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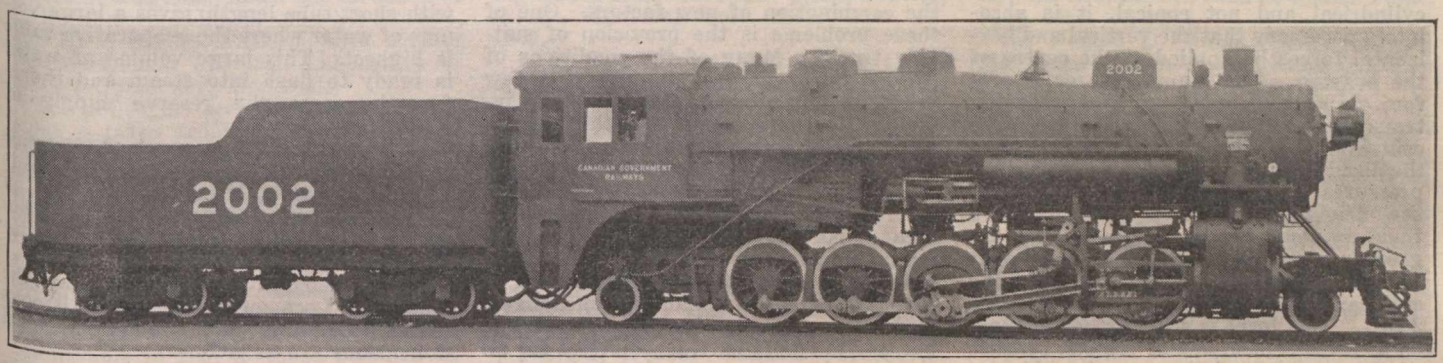
2-10-2 Locomotives for Intercolonial Railway.

The Intercolonial Division, Canadian Government Railways, has received recently ten 2-10-2 type locomotives, one of which is illustrated herewith.

As train loads outgrow the capacity of the mikado type, the 2-10-2 type becomes its logical successor in the same way as the mikado type succeeded the consolidation. The 2-10-2 type has formerly been handicapped by its long rigid wheel base. The application of lateral motion driving axles and boxes to the first pair of drivers was made for the purpose of reducing the rigid wheel base to that which is in common use on locomotives of smaller capacity and at the same time securing the advantages of the 10 coupled wheel arrangement, with the resulting increased capacity of the locomotive.



2—10—2 Locomotive, Intercolonial Division, Canadian Government Railways.

The lateral box arrangement consists of two independent driving boxes, whose transverse lateral centres are about on a line with the inside of the main engine frames. These two driving boxes are held in a fixed relation to each other by a bridge or spacing member, which engages the inner flanges of the boxes. The weight which is transmitted through this bridge member is applied to the boxes on their transverse centres. The lugs on the spacing member, which engage the inner flanges of the boxes, are for the sole purpose of maintaining the proper spacing of the boxes, and do not transfer any vertical load. The driving springs are in about the normal position, and are carried upon a cross member, which has a vertical movement only between the engine frames, a wearing shoe being placed upon the inner side of the main frames to prevent side motion. Between this cross member and the bridge or spacing member above mentioned, are interposed 2 inverted rockers, designed so that a lateral force equal to 20% of the vertical weight transmitted is required to deflect them from their normal position. When the boxes are deflected by a side movement of the first pair of driving wheels from their normal centre position, the boxes and the bridge casting are moved laterally in reference to the member carrying the springs. This movement deflects the inverted rockers, which offer a definite resistance against the motion. The spring and equalizer work is not shifted from its normal position when the boxes are deflected laterally. One side of the bridge member is carried down below the driving axle with a bolting flange. This is provided for the attachment of a finger, to guide the brake beam, and ensure that the brake heads register properly with tires on no. 1 driver.

The rod connections between the first and second drivers are arranged with a ball knuckle joint ahead of the pin on no. 2 driver, which allows for lateral deflection of the side rods. The crank pin and rod bearing at no. 1 driver consist of an ordinary design of cylindrical crank pin, on which is placed a hard bronze bushing, the interior being bored cylindrical and the outside turned to a spherical surface. Encasing this bushing are two half pieces of hard steel, which are held in place in a rod end with a wedge, in the same manner as two ordinary half brasses. The bushing can revolve either on the crank pin or within the two steel halves. When the rod is deflected from the normal position, the spherical bushing allows the parts to rotate sidewise around the centre of the front crank pin; at the same time the bushing can revolve on the cylindrical portion of the pin. Several oil holes are provided through the bronze bushing, which ensure lubrication of both the spherical and cylindrical surfaces of the bushing.

The operation of the lateral motion axle should be considered in connection with the engine truck. The driving springs of the first and second axles are equalized in the usual manner to the engine truck; therefore, the weight upon the engine truck centre pin and the lateral motion boxes on the first axle is divided in proportion to the arms of the front equalizer. The engine truck on this engine is of the inverted rocker type, having a resistance of 50% against the initial movement, and, as stated, the resistance of the lateral device at the first driver is 20%. These resistances are so chosen in relation to the weight coming upon each centring device that the lateral resultants at the engine truck and the first driver are just about the same in amount. It will thus be seen that in effect, the engine truck and the first driver act in practically the same way as a 4-wheel engine truck, in guiding the front of the locomotive, except that the lateral resistance is applied in the plane of each wheel, instead of being applied midway between the wheels and divided between them as in the case of a 4-wheel truck. As far as guiding the engine in concerned, therefore, the arrangement is very similar to a 4-wheel truck application with the rear wheel of the truck acting as a driving wheel.

The resistance of the lateral motion box is proportioned with the idea of providing enough initial resistance so that for any ordinary road service on tangent track or road curves, the first driver will remain in normal position and deflect only when passing through turnouts and yard curves. The operation of the device in service has clearly demonstrated the correctness of the design in this particular. A close inspection of the locomotives in operation discloses the fact that the lateral motion first driver very rarely deflects when they are upon the road. When the locomotive passes through sharp turnouts or is operating around yards, the lateral motion driver will deflect, thus preventing the cramping of the driving wheel base in the curve and excess pressure upon the driving wheel flanges.

The action of the rockers provides a limit to the lateral pressure which can be placed upon the first driving wheel flange. When this lateral resistance exceeds 20% of the weight carried upon the lateral motion rockers, the boxes will deflect, the excess lateral pressure being then transferred to the second driver, thus dividing the work of guiding the engine through curves between the truck, first and second drivers, instead of truck and first driver only as in the ordinary 10-coupled arrangement.

Driving boxes for locomotives have generally been designed only for the weight which they are required to support, so that the size has been in direct proportion to the load borne by each journal and driving wheel. This method has been satisfactory so far as the weights are concerned, but unsatisfactory for horizontal forces, resulting in too rapid wear. This is especially true of large locomotives built in recent years, in which it has been necessary to increase, on account of their dimensions, the transverse spacing from centre to centre of cylinders. At the same time the distance apart of the frame centres has been actually decreasing, on account of the necessity of longer bearings and maintaining frames in the centre of the bearings.

The standard gauge of 4 ft. 8½ in. imposes certain limitations on locomotive