COMPANY, OF DAYTON, OHIO, A CORPORATION OF OHIO

BEATER ROLL

Application filed October 13, 1930. Serial No. 488,424.

This invention relates to beater rolls for pulp making apparatus, and more particularly to the construction of the fly bars therefor and the means of anchoring the fly bars in the mounting heads or drum.

The fly bars of a beater roll meet with considerable resistance to rotation and are subject to severe strains which necessitate secure anchorage in the drum or mounting head. Due to such strains and severe conditions of use, breakage and impairment of the fly bars occurs which makes it imperative that the bars be readily removable and replaceable relative to the mounting heads or drum without disturbance of adjacent bars. It is quite the common practice to seat the fly bars of a beater roll in tapered slots in the peripheries of the mounting heads or drum and to secure them by driving wedges into the slots beside the bars. As a result of irregularities of manufacture and assembly, the wedges do not always bear uniformly upon the contact surfaces of the bars and the opposing walls of the slots, and looseness or play of the fly bars within the slots develops. Moreover, in the production of fly bar stock, the rolling mill operators in changing from one thickness of the working edge of the bar to another, merely tilt the mill rolls to greater or less degree of angularity, thereby changing the angular relation of the opposite faces of the fly bar stock. This condition further increases the lack of uniform contact bearing of the anchoring wedges or necessitates the provision of special wedges for fly bars of each changed dimension however slight this may be.

The present construction is designed to afford a universally adjustable locking wedge which will automatically compensate for irregularities of manufacture and changes of shape of the fly bars. In the present construction either the fly bar or the opposing inner wall of the receiving slot is formed with an arcuate concave surface to receive a corresponding face upon the interposed locking wedge. The locking wedge being formed with a substantially flat bearing face on one side and an opposite convex bearing face on the other side is capable of slight rocking adjustment until it conforms to and seats uniformly upon the opposing bearing surfaces of the fly bar and the inner wall of the slot or recess in which the bar is seated. The invention is applicable in various forms, as for example, the concave bearing seat may be formed on either the fly bar or in the inner face of the slot, the locking wedge being correspondingly reversed, or there may be concave seats in both said surfaces in which case two reversely disposed locking wedges are employed.

The object of the invention is to simplify the construction as well as the means and mode of operation of anchoring fly bars in the periphery of a beater roll or drum.

A further object is to provide a limited degree of universal adjustment of the locking wedges whereby they will automatically adjust themselves into uniform bearing contact with the opposing surfaces of the fly bar and wall of the receiving slot.

A further object of the invention is to provide an improved form of fly bar having in the lateral face thereof a longitudinally disposed concave bearing seat to receive a locking wedge.

A further object of the invention is to provide a mounting head or drum having peripheral slots to receive fly bars, one wall of each of the slots being formed with a concave bearing face for the engagement of an interposed locking wedge.

A further object of the invention is to provide an improved form of tapered locking wedge having one substantially flat bearing face and an opposite convex bearing face.

The primary object and purpose of the invention is to provide means for firmly and securely anchoring the fly bars in the mounting heads or drum against the loosening effect of the strain and impact of the fly bars in their action upon the pulp.

With the above primary and other incidental objects in view, as will more fully appear in the specification, the invention consists of the features of construction, the parts and combinations thereof and the mode of operation or their equivalents as hereinafter described and set forth in the claims.

Referring to the accompanying drawings

wherein is shown the preferred, but obviously not necessarily the only form of embodiment of the invention, Fig. 1 is a transverse sectional view through the beater roll, showing in side elevation one of the mounting heads and a series of fly bars mounted therein.

Fig. 2 is an enlarged detail view of one of the fly bars and the anchoring means therefor, there being shown diagrammatically the variations of the fly bar to afford operating edges of different thickness.

Fig. 3 is a perspective view of a portion of a beater roll showing the location of fly bars therein.

Fig. 4 is a detail sectional view of the mounting head and a fly bar connected therewith. Fig. 5 is a detail plan view of a fly bar and its mounting.

Fig. 6 is a detail perspective view of one of the locking wedges. Figs. 7, 8, 9, 10, 11, 12, 13, 14 and 15 are detail views illustrating various modifications.

