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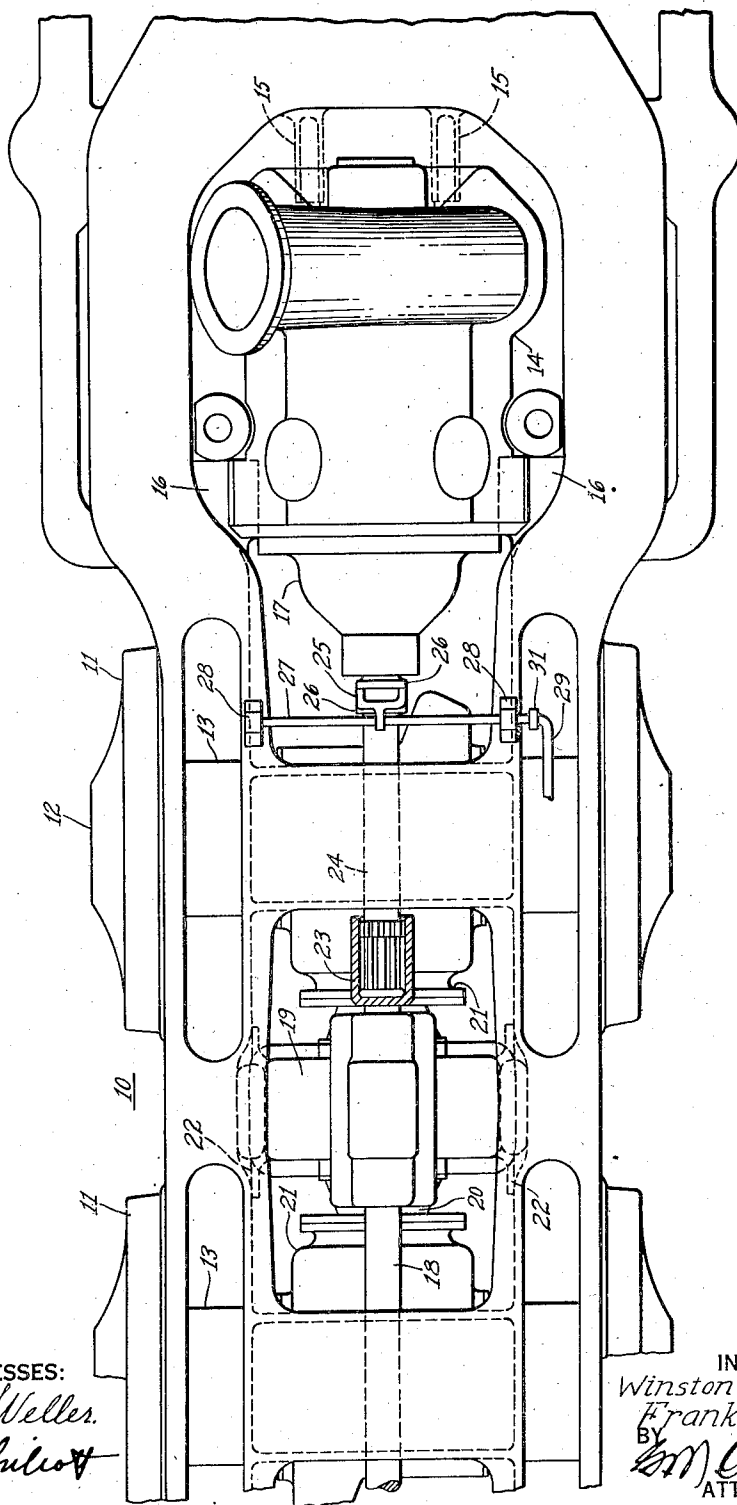
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TURBINE LOCOMOTIVE.

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2 Sheets-Sheet 1

Fig. 1.



