S. G. THOMSON.

DRIVING MECHANISM FOR LOCOMOTIVES.

APPLICATION FILED MAY 18, 1915.

1,178,555.

Patented Apr. 11, 1916.

2 SHEETS—SHEET 1.

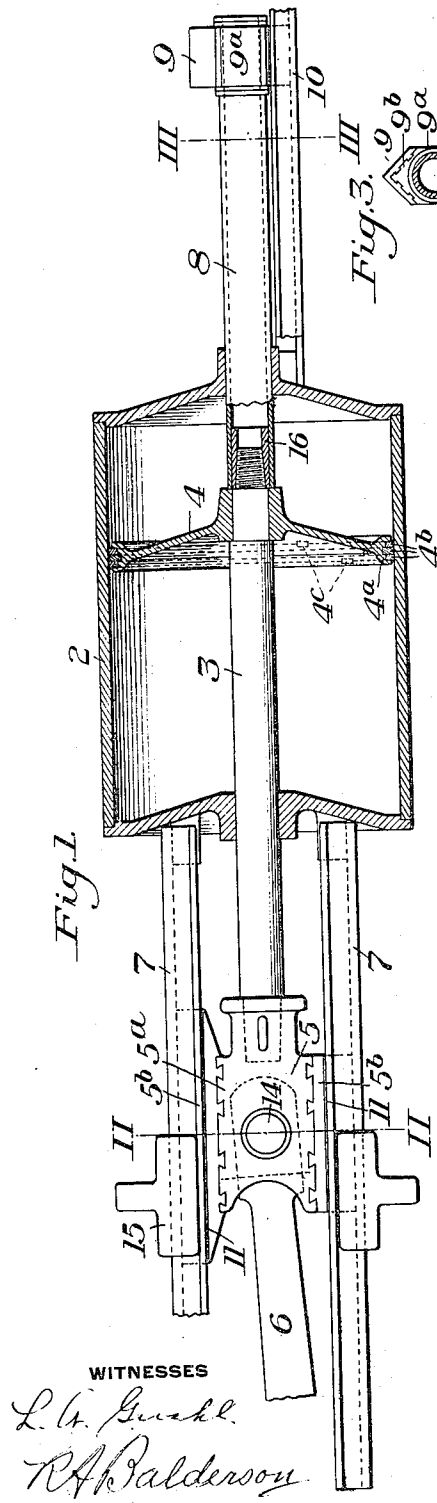

Fig. 1.

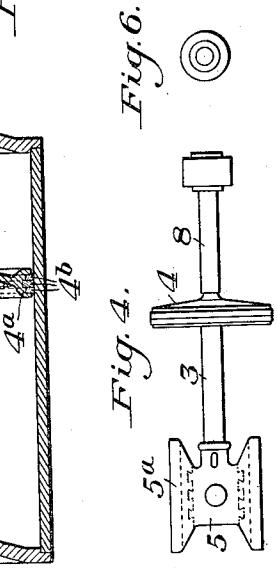

Fig. 3.

Fig. 6.

Fig. 4.

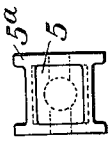

Fig. 5.

Fig. 9.

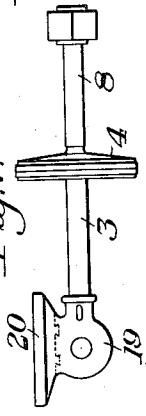

Fig. 7.

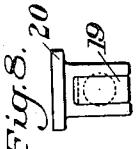

Fig. 8.

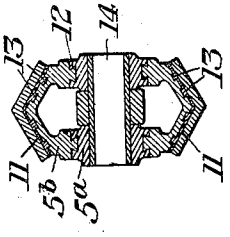

Fig. 2.

WITNESSES

L. A. Gunkel.

R. A. Balderson

INVENTOR

S. G. Thomson.

by Bakewell, Byrnes & Parmele

Attys.

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2 SHEETS—SHEET 2.

Fig. 10.

