Feb. 28, 1950 J. J. LAUDIG 2,498,994

RAILROAD JOURNAL BEARING

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FIG. 1.

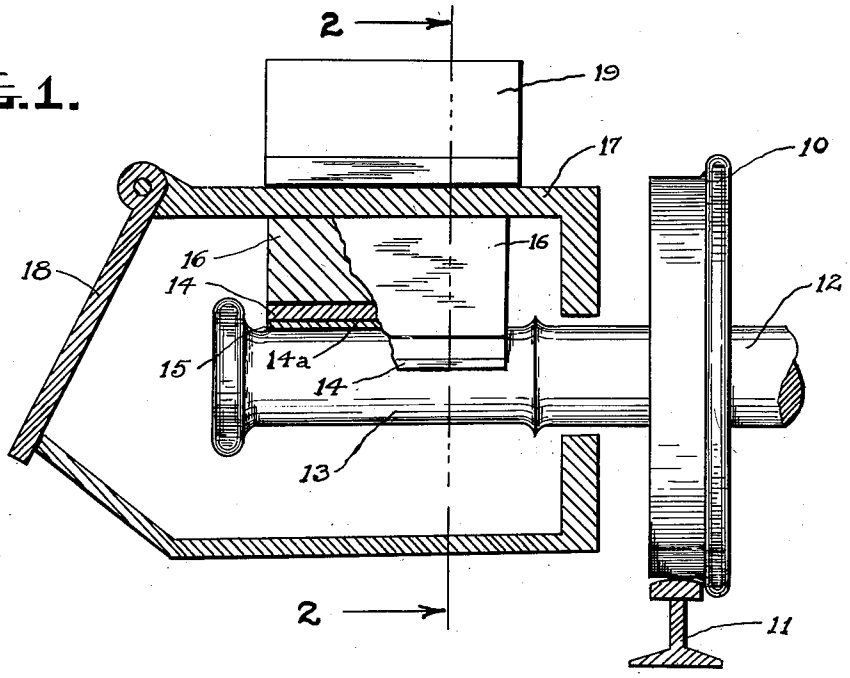
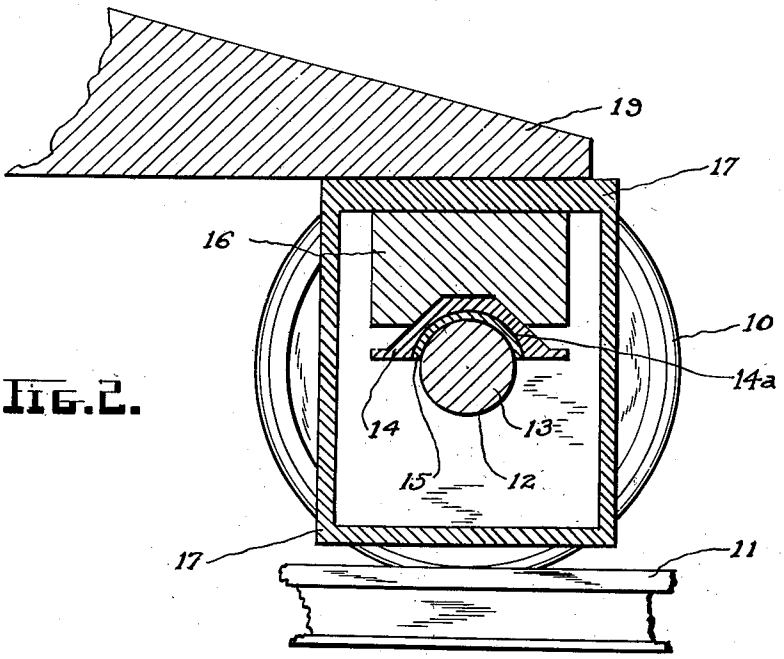


FIG. 2.



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RAILROAD JOURNAL BEARING

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11 Claims. (Cl. 308—56)

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This invention relates to journal bearings and axles for railroad rolling stock, and more specifically relates to means for improving the operating and safety characteristics thereof.