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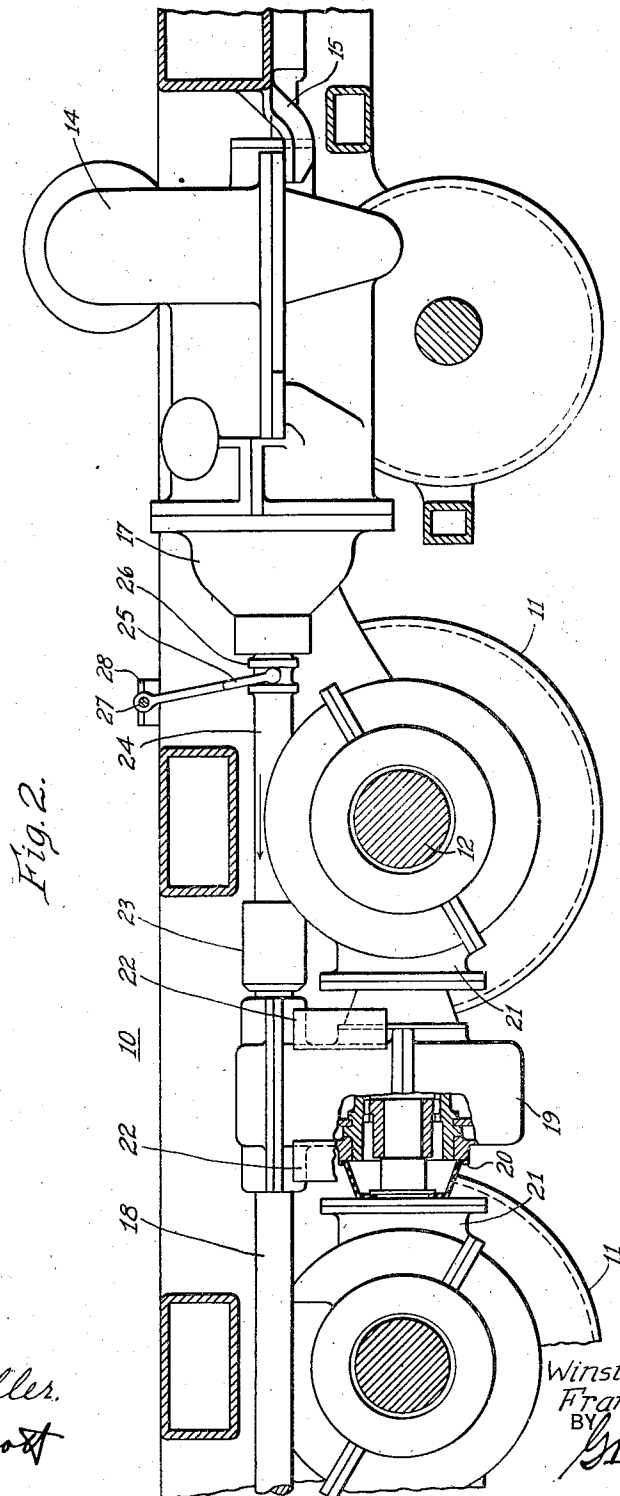
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TURBINE LOCOMOTIVE

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2,394,037

TURBINE LOCOMOTIVE

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Application August 26, 1943, Serial No. 500,097

5 Claims. (Cl. 105—38)

Our invention relates, generally to railway locomotives and, more particularly, to locomotives which are driven by steam turbines.

In order to increase the efficiency and provide high speed motive power for hauling larger freight and passenger trains, it is necessary to provide locomotives having more horsepower output which are capable of hauling trains at a speed of 100 miles per hour or higher. The utilization of steam turbines as the prime movers for locomotives makes possible the provision of locomotives fulfilling the foregoing requirements. However, the application of steam turbines to locomotives involves certain problems, among which are the mounting of the turbines in the locomotives and transmitting their torque to the driving axles.

An object of our invention, generally stated, is to provide a turbine-driven locomotive which shall be simple and efficient in operation and which may be economically manufactured and installed.

A more specific object of our invention is to provide for driving a plurality of the axles of a locomotive from a single turbine.

Another object of our invention is to provide a double-reduction gear drive for a turbine locomotive.

A further object of our invention is to provide for mounting a reduction gear unit between adjacent axles of a locomotive.

Still another object of our invention is to provide for reversing a turbine-driven locomotive.

