

J. E. HANSBOTTE.

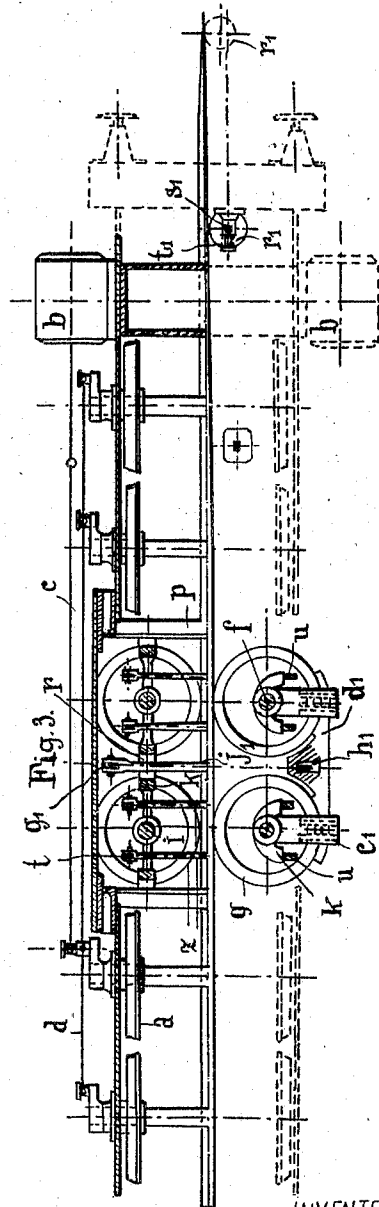
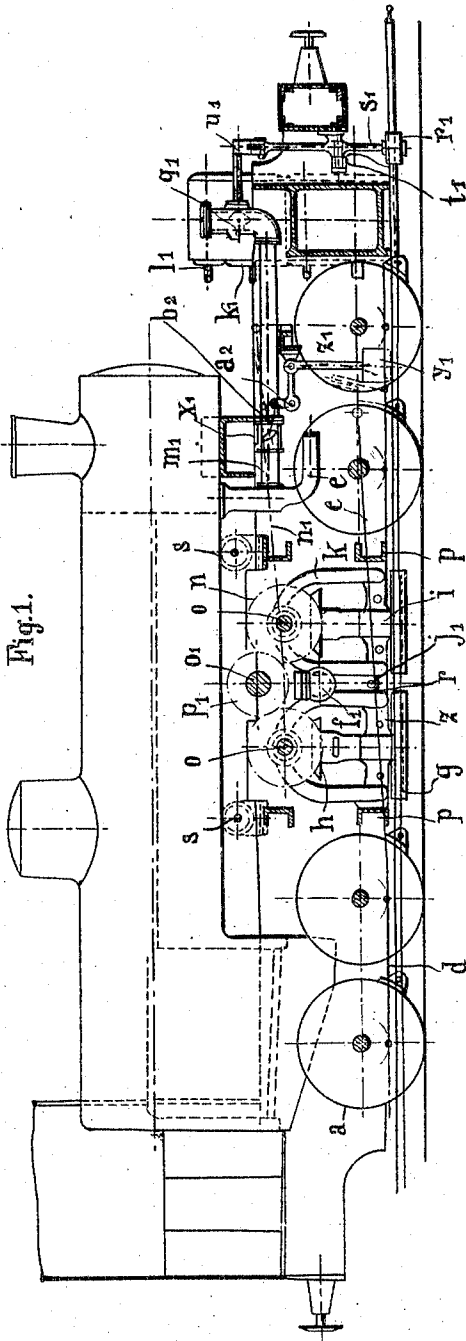
LOCOMOTIVE.

APPLICATION FILED APR. 27, 1918.

1,325,870.

Patented Dec. 23, 1919.

4 SHEETS—SHEET 1.



INVENTOR

Jules E. Hanscotte

BY *Paul H. H. H. H.*

ATTORNEY

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4 SHEETS—SHEET 2.