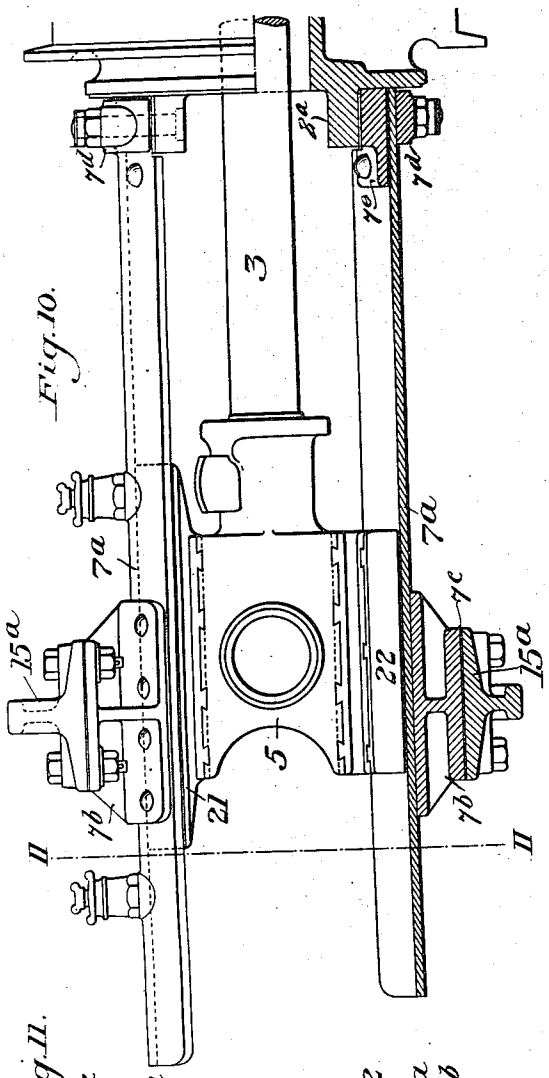


Fig. 11.

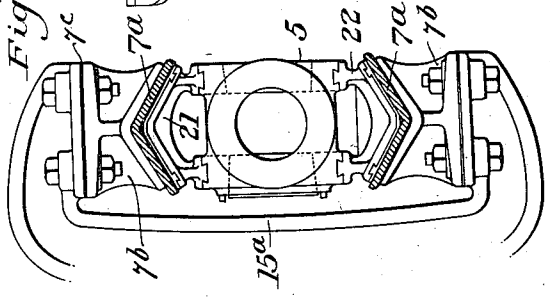


Fig. 16.

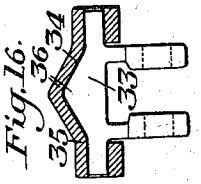


Fig. 15.

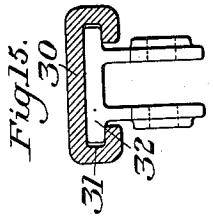


Fig. 14.

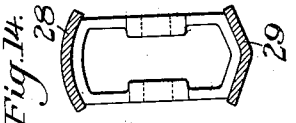


Fig. 13.

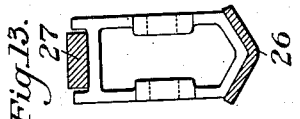
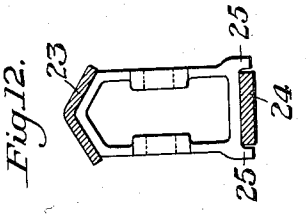


Fig. 12.



WITNESSES

L. A. Gaskill.

R. A. Balderson

INVENTOR

S. G. Thomson,

by Bakewell, Byrnes & Parmelee

Attys.

UNITED STATES PATENT OFFICE.

SAMUEL G. THOMSON, OF READING, PENNSYLVANIA.

DRIVING MECHANISM FOR LOCOMOTIVES.

1,178,555. Specification of Letters Patent. Patented Apr. 11, 1916.

Application filed May 18, 1915. Serial No. 28,829.

