June 7, 1955 W. C. COX 2,709,968

TRACTION INCREASING DEVICES FOR RAILROADS

Filed Jan. 28, 1952

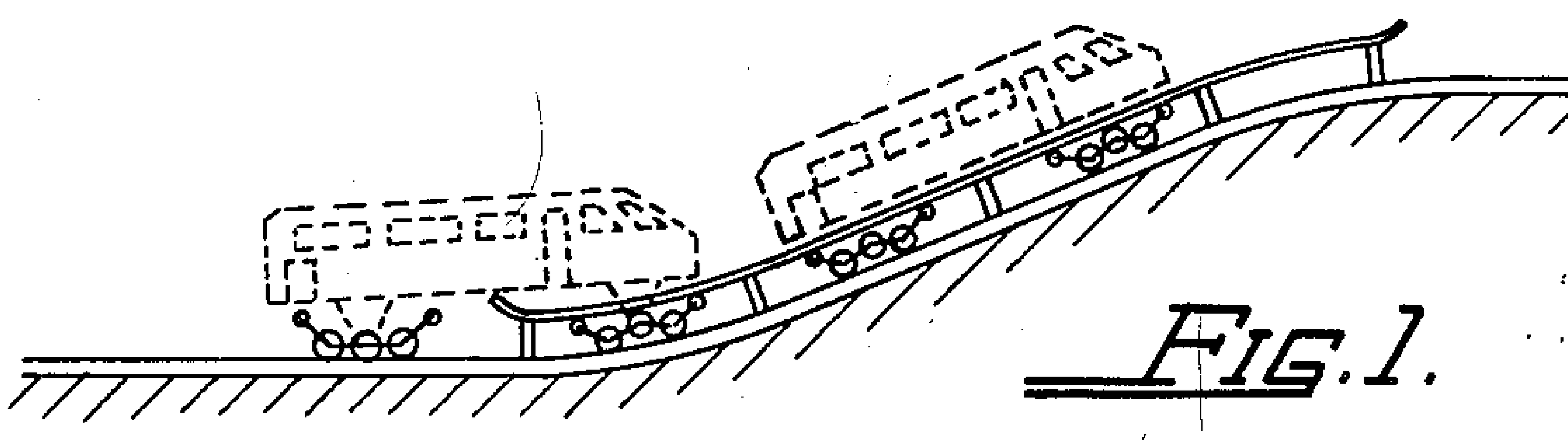

FIG. 1.