Railroad type journal bearings and axles, heretofore used have consisted in part of a brass shell provided with a bearing-metal lining, which has generally been made from babbitt. The lining provides a good bearing surface against which the steel car axle rotates. During normal operation the bearing-metal lining slowly wears away, and unless a newly lined bearing shell is installed, the car axle will eventually come into contact with the brass portion of the bearing shell. Furthermore, when a bearing is not properly lubricated, the turning of the axle in the unlubricated bearing, generates sufficient heat to rapidly melt away the bearing lining. This also allows the axle to come into contact with the brass portion of the shell. In either event, if the worn out bearing shell is continued in service, the turning of the axle against the brass shell will generate more heat than was produced when the axle was turning against the bearing-metal lining. This produces an overheated bearing, which in railroad parlance is referred to as a "hot box." If the railroad car with the so-called hot box, is allowed to operate, a serious accident may result due to the failure or "burning off" of the steel axle.

I have found that the phenomenon, which causes a heavy railroad car axle to burn off, is due to a metallurgical reaction that occurs between the steel axle of the car and the copper from the brass shell. It is well known in the metallurgical art, that steel when stressed and heated to a high temperature in the presence of copper or brass, will pick up some copper, which is deposited along the grain boundaries of the steel. This phenomenon, known as copper penetration, makes the steel brittle and greatly weakens it.

The steel of a railroad car axle which is in operation is under stress and a hot box generates a large amount of heat and the heat thus generated is enough to cause the copper from the brass shell to penetrate the stressed steel car axle. Once the copper has thus penetrated the steel, the axle is permanently weakened, for even though the worn bearing shell is replaced, the damaged axle remains as a potential hazard to safe railroad operation. Therefore, one object of the invention is to provide a new method and means for operating and constructing railroad journal bearings, which eliminates the danger

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of damaging a car axle by subjecting it to destructive copper penetration.

This invention also has for one of its objects, the provision of a new and improved journal bearing for use with railroad rolling stock.

Another object of the invention is to provide a stronger bearing than any which has heretofore been used.

Another object of the invention is to provide a new type of journal bearing which will increase the safety of railroad operation.

A further object of the invention is to provide a new type of journal bearing which will not only be less expensive than bearings now in general use, but which will also save strategic materials for the war effort.

A still further object of the invention, is to provide railroad type journal bearings which will eliminate the danger of having a railroad car axle fail, due to being damaged by destructive copper penetration.

A still further object of the invention is to provide a new and improved journal bearing which will not cause failure, as bearings, now in general use, have been known to do.

A specific object of the invention is to provide a railroad bearing which contains no copper or copper containing metal.

Other important objects of the invention will be apparent during the course of the following description.

In accordance with one form of the invention, a railroad journal bearing is equipped with a non-copper containing bearing shell, which has a bearing-metal lining.

For a more complete understanding of the invention, reference should be had to the accompanying drawings, in which,

Figure 1 is a side view, showing some of the important parts of a standard railroad bearing assembly with parts broken away to show the new bearing shell of this invention in place, and

Figure 2 shows a cross section through Figure 1 taken on the line 2—2, and looking in the direction of the arrows.

In the drawings, I have chosen to show a standard railroad type journal bearing and axle assembly with my special non-copper containing bearing-shell in place. Numeral 10 indicates a car wheel, which rides on a rail 11, and is coaxially assembled with a cylindrical axle 12. The outer end or journal 13 of the axle 12 is fitted with a bearing assembly, comprising my special bearing shell 14, having a bearing-metal lining 15 secured to a concave portion 14a of the shell

14. The lining 15 on the shell 14 contacts somewhat less than 180 degrees of the upper side of the journal 13. Preferably the lining 15 is made of Babbitt-metal, although other materials may be used. A wedge 16 is positioned above the shell 14 and a housing 17, having a door 18, is positioned around the whole bearing assembly. Positioned above and resting on the bearing housing 17 is a side frame 19 of any type of railroad rolling stock, as for example, a railroad box car. While not shown in the drawing, it will be understood that the bearing will be lubricated in the usual manner, as for example, by packing the housing 17 with oil soaked waste.

The weight of the car is transmitted by means of the side frame member 19 to the top portion of the housing 17, and thence to the wedge 16. The wedge 16 rests upon the shell 14 and thus transmits the weight to the shell 14 and its lining 15. The weight is then transmitted by way of the bearing-metal lining 15 to the outer end or journal 13 of the car axle 12. The weight is then transmitted to the wheel 10 and thence to the rail 11.