Fig. 2

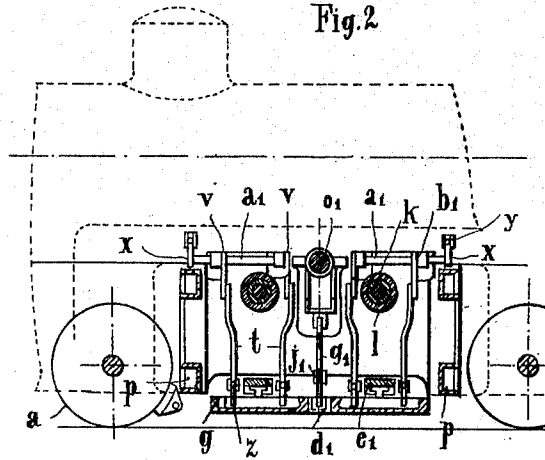


Fig. 5

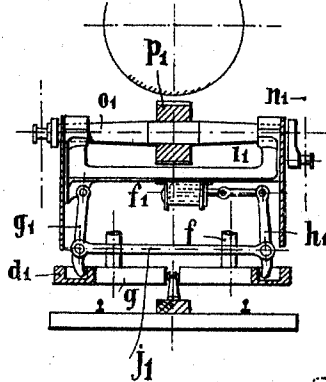


Fig. 6

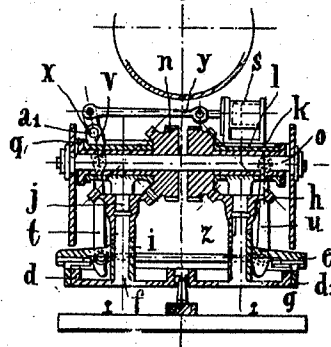
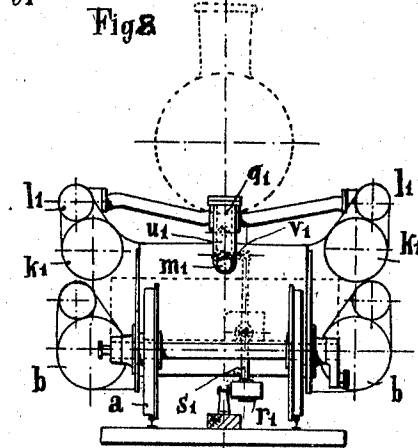


Fig. 8

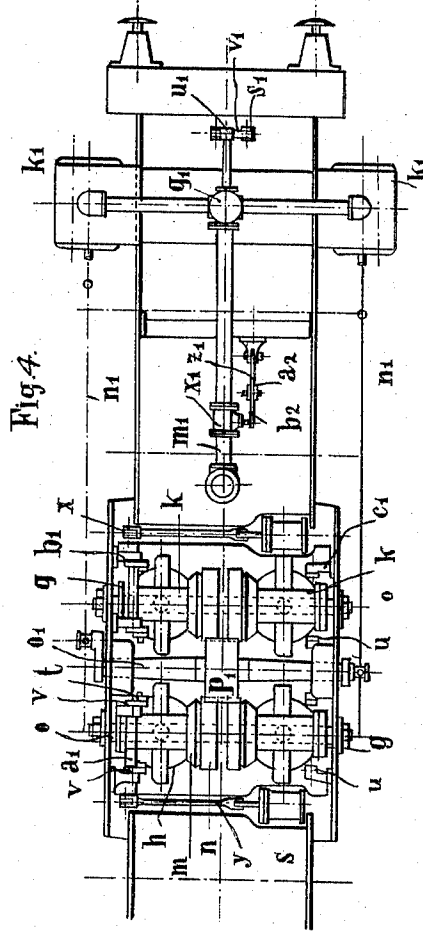
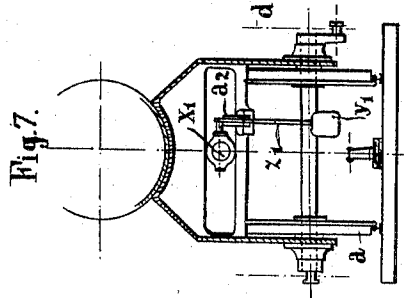


