July 7, 1936. K. P. BILLNER 2,046,310

APPARATUS FOR STABILIZING HIGH SPEED TRAINS

Filed June 28, 1934

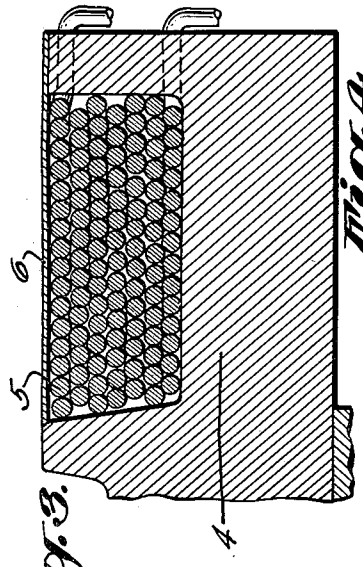

Fig. 3.

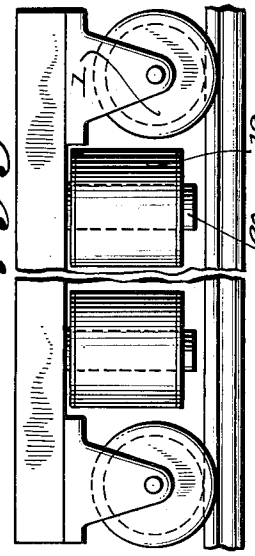

Fig. 4.

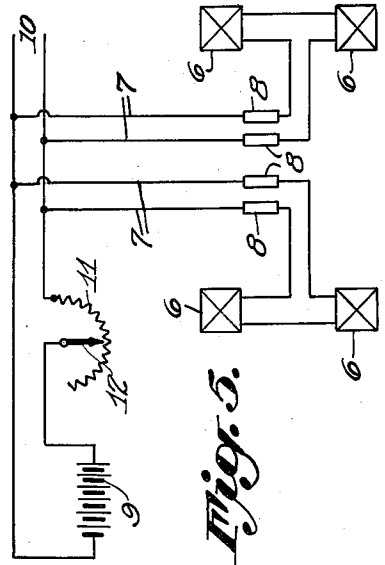

Fig. 5.

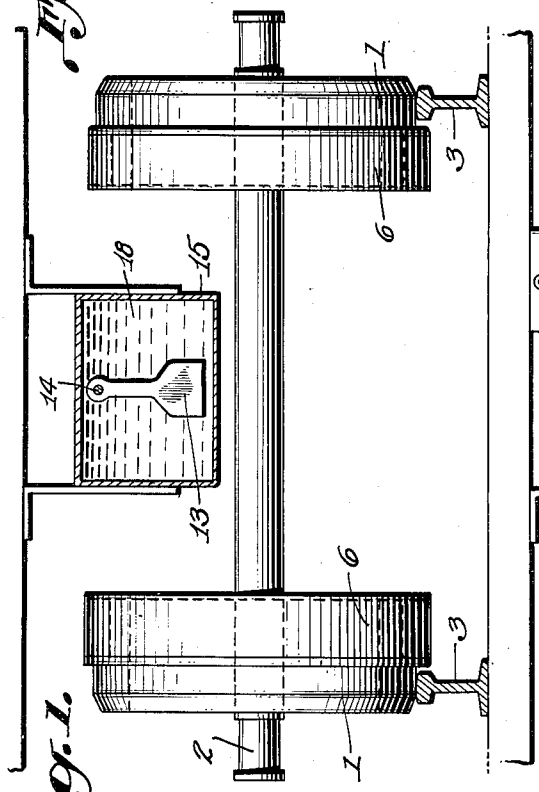

Fig. 1.

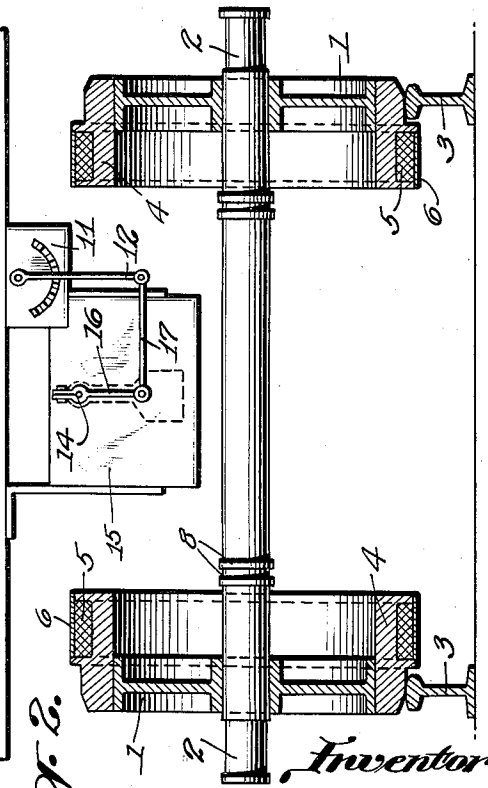

Fig. 2.

