

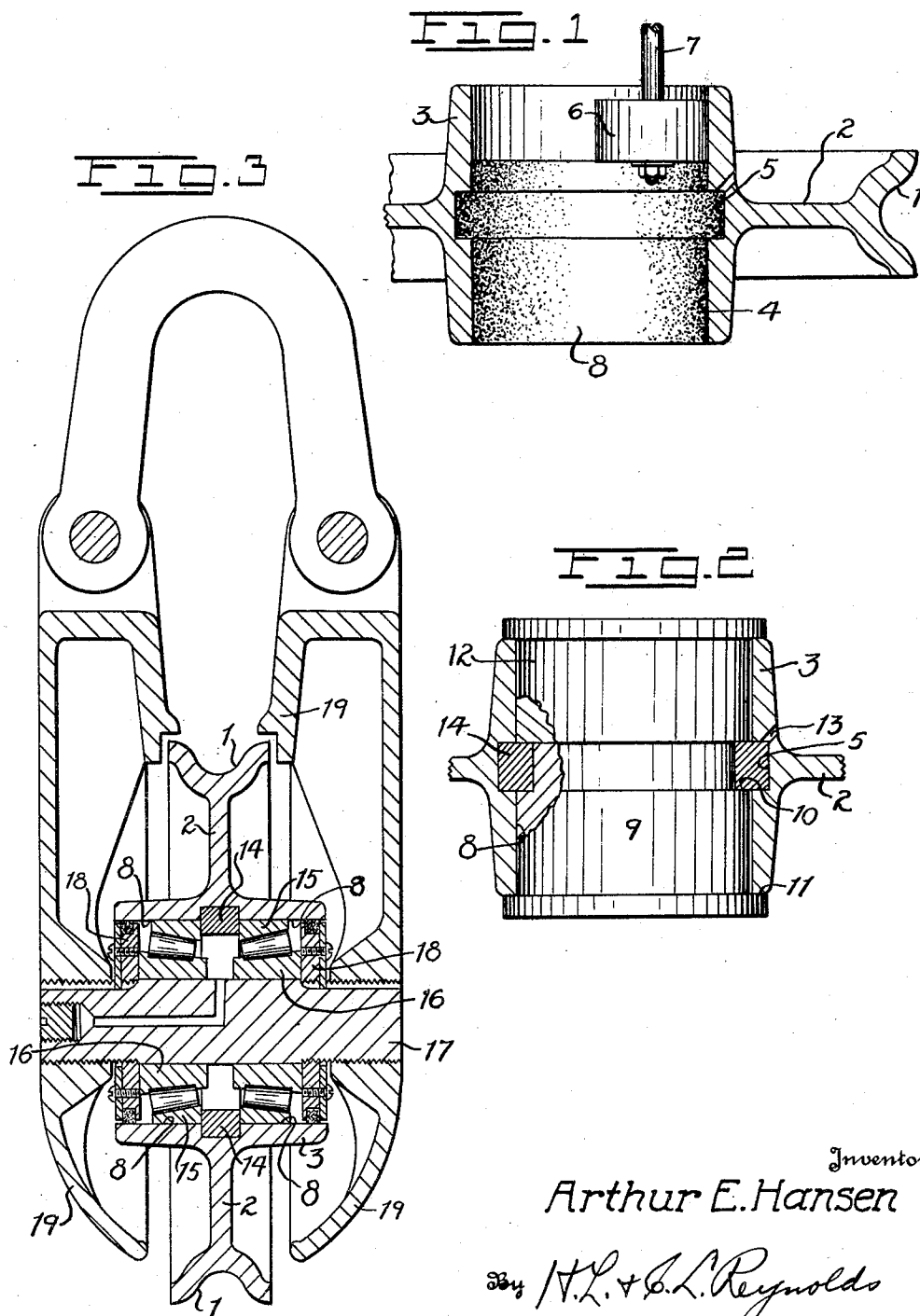
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PROCESS OF PREPARING SHEAVES

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PROCESS OF PREPARING SHEAVES

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My invention relates to an improvement in sheaves or like rotative wheels, and particularly to a construction adapting such sheaves of refractory materials to receive anti-friction bearings, particularly, though not necessarily, such as include a thrust-receiving member or race which must be exactly positioned, and it relates further to the process of manufacturing such sheaves and finishing them for the purpose described.