INVENTOR
Jules E. Hanscotte
BY *Edw. R. H. H. H.*
ATTORNEY

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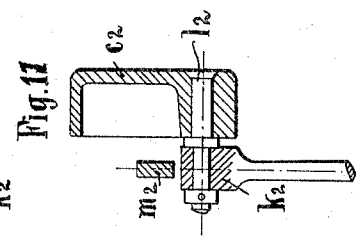
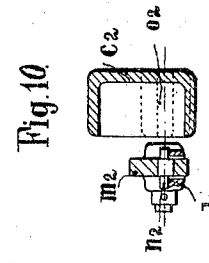
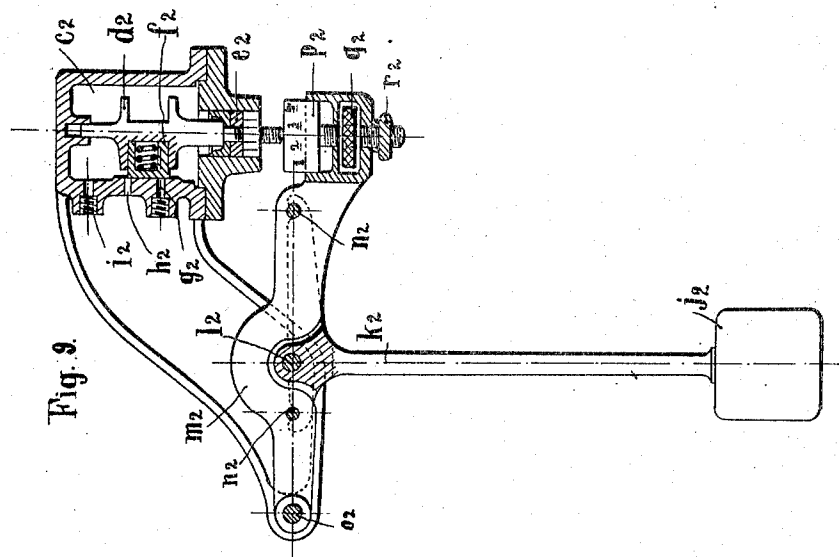
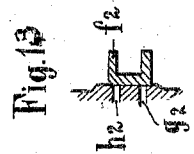
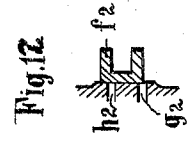
Patented Dec. 23, 1919.
4 SHEETS—SHEET 3.



INVENTOR
Jules E. Hanscotte
BY
Lawrence H. H. H.
ATTORNEY

1,325,870.

Patented Dec. 23, 1919.
4 SHEETS—SHEET 4.



INVENTOR
Jules E. Hanscotte
BY *Emil W. Winkler*
ATTORNEY

UNITED STATES PATENT OFFICE.

JULES ETIENNE HANSCOTTE, OF COLOMBES, FRANCE.

LOCOMOTIVE.

1,325,870.

Specification of Letters Patent.

Patented Dec. 23, 1919.

Application filed April 27, 1918. Serial No. 231,162.

To all whom it may concern:

Be it known that I, JULES ETIENNE HANSCOTTE, citizen of the Republic of France, and resident of Colombes, France, post-office address 12 Rue Besson, have invented new and useful Improvements in Locomotives, which improvements are fully set forth in the following specification.

The present invention relates to a locomotive with horizontal wheels acting upon an auxiliary central rail for the purpose of augmenting the frictional engagement or gripping action for the ascent of steep gradients.

There are locomotives having horizontal wheels, the action of which is satisfactory, which are suitable for lines of railway requiring the use of supplementary gripping action on a great part of their length and having numerous interruptions of the central rail, at the crossing of the tracks and in front of estates. Under these conditions the horizontal wheels of these locomotives have been made integral with those of the axles, that is to say these two kinds of wheels are driven by the same motor and never rotate one without the other.

If, however, the lines of railway have long stretches for which ordinary frictional engagement is sufficient, or if it is desired to be able to utilize in certain cases merely the frictional action of the horizontal wheels, it is necessary that the horizontal wheels be capable of being set in action or left at rest at will. In the latter case, the horizontal wheels are also utilized to augment by their weight the ordinary frictional action produced by the vertical wheels.

The new locomotive is essentially characterized,—1, by the two systems of traction which it possesses, the one by ordinary frictional engagement for level stretches of track and gentle gradients, the other by this ordinary frictional action occurring simultaneously with the supplementary friction of the horizontal wheels for steep gradients. 2, by an improved mechanism suitable for the separate operation of a group of two pairs of these horizontal wheels. 3, by automatic devices for operating the motor of the said wheels and the gripping pressure of these latter against the central rail augmenting the reliability of the action and allowing complications in the driving of the locomotive to be avoided.

