No. 661,305. Patented Nov. 6, 1900.

J. DE BUIGNE.

WORKING DEVICE FOR RAILWAYS WITH AUTOMATIC CORRECTION OF THE AXLES.

(Application filed Dec. 30, 1897.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.

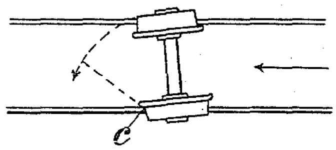


Fig. 3.

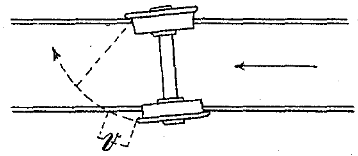


Fig. 2.

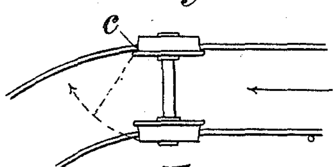


Fig. 4.

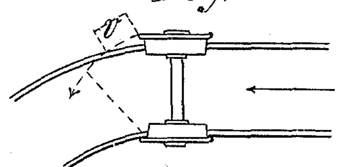


Fig 5.

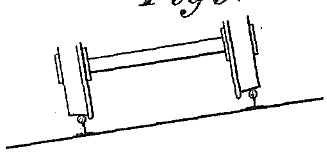


Fig 6

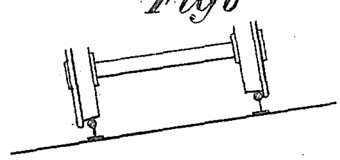


Fig. 7.

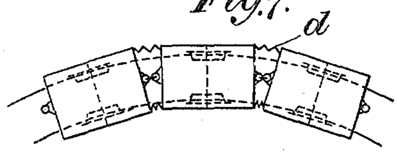
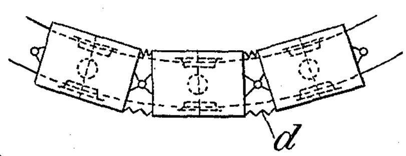


Fig. 8.



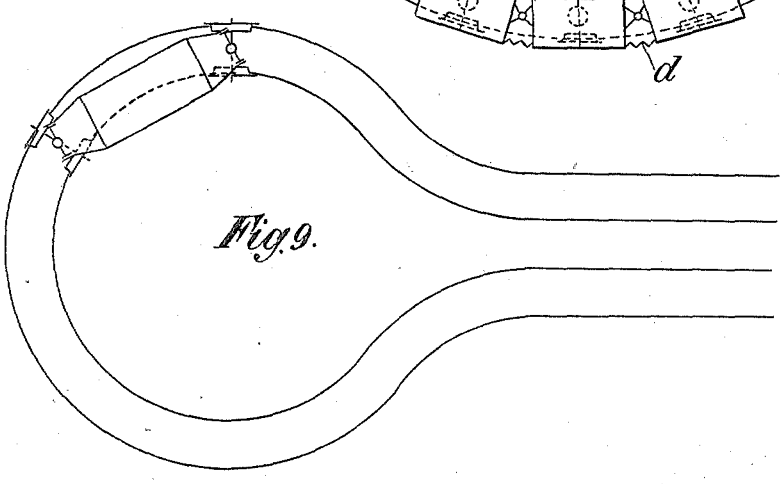


Fig. 9.

WITNESSES:
Geo. W. Jaekel
M. H. Quitzel

INVENTOR
Josef de Buigne
BY Goepel & Raegener
ATTORNEYS.

No. 661,305. Patented Nov. 6, 1900.

J. DE BUIGNE.

WORKING DEVICE FOR RAILWAYS WITH AUTOMATIC CORRECTION OF THE AXLES.

(Application filed Dec. 30, 1897.)

(No Model.) 5 Sheets—Sheet 2.

Fig. 10.