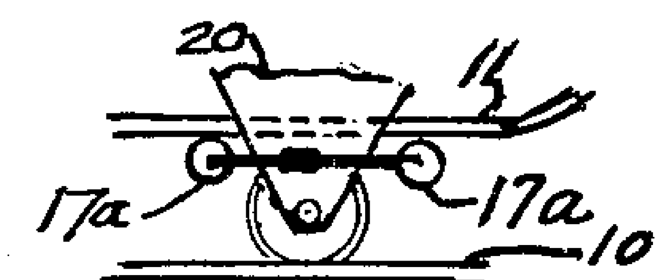

FIG. 7

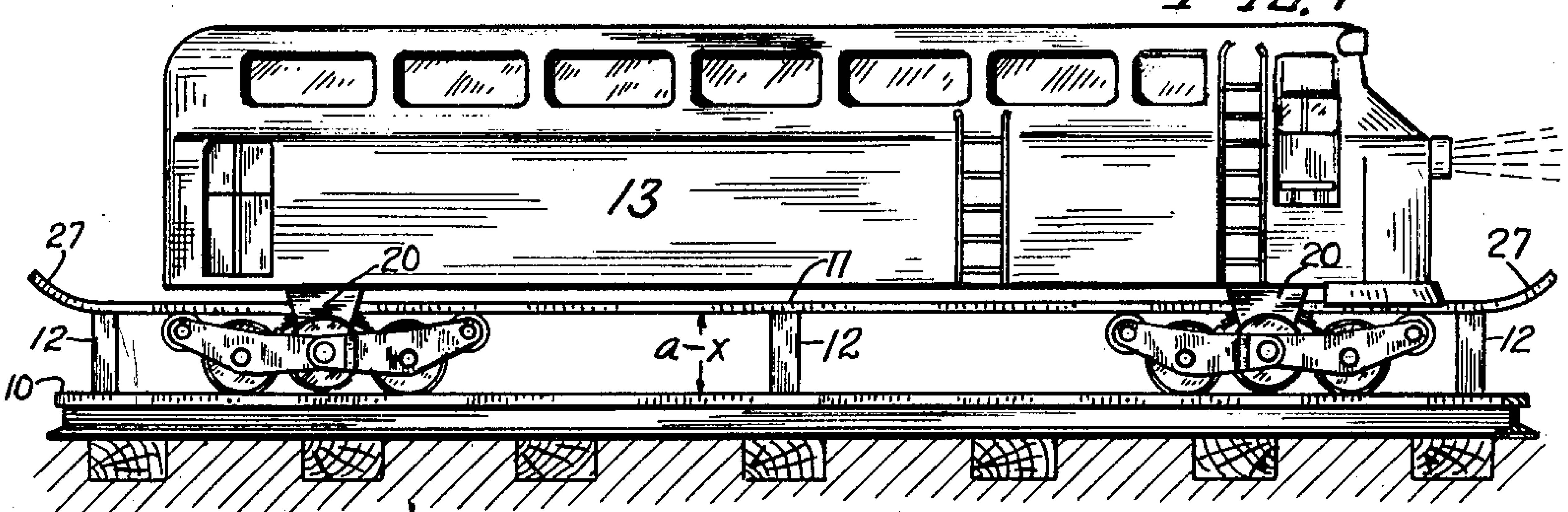

FIG. 2.