The devices of this locomotive may be applied to railways, tramways and tractors worked by steam, electricity, compressed air or other means. In the description which follows one type of locomotive is described, but it must be understood it is only an example of application of the devices forming the subject matter of the present invention.

The figures of the accompanying drawing relate to a steam locomotive, with four coupled pairs of coupled vertical wheels and two pairs of horizontal wheels, having four steam cylinders two of which operate the vertical wheels and the two others the horizontal wheels.

Figure 1 is a longitudinal vertical section through the axis of the locomotive.

Fig. 2 is a longitudinal vertical section taken in the plane of one of the track rails.

Fig. 3 is a horizontal sectional view taken partly in the plane of the driving axles and partly in the plane of the mechanism of the driving wheels.

Fig. 4 is a plan view of the locomotive, the boiler being removed.

Fig. 5 is a transverse section through the axis of the driving shaft of the horizontal wheels.

Fig. 6 is a transverse section through the axis of one pair of horizontal wheels.

Fig. 7 is a transverse section between the two axles placed on the side of the steam cylinders.

Fig. 8 is a transverse section through the axis of the adjacent axles of the steam cylinders.

Figs. 9, 10, 11, 12, and 13 represent an apparatus which permits of the automatic distribution of compressed air to the controlling cylinders of the horizontal wheels or to the brake cylinders of the horizontal wheels or the vertical wheels at a pressure proportionate to the declivities.

Fig. 9 is a longitudinal vertical section of this distributing apparatus.

Figs. 10 and 11 are transverse sections of certain levers comprised in the distributing apparatus.

Figs. 12 and 13 are longitudinal sections showing two positions of the slide valve of the distribution other than that which it occupies in Fig. 9.

In Figs. 1, 2, 3, 7 and 8 the system of traction by ordinary frictional action is represented by the vertical wheels a , the steam

cylinders *b*, the motor connecting rods *c*, the coupling rods *d* and the pipe *e* which supplies steam to the cylinders *b*.

In Figs. 1, 2, 3, 4, 5, 6, 7 and 8 the shafts *f* of the horizontal wheels *g* which are fixed to conical toothed pinions *h* are mounted on the one hand in the bearings *i* and on the other hand in the journals *j*. These bearings and journals form a unit with the supports *k* in which rotate the hubs *l* common to the conical toothed wheels *m* and to the cylindrical toothed wheels *n*. These hubs *l* rotate likewise on the shafts *o* fixed to the frame plates of the locomotive.

The supports *k* are arranged between the guides *p* serving as cross ties to the frame plates of the locomotive, and they are mounted to slide transversely of the track on the shafts *o* through the medium of the hubs *l*. These hubs carry stop rings *q* at their outer ends so that the toothed wheels *m* and *n* follow the horizontal wheels *g* in their movements transversely to the track.

One pair of horizontal wheels is adapted to move in a direction at right angles to the track relatively to the other pair; in this movement the contacts *r* of the supports *k* of the first pair slide between the similar contacts of the supports of the other pair. The pressure of the horizontal wheels *g* against the central rail is produced by the compressed air cylinders *s* which are single acting and communicate with each other by a pipe and are supplied by the air reservoir on the locomotive, either directly or through the medium of automatic apparatus hereinafter described and forming the subject matter of Figs. 9, 10, 11, 12 and 13.

The action of these cylinders *s* is multiplied by means of gearings composed of the levers *t*, *u*, *v*, *x*, the connecting rods *y*, *z* and the shafts *a'* mounted upon the supports *b'*. The upper ends of the levers *u* are jointed on the supports *o'* fixed to one of the frame plates of the locomotive while the upper ends of the levers *t* describe a stroke when the levers *v* oscillate about the shafts *a'*.

The point of application of the force produced by the levers *t* and *u* upon the horizontal wheels *g* is located in the plane of the axis of the central rail, so that the shafts *f* remain parallel and no jamming of the supports *k* upon the hubs *l* takes place when these wheels move transversely to the track.