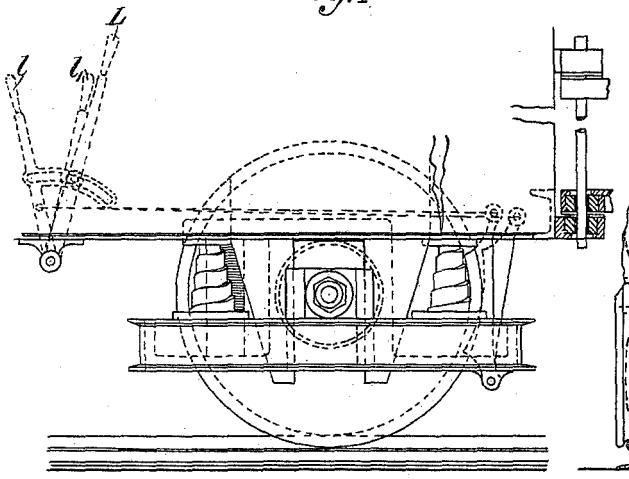


Fig. 11.

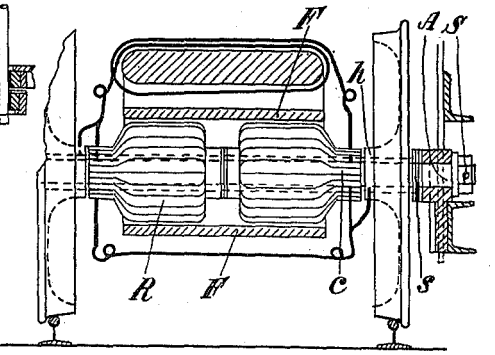
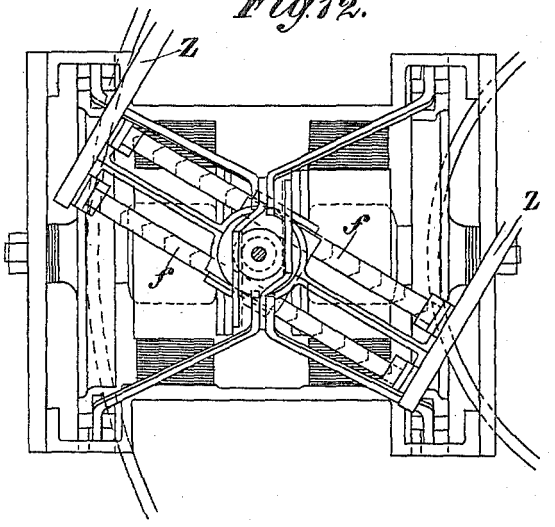


Fig. 12.



WITNESSES:

Geo. H. Jaeckel,

M. F. Quintzel.

INVENTOR

Josef de Buigne

BY Church & Kaegener

ATTORNEYS.

No. 661,305. Patented Nov. 6, 1900.

J. DE BUIGNE.

WORKING DEVICE FOR RAILWAYS WITH AUTOMATIC CORRECTION OF THE AXLES.

(Application filed Dec. 30, 1897.)

(No Model.) 5 Sheets—Sheet 3.

Fig. 13.

