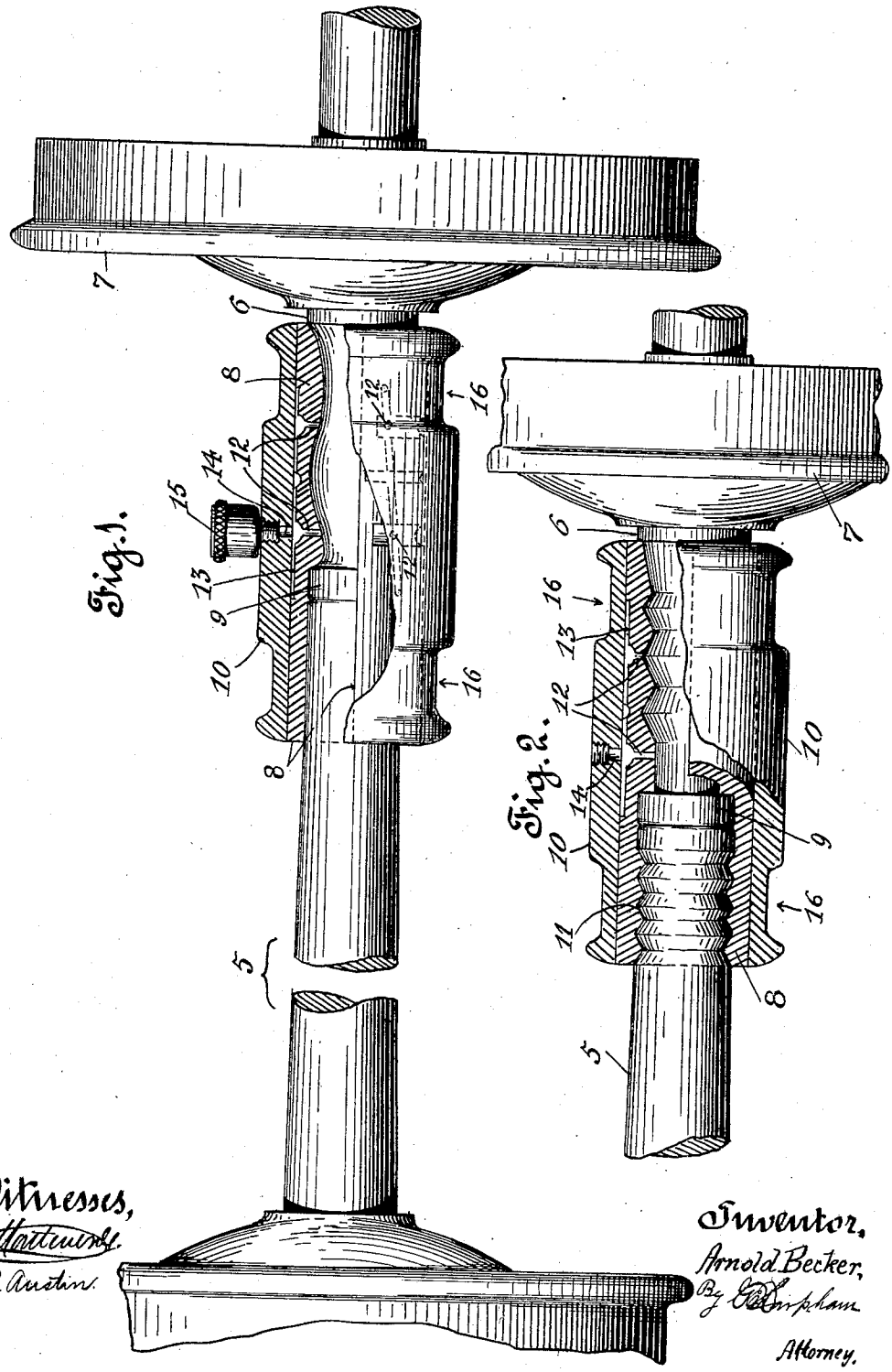
A. BECKER.

DIFFERENTIAL AXLE DEVICE.

APPLICATION FILED MAY 24, 1910.

966,073.

Patented Aug. 2, 1910.



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ARNOLD BECKER, OF SANTA BARBARA, CALIFORNIA.

DIFFERENTIAL AXLE DEVICE.

966,073. Specification of Letters Patent. **Patented Aug. 2, 1910.**

Application filed May 24, 1910. Serial No. 563,063.

To all whom it may concern:

Be it known that I, ARNOLD BECKER, an Austrian subject, residing in the city of Santa Barbara, county of Santa Barbara, State of California, have invented new and useful Improvements in Differential Axle Devices, of which the following is a specification.

My invention relates to a divided axle, or shaft, on the ends of which are rotating parts, which at times are required to rotate at different rates of speed, and is primarily designed for use on railways. When applied to railways, the object thereof is to eliminate the torsional strain, now incident to railway axles when turning a curve, and obviate the wear on the wheels and the noise made thereby when turning a curve.