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

In accordance with one embodiment of our invention, the turbine for driving a locomotive is mounted with its axis disposed longitudinally of the locomotive frame and is connected through a reversing unit to a drive shaft which extends longitudinally of the locomotive. A low speed gear is mounted on each driving axle and the low speed gears for a pair of adjacent axles are both connected to a common gear unit disposed between the axles and driven by the drive shaft.

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

Figure 1 is a view, partially in plan and partially in section, of a portion of a locomotive structure embodying our invention, and

Fig. 2 is a view, partially in elevation and partially in section, of the structure shown in Fig. 1.

Referring to the drawings and particularly to Fig. 1, the portion of a locomotive structure shown therein comprises a frame 10, the side members of which are disposed inside of wheels 11 which are mounted on driving axles 12. The frame 10 may be mounted on the axles 12 by means of journal bearings 13 of the usual type. In order to simplify the drawings, only two driving axles have been shown. It will be understood that additional driving axles may be provided, if desired.

The power for propelling the locomotive may be developed by a steam turbine 14 which is mounted in the frame 10 with its axis disposed longitudinally of the locomotive. The front end of the turbine 14 is supported by a pair of brackets 15, secured to a cross member of the frame 10, and the rear end is supported by brackets 16 secured to the side members of the frame 10.

In order to reverse the direction of operation of the locomotive, a reverse gear unit 17 may be mounted on the rear end of the turbine 14. The reverse gear unit 17 may be of a type having a slidable member for controlling the direction of operation, as will be explained more fully hereinafter. The torque developed by the turbine 14 is transmitted to the driving axles 12 through a drive shaft 18, a reduction gear unit 19, which is disposed between the adjacent axles 12, and additional reduction gear units 21, one of which is mounted on each one of the driving axles 12 and cooperates with the unit 19 in driving the axles.

The gear units 19 and 21 may be of the type disclosed in the copending application of W. A. Brecht, Serial No. 500,096, filed August 26, 1943. As shown, the gear unit 19 is supported by brackets 22, which may be removably secured to the side members of the frame 10, thereby rigidly mounting the gear unit 19 in the truck frame. Each gear unit 21 is supported by one of the axles 12 and is so connected to the gear unit 19 by a coupling 20, that a predetermined amount of relative motion is permitted between the axle gear units 21 and the intermediate gear unit 19.

In this manner both axles of a pair of adjacent axles may be driven from a single gear unit disposed between the axles, thereby simplifying and reducing the size and weight of the gearing structure. Since the drive shaft 18 may readily be extended, additional pairs of driving axles may be driven in the manner hereindescribed. Thus, the torque from a single turbine may be transmitted to as many driving axles as desired.

As shown, the drive shaft 18 is disposed longitudinally of the locomotive and is supported by

the gear unit 19. The shaft 18 is connected to the reverse gear unit 17 by means of a longitudinally movable coupling comprising a cylindrical member 23 having internal gear teeth and a slidable member 24 having external gear teeth which mesh with the teeth in the member 23.

The slidable member 24 extends into the reverse gear unit 17 and the direction of operation of the locomotive may be reversed by moving the member 24 in the direction indicated by the arrow in Fig. 2. The desired movement of the member 24 may be controlled from the operator's cab (not shown) by means of a yoke 25 which is disposed between collars 26 on the member 24 and is actuated by a rotatable shaft 27 disposed transversely of the frame 10 in suitable bearings 28. The shaft 27 may be rotated by a rod 29, one end of which is connected to an arm 31 on the end of the shaft 27. The other end of the rod 29 may be connected to a suitable control lever in the operator's cab. If desired, the operation of the member 24 may be pneumatically or hydraulically controlled in a manner well known in the art.

From the foregoing description, it is apparent that we have provided a double-reduction gear drive structure which makes it possible to transmit torque from a steam turbine, or other suitable prime mover to any desired number of driving axles on a locomotive. The provision of the present structure makes it possible to utilize a locomotive running gear having a relatively short wheel base which is highly desirable and at the same time reduces the weight of the running gear. Furthermore, the utilization of an inside frame also reduces the weight and cost of the running gear.