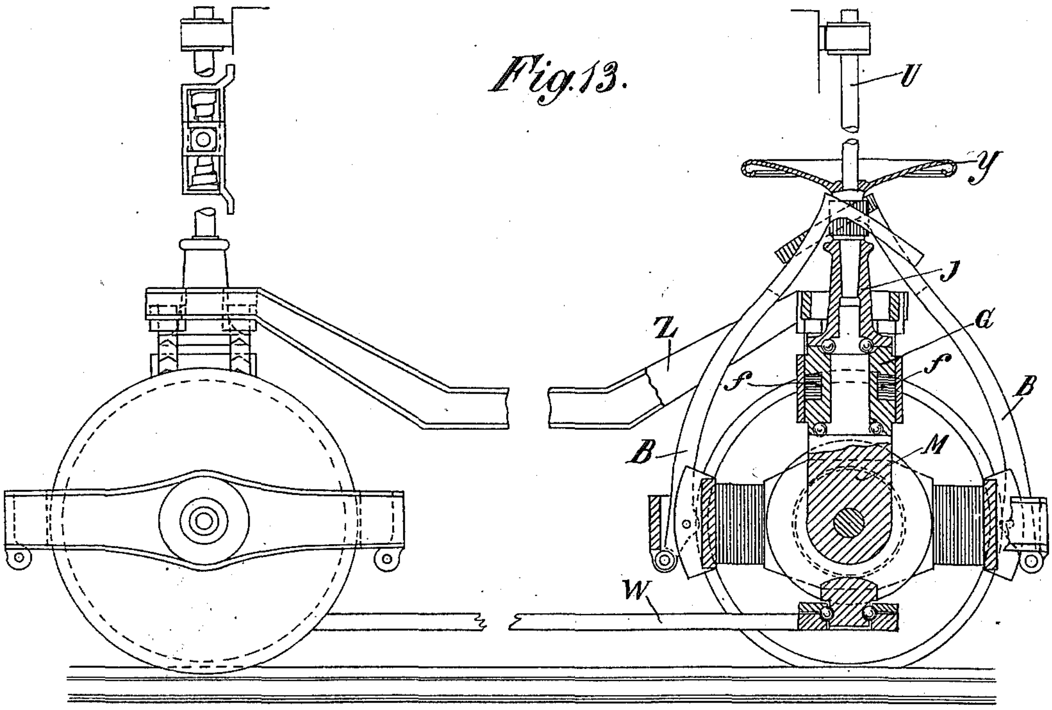
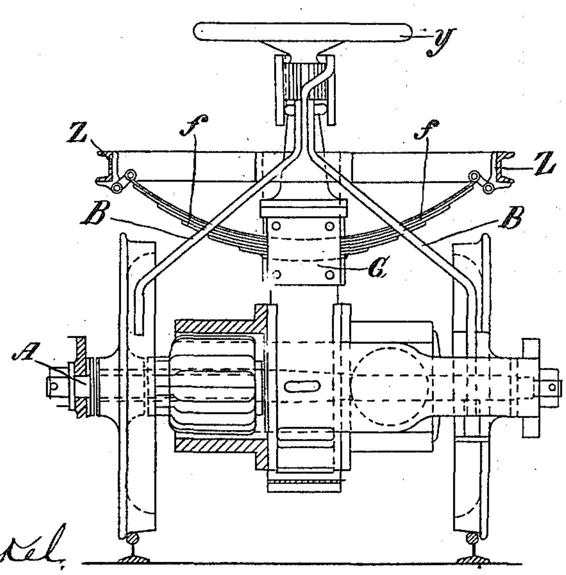


Fig. 14.



WITNESSES:
Geo. W. Jaekel.
M. H. Wurtzel

INVENTOR
Josef de Buigne
BY Goepel & Raegener
ATTORNEYS.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 661,305. Patented Nov. 6, 1900.

J. DE BUIGNE.

WORKING DEVICE FOR RAILWAYS WITH AUTOMATIC CORRECTION OF THE AXLES.

(Application filed Dec. 30, 1897.)

(No Model.) 5 Sheets—Sheet 4.

Fig. 16.