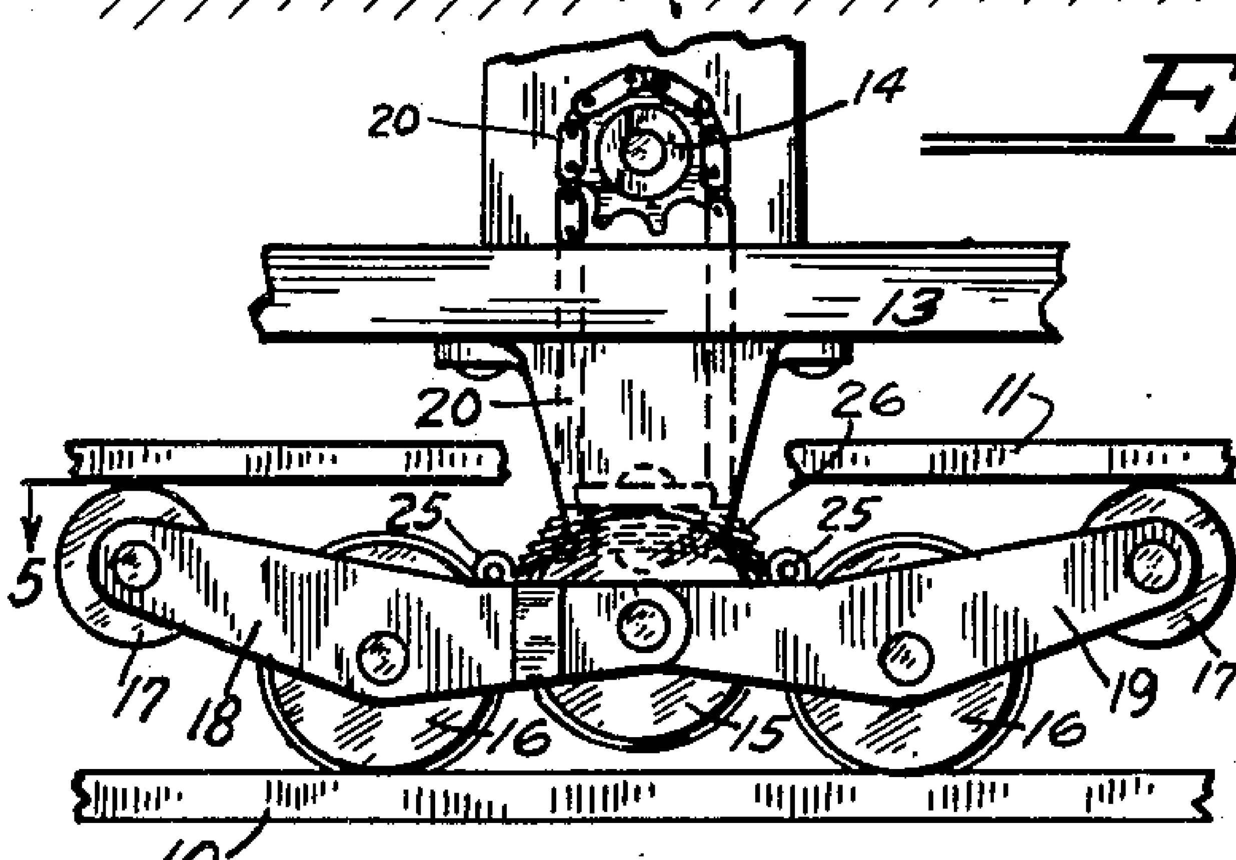

FIG. 3.