In the manufacture of logging blocks, particularly, it has been found practically essential to employ sheaves made of manganese steel, a highly refractory substance. The small diameters of such sheaves, the heavy loads under which and the high speeds at which such sheaves are run create a tendency for the steel cables, which run over the sheaves, to wear them rapidly, and in sheaves of less refractory materials the cables will cut grooves and cross grooves, and this, in turn, wears on the cable, cuts the strands and in a short time breaks the cables. It is, therefore, desirable to use such highly refractory materials as manganese steel to resist this wear. However, such materials are inherently incapable of being machined in the ordinary manner to receive anti-friction bearings which the high speeds and heavy loads require. The bearings employed, whether utilizing balls, plain rollers, or tapered rollers, usually include a thrust member or race, which must be exactly positioned within the hub of the sheave in order to maintain the rim of the sheave in proper relationship to the cheek plates at each side, close thereto, and in all positions of the sheave. This requires careful finishing of a thrust shoulder within the hub, against which such a thrust member abuts. With such refractory materials as manganese steel, and with the finishing methods heretofore known, such exact finishing has not been directly possible. Grinding is the only practicable method for finishing such refractory materials, ordinary cutting tools having been found altogether unsuitable because the material is as hard as or harder than the tools, but with a grinding wheel it is hardly possible to finish down an axially-facing shoulder to an exact measure-

ment. In fact, it has not been found feasible to finish such a shoulder properly because of the danger of breaking the grinding tool, nor to do the work economically because of the extreme care required to stop the grinding tool at the exact point. Furthermore, the wearing of the corners of the tool renders it difficult to finish a good square corner for the proper reception of the bearing race against the finished shoulder.

Tapered roller bearings are frequently employed, for, as brought out in my Patent No. 1,492,793, these serve to keep the sheave from contact with the cheek plates which lie closely adjacent thereto; ball bearings have also been proposed, and a ball bearing of the thrust-absorbing type has been found satisfactory. Exact positioning of such bearings, therefore, being of considerable importance, it is necessary to provide some method adapted to present shop practices, and lending itself to quantity production methods, whereby such bearings can be readily and exactly fitted in sheaves of this or like refractory material.

As has been brought out above, in order to fit a sheave to receive a bearing of the types now commonly employed, it is essential that their bore be provided with a shoulder which acts as a backing for the bearings, and to position them exactly. Such a shoulder, when cast in place, as is sometimes done, projects into the bore, and thus prevents grinding straight through the bore. The necessity for using such a shoulder and for locating its position with exactness, has rendered ordinary grinding processes impracticable, and too slow or otherwise too expensive for quantity production; for, as explained above, it is difficult to stop an internal grinding operation at any exact line, and the corners of the wheels wear off and will not grind a sharp angle, or an exact curve.

Efforts have been made heretofore to eliminate the difficulty thus outlined, as by inserting a shoulder, either by sweating in place, or driving in and countersinking, or casting in place a soft steel bushing which could then be machined, but this has been found slow and expensive, and, in addition, increases the

weight of the sheave unduly. Other attempts to solve this difficulty have been by means of a soft metal ring inserted and expanded within a channel cast into the bore of the sheave.

Thereafter, the soft metal ring was machined. This likewise has been found slow and expensive and not as accurate as is required by roller bearing practice. Other attempts to solve this problem have consisted in casting a circumferential rib within the bore of the sheave and then grinding down to and including a small portion of this rib. It has been found in this connection, however, (as in the finishing of an integrally-cast shoulder), that the grinding tools have their corners rounded off by the hard manganese steel, and that, in addition, it is impossible so to control a grinding tool of several tons weight that it will go just to this rib and not farther, so that the grinding tool will not be fractured, yet far enough to make it effective for the purpose intended.

My invention, therefore, has as its object the elimination of these costly and slower methods and the substitution therefor of a method and the resulting product which is light, which enables the bore to be completed by one straight-through grinding operation coupled with a simple casting operation, by means of which the bore is first completed and the ring is thereafter formed complete and ready for use.

My invention comprises the novel process and the novel product thereof, as shown in the accompanying drawings, described in this specification, and as particularly defined by claims terminating the same.

In the accompanying drawings, I have shown diagrammatically the steps of the process, and a sheave completed in accordance with my process.

Figure 1 illustrates the first step of my finishing process;

Figure 2 illustrates the second step;

Figure 3 illustrates the completed sheave equipped with roller bearings.

According to my invention, the sheave is made with the usual grooved rim 1, web 2 and hub 3, these parts being made as light as good practice would indicate, to save weight and metal. The finished rough casting then has a somewhat rough bore, as indicated at 4 in Figure 1, and between the ends of the bore there is formed a circumferential channel 5. Preferably this is in the plane of the web 2. The sheave is now set up properly with respect to a grinding wheel 6, which is rotated from any suitable source of power, as by the shaft 7, and the bore 8 is then finished by grinding from end to end without regard to the channel 5. The upper portion of the bore is illustrated as finished, in Figure 1. This constitutes a single operation, and when completed, the bore is perfectly smooth and true. It will be noted that this requires the

use only of the peripheral edge of the grinding tool, not its end face, and there is no angle to grind, nor any exact point where it must stop advancing.