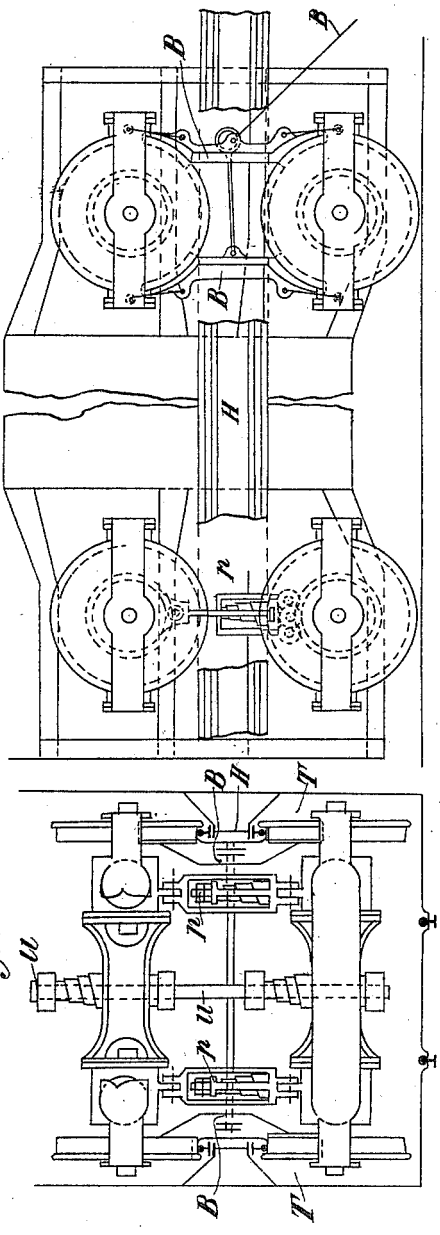


Fig. 22.

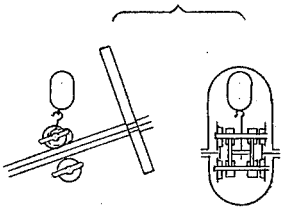


Fig. 15.

WITNESSES:

Geo. H. Graves.

M. H. Christel.

INVENTOR

Josef de Buigne

BY Goepel & Raegener

ATTORNEYS.

No. 661,305. Patented Nov. 6, 1900.

J. DE BUIGNE.

WORKING DEVICE FOR RAILWAYS WITH AUTOMATIC CORRECTION OF THE AXLES.

(Application filed Dec. 30, 1897.)

(No Model.) 5 Sheets—Sheet 5.

Fig. 19.

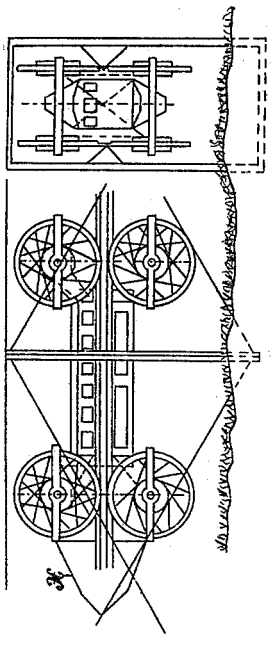


Fig. 21.

Fig. 20.

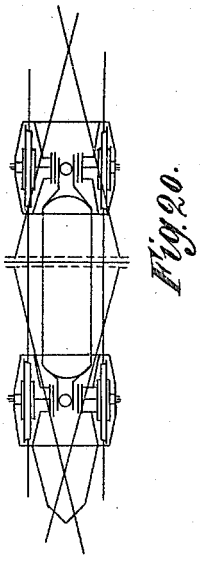


Fig. 17.

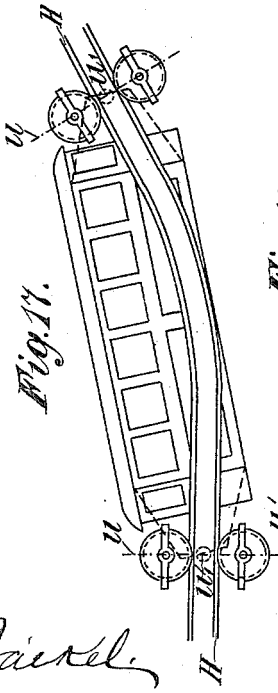
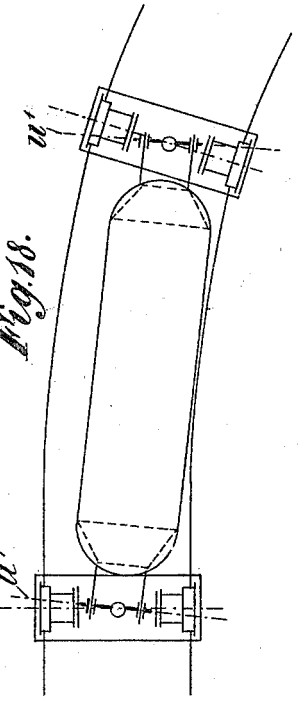


Fig. 18.



WITNESSES:

Jos. N. Jaeckel.