Like parts are indicated by similar characters of reference throughout the several views.

In the accompanying drawings, 1—1 are the end heads and 2 the center head of the roll or drum within which the fly bars 3 are fixedly but removably mounted. The heads 1 and 2 are provided with radially disposed peripheral slots 4 which are slightly tapered transversely of the heads or in an axial direction. The terminal heads 1 are shrouded or provided with a wall or face 5 which closes the slots 4 at their outer ends. At the inner side of the terminal heads 1 and at each side of the center heads 2 there are provided bearing ledges or shoulders 6 which are machined to afford uniform bearing surfaces or rest for the fly bars 3.

In its preferred form, as shown in Fig. 2, the fly bar 3 is perfectly flat on one face or side, while the opposite side of the fly bar is formed with a re-entrant arcuate channel or seat 7 extending longitudinally of the bar 3, adjacent to which there is formed a flat bearing surface 8 disposed angularly relative to the general plane of the fly bar. The fly bar 3 is mounted in the drum formed by the mounting heads 1 and 2 with its center line x—x extending in a radial relation relative to the axis of rotation of the mounting heads. The slots 4 in the mounting head in addition to being tapered transversely of the heads, are somewhat enlarged inwardly to afford a substantially dovetail effect. The advance side of each slot relative to the direction of rotation is substantially flat and disposed in parallel relation with the radius of the mounting head coinciding with the center line of the fly bar. This flat inner wall of the slot 4 conforms to and agrees with the flat side of the fly bar 3 which abuts thereon, as shown particularly in Fig. 2. The opposite side of the receiving slot 4 is formed with a longitudinal concave arcuate seat or channel 9 disposed opposite the inclined bearing face 8 of the fly bar 3. The inner portion of the slot 4 is of divergent form affording an inclined bearing face or seat 10 opposite the concave seat 7 of the fly bar. Interposed between the fly bar 3 and the interior wall of the slot 4 are two reversely disposed locking wedges 11. Each of these wedges comprises a tapered body having one substantially flat face and an opposite convex face, the curvature of which agrees with that of the arcuate concave seats 7 and 9. One of these wedges 11 is forcibly driven between the fly bar 3 and the opposing wall of the receiving slot 4 with its flat face bearing upon the beveled or inclined seat 8 of the fly bar and its arcuate or convex face engaging the concave seat 9 in the inner wall of the slot. The other wedge 11, turned in reverse position, is also driven into the space between the fly bar and the wall of the slot with its flat face engaging the inclined seat 10 upon the inner wall of the slot while its convex face bears within the concave seat 7 of the fly bar. The construction is such that these wedges 11 are capable of a slight shifting movement relative to their concave seats 7 and 9 or a slight rocking movement which will permit the wedges 11 to conform to and bear uniformly upon the inclined or beveled seats 8 and 10. If, due to any inequality of manufacture or warping of the mounting heads, the position of the fly bar is slightly changed, the wedges 11 will readily accommodate themselves to such variation. This adaptibility of the locking wedges to slight changes of angularity is particularly effective and valuable in the anchoring of fly bars of different thickness. The outer or working edges of the fly bars vary somewhat in thickness for different conditions of use, the range being approximately from five sixteenths of an inch to one half inch in thickness, the standard bar usually employed being approximately three eighths of an inch thick. These fly bars are rolled to form at the steel mills. The steel mill operators in changing the rolling mill to produce a fly bar of different thickness, merely tilt the forming rolls to different angular relations whereby the outer edge or working edge of the bar is increased in thickness while the inner edge or foot of the bar is maintained uniform. This effects an angular change of the flat face of the fly bar which abuts upon the flat inner wall of the receiving slot 4, and consequently changes the angular position of the bearing seats 7 and 8. This variation of angularity of the flat face due to the increase or diminished thickness of the working edge of the fly bar is diagrammatically illustrated in Fig. 2. Such change of angularity of the bearing faces 7 and 8 is readily compensated for by the

shifting of the locking wedges 11 relative to their concave seats 7 and 9 so that these wedges conform to and bear uniformly upon the inclined bearing seats 8 and 10 at all times and with all thicknesses of fly bars. The concave seats 7 not only afford this adjustability and capability for automatic compensation for irregularities and change of shape of the bar, but it also provides an enlarged foot or margin at the inner edge of the bar which is overhung by the inner wedge 11 to afford an interlocking or dovetail engagement. This affords a secure anchorage locking of the bar within the receiving slots of the heads. By employing two wedges 11 instead of a single large wedge, the strain is divided and each wedge exerting its clamping influence independently of the other tends to hold the fly bar more securely against the loosening effect of vibration.