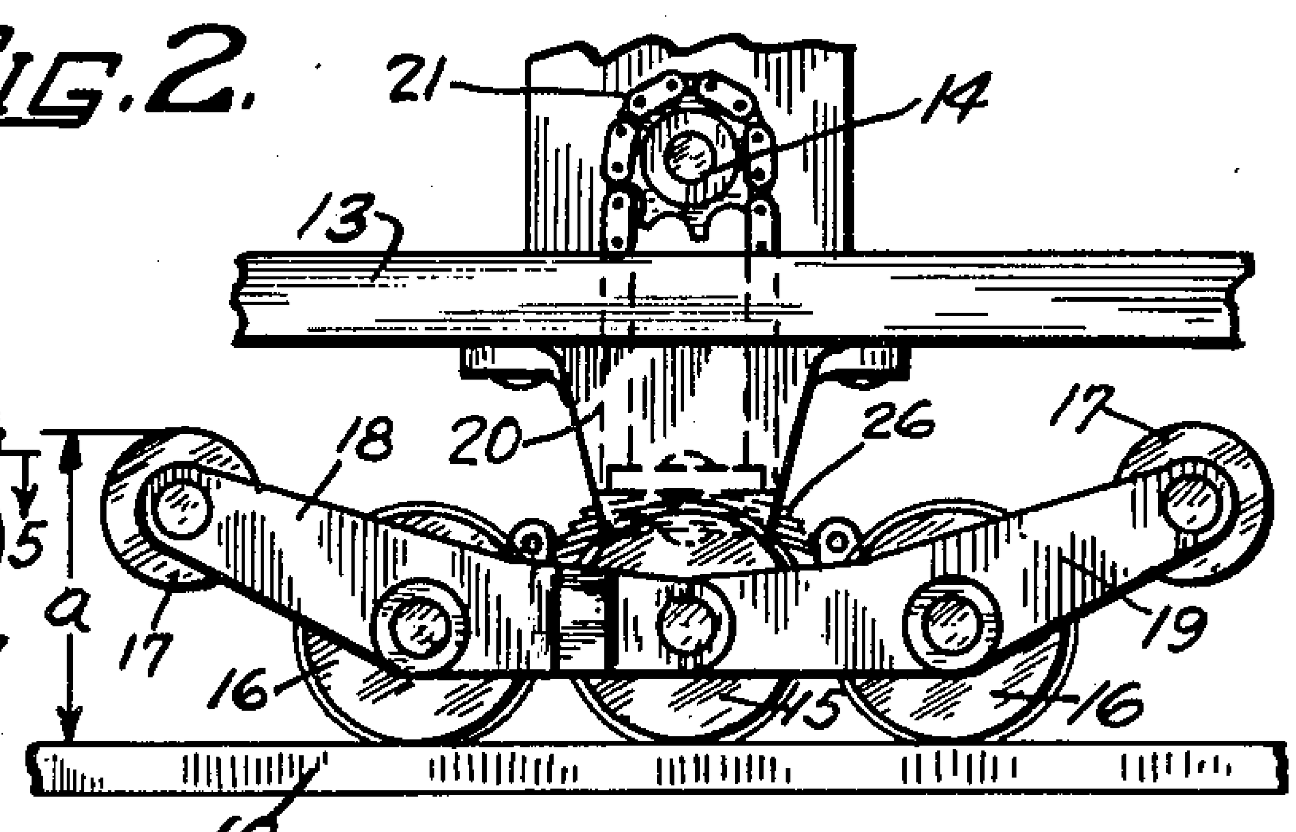

FIG. 4.