M. H. Huntzel.

INVENTOR

Josef de Buigne

BY Jaquet & Raguet

ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOSEF DE BUIGNE, OF VIENNA, AUSTRIA-HUNGARY.

WORKING DEVICE FOR RAILWAYS WITH AUTOMATIC CORRECTION OF THE AXLES.

SPECIFICATION forming part of Letters Patent No. 661,305, dated November 6, 1900.

Application filed December 30, 1897. Serial No. 664,566. (No model.)

To all whom it may concern:

Be it known that I, JOSEF DE BUIGNE, a subject of the Emperor of Austria-Hungary, residing at Vienna, in the Empire of Austria-Hungary, have invented new and useful Improvements in Working Devices for Railways with Automatic Correction of the Axles, of which the following is a specification.

This invention has reference to certain improvements in railways which are based on the following theoretical considerations:

First. When a pair of wheels which are rigidly connected to an axle and provided with inner flanges are running freely on a straight horizontal track, it is a well-known fact that a deviation of the normal position of the axle will very soon take place, so that the flange of one wheel will approach the rail and cause gradually-increasing frictional resistance between the flange and the rail. The consequence is that there will be a greater space between the rail and the advance wheel on its forward end, so that a certain jamming action of the flanges of the wheels on the rails of the track is produced. This may to some extent be obviated by journaling two axles on one truck, by which, however, the increased friction of the flanges of the wheels against the sides of the rails cannot be overcome. To overcome the objection to the inner wheel-flanges, it is proposed to use wheels with outer circumferential flanges, so that the cause of the irregularity and retardation is removed and in place thereof a tendency imparted to the wheels to advance and place the axle in a radial position to the truck.

Second. In connection therewith it is proposed to make each wheel independently movable on the axle and impart to each wheel a motion independent of the other by a suitable motor, for which an electromotor is best adapted, owing to the nature of the electric current and the facility by which the same can be transmitted to any desired point.

There are already known, on one hand, wheels with outer flanges and, on the other hand, wheels driven one independently of the other, and, furthermore, the mobility of wheel-frames is known, but the combination of these features and the cognition of their reciprocal action in kinematical, as well as in electrotechnical, respects are new.

The invention consists of a device of the character stated which comprises an axle, wheels mounted loosely on said axle and being movable independently, each wheel having an outer circumferential flange, and means for imparting rotary motion to each wheel independently, all as hereinafter described and then particularly claimed.

In the accompanying drawings, Figures 1 and 2 are diagrammatic views showing how inner flanges act on both a straight track and a curve. Figs. 3 and 4 are diagrammatic views showing how outer flanges alone and without independent motors for each wheel act. Figs. 5 and 6 are diagrammatic views showing how both inner and outer flanges act on slanting or inclined tracks. Figs. 7 and 8 show the bodies of the vehicles divided between the axles in such manner that the latter are equally weighted on both sides. Fig. 9 shows a truck arranged in a suitably elastic manner on both ends of a car. Fig. 10 is a side view, partly in section, of a truck such as is used in the form shown in Figs. 7 and 8. Fig. 11 is a transverse section thereof. Fig. 12, as well as the subsequent figures, shows a truck capable of use as shown in Fig. 9, said Fig. 12 being a plan view. Fig. 13 is a side elevation, partly in section, showing such a truck. Fig. 14 is an end view of the same, partly sectioned. Fig. 15 is an end view of a double-wheeled truck for an elevated track. Fig. 16 is a side view thereof. Figs. 17 and 18 are side and plan views showing another form of the invention applied to elevated tracks. Figs. 19, 20, and 21 are side, plan, and end views of still other forms on the same principle; and Fig. 22 is another modification showing a trolley device.

In the form of the construction shown in Figs. 7 and 8 of the accompanying drawings the body of the vehicles is divided between the axles in such a manner that the latter are equally weighted on both sides. Two or more such parts are connected with each other by suitable spring-joints D, which, if desired, may form at the same time couplings susceptible of being uncoupled. According as the body of the vehicle is fast or movable upon the wheel-frame such a joint requires a double or single hinge. (See Figs. 7 and 8.)