Instead of employing double wedges, as shown in Fig. 2, a single locking wedge having a convex face of somewhat greater radius may be employed as illustrated in Fig. 7. In this construction the lateral face of the fly bar 3 is provided with a concave arcuate seat 12 extending substantially the full depth of the slot 4. The opposing face of the receiving slot 4 is inclined inwardly in divergent relation with the opposite wall of the slot to form an inwardly enlarged wedge-shaped recess of substantially dovetail form. Driven forcibly into this recess intermediate the concave arcuate seat 12 of the fly bar 3 and the opposing flat inclined face 13 of the slot 4, is a locking wedge 14 which, although of different proportion, like the wedges 11 comprises a tapered body having on one side a substantially flat surface conforming to and bearing uniformly upon the tapered interior wall 13 of the slot 4 while its opposite face is of convex arcuate form agreeing with the curvature of the concave channel or seat 12 in the side of the fly bar 3. Like the wedges 11, this locking wedge 14 will accommodate itself to any change of angularity of the fly bar or change of angularity of the inclined seat 13 due to inequalities of manufacture or warping of the mounting heads.

In Figs. 8 and 9 there is shown a further modification wherein in lieu of a single filler or wedge, such filler or locking member is formed in two cooperating parts. Moreover, in these figures there is illustrated a conventional and more or less common type of fly bar 3 having a beveled or inclined face 15 at one side thereof and at its inner margin having a laterally projecting flange or shoulder 16 to be overhung by the locking filler or wedge. In this embodiment of the invention, the interior face of the bar-receiving slot 4 is formed with a concave arcuate bearing seat 17 of comparatively large radius. Interposed between the face 15 of the fly bar 3 and the concave bearing seat 17 of the receiving slot, is a sectional filler or wedge comprising two parts 18 and 19. In the construction illustrated in Fig. 8 the receiving slot 4 is not necessarily tapered, but may be straight or have parallel walls in a longitudinal direction. The member 19 is formed with a convex face conforming to and bearing upon the concave seat 17 of the slot. The companion part 18 is contoured to agree with and bear upon the beveled face 15 and the marginal flange 16 of the fly bar. These filler parts 18 and 19 in turn have bearing contact upon each other. In this instance both members 18 and 19 are beveled or tapered longitudinally into substantially wedge form and by their wedging or camming effect one upon the other they exert both lateral and inward pressure upon the fly bar. However, due to the concave bearing seat 17 within the slot and the corresponding bearing face of the filler or wedge 19, the construction has a capability for adjustment to effect a uniform bearing contact upon the fly bar.

The construction illustrated in Fig. 9 is quite similar to that of Fig. 8 except the slot 4 has been shown as of tapered form in a longitudinal direction thereby necessitating tapering only one of the filler members. As illustrated, the member 18 is not tapered in a longitudinal direction but comprises merely a shim interposed between the tapered or wedge shaped filler member 19 and the side of the fly bar 3 to which the filler strip 18 conforms.

In Fig. 10 the fly bar 3 is formed with parallel arcuate grooves 7 and 7′ while the inner face of the recess is formed with double inclined faces 10 and 10′, the locking wedges 11 being both turned in the same direction. This construction increases the holding effect of the outermost wedge. The wedges have the same capability for automatic adjustment to uniform bearing position as before described.

In Fig. 11 the primary construction illustrated in Fig. 2 is shown in a slightly modified form wherein the beveled bearing face 8 is shown reversely inclined to the plane of the fly bar to afford a somewhat dovetailed formation and to effect an increased holding action of the outer wedge or filler 11. In this case the outer wedge 11 exerts a slight inward pressure coincident with its lateral pressure upon the fly bar and thus augments the holding effect of the inner wedge or filler 11 to prevent withdrawal of the fly bar from the slot or recess whereas in the primary construction Fig. 2, the pressure effect of the outer wedge or filler 11 is to slight extent opposed to that of the inner wedge or filler.