Inventor:
Karl P. Billner
by Francis L. Dyer
Attorney

Patented July 7, 1936 2,046,310

UNITED STATES PATENT OFFICE

2,046,310

APPARATUS FOR STABILIZING HIGH SPEED TRAINS

Karl P. Billner, New York, N. Y.

Application June 28, 1934, Serial No. 732,781

4 Claims. (Cl. 104—242)

My invention relates to an improved apparatus for stabilizing high speed trains whereby such trains will be able to negotiate curves with entire safety at speeds which will be dangerously high under present conditions.

Practically the entire railroad trackage of the world has been designed to accommodate the speeds of seventy-five years ago. Some of the curves have been of such great radius and have been so banked as to permit with entire safety speeds of perhaps sixty miles per hour but in many cases such a speed cannot be maintained on a curve without disaster. Obviously the danger is due to the fact that in traversing a curve centrifugal forces are developed, tending to derail the train, and care has to be taken that the speed at all times must be kept sufficiently low as to prevent the development of dangerously high centrifugal forces.

Under the spur of modern civilization and due to the competition of other methods of transportation such as airplanes, it has been found desirable to substantially increase the speed of railroad trains to one hundred miles per hour or more. This development is exemplified for example in modern Diesel driven stream line trains capable of as high a speed on a straight track as one hundred and twenty miles per hour. The curves, however, still present difficulties and the speed has to be reduced at more or less frequent intervals to a safe figure which means of course a lower average speed for the entire run.

The object of my invention is to provide an improved apparatus by which trains may negotiate curves with entire safety at speeds which under present conditions would be impossible.

To this end, my invention consists in providing an apparatus by which opposing forces will be developed to counteract the centrifugal forces tending to derail the train and also to develop those opposing forces substantially in proportion to the centrifugal forces. The development of these opposing forces is preferably brought about automatically as will be hereinafter explained.

These opposing forces which counteract and oppose the otherwise destructive centrifugal forces are developed magnetically by increasing the traction of the wheels of the train on the rails in proportion to the value of the centrifugal forces tending to cause the wheels to leave the rails.

This may be done either by magnetizing the wheels to cause them to engage the rails with a greater or less increase of pressure or by carrying upon the train a series of electro-magnets movable in close relationship to the tracks which therefore form the armature of a magnetic circuit.

I control the development of the counteracting forces automatically and this is effected by the employment of a normally quiescent mass, such as a pendulum or a sliding weight. Such mass will be thrown out of equilibrium under the effect of and to the extent of the centrifugal forces. This movement of the mass from its condition of equilibrium, may be utilized to control an electric current the value of which will determine the extent of the magnetic pull.

In utilizing a shiftable mass to thus automatically adjust the value of the opposing forces it is desirable that said mass shall not be affected by ordinary conditions of run but shall be influenced only by the centrifugal forces which are to be guarded against. Therefore, I prefer to mount the pendulum or weight in a casing containing a liquid like oil or water or glycerin or containing a readily mobile solid like petroleum jelly, whereby the controlling mass will move from its position of equilibrium only under the effect of a sustaining force such as will be encountered when the train rounds a curve.

For obvious reasons it is important that the automatic controlling apparatus shall be located at the front of the train so as to overcome the destructive centrifugal forces at the instance of their development. In fact the automatic controlling apparatus is preferably located under each car whereby every car will be equipped with its individual automatic stabilizing apparatus brought into operation when centrifugal forces are encountered.

Attention is directed to the accompanying drawing forming a part of this specification and in which

Figure 1 is a front view of the axle and two of the wheels of a train, the casing containing the controlling pendulum being shown in section.

Figure 2 is a similar view, the wheels being shown in section and the casing and the controlling rheostat in elevation.

Figure 3, an enlarged section showing a portion of the core,

Figure 4, an elevation showing conventional supports for the wheels and illustrating a modified arrangement for increasing the tractive effect electro-magnetically, and

Figure 5, a diagram illustrating the electrical circuits.

In all of the above views corresponding parts are presented by the same characters of reference.