To all whom it may concern:

Be it known that I, SAMUEL G. THOMSON, a citizen of the United States, residing at Reading, in the county of Berks and State of Pennsylvania, have invented a new and useful Improvement in Driving Mechanism for Locomotives, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a view partly in side elevation, partly in vertical section, and somewhat diagrammatic, illustrating one form of locomotive driving mechanism embodying my invention. Figs. 2 and 3 are sections taken respectively on the lines II—II and III—III of Fig. 1. Fig. 4 is a side view of the cross-head, piston rod, piston, and piston rod extension. Figs. 5 and 6 are end views of Fig. 4, looking at opposite ends thereof, respectively. Figs. 7 and 8 and 9 are views similar respectively to Figs. 4, 5 and 6, but showing a modification of the cross-head. Fig. 10 is a view partly in side elevation, and partly in vertical section showing another form of cross-head and its guides. Fig. 11 is a section on the line II—II of Fig. 10. Figs. 12, 13, 14, 15 and 16 are cross sectional views showing different forms of cross-heads and guides which may be employed.

My invention has relation to driving mechanism for locomotives, and is designed to provide a driving mechanism in which the weight of the parts is materially reduced.

Modern development in locomotive design has created reciprocating parts in the driving mechanism of such size as to require excessive amounts of counterbalance in the wheels. This amount of added counterbalance, over and above the amount necessary to balance the revolving parts, results in damaged track to such an extent that reduction in the weight of the reciprocating parts is extremely desirable.

My invention is designed to provide a construction in which this object is attained for modern high-speed locomotives and whereby such parts can be made much lighter than anything heretofore used, while at the same time they will have the proper strength.

The nature of my invention will be best understood by reference to the accompanying drawings in which I have shown a number of embodiments thereof, and which will now be described, it being premised, however, that the invention is susceptible of various other embodiments within the scope of the appended claims.

Referring first to that form of my invention shown in Figs. 1 to 6, inclusive, the numeral 2 designates one of the locomotive cylinders, 3 the piston rod, 4 the piston, 5 the cross-head, 6 the main rod connected to the cross-head, 7 the cross-head guides, 8 the piston rod extension at the front of the cylinder, 9 a guiding cross-head on said extension, and 10 a guide for the cross-head 9. Each of the cross-heads is shown as consisting of a steel center portion 5^a or 9^a upon which is cast facing portions 5^b and 9^b of some lighter metal, preferably aluminum. These facing portions may themselves provide the bearing surfaces for engagement with the cross-head guides; but preferably they are themselves provided with a facing 11 of suitable bearing material. The steel centers of the cross-heads are provided with suitable recesses 12, preferably of dovetailed form into which the aluminum facings are cast, thus forming a secure joint between the parts. Where separate facings of bearing metal are applied to the aluminum portions, the latter may also have suitable recesses, as indicated at 13, into which the bearing metal, such as lead or Babbitt metal, is cast. The steel center may, however, be omitted in the cross-head 9, which may consist only of an aluminum center with a facing of bearing metal. The steel center construction gives the requisite strength and forms a proper bearing for the pin 14 connecting the main rod to the cross head. The aluminum portions act merely as the guiding or spacing portions and greatly lighten the weight of the cross-head as a whole. The cross-head guides 7 are shown in these figures as consisting of relatively thin plates bent at an angle to form V-shaped guides for the cross-head 5, the bearing portions of the latter being of corresponding form. The cross-head guide 10 may be of similar construction, as shown in Fig. 3. This form of plate guides gives great resistance to both vertical and lateral thrusts, and at the same time the guides afford stiffness in themselves on account of their shape. They are supported about midway of their length in the guide yoke 15. On account of the stiff shape of the guides, it is not necessary to support them at the ends.

The feature of locating the guide yoke at an intermediate point in the length of the guides permits a much thinner and lighter plate to be used, since the unsupported span is only about one-half as long as when the guides are supported at their two end portions. Furthermore, the thrust of the main rod against the cross-head guides is at a maximum at the midpoint; or, in other words, when the crank-pin of the driving wheel is at the lower or upper quarter of its movement. The yoke support, therefore, is placed at the point of maximum thrust.