As outlined above, it has been the most common practice to form the bearing shell 14 from brass which contains a large percentage of copper. In fact, according to a recent Association of American Railroads specification, the composition of the brass or bronze recommended for bearing shells was given as: copper 64 to 70 percent, tin 6 to 8 percent and lead 24 percent maximum. My bearing shell 14, which is formed preferably by casting from a metal that contains no copper, is much superior, stronger and less expensive than bearing shells heretofore used. Being stronger than the bronze shells meeting the Association of American Railroads specification requirement, it naturally follows that my bearing has the requisite strength to carry the weight of a loaded railroad car and to withstand the impacts to which journal bearings are normally subjected in service in railroad rolling stock.

A very satisfactory bearing is obtained, when the shell 14 is formed from a non-copper containing metal such as a high strength ferrous-alloy metal. While other high strength ferrous-alloy metals may be used, I prefer to use a ferrous metal that has been deoxidized and graphitized by calcium silicide and which preferably contains silicon, manganese and zirconium. A well known metal of the type of high strength ferrous-alloy metals referred to is identified by the trade name "Meehanite," which is a well-known pearlitic cast iron, and it is known that pearlitic cast irons other than those identified by the trade-name "Meehanite" are available and may be made by heretofore known processes.

By forming the shell from a high strength ferrous-alloy metal, the shell 14 is much stronger than the brass shells which have heretofore been generally used. Also, in the event that the lining of the bearing shell should fail and allow the axle 13 to operate in contact with the shell 14, the ferrous-alloy metal is less likely to cause a hot box than is the brass shell now in general use. Furthermore, and of great importance, my ferrous-alloy shell does not contain copper, and therefore, if the bearing-metal lining should wear or melt away, there is no possibility of the steel car axle, while under stress, coming into contact with a copper containing material. Thus there is no danger of the steel car axle being weakened or made brittle by the penetration of copper along the grain boundaries thereof.

There are many methods by which a bearing-metal lining can be attached to a ferrous-alloy shell. As an example of one of these, I will specifically point out that a Babbitt-metal lining can be attached to a ferrous-alloy metal shell by means of electrolysis. While other processes may be used, I prefer to use the well known Kolene process, and since this process is known, it is believed sufficient to say that the inner or concave portion 14*a* of the high strength ferrous alloy shell is first thoroughly cleaned by the electrolytic process. This removes the carbon particles lying exposed to the surface of the metal and creates a multiplicity of tiny recesses. Then the surface 14*a* is tinned in the usual manner and the Babbitt-metal lining is attached to the tinned surface by any one of the several methods well known in the art. The multiplicity of tiny recesses created by the electrolysis greatly facilitates tinning and assures that the tin and the babbitt will be securely held to the ferrous-alloy shell.

Various other non-copper containing materials can be used to form a bearing shell in place of the metals hereinbefore described, however, the illustrations given are deemed sufficient to fully explain the invention to one versed in the art. Thus, the foregoing embodiments of my invention are intended to be only for the purpose of illustration, and I do not desire therefore to be limited to any of the details shown and described herein, except as limited by the scope of the appended claims. In the foregoing I have used the term "brass" shell and it is to be understood that I have used the term as it is commonly used in the parlance of railroad men to mean what is perhaps more accurately described as a bronze shell and it will be noted that I have used the terms "brass" shell and "bronze" shell interchangeably.

I claim as my invention:

1. A bearing for a steel journal of a wheel axle of a railroad car which comprises a copper-free bearing-metal lining having a surface shaped to conform with the circumference of the journal and to ride in contact therewith, a backing for said lining in the form of a high strength cast iron shell to carry the overlying weight of the railroad car and transmit it to the axle, said lining being made of metal suitable as a bearing for steel and said shell being free from copper so that in its use on steel railroad car journals broken journals due to copper penetration are avoided, said bearing having a strength to carry the weight of a loaded railroad car and to withstand impacts to which journal bearings are normally subjected in service in railroad rolling stock.

2. A copper-free bearing assembly for railroad rolling stock, comprising a steel axle having a journal, a cast high strength graphitized ferrous-alloy bearing shell having a bearing-metal lining said shell having a surface free of graphitic carbon and the bearing metal adhering to that surface, the said journal being rotatable in the said lining of the said bearing shell, and the bearing shell arranged to transmit the weight of the said rolling stock to the said axle.

3. A bearing for a steel journal of a railroad car axle which comprises a shell formed of graphitized cast iron throughout its body and containing no copper which can cause impairment of the axle by copper penetration, a Babbitt lining for said shell shaped to conform to the cir-

cumference of the journal and secured to said shell, the surface of said shell at the interface between said shell and lining being substantially free of carbon whereby said Babbitt lining will remain tenaciously bonded to said shell, said graphitized cast iron having sufficient strength to carry the weight of a loaded railroad car and to withstand impacts to which journal bearings are normally subjected in service in railroad rolling stock.

