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PORTABLE DYNAMOMETER

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My invention relates, generally, to dynamometers and, more particularly, to dynamometers of a portable type.

It is desirable to be able to measure the drawbar pull developed by locomotives under actual operating conditions. However, a complete dynamometer car of the type utilized in the past for measuring the drawbar pull of locomotives is so expensive that a large number of railroads cannot afford to purchase one.

Accordingly, an object of my invention, generally stated, is to provide a portable dynamometer which shall be simple and efficient in operation and which may be economically manufactured and installed.

A more specific object of my invention is to provide a dynamometer which may be installed on a standard locomotive or railway car.

A further object of my invention is to provide a dynamometer which may be substituted in place of the draft gear in a locomotive or railway car.

Another object of my invention is to provide a portable dynamometer which may be easily removed from a locomotive or car.

Other objects of my invention will be explained fully hereinafter or will be apparent to those skilled in the art.

In accordance with my invention a dynamometer is so constructed that it takes the place of a standard draft gear and will fit any locomotive or car which is provided with a draft gear. The dynamometer may be easily installed in or removed from a locomotive or car and, therefore, may be readily changed from one car to another.

For a fuller understanding of the nature and objects of my invention, reference may be had to the following detailed description, taken in conjunction with the accompanying drawing, in which:

Figure 1 is a view, in perspective, of a portion of a vehicle structure including a dynamometer constructed according to my invention:

Fig. 2 is a view, in section, taken along the line II—II of Fig. 3; and

Fig. 3 is an enlarged view, in elevation of the dynamometer shown in Fig. 1.

Referring to the drawing and, particularly, to Fig. 1, the structure shown therein comprises a draft rigging 10 which is carried in the usual manner by a pair of vehicle frame members 11 and 12, only a portion of which is shown. The draft rigging 10 is of a well known type utilized in locomotive and railway car structures. The

rigging comprises a coupler bar 13 which is connected to one end of a draft gear yoke 14 by a removable plate 15. The yoke 14 is slidably disposed between the frame members 11 and 12 and is supported by the frame members.

In place of the usual draft gear, which is carried by the yoke 14, I have provided a dynamometer 16 which is so disposed in the yoke 14 that it is under a compressive load whether the vehicle is pulling or pushing. The dynamometer 16 is so constructed that it may be readily substituted for the usual draft gear and, therefore, may be utilized with any locomotive or car.

As shown, the dynamometer 16 comprises a cylindrical test section 17 having end members 18, the outside surfaces of which are spherically shaped. One of the end members 18 is spherically seated in a rectangular end plate 19 and the other is seated in a similar end plate 20. The spherical ends 18 reduce the bending stresses in the test section to a minimum when it is placed under a compressive load.

Each end of the test section is held in position in one of the end plates by a bolt 21 which extends through the end plate into a tapped hole in the end member 18 of the test section. A washer 22, of rubber or other resilient material, is disposed between the head of the bolt 21 and the end plate to permit the spherical end member 18 to move slightly in the spherical seat in the end plate 19, thereby reducing the bending stresses in the test section.

The characteristics of the test section 17 are such that the stress on the section is below the elastic limit of the material of which it is composed. The test section is preferably formed by boring a hole through a round bar of high-grade steel of the desired length which is properly heat-treated to secure the desired characteristics of the material. The end members 18 are provided with shoulders 23 which may be pressed into the cylindrical member 17 before it is mounted between the end plates 19 and 20. In this manner the test section is secured in position between the end plates.

As shown in Fig. 1, the dynamometer 16 is so disposed in the yoke 14 that the end plates 19 and 20 engage abutment members 24 which are secured to the frame members 11 and 12 by rivets 25. Thus, when the locomotive is pulling on the coupler bar 13 and the yoke 14, the yoke engages the end plate 20 and the force of the locomotive is transmitted through the test section 17 to the end plate 19 which engages the one

pair of abutment members 24, thereby transmitting the force to the frame of the vehicle.

When the locomotive is pushing on the coupler bar 13, one end of the bar engages the end plate 19 and the force is transmitted through the test section 17 to the end plate 20 which engages the other pair of abutment members 24 to transmit the force to the vehicle frame. In this manner the test section 17 is under compression whether the locomotive is pulling or pushing the load.

In order to determine the deformation of the test section 17 under load, a pair of magnetic strain gauges 26 are secured to the test section 180 degrees apart. The magnetic strain gauges 26 may be of a well known type suitable for the accurate determination of the deformation of the test section 17. The two strain gauges may be wired together and connected to a single oscillograph element, or other suitable indicating instrument, in such a manner that they give an average reading. In this way all effects of bending stresses are removed and the oscillograph gives a reading of pure compression, which provides a means of measuring the drawbar pull of a locomotive. It will be understood that the test section and the instruments may be calibrated before the dynamometer is installed in the vehicle in order that a direct reading of the drawbar pull may be obtained.

From the foregoing description it is apparent that I have provided a dynamometer which is extremely low in cost as compared to a dynamometer car of the usual type. Furthermore, the present dynamometer may be utilized with any locomotive or railway car having a draft gear, which permits the dynamometer to be transferred from one vehicle to another as desired.

Since numerous changes may be made in the above described construction and different improvements of the invention may be made without departing from the spirit and scope thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

10 1. A dynamometer for use in a draft gear rigging mounted in the frame members of a vehicle, said dynamometer comprising a cylindrical test section disposed between a pair of rectangular end plates removably disposed in said rigging to react against said frame members, said test section having rounded ends seated in said end plates, bolts countersunk in the end plates and spaced therefrom by resilient material for attaching the end plates to the test section, and means secured to the test section for measuring the deformation of the test section under load.

25 2. A dynamometer for use in a draft gear rigging mounted in the frame members of a vehicle, said dynamometer comprising a cylindrical test section disposed between a pair of rectangular end plates removably disposed in said rigging to react against said frame members, hemispherical end members disposed in the ends of said test section, said end plates having spherical seats for receiving the rounded surfaces of said end members, a bolt countersunk in each end plate and spaced therefrom by resilient material and centrally disposed in one of the end members for attaching the end plates to said end members, and a magnetic strain gauge for measuring the deformation of the test section.

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