The car wheels 1—1 are carried as usual by an axle 2 and travel on the steel rails 3—3. In order that the wheels 1—1 may be magnetized I employ a core 4 in the form of a ring as shown particularly in Figures 2 and 3. This core for each wheel is formed of any suitable magnetic material, and it may be a separate core intimately welded to its associated wheel 1. Preferably, however, the core 4 is formed integrally with its associated wheel. Each of the cores 4 may be magnetized by coils 5 of insulated wire as shown particularly in Figure 3, thereby magnetizing the wheels 1—1 so as to increase the traction between said wheels and the rails 3—3. To protect coils 5 a metal covering 6 is employed.

Current is applied to the coils through lead wire 7—7 cooperating with insulated contact rings 8—8 as will be readily understood and as indicated in Figure 5. These contact rings are shown as being carried upon the axles 2 but they may be mounted on the cores or upon any movable element associated with the cores.

Current for energizing the several coils is supplied from any suitable source, such as storage battery 9. Two sources of supply are preferably used so as to provide current in case of a breakdown of one source. A rheostat or a series of relays 11 is interposed in one of the supply circuits of the wheels on each car as shown in Figure 5.

The central or normal position of the rheostat arm 12 cuts off current to the several coils 5 but when the rheostat arm is moved to either side of this central position current of proportional value will be supplied to the coils so as to proportionately determine the value of the tractive effect of the wheels 1—1 with respect to the rails 3—3.

The rheostat arms 12 of the train are preferably automatically adjusted by a shiftable mass influenced by the centrifugal effect as the train rounds a curve. The mass may be a pendulum 13 mounted on a shaft 14 within a suitable container 15. The shaft 14 is provided with an arm 16 connected by link 17 with the rheostat arm 12.

The container 15 may be supplied with a material 18 to provide a dashpot effect, thus preventing the weight 13 from responding to brief intermittent forces but allowing the weight to respond to a continuous effect like the centrifugal force developed when the train rounds a curve. The material 18 may be either a liquid such as water, oil, or glycerin, or it may be a readily mobile solid such as petroleum jelly.

The operation of my improved apparatus, one form of which has been described, will be readily understood. Under normal conditions when the train is traversing a straight track the rheostat 11 will cut off current from the coils 5 so that no magnetic effect will be secured. When, however, the train rounds a curve in either direction the centrifugal force will cause the weight 13 on each car to be deflected to the right or left and this deflection will be proportional to the centrifugal force. The value of this centrifugal force depends upon the speed and the radius of the curve. Since the deflection of the weight 13 is proportional to the disturbing centrifugal force, the current supplied to the coils 5 will be likewise proportional to that force and in consequence the counteracting force tending to increase the attraction between the wheels 1—1 and the rails will be correspondingly and automatically regulated.

With the modified arrangement shown in Figure 4 coils 19 are mounted upon cores 20 which move closely adjacent to the rails as shown. Current to these coils 19 may be supplied in the same way as to the coils 5, so as to provide for an increase in the tractive effect substantially proportional to the centrifugal force tending to derail the train.

Having now described my invention what I claim is:

1. Apparatus for stabilizing a train at high speeds comprising energizing coils carried by the train and so located as to increase through magnetic effect the tractive effect between the wheels and rails when energized, means for controlling the current of said coils and a shiftable weight for actuating said controlling means and movable from a position of equilibrium under the effect of centrifugal force whereby the current will increase the tractive effect in proportion to the centrifugal force tending to derail the train in rounding a curve.

2. Apparatus for stabilizing a train at high speeds, comprising electro-magnets movable in close relationship to the rails to increase the tractive effect when energized, means for controlling the current of said magnets and a shiftable weight for actuating said controlling means and movable from a position of equilibrium under the effect of centrifugal force whereby the current will be supplied to increase the magnetic pull between said magnets and the rails in proportion to the centrifugal force tending to derail the train in rounding a curve.

3. Apparatus for stabilizing a train at high speeds comprising energizing coils located adjacent the wheels for magnetizing said wheels so as to increase the tractive effect thereof, means for controlling the current of said coils and a shiftable weight for actuating the controlling means and movable from a position of equilibrium under the effect of centrifugal force whereby the current will be supplied to magnetize the wheels in proportion to the centrifugal force tending to derail the train in rounding a curve.

4. Apparatus as recited in claim 3 in which the movable weight is subjected to a dashpot effect so as to be influenced only by a continuing centrifugal effect.

KARL P. BILLNER.