I prefer to provide the guide yoke with rigid supporting shoes 7^b, detachably secured to the yoke, and which have concave seats for the guides, and conform thereto. The shoes being detachable, the guides can be readily lined up by the use of shims such as indicated at 7^c in Figs. 12 and 13. At their opposite ends, the guides may be secured to the cylinder head by means of suitable clamps 7^d, having members 7^e which fit the flange 2^a of said head, and also within the V of the guide.

The cross-head guides must be spaced sufficiently far away from the center of the cross-head to allow proper angularity of the main rod 6. In the usual types of cross-heads this has required the use of a large amount of metal in the cross-head, adding greatly to the weight of the parts where strength is not required. By the angular design of cross-heads shown, the cross-head bearing surfaces are brought as closely to the center of the cross-head as possible, while allowing sufficient clearance for set screws, keys, etc., in the main rod and which are arranged adjacent to the vertical longitudinal center line of the rod. This construction of the guides also largely reduces the weight of the parts.

I prefer to make the piston rod extension 8 in the form of a light tubing of substantially the same diameter as the diameter of the piston rod and having a bushing 16 forced into its rear end. This bushing is internally threaded and is screwed to the end of the piston rod. When tightened in this position, the tubing is then welded, making a very substantial connection. The connection may, however, be made in any other suitable way. It may of course be attached to an extension of the piston head instead of to the piston rod. The novel feature consists in the use of a light piece of tubing as the rod extension, rather than making it of the same forging as the piston rod and relying on drilling holes through its center to afford lightness. Tubing of large diameter can be used without involving much metal, and great stiffness can thus be obtained with a comparatively small weight.

The cross-head 9 is preferably mounted so as to be turned on the end of the piston rod extension and reversed edge for edge so that as its lower portion becomes worn, it can be reversed and the upper aluminum portion 9^b will again provide proper alinement before the cross-head has to be refaced.

I have also shown in Fig. 1 a type of piston which allows great lightness in construction. This design embodies a single packing ring groove in the enlarged ring portion 4^a, this groove having three packing rings 4^b seated therein in contact with each other. The portion of the groove which seats the center ring is preferably deeper than the portions which seat the side rings, so that when the groove is filled with the rings a greater seal is provided against steam blowing through under the rings or between the packing rings and the cylinder. The two side rings may be doweled to the piston head, as indicated at 4^c, in such positions that their ends will be at opposite sides of the piston. The middle ring may then be allowed to float between the two side rings. This arrangement will never permit the ends of all three rings getting together and thereby giving an opportunity for the steam to blow through.

Figs. 7, 8 and 9 illustrate a modification in which the cross-head 19 has only one bearing portion 20, this preferably being of aluminum cast to a steel center. Fig. 10 shows another form of cross-head in which the top bearing portion 21 is made longer than the bottom bearing portion 22. This figure, together with Fig. 11 shows more in detail the manner in which the cross-head guides 7^a are supported in the yoke 15^a. Fig. 12 shows a form of cross-head and guides in which the upper guide 23 is of the inverted V-form similar to that first described, while the lower guide 24 is of flat plate form, and the cross-head has the guiding flanges 25 which embrace the edges of the lower guide. In Fig. 13 the construction of Fig. 14 is reversed, the V-shaped guide 26 being at the bottom and the flat guide 27 at the top. Fig. 14 shows a form in which the top guide 28 is curved to the arc of a circle, while the lower guide 29 is of angular form. Fig. 15 shows a modification in which only the top guide 30 is employed, this having a T-shaped guide slot 31, and the cross-head having a corresponding portion 32 sliding therein. Fig. 16 shows a modification in which the cross-head has a T-head 33 sliding in a way 34 of corresponding shape in the top guide 35, the cross-head and the guide-way having the central V-portions 36 of complementary form. These various forms are illustrative only as showing different possible embodiments of my invention.