In Fig. 12 the construction disclosed is the reverse of that shown in Fig. 10, and a partial reversal of that shown in Fig. 2. In Fig. 11 the inner face of the recess in the mounting head is formed with inclined parallel

arcuate grooves 9 and 9′ while the fly bar 3 is formed with double inclined faces 8 and 8′. Both wedges exert anchoring pressure upon the fly bar independently of each other, and each wedge is capable of automatically adjusting itself into uniform pressure contact with the fly bar.

The wedges 11 are preferably, though not necessarily notched as at 22 which notch communicates with the recess 23 in the mounting head, when the wedge is in place. By filling the recess 23 with molten lead or Babbitt metal, which flows into and fills the lowermost notch 22, the wedge 11 is securely keyed in locking position.

While the constructions heretofore described provide for an automatic equalizing adjustment of the wedge about one axis it does not provide for simultaneous adjustment about a transverse axis. In Figs. 13, 14 and 15 there is illustrated a further development of this construction wherein the wedge is universally adjustable into uniform bearing engagement. In this form of embodiment of the invention the interior face of the recess in the mounting head is formed with a spherical socket or depression 20 which receives a universally adjustable shim 21 formed as a section of a sphere, the spherical face of which agrees with that of the socket or depression 20. Interposed between the shim and the face of the fly bar is a wedge 18 like that shown in Fig. 8. In this construction the spherical shim may adjust itself in any plane of oscillation, either radially relative to the mounting head or transversely relative thereto, into uniform bearing contact with the locking wedge 18. Thus an absolutely tight bearing of the locking wedge is assured, regardless of inequalities of manufacture or variation in dimensions of the parts.

It is obvious that the present invention including the provision for automatic adjustment of the locking filler or wedge into equalized pressure contact with the fly bar and with the opposing face of the recess or slot, in which the fly bar is mounted, may be embodied in various different detailed constructions within the scope of the present invention.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific details shown, but that the means and construction herein disclosed comprise the preferred form of several modes of putting the invention into effect, and the invention is, therefore, claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. A fly bar for a beater roll having one flat side and having an arcuate concave face on the opposite side of the bar.

2. A fly bar for a beater roll having formed in one side thereof an arcuate concave face extending longitudinally of said bar.

3. A fly bar for a beater roll having in one face thereof a longitudinal arcuate channel and contiguous thereto a flat face inclined transversely of the bar.

4. A beater roll having peripheral slots to receive fly bars, one inner side wall of each of said slots being formed with an arcuate concave face.

5. A locking wedge for a fly bar comprising a longitudinally tapered body having a substantially flat bearing face and an opposite convex bearing face.

6. A locking member for a fly bar comprising a tapered body having an arcuate convex bearing surface.

7. The combination with a mounting head having peripheral slots therein to receive fly bars, and fly bars located therein, one side of each of the recesses having therein a longitudinal concave bearing face, and a locking wedge interposed between the fly bar and the concave side of the slot, said wedge having a convex face engaging said concave bearing face of the slot, and transversely adjustable thereon into conformity with the fly bar.

8. The combination with a mounting head having peripheral slots therein to receive fly bars, and fly bars mounted in said slots, of locking wedges therefor inserted in the slots beside the fly bars, and concave bearing surfaces on which the wedges are capable of limited rocking movement about a longitudinal axis into uniform bearing engagement with the fly bars and the inner walls of the slots.

9. The combination with a mounting head having peripheral slots therein to receive fly bars, and fly bars mounted in said slots, of locking wedges therefor inserted in the slots beside the fly bars, converging convex and flat faces on said wedges for engagement with the opposing faces of the fly bars and inner walls of the slots, one of which faces is formed with a concave seat to receive the convex face of the wedge.

10. The combination with a mounting head having peripheral slots therein to receive fly bars and fly bars mounted therein, of longitudinal concave bearing faces upon the fly bars, and locking wedges interposed between

the fly bars and the opposing sides of the peripheral slots, said wedges having convex faces engaging said concave bearing face of the bar and transversely adjustable thereon into conformity with the opposing inner faces of the slots.