A further object is to provide a coupling joint containing the maximum amount of strength with the minimum amount of material.

A further object is to provide a joint in which the parts are finally secured by the compression of a portion of the parts upon a portion of the other parts accomplished at one operation.

I accomplish these objects by the device described herein and illustrated in the accompanying drawings, showing it applied to a railway axle, in which drawings,

Figure 1 is a side elevation partly in longitudinal section of a railway axle. Fig. 2 is a like view showing a modified form of coupling joint.

In the drawings the axle is formed of two sections 5 and 6, which may be of equal length, or as shown in the drawings, the section 6 is much shorter than the section 5, the axle being cut as close to the wheel 7 as is convenient in assembling.

The shorter section of the axle is revoluble independently of the coupling shell and is turned down in parts so as to present a plurality of surfaces angularly inclined to the longitudinal central line of the axle in that portion of the same which is inclosed by the inner shell 8, within which it is independently revoluble, except that a small section 9 at the abutting end has the outer surface thereof parallel with the longitudinal central line of the axle. In Fig. 1 I have shown the outer surface of section 6 as formed by curved lines, and in Fig. 2 as formed by straight lines. The inner shell 8 is longitudinally divided into halves, and extends the whole length of the coupling. That portion of the inner sleeve which is mounted upon section 6 has a working fit thereon, being of an internal configuration to fit upon the external configuration of said section. It also extends over the end of section 5 a sufficient distance to be frictionally held thereon when the outer shell 10 is forced upon the inner shell as shown in Fig. 1. As shown in Fig. 2 the abutting end of section 5 is corrugated as shown at 11, and the inner sleeve is of a configuration to fit upon such corrugations with a pressed fit formed by the forcing of the outer shell upon the inner shell. The inner shell is provided with a plurality of transverse lubricating channels 12 which are connected by longitudinal channels 13. The outer shell is provided with a transverse lubricating channel 14 which is supplied with lubricating fluid from oil cup 15 secured thereto. The outer shell is preferably provided near the ends thereof with channels or grooves 16 for convenience in disassembling the parts. The exterior of the inner shell and the interior of the outer shell are preferably slightly tapered so that the outer shell can be more conveniently forced upon the inner shell than would be the case if such taper were not provided.

In assembling the parts the two axle sections are placed in alinement with their ends abutting. The halves of the inner shell are then placed upon said sections in their proper relation to the same. The outer shell is then placed upon the inner shell until the surfaces meet when the outer shell is forced completely upon the shell by hydraulic or other pressure, sufficiently great to cause that portion of the inner shell which surrounds section 5 to frictionally engage the same with sufficient tenacity to resist separation therefrom when the axle is in practical use. Instead of using hydraulic pressure the outer shell could be heated and shrunk upon the inner shell, so that by compression and frictional contact, the engagement between the outer and inner shell shall be rigid, and also so that the engagement between the inner shell and the section not having the working fit shall be rigid.

By this construction and assembling, the rigid engagement between the inner shell and section 5, and the working engagement between the inner shell and section 6, and the rigid engagement between the inner and

outer shells are effected at one operation, either by the forcing or shrinking of the outer upon the inner shell. By the construction of a working fit between one section of the axle and one end of the inner shell and by extending the inner shell and providing it with a pressed fit upon a portion of the other section of the axle, and by inclosing the entire inner shell in an outer shell, the strength of the axle is preserved with a minimum use of material and the actual working surface of the bearing is increased, thereby increasing the life of the journal. By the construction and arrangement of both the inner and outer shells, to inclose the abutting ends of the axle sections, the maximum of axle strength is provided with the minimum amount of material at the point where the abutting ends meet.

Having described my invention what I claim is:—

1. A differential axle device mechanism comprising an axle divided into two sections in alinement; one of said sections having a portion thereof formed with its outer surface angularly disposed as to the central longitudinal line thereof; an inner sleeve longitudinally divided and having one of its ends of a configuration to fit upon the axle section whose outer surface is angularly disposed to the central longitudinal line thereof with a working fit and its other end adapted to fit upon the abutting end of the other axle section with a rigid fit; and an outer sleeve rigidly secured upon the inner sleeve whereby the inner sleeve is secured with a rigid fit upon one axle section and a working fit upon the other axle section.

2. A differential axle device comprising an axle divided into two sections in alinement, said sections having the abutting portions thereof formed for a portion of their length with their outer surfaces composed of a plurality of angularly disposed surfaces as to the central longitudinal line of the axle; an inner sleeve longitudinally divided and having its inner surface of a configuration to fit upon the portion of the axle sections whose outer surfaces are angularly disposed to the central longitudinal line thereof, the inner surface of said sleeve as to one section having a working fit and as to the other section adapted to be held thereon with a rigid fit; and an outer sleeve rigidly secured upon the inner sleeve, whereby the inner sleeve is secured with a rigid fit on one axle section and a working fit on the other axle section.

In witness that I claim the foregoing I have hereunto subscribed my name this 16th day of May, 1910.

ARNOLD BECKER.

Witnesses:
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