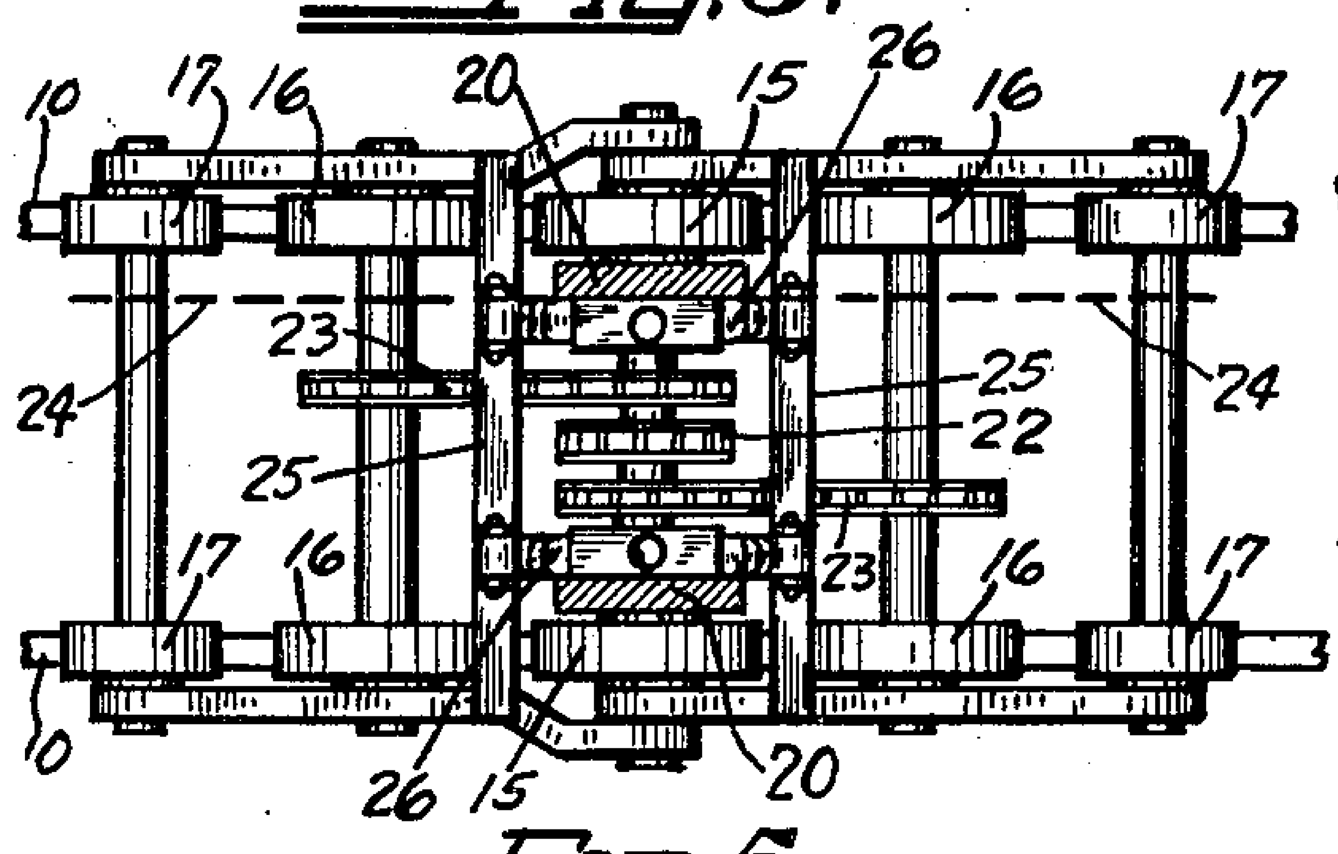

FIG. 5

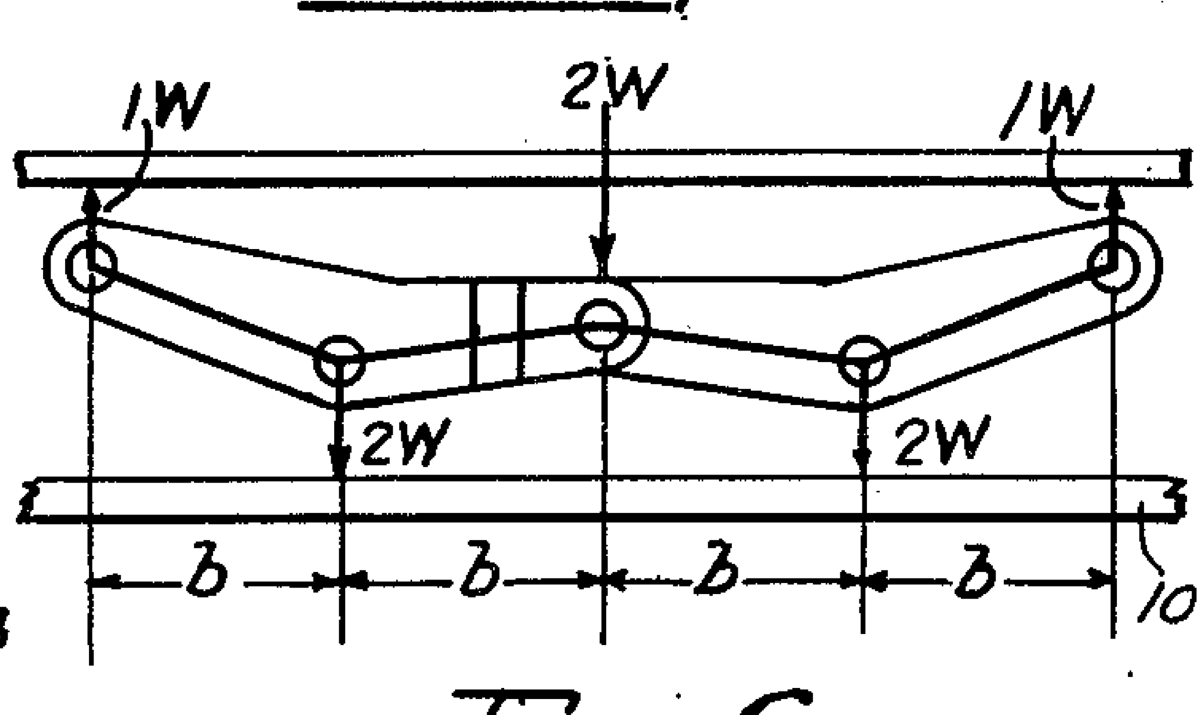

FIG. 6.

INVENTOR.

WALTER C COX

BY

Martin E Anderson

ATTORNEYS

United States Patent Office

2,709,968

Patented June 7, 1955

2,709,968

TRACTION INCREASING DEVICES FOR RAILROADS

Walter C. Cox, Denver, Colo.