4. A copper-free bearing for a journal bearing assembly for railroad rolling stock, which bearing comprises a bearing shell formed from a high strength copper-free ferrous alloy, the ferrous alloy comprising cast iron which has been graphitized and which has the requisite strength to carry the weight of a loaded railroad car and to withstand the impacts to which journal bearings are normally subjected in service in railroad rolling stock, and a Babbitt metal lining, the inner surface of said shell being free of graphitic carbon and the Babbitt lining being securely held to said surface.

5. A journal bearing for a steel journal of a railroad car axle which comprises a shell formed of a deoxidized and graphitized copper-free high strength cast iron shell, a Babbitt lining secured to said shell and shaped to conform to the circumference of the steel journal, the surface of said shell at the interface between said lining and shell being substantially free from exposed carbon particles and tinned whereby said Babbitt lining will remain tenaciously bonded to said shell.

6. For a journal bearing assembly for railroad rolling stock, a high strength cast iron bearing shell formed from cast copper free ferrous-alloy metal that has been graphitized, said shell having an inner surface curved to conform to the circumference of a journal of a railroad wheel axle, said surface being free of exposed carbon particles and having a multiplicity of tiny recesses and tinned; and a Babbitt-metal lining attached to the tinned surface and adapted to ride on the journal; said recesses serving to hold said lining securely to said shell.

7. A journal bearing for a steel axle of railroad rolling stock which comprises a pearlitic cast iron shell containing no copper which can cause impairment of the axle by copper penetration and having sufficient strength to withstand the shocks to which journal bearings are normally subject in railroad rolling stock and a bearing-metal lining shaped to ride on the railroad wheel axle and secured to said shell, the surface of said shell at the interface between said bearing-metal lining and shell being substantially free of exposed carbon particles and having a multiplicity of tiny recesses serving to anchor said bearing-metal to said shell whereby the lining is tenaciously bonded to said shell.

8. A journal bearing for a steel axle of railroad rolling stock which comprises a shell made of cast iron graphitized with calcium silicide and free of copper and having sufficient strength to withstand the shocks to which journal bearings are normally subjected in service in railroad rolling stock, and a Babbitt-metal lining shaped to ride on the wheel axle and secured to said shell, the surface of the shell at the interface between said Babbitt-metal lining and shell being substantially free of exposed carbon particles and having a multiplicity of tiny recesses serving to anchor said Babbitt-metal to said shell, whereby the lining is tenaciously bonded to said shell.

9. A journal bearing for a steel axle of railroad rolling stock which comprises a shell made of high strength graphitized cast iron and containing small amounts of manganese, silicon and zirconium, and a Babbitt-metal lining shaped to ride on the wheel axle and secured to said shell, the surface of the shell at the interface between said Babbitt-metal lining and shell being substantially free of exposed carbon particles and having a multiplicity of tiny recesses serving to anchor said Babbitt-metal to said shell whereby the lining is tenaciously bonded to said shell.

10. A bearing assembly for railroad rolling stock comprising a steel car axle, a high strength copper-free shell made of cast iron graphitized with calcium silicide, said shell having an inner surface shaped to accommodate a Babbitt-metal lining for said axle, said surface being free from exposed carbon and tinned, a Babbitt-metal lining securely attached to said carbon free tinned surface and journaled to said axle and arranged so that, when the Babbitt-metal lining wears out, the steel axle will run in contact with a shell which will not cause a burned off journal by copper penetration.

11. A journal bearing assembly for a railroad car comprising a steel axle, a copper free bearing shell formed from a high strength ferrous-alloy metal that has been deoxidized and graphitized by calcium silicide and which contains silicon and manganese, a Babbitt-metal lining secured to a lower portion of the said shell and being arranged to contact somewhat less than 180 degrees of the upper half of the said axle, the surface of said shell where it contacts the lining being free of graphitic carbon and the lining adhering to said surface, a wedge positioned above the said shell, whereby a portion of the weight of a railroad car can be carried on the said wedge and can be transmitted from the said wedge to the said axle, and whereby the said bearing assembly can be operated for long periods of time and under all conditions of stress, without the said axle being damaged by the penetration of copper along the grain boundaries of the steel.

JAMES J. LAUDIG.

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