The closure of the walls of the car is formed,

as in the Pullman cars, by flexible plaited walls *d*.

In the form of construction shown in Fig. 9 a body-frame is arranged in a suitable elastic manner on both ends of the body of the vehicle. Extending through and connected with the frame is the axle on which run the wheels provided with outer flanges and with extensions of the hub *h*. The armature is divided, and each half R thereof is suitably insulated and fastened to each of the hub extensions. These armatures, connected in this manner with the wheels belonging thereto, run, therefore, independently of each other in the common magnetic field F, each armature carrying a commutator C. The impetus of the wheels independent of each other can in the case of divided armatures be effected by a toothed-wheel mechanism from a first-motion shaft, as is usual for rigidly-connected wheels with an undivided armature; but, as far as such a toothed-wheel mechanism is required, owing only to the dimensions and to velocity corresponding to a higher tension claimed for bound wheels, its omission is favored in a separate working of the wheels by the division of the load and work. Moreover, the separate working of the wheels facilitates by itself essentially the starting of the vehicle, which, if necessary, may be aided by a supplemental accumulator. In case of stationary track-tongues open on both sides such a vehicle can be governed by the motorman or other operator. By putting on the brake 1, Fig. 10, acting on the right wheel, the vehicle will enter the right switch, and by putting on the left brake 1′ it will enter the left switch. By actuating the brake apparatus opposite to a switch the vehicles will continue to run over the straight track, while for stopping the car the brake apparatus L, acting on both wheels, is put on. Between the bearing of the axle and the hub of the wheel there is provided an embedded elastic cushion *s* for the purpose of compensating, with respect to the sensibility of the automatic correction, for irregularities of the railway-gage, also for running through widened curves. Owing to the suppression of any shock it is sufficient to secure the axle simply by an axle-nut S. (See Figs. 10 and 11.)

In the forms of construction shown in Figs. 12, 13, and 14 and also in the subsequent figures a wheel-frame is provided on each end or on the front ends of the body of the vehicle in a movable manner. The wheel-shaft is held fast in a central piece M, the under extension of which receives a piece W, fastened to the car-body and connecting the two sets of wheels, and the upward extension the saddle G. With the aid of a headpiece J the joint-bolt U is mounted on the piece M in such a manner that this saddle G, as well as the connecting-piece W, allow of an easy mobility of the central piece M, which for this reason is supported in ball-bearings. The upper end of the joint-bolt U is supported in a suitable springy and movable manner on the wall of the car. The saddle G takes up the bearing-springs *f* and *f′*, by which are supported the body-bearers Z. By means of the hand-wheel Y the simple acting brake B B is put on. By the same hand-wheel at the same time the brake of the other wheel-frame can be put on if the two joint-bolts U are rotatable and connected with each other by a chain (not shown in the drawings) led over the top of the car. This automatic correction will remain, though less sensitive, but still efficacious, if it is applied in lieu of to a single pair of wheels to a set of wheels of two axles, (American swivel-truck,) where the center of motion is between the axles. Only one or both wheels may be driven on each side, with or without a communicator, with a common or with a separate connecting-gear. By means of a suitable lever arrangement (not shown in the drawings) such a carriage provided with bogie-frame can be governed like a velocipede from the location of the driver. For tramways already worked it is sufficient to cut off the edges of the adjoining pavement a little for obtaining space for the outer flange of the wheel, the rails at crossings being left untouched.