Application January 28, 1952, Serial No. 268,499

1 Claim. (Cl. 105—75)

This invention relates to improvements in railways and has reference more particularly to an improved locomotive and track by means of which greater traction can be obtained with the same weight of locomotive or tractor.

In many parts of the world there is a great need for an efficient mode of transportation, more particularly for freight. The present method of railway construction is to expensive for places that are not fully developed because the grades that can successfully be traveled are limited to a few degrees and as a result of this it requires a great amount of filling, cutting and tunneling to construct a standard type of railway over hilly terrain.

This difficulty has been recognized and elevated railways have been proposed as a solution. The structure required for such railways result in prohibitive costs.

The use of rack and pinion construction has been utilized in some mountainous railway construction but merely for what may be termed "scenic railways" that climb to some mountain top or resort. Cog roads are limited to slow speeds.

It is the object of this invention to produce a system of railway construction that will utilize the present type of track, cars and locomotives with slight modifications to enable the train to travel over grades that are much too steep for present railroads.

Another object is to produce a railroad locomotive that can travel at normal speeds over the comparatively level sections and slow down only at steep grades.

In the standard type of railroads the traction is exerted by a locomotive employing steam, electricity or internal combustion engines for power. The tractive effort is limited to the frictional resistance between the rails and the drive wheels of the tractor and this is directly proportioned to the weight of the tractor. When such tractors or locomotives travel over level tracks the weight is perpendicular to the rail surface but when there is an upgrade the weight is divided into two components one of which is perpendicular to the track and the other parallel thereto and directed downwardly. It is evident that on an upgrade a locomotive cannot exert the same tractive effort as it can on a level track. If the weight of the tractor unit were increased to keep the component perpendicular to the rails the same as it is on a level track the component parallel with the rail surface would likewise increase.

It is the object of this invention to produce a construction of track and tractor by means of which the pressure of the tractive or drive wheels on the rails can be greatly increased without adding to the weight of the tractor or locomotive and thereby enable it to negotiate higher grades thereby simplifying and reducing the cost of track construction.

In order to explain the invention so that it can be readily understood reference will be had to the accompanying drawing in which the invention has been illustrated and in which,

Figure 1 is an illustrative view showing a train traveling up a steep grade,

Figure 2 is a side elevation showing the tractor or locomotive in position to exert increased rail pressure by the drive wheels per unit tractor weight,

Figure 3 is a side view to a somewhat larger scale showing the relationship between the drive wheels and the track to effect increased traction,

Figure 4 shows the relationship of the drive wheels to the track during travel over comparatively level track sections,

Figure 5 is a top plan view of a tractor truck, taken on plans 5—5 Figure 3,

Figure 6 is a force diagram illustrating the relationship of the forces during the time the increased traction arrangement is in force; and

Figure 7 is a diagram showing a slight modification.

In the drawing reference numeral **10** designates the rails of an ordinary railway track and numeral **11** designates the auxiliary rails which are provided at steep grades. The auxiliary rails are rigidly connected with rails **10** by means of bars **12**, which of course, are positioned quite close together. Instead of spaced bars **12** a continuous plate may be used.

The locomotive or tractor car **13** has been illustrated as an ordinary coach body and carries the power plant which has been designated by numeral **14** in Figures 3 and 4. Any suitable power may be used such as steam, gasoline engine, diesel engine or electric motor. The tractor car is provided with novel trucks of which two have been shown.