When thus completed, a plug 9 is inserted within one end of the bore, this plug having a shoulder 10 which coincides with or bears some other definite relation to the side wall of the channel 5. Stops 11, or like means, may be employed to locate these two surfaces in registry. The upper end of the plug 9 lies substantially in the plane of the opposite side wall of the channel 5. A second plug 12 is now inserted from the opposite end of the bore 8, coming to rest on the top of the plug 9. Its bottom surface coincides with the upper surface of the plug 9 and, consequently, with a side wall of the channel 5. There is thus defined by these two plugs 9 and 12 an annular space which includes the channel 5 and the space immediately thereabout, and thus lies partly within and partly without the confines of the ground surface of the bore 8. It will be understood that the plugs may be alike and meet at a plane not coinciding with a plane of the channel 5, or that the annular space thus defined may assume various forms, best adapting it to back up the races of the bearings to be received.

By leaving a small port 13 in the hub of the sheave when it is cast, communicating with the channel 5, or by like provision, it is now possible to pour molten metal into this annular space, such a metal as zinc having been found suitable for the purpose. Zinc has been found suitable because it melts at low temperatures, has a sufficiently high resistance to shearing and compression, is inexpensive, and may be finished smoothly by casting. It will be understood that the channel and the annular space need not be continuous, but that a series of circumferentially disposed lugs, if properly anchored in the hub, would be the equivalent of the ring 14.

The plugs 9 and 12 would be made of finished metal and would fit the finished bores 9 perfectly. Their smooth surfaces forming a mold for the zinc ring 14 (see Figure 3), enables this ring to be cast in place, so that it is accurately located and smoothly finished when this second or casting step of the operation is completed. Thus two operations only are necessary, the first a straight-through grinding of the bore, and the second, the casting in place of a ring of soft metal, that is, a metal which may be easily melted and handled, and which finishes smoothly. It might be feasible to cast a harder metal than zinc in the ring 14, but usually such a ring would require an additional setting up and finishing operation.

Such a ring of zinc requires no finishing, and immediately upon removal of the plugs 9 and 12, which may be within a minute of

the time the metal is poured, the sheave is completed and ready to receive the roller bearings. These are shown in place in Figure 3 with the outer races 15 snugly fitting the angles formed between the zinc ring 14 and the ground bore 8. The inner races 16, held on the pin 17 by means such as the nuts 18, cooperate with the outer races to exactly position the sheave, especially relative to the cheek plates 19. For the reasons given in my patent referred to above, these cheek plates must lie close to the sheave, yet there must be some clearance.

This process, and the product thus produced, have been found wholly practical in the manufacture of logging sheaves, and will be found practical in other fields where like problems are encountered. Its use has already created a saving of thousands of dollars in a single shop, inasmuch as it enables rapid finishing of this highly refractory and resistant material by methods and means which adapt themselves to quantity production. There is only one setting up operation required, that of setting up the sheave to the grinding machine. The process is also desirable in that it requires no precise manipulation of the grinding tool axially of the bore, that is to say, it may bore straight through and need not be stopped at any precise point.

What I claim as my invention is:

1. The process of preparing sheaves of refractory material for the reception of anti-friction bearings, which process consists in forming the sheaves in the general form desired, and with a circumferential groove extending about the inside of the hub, between its ends, finishing the inside of the hub, at each side of said groove, by a smoothing process, inserting a plug in the hub having a shoulder cooperating with said groove to form an annular space lying partly within and partly without the confines of the ground surface of the hub, casting within said annular space a ring which is anchored in said groove, and finally removing said plug to leave said ring projecting above the ground surface of the hub.

2. The process of preparing sheaves of refractory material for the reception of anti-friction bearings, which consists in primarily forming the sheave in the general form desired, and with a circumferential groove extending about the inside of the hub, substantially midway between its ends, grinding the inside of the hub from end to end, disregarding the groove, to finish its surface, inserting a plug in each end of the hub, said plugs being formed to cooperate with the groove in the definition of an annular space lying partly within and partly without the confines of the ground hub surface, casting a ring within said annular space, and finally withdrawing said plugs to leave said ring an-

chored in said groove and projecting above the ground hub surface.

3. The process defined in claim 2, the surfaces of the plugs which form the annular space being finished, and the ring being cast of a metal of good shearing and compressive strength, and which will retain smooth surfaces when so cast.

4. The process of preparing sheaves of refractory material for the reception of anti-friction bearings, which consists in roughly forming the sheave in the general form desired, finishing the inside of the hub by a surfacing operation, and finally positioning and anchoring a ring in said hub, projecting above its ground surface and between its ends, by a casting operation, said hub having a recess initially formed in its inner surface, beneath the level of the finished surface, to receive the cast metal forming the anchor for said ring.

Signed at Seattle, King County, Washington, this 7th day of April, 1927.

ARTHUR E. HANSEN.