We do not desire to be restricted to the particular form or arrangement of parts herein shown and described, since it is evident that they may be changed and modified without departing from the spirit and scope of our invention as defined in the appended claims.

We claim as our invention:

1. In a locomotive having a frame and a plurality of pairs of driving axles, in combination, a turbine having its axis disposed longitudinally of the locomotive frame, a drive shaft extending longitudinally of the locomotive and connected to the turbine, a reduction gear unit disposed between a pair of adjacent axles for driving both axles of said pair from said drive shaft, a housing enclosing said reduction gear unit, brackets removably secured to the locomotive frame for rigidly supporting said housing, said drive shaft being supported by and extending through said housing, a gear unit mounted on each one of said adjacent axles and cooperating with said reduction gear unit in driving said axles, and coupling means disposed between each gear unit and the reduction gear unit for movably connecting the gear unit to the reduction gear unit.

2. In a locomotive having a frame and a plurality of pairs of driving axles, in combination, a turbine having its axis disposed longitudinally of the locomotive frame, means for supporting the turbine in the frame, a reverse gear unit for the turbine, a drive shaft extending longitudinally of the locomotive and connected to the turbine through the reverse gear unit, a reduction gear unit disposed in said frame between adjacent axles for driving them from said drive shaft, a housing enclosing said reduction gear unit, brackets removably secured to the locomotive frame for rigidly supporting said housing, 75

said drive shaft being supported by and extending through said housing, a gear unit mounted on each of said adjacent axles and movable therewith, and coupling means disposed between each of said gear units and said reduction gear unit for connecting said gear units to the reduction gear unit and permitting relative motion therebetween.

3. In a locomotive having a frame and a plurality of pairs of driving axles, in combination, a turbine having its axis disposed longitudinally of the locomotive frame, means for supporting the turbine in the frame, a reverse gear unit for the turbine, a drive shaft extending longitudinally of the locomotive and connected to the turbine through the reverse gear unit, a reduction gear unit mounted in said frame between a pair of adjacent axles for driving both axles of said pair from said drive shaft, a housing enclosing said reduction gear unit, brackets removably secured to the locomotive frame for rigidly supporting said housing, said drive shaft being supported by and extending through said housing, a gear unit mounted on each of said adjacent axles and movable therewith, and coupling means disposed between each of said gear units and said reduction gear unit for connecting said gear units to the reduction gear unit and permitting relative motion therebetween.

4. In a locomotive having a frame and a plurality of pairs of driving axles, in combination, a turbine having its axis disposed longitudinally of the locomotive frame, means for supporting the turbine in the frame, a reverse gear unit for the turbine, a drive shaft extending longitudinally of the locomotive and connected to the turbine through the reverse gear unit, a reduction gear unit mounted in said frame between a pair of adjacent axles for driving both axles of said pair from said drive shaft, a housing enclosing said reduction gear unit, brackets removably secured to the locomotive frame for rigidly supporting said housing, said drive shaft being supported by and extending through said housing, an additional gear unit mounted on each one of said adjacent axles and cooperating with said reduction gear unit to drive said axles, and coupling means disposed between each additional gear unit and the reduction gear unit for movably connecting said gear units.

5. In a locomotive having a frame and a plurality of pairs of driving axles, in combination, a turbine having its axis disposed longitudinally of the locomotive frame, means for supporting the turbine in the frame, a reverse gear unit for the turbine, a drive shaft extending longitudinally of the locomotive and connected to the turbine through the reverse gear unit, a reduction gear unit mounted in said frame between a pair of adjacent axles for driving both axles of said pair from said drive shaft, a housing enclosing said reduction gear unit, brackets removably secured to the locomotive frame for rigidly supporting said housing, said drive shaft being supported by and extending through said housing, an additional gear unit mounted on each one of said adjacent axles and cooperating with said reduction gear unit to drive said axles, a gear case enclosing each one of said additional gear units and supported by the axle, and a flexible coupling disposed between each additional gear unit and the reduction gear unit for connecting said gear units.

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