11. A mounting head for fly bars having peripheral slots therein to receive fly bars, one inner face of each slot being substantially flat and a concave bearing surface in the opposing face of each slot and locking members insertable within said slots and engaging said concave bearing surfaces.

12. The combination with a mounting head having therein a peripheral slot to receive a fly bar, of a fly bar therein, said fly bar having in its lateral face within said slot a longitudinal concave arcuate channel, the opposing inner face of the slot being outwardly convergent relative to the plane of the fly bar, and a locking member interposed within the slot beside the fly bar, having a substantially flat face conforming to the inner wall of the slot and a convex face conforming to the concave arcuate channel of the fly bar.

13. The combination with a mounting head having therein a peripheral slot to receive a fly bar, of a fly bar therein, the inner wall of the slot having therein a longitudinal arcuate channel, the opposing face of the fly bar being inclined to the general plane of the fly bar, and a locking member interposed within the slot beside the fly bar having a substantially flat face conforming to the inclined face of the fly bar, and a convex face conforming to the concave arcuate channel of the slot wall.

14. In a beater roll, a mounting head having peripheral slots, one inner wall of which is of concave arcuate form, fly bars positioned within the slots, each having a beveled side and a longitudinal shoulder terminating the beveled side at its inner edge, and a pair of locking members being shaped to agree with the beveled side of the fly bar and having a portion conforming to and engaging the shoulder of the fly bar, the other locking member having a convex face conforming to and engaging the interior concave face of the bar-receiving slot, the opposite face of said member engaging the first mentioned locking member with wedging contact.

15. In a beater roll construction, the combination with a mounting head having peripheral slots to receive fly bars, one inner face of each slot being formed with a concave arcuate bearing face, and a series of fly bars mounted therein, each fly bar having a beveled lateral face and a marginal offset shoulder at its inner edge, and a locking wedge inserted within the slot beside each fly bar, one side of the wedge being of convex form conforming to and engaging the concave interior face of the slot, the other side of the wedge conforming to and engaging the beveled face and marginal shoulder of the fly bar.

16. In a beater roll construction, a mounting head having radial slots to receive fly bars, said slots having on one side thereof concave arcuate bearing faces, and a series of fly bars positioned therein, each fly bar having a substantially flat lateral bearing face and a marginal flange at the inner edge of the fly bar beyond said bearing face, locking fillers inserted within said slots beside the fly bars having bearing surfaces conforming to and engaging the flat bearing faces and marginal flanges of the fly bars at one side, and convex bearing surfaces conforming to and engaging the concave interior faces of the slots at the opposite sides of such locking fillers.

17. In a beater roll, a mounting head having a series of peripheral slots to receive fly bars, said slots being formed with an interior concave arcuate bearing face, fly bars positioned within the slots, and locking fillers inserted within the slots beside the fly bars, each wedge having a bearing face at one side conforming to and engaging the fly bar and having at its opposite side a convex face conforming to and engaging the concave seat within the slot.

18. In a beater roll, a mounting head having a series of peripheral slots to receive fly bars, a series of fly bars positioned within said slots, the fly bars being formed with a lateral concave arcuate bearing face, and locking fillers inserted within the slots beside the fly bars having at one side a bearing face conforming to and engaging the interior face of the slot and having at the opposite side a convex bearing face conforming to and engaging the concave bearing seat of one of said fly bars.

19. In a beater roll, a mounting head having a series of peripheral slots to receive fly bars, a series of fly bars positioned within the slots, the inner face of each slot being formed with a spherical depression, a shim having a spherical face seated in said depression for universal tilting movement relative to the mounting head, and a wedge interposed between the fly bar within the slot and said universally adjustable shim.

20. In a beater roll, a mounting head having peripheral slots to receive fly bars, a series of fly bars positioned therein, an adjustable locking wedge also inserted within the slot and a universally adjustable bearing member for said wedge capable of tilting movement in transverse planes.

In testimony whereof, I have hereunto set my hand this 13th day of September, A. D. 1930.

WILLIAM V. PHENICE.