While I have spoken herein of the use of

aluminum in the cross-heads, I may, of course, use any of the various suitable alloys of aluminum, such as those in which small portions of tin, copper and nickel are added, since pure aluminum is difficult to use where strength is required or where machining or threaded work is to be greatly depended upon. I believe that my invention makes practical use of such alloys in a service which is unusually severe; and the benefits afforded by the reductions in weight are very marked. By the term "aluminum" as used herein and in the appended claims, I intend therefore to include various alloys in which aluminum forms the main element.

I claim:

1. A driving mechanism for a locomotive, comprising a cross-head and guide, said cross-head having a steel portion to provide connections for the main rod and the piston rod, and said steel portion having an aluminum portion fastened to it and interposed between it and said guide.

2. A driving mechanism for a locomotive, comprising a cross-head and guide, said cross-head having a steel portion and an aluminum portion, said aluminum portion having a facing to engage said guide.

3. A driving mechanism for a locomotive, comprising a cross-head and guide, said cross-head having a central steel portion to provide connections for a main rod and a piston rod, and said steel portion having an aluminum cage portion attached thereto.

4. A driving mechanism for a locomotive, comprising a cross-head and guide, said cross-head having an aluminum member with recessed or dove-tailed grooves to receive bearing metal to contact with said guide.

5. A driving mechanism for a locomotive, having a cross-head with a steel central portion to provide connections for a main rod and a piston rod, said steel central portion having a plurality of projections, and an aluminum portion cast around said projections.

6. A driving mechanism for a locomotive, having a cross-head with a steel central portion to provide connections for a main rod and a piston rod, said steel central portion having a plurality of projections, and an aluminum portion cast around said projections, said aluminum portion providing recesses or dove-tailed grooves to hold a facing of bearing metal for said cross-head.

7. A locomotive driving mechanism, comprising a cylinder, a piston therein, a piston rod having a crosshead, and a concave guide, said guide forming concaved guide-bearing faces for the crosshead and fastened at one end to the locomotive, together with a guide yoke to which said guide is fastened adjacent to its middle portion.

8. A locomotive driving mechanism, comprising a cylinder, a piston therein, a piston rod having a crosshead, and a guide for said crosshead, said guide forming V-shaped guiding surfaces for similar angular bearing faces on the crosshead, said guide being fastened at one end to the locomotive and also fastened adjacent to its mid-length by means of a guide yoke.

9. A locomotive driving mechanism, comprising a cylinder, a piston therein, a piston rod having a cross-head, and oppositely arranged guides for said cross-head consisting each of a plate member bent to form concaved guide-bearing faces in the cross-head, and fastened at one end to a head of the cylinder, together with a guide-yoke to which said plate members are fastened adjacent to their middle portions.

10. A locomotive driving mechanism, comprising a cylinder, a piston therein, a piston rod, a cross-head connected to the piston rod, a main driving rod connected to the cross-head, and upper and lower guides for said head, said guides having concaved bearing faces, and being unsupported near their rear ends, the concave form of said guides and the absence of supporting means at their rear portions permitting a maximum angularity of the driving rod, with a minimum separation of the guides.

11. A locomotive driving mechanism, comprising a cylinder, a piston therein, a piston-rod having a crosshead, and oppositely arranged guides for said head, said guides being formed of thin plate metal shaped to give concaved bearing surfaces for the head, and a supporting yoke for the guide having rigid shoes provided with seats for the guides and conforming approximately thereto.

12. A locomotive driving mechanism, comprising a cylinder, a piston therein, a piston-rod having a crosshead, and oppositely arranged guides for said head, said guides being formed of thin plate metal shaped to give concaved bearing surfaces for the head, and a supporting yoke for the guide having rigid shoes provided with seats for the guides and conforming approximately thereto, said shoes being detachable to facilitate lining up of the guides.

In testimony whereof, I have hereunto set my hand.

SAMUEL G. THOMSON.

Witnesses:
HARRY EGOLF,
J. J. WEIGHTMAN.