The pug mill is, in general, of known construction and operation, and a brief description thereof will suffice.

The pug mill comprises a housing or casing 5 in the form of a double trough having arcuate bottom walls 6 concentric with shafts 8 rotatably mounted in the end walls of the casing 5, in suitable bearings mounted thereon, on the two shafts 8 being driven in timed relation in a known manner. Each of the shafts 8 is provided with a plurality of paddle arms 9 extending radially therefrom and provided at their radially outer ends with paddles which operate upon the material being treated in the pug mill and propel such material, as it is mixed or worked, toward an outlet opening (not shown) of the pug mill, as is known.

Referring to Figures 2, 3 and 4, the pug mill shaft 8 may be of tubular construction, as is shown, and the paddle arms 9 preferably are in the form of cylindrical rods secured through shaft 8 diametrically thereof and welded thereto at 10. Each paddle arm 9 is provided, adjacent its outer end, with one or more, conveniently three, circumferential grooves 11 disposed contiguous one to the other. The groove 11 is of approximately semi-circular shape at its radially outer portion and tapers in width radially inward. A split steel clamping ring 12, of circular cross section, is disposed in one of the grooves 11, selectively. Ring 12 seats in the semi-circular outer portion of groove 11 and, when not subjected to radial inward pressure, is held expanded by its inherent resiliency so as to be out of binding contact with the wall of groove 11 and freely turnable therein.

A paddle 13 is mounted on the radially outer end of arm 9 by means of the ring 12 and associated cooperating parts of the paddle. The paddle 13 comprises two substantially rectangular generally flat sections 14 each having an integral collar 15 substantially tangent thereto. The collars 15 are of a size to fit snugly about the arm 9 without binding thereon and are disposed at opposite sides of the ring 12. Each of the collars is provided, at the end thereof adjacent ring 12, with an inner beveled surface 16 disposed to contact ring 12 when the collars 15 are forced toward each other. Each collar 15 is further provided with three bosses 17 suitably bored for reception of headed bolts 18 inserted therethrough, with the heads 19 seating on the outer faces of the bosses 17 of one of the collars 15. Securing nuts 20 are threaded on the other ends of the bolts 18 and seat on spring washers 21 seating on the outer faces of bosses 17 of the other collar 18. By turning the nuts 20 tightly onto the bolts 18, the collars 15 may be forced toward each other so as to force the inclined or beveled surfaces 16 into clamping pressure contact with the split ring 12, effective for compressing the latter and forcing it into clamping pressure contact with the surrounding wall of groove 11. In that manner, the paddle 13 is clamped upon arm 9 so as to be fixed in desired adjustment thereabout. By turning the nuts 20 off of the bolts 18 to appropriate extent, the pressure is relieved and ring 12 then expands by its inherent resiliency, exerting a wedging effect on the beveled surfaces 16 and spreading the collars 15 apart to the extent permitted by the nut and bolt securing means. The paddle 13 may then be turned about arm 9 to desired position and clamped thereon in the manner above described. Accordingly, when the clamping pressure on ring 12 is relieved, the paddle 13 may be turned freely about the arm 9 through a complete revolution to any desired angular position. That renders it possible to adjust with expedition and facility the angle of the paddles relative to the associated arms 9 to any extent, to suit the material being mixed or operated upon in the pug mill.

The two sections 14 of the paddle 13 preferably are the same, as shown, so that they are reversible and inter-
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changeable. When the leading edge portion, such as portion 22 of the paddle 13 becomes worn to objectionable thicknesses, the paddle may readily be removed and reversed, the former outer section replacing the inner section and vice versa, so that the unworn following edge portion 23 of the paddle then becomes the leading edge portion. In that manner, wear of the leading edge portion of the paddle may be readily compensated for. Further, wear of the radially outer end portion of the paddle may be compensated for, as such wear progresses, by moving the ring 12 outward into the successive grooves 11. That may readily be accomplished by expanding ring 12, by means of a suitable tool, so as to remove it from the groove in which it is then positioned and replace it in an outer groove. Obviously, the number of grooves 11 may be varied as desired and to suit requirements.

Preferably, before placing the ring 12 in one of the grooves 11, a protective sleeve 25 is placed upon the arm 9 so as to extend a substantial distance outward therefrom, and the inner section 14 of the paddle 13 is placed on arm 9 inwardly beyond grooves 11. The sleeve 25 serves to protect arm 9, for the major portion of the length thereof, from wear and abrasion by the material treated in the sleeve 25, and, of course, it may readily be replaced in an obvious manner. Referring further to the adjustment of the paddle about arm 9, in Figure 3 the paddle is shown in full lines in one angular position on arm 9 and in dot and dash lines in a second angular position, to which it may readily be turned by slightly loosening the nuts 20 on the bolts 18 and thereafter turning up the nuts tight onto the bolts so as to clamp the paddle in fixed adjustment on arm 9 in the manner previously described. As will be understood from what has been said, the paddle 13 may be turned into any position desired about arm 9 throughout a complete revolution thereabout.

Instead of using a one piece clamping ring 12, a clamping ring 12a formed in two approximately semi-circular sections 12b may be used. The two part ring 12a functions in substantially the same manner as the one piece ring 12, except that it is not resilient and does not exert a spring action, and need not be described in greater detail. As will be understood from the foregoing, the two part ring of Figure 5 and the one part ring of Figure 2 each constitute a compression member which is compressed about arm 9 in clamping engagement therewith.