The requirements of modern times with respect to extraordinary velocities or in general to overcome great resistance can be satisfied only by way of an artificial friction, as the pressure of the weight upon the rail forming the natural friction is sufficient or is annihilated. It offers several advantages to mount the sets of wheels on an elevated track in order to obtain an artificial friction in such a manner one over the other (see Figs. 15 to 21) that in applying suitable pressure means *p p* they run under a determinable pressure on both sides under friction on the track; but such a carriage would enter from one squeezing position into the other unless, first, for avoiding a dragging and squeezing of the wheels the lower wheels are also driven independently of the upper ones, and, secondly, also the separate impulse, above described, of the lower and upper wheels in the axial sense and with the outer flanges is combined therewith. Only by the universal automatic correction is it prevented that with the useful friction also the injurious lateral friction is increased by the pressure. A prejudice to the sensibility of the correction is not to be feared in this form, because under an increased pressure a difference of velocity of the wheels is the consequence of a less approach of the tire-groove to the rail than in a less weighted condition. This pressure immediately produces a tendency of the wheels arranged one above the other to place themselves normally with respect to the pressed rail, as, on the other hand, such a tendency takes place immediately by the independent impulse of the wheels with outer flanges. According to the condition of the railway such a wheel-frame of four wheels re-

quires in consequence, in addition to its mobility around a vertical axis, also more or less a mobility around a horizontal axis. By combining these two forms an equal race between all four wheels of such a set of wheels is produced by the counter tension in all directions. Where a flange contact can take place, a play for the correction is always left for the wheel running after, in which case it is immaterial which pair of wheels of such a set of four wheels is considered as a pair of wheels acting together. As the axle is weighted only in the longitudinal section, it is without any influence, whether such a wheel-frame acts in a drawing or pressing manner. The railway-gage may overspan without any inconvenience the whole passage profile, as it is shown in Fig. 15. With regard to this the axle is divided, and each half, which is separately supported, may be worked, according to the purpose, by an armature directly arranged upon the same or by a usual toothed-wheel mechanism actuated from a driving-armature. The carriage-body is suspended on both sides in such a wheel-frame of four wheels by means of the joint-bolt U in a springy and movable manner. The brake B acts at the same time on the upper and lower wheel, or, as the track is free, it may act in the same manner on the track. The feeding device of the circuit T T is arranged under the rails. This modified form is useful as an underground railway or also as an auxiliary locomotive for leading trains through tunnels in putting the steam-locomotive out of activity. (Baltimore and Ohio railway.) For such purposes on normal tracks switches may be replaced by suitable sliding platforms.

The form of construction represented in Figs. 17 and 18 relates to a mountain-engine provided with an improved mobility of the wheel-frames obtained by inserting a horizontal joint-bolt u', in combination with the vertical joint-bolt u, (universal joint,) in order to secure, besides the axial, a vertical automatic correction of the wheel-frame.

The form of construction shown in Figs. 19, 20, and 21 is particularly fit for extraordinary velocities. The necessary large diameter of the wheels facilitates the direct insertion of the electromotors therein. The complete omission of the railway-sleepers allows with respect to the elevated track of this form a free escape of air in all directions, and in order to overcome more easily the resistance of air the carriage is provided at front with a tapered projecting part X. The artificial friction, in combination with the separate impulse of the wheels, still permits of many applications in the form of trolleys in place of wire-rope tramways for field, post, and other purposes. (See Fig. 22.)

What I claim is—

1. The combination, with an axle, of wheels, mounted loosely on said axle and being independently movable one of the other, each wheel being provided with an outer circumferential flange, and means for imparting rotary motion to each wheel independently of the other, substantially as set forth.

2. The combination, with an axle, of wheels, mounted loosely on said axle and being independently movable one of the other, each wheel being provided with an outer circumferential flange and with a hub, and a motor on the hub of each wheel for rotating one wheel independently of the other, substantially as set forth.

3. The combination, with a truck, of an axle applied to said truck, wheels mounted loosely on said axle and being independently movable one of the other, each wheel being provided with an outer circumferential flange, means for imparting rotatory motion to each wheel independently of the other, and means for flexibly coupling one truck with the adjacent truck, substantially as set forth.

4. The combination with a car-axle, wheels journaled independently thereon, and an additional car-axle suitably suspended below aforesaid car-axle and wheels journaled independently thereon, said wheels having outer flanges, of means for driving said wheels independently, and pressure means for pressing the opposing wheels with more or less friction against the rails on which they are adapted to travel, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOSEF DE BUIGNE.

Witnesses:
CARL MÜLLER,
GUSTAV HÜLSMANN.