The construction of the truck will now be described; it is to be understood, however, that only such parts have been shown as are necessary to explain the principle on which it operates. Each truck consists of five pairs of wheels each pair being secured to an axle. There are three pairs of drive wheels for each truck; one pair has been designated by reference numeral **15**, two pairs by numeral **16** and two other pairs by numeral **17**. The axles have not been designated by any numerals. The wheels are interconnected by means pairs of levers **18** and **19** each pair being fulcrumed at approximately its center point on the axle connecting the pairs of drive wheels **16**. The intermediate ends of the pairs of levers overlap as shown in Figure 5 and are connected by the axle of the wheel pair **15**. Wheels **17** are journaled in the outer ends of levers **18** and **19**. The body of the tractor is supported from the axle of wheels **15** by brackets **20**. Under normal conditions all six wheels **15** and **16** rest on rails **10** as shown in Figure 4. Wheels **15** are rotated by power from engine **14** by means of a sprocket chain **21** which engages sprocket wheel **22** on the shaft and wheels **16** are rotated from the driven shaft by sprocket chains **23**. The drive shown is illustrative only. Since wheels **15** and **16** are the same size they all have to rotate at the same speed. Wheels **17** have not been shown as driven but they may be rotated from the adjacent driven axles, as for example, by a crossed belt or its equivalent. The gear ratio must be such as to produce the same peripherial speed as that of the other drive wheels. The belt drive just referred to has been indicated by dotted lines **24** in Figure 5. Each pair of levers **18** and **19** is joined by a bar **25** that are engaged by the ends of the semi-elliptical springs **26** that are carried by brackets **20** and normally rest on these bars. When the tractor travels over a level or slightly inclined portion of the track the parts are as in Figure 4. At steep grades the track is provided with auxiliary rails **11**. Under normal operations the highest point of the peripherial surfaces of wheels **17** is spaced a distance a from the top of rails **10**. The distance between adjacent surfaces of rails **10** and **11** is less than a by a distance x or $(a-x)$. The ends of rails **11** are curved upwardly as indicated at **27**. When the locomotive or tractor reaches that part of the road where rail 11 begins, wheels 17 will engage rails 11 and be moved downwardly a distance x thereby tilting the levers on their fulcrums and raise wheels 15 from rails 10, as shown in Figure 3. Since the weight of the tractor is transmitted to the axle of wheels 15 by brackets 20 wheels 16 and 17 exert a force that tends to increase the distance between rails 10 and 11 with the result that, if the lever arms are equal and the weight transmitted to the axle of wheels 15 is 2W the forces will be distributed as in Figure 6. The pressure exerted on rails 10 by wheels 16 will now be 4W which is equivalent to doubling the weight of the tractor.

Under the conditions shown in Figure 4 a portion of the weight is transmitted to wheels 16 and by properly designing the spring and positioning it the weight can be equally distributed between wheels 15 and 16.

The modification illustrated in Figure 7 shows a four wheel truck to which the weight from the tractor is transmitted by brackets 20. The distance from rail 10 to the tops of wheels 17*a* is greater than the distance between the two rails and, therefore, a spring must be flexed when the truck enters between the rails into the position and this produces a force that is transmitted to wheels 16 and rail 10. The value of this force depends on the strength of the spring and the amount of flexure.

What is claimed is:

A railway comprising an upwardly inclined track having two horizontally spaced rails, each rail having another rail directly above it uniformly spaced therefrom and rigidly connected therewith, a railway car having a supporting truck having three pairs of drive wheels normally resting on the first mentioned rails, the diameters of the drive wheels being less than the distance between the vertically spaced rails, the axles of the three pairs of wheels being interconnected at each end by levers, one end of each lever being pivoted to the intermediate axle and pivoted intermediate their ends to the other axles, the other ends of the levers being interconnected by axles each of which has a pair of wheels positioned to engage the upper rails, the normal distance between a plane tangent to the bottoms of the three pairs of wheels that normally rest on the under rail and a plane tangent to the tops of the wheels carried by the ends of the levers being greater than the distance between the upper and lower rails, whereby when the truck is positioned between the upper and lower rails the intermediate pair of drive wheels will be raised out of contact with the lower rail, and means for supporting the weight of the car from the intermediate axle, whereby the pressure between the drive wheels resting on the rails will be increased.

References Cited in the file of this patent

UNITED STATES PATENTS

9,052	French	June 22, 1852
715,791	Happe	Dec. 16, 1902
1,024,084	Kinter	Apr. 23, 1912