It will be understood that changes in detail may be resorted to without departing from the field and scope of our invention, and we intend to include all such variations, as fall within the scope of the appended claims, in this application in which the preferred form only of our invention has been disclosed.

We claim:

1. In a pug mill, a casing and a rotatable shaft therein, paddle arms secured to said shaft extending substantially radially therefrom, paddles on said arms respectively comprising opposed clamping members fitting about the associated arm, a compression member extending about said arm between said opposed paddle clamping members effective for clamping said paddle clamping members in fixed adjustment about said arm when said paddle clamping members are forced toward each other into clamping pressure contact with said compression member, and means for forcing said paddle clamping members toward each other into clamping pressure contact with said compression member.

2. In adjustable mounting means for pug mill paddles, a paddle arm, a paddle comprising opposed clamping members carried by said paddle and fitting about said arm and freely turnable thereabout when released from said arm, a compression member extending about said arm between said paddle clamping members and in cooperation therewith clamping said paddle in fixed adjustment about said arm when said paddle clamping members are forced toward each other into clamping pressure contact with said compression member, and means for forcing said paddle clamping members toward each other into clamping pressure contact with said compression member.

3. In adjustable mounting means for pug mill paddles, a paddle arm, a paddle comprising two opposed clamping members fitting about said arm and freely turnable thereabout when released from said arm, a compression member cooperating with said compression member for frictionally securing the latter and said paddle clamping members to said arm in fixed adjustment thereabout when said paddle clamping members are forced toward each other into clamping pressure contact with said compression member, and means for forcing said paddle clamping members toward each other into clamping pressure contact with said compression member.

4. In adjustable mounting means for pug mill paddles, a paddle arm, a paddle formed in two substantially identical sections each comprising a collar fitting on said arm and a substantially rectangular paddle element on said collar substantially tangent thereto, a resilient clamping ring on said arm between the collars of said paddle sections and normally out of clamping contact with said arm, said collar and said arm having elements cooperating with said ring effective for clamping the latter and said collars to said arm in fixed adjustment thereabout when said collars are forced toward each other into clamping pressure contact with said arm, and means for forcing said collars toward each other into clamping pressure contact with said arm.

5. In adjustable mounting means for pug mill paddles, a paddle arm, a paddle formed in two similar sections each comprising a collar fitting on said arm and a substantially rectangular paddle element on said collar substantially tangent thereto, a resilient clamping ring on said arm between the collars of said paddle sections and normally out of clamping contact with said arm, said collar and said arm having elements cooperating with said ring effective for clamping the latter and said collars to said arm in fixed adjustment thereabout when said collars are forced toward each other into clamping pressure contact with said arm, and means for forcing said collars toward each other into clamping pressure contact with said arm.

6. In adjustable mounting means for pug mill paddles, a paddle arm, a paddle formed in two similar reversible and interchangeable sections each comprising a collar fitting on said arm and a substantially rectangular paddle element on said collar substantially tangent thereto, said collar having a circumferential groove diminishing in width radially inward of said arm, a split clamping ring seating in the radially outer portion of said groove and disposed between the collars of said paddle sections, said collar having beveled surfaces effective for compressing said ring and clamping it and said collars to said arm in fixed adjustment thereabout when said collars are forced toward each other into clamping pressure contact with said arm, and means for forcing said collars toward each other into clamping pressure contact with said arm.

7. In adjustable mounting means for pug mill paddles, a paddle arm having a plurality of circumferential grooves diminishing in width radially inward of said arm, a split clamping ring positionable in said grooves selectively and seating in the outer portion of said grooves when the paddle formed in two sections each comprising a collar fitting on said arm, said ring being disposed between the
collars of said paddle sections and said collars having elements cooperating with said ring effective for compressing it and clamping said ring and collars to said arm in fixed adjustment thereabout when said collars are forced toward each other into clamping pressure contact with said ring, and means for forcing said collars toward each other into clamping pressure contact with said ring.

8. In adjustable mounting means for pug mill paddles, a paddle arm, a paddle formed in two similar sections each comprising a collar fitting on said arm and a substantially rectangular paddle element on said collar substantially tangent thereto, said arm having a circumferential groove diminishing in width radially inward of said arm, a sectional clamping ring seating in the radially outer portion of said groove and disposed between the collars of said paddle sections, said collars having beveled surfaces effective for compressing said ring and clamping it and said collars to said arm in fixed adjustment thereabout when said collars are forced toward each other into clamping pressure contact with said ring, and means for forcing said collars toward each other in clamping pressure contact with said ring.

9. In adjustable mounting means for pug mill paddles, a paddle arm, a paddle formed in two similar sections each comprising a collar fitting on said arm and a substantially rectangular paddle element on said collar substantially tangent thereto, said arm having a circumferential groove diminishing in width radially inward of said arm, a two part clamping ring seating in the radially outer portion of said groove and disposed between the collars of said paddle sections, said collars having beveled surfaces effective for compressing said ring and clamping it and said collars to said arm in fixed adjustment thereabout when said collars are forced toward each other into clamping pressure contact with said ring, and means for forcing said collars toward each other into clamping pressure contact with said ring.

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