The horizontal wheels *g*, despite the powerful pressure which they exert against the central rail, are therefore capable, with the toothed wheels *m* and *n*, of following the curves of this rail if its width is variable or it is not mounted regularly in the median line of the track, and they are also capable of following the curves of the track itself. In consequence of this easy movement of the horizontal wheels the central rail may be mounted with great latitude relatively to the

two rails of the track. Great latitude may also be allowed in the position as to height of this rail seeing that the treads of the horizontal wheels may have all the necessary height. During the transverse movement of the horizontal wheels *g* the friction of the hubs *l* upon the shafts *o* is much reduced because these hubs in rotating move simultaneously and describe a helicoidal path on these shafts *o*.

The brake shoes *d'* of the horizontal wheels *g* are mounted to slide in the arms *e'* (Fig. 6) of the supports *k*; the pressure of the blocks is produced by the brake cylinder *f'* (Fig. 5) worked by compressed air and double acting, through the medium of a gearing composed of the levers *g'*, *h'* and the connecting rods *i'*, *j'*. The point of application of the force produced by these levers upon the shoes *d'* is located in the plane of the axis of the central rail as for the gripping levers *t* and *u*.

The cylinder *f'* is in communication with the air reservoir in the locomotive the constant pressure of which acts upon one of the faces of its piston and with the main brake pipe, the pressure of which, variable according to the inclines, acts upon the other face of this piston. Under these conditions, the locomotive has only a single brake valve, of a type usually provided on locomotives for ordinary braking purposes; the manipulation of this valve by the driver produces simultaneously the application of the brakes both to the vertical wheels *a* and to the horizontal wheels.

The brake cylinder *f'* may be single acting and supplied from the air reservoir on the locomotive, through the medium of the automatic distributor represented in Figs. 9 to 13. This distributor automatically supplies air to the cylinder *f'* at pressures proportionate to the inclines so that the action of the blocks *d'* is the greater the steeper the declivity. The horizontal wheels *g* are driven by the steam cylinders *k'* which are equipped with slide valves *l'* and steam supply pipe *m'*, the connecting rods *n'*, the driving shaft *o'*, and the toothed pinion *p'* which gears into the toothed wheels *n*.

When the horizontal wheels move in a direction at right angles to the track and when the cylinders *k'* are in action, the toothed wheels *n* gear into the teeth of the central pinion *p'* and simultaneously slide across the teeth of said pinion as they do so.

The foregoing explanations show that the two pairs of horizontal wheels are capable of moving easily at right angles to the track, in order to follow the central rail, either one relatively to the other or both in the same direction, without ceasing to act as drivers or as a brake, without impeding the movement of the steam engine which drives these horizontal wheels and without interfering

with the travel of the vertical wheels a over the two side rails of the track.

The steam cylinders k' and b each have their valve gear similar to those customary on locomotives for ordinary frictional engagement, but the two mechanisms are operated by a single reversing apparatus so as not to complicate the work of the driver for the driving of the locomotive. It follows that the driver can vary simultaneously and in the same proportion the admission of steam to the cylinders k' and b .

A single regulator, similar to those customarily used, admits steam to the four cylinders, but it is only supplied to the cylinders k' of the horizontal wheels on those sections of the track provided with the central rail.

When the locomotive ascends a section of the track not provided with the central rail, or passes along a line on which this rail is interrupted, it is necessary that the cylinders k' shall only receive a small quantity of steam or none at all because as the horizontal wheels rotate idly, the steam engine of these wheels, and the toothed wheels which it drives, might be liable to "race." When the horizontal wheels pick up the central rail again it is necessary on the contrary that steam be supplied to the cylinders k' .

These conditions are realized by means of an auxiliary automatic steam regulator formed by a valve q' (Figs. 4 and 8) the closing and opening of which are produced by the roller r' which is mounted on the lower end of a two-armed lever s' and travels along against the central rail, being pressed against this rail by the torsion spring t' .

The valve q' is connected to the lever s' by the lever u' and the connecting rod v' .

When the roller r' is in contact with the straight part of the central rail, the valve q' is open. When it leaves the rail after having rolled along the elongated point of the rail, the roller r' approaches the axis of the rail due to its being thrust inwardly by the spring t' , and assumes the position shown by dotted lines, in Fig. 3; the levers s' and u' have been shifted and the valve is closed.

Conversely, when the roller r' resumes contact with a point of the central rail it rolls against the inclined face of this point, compresses the spring t' and opens the valve q' .

The valve q' may be operated by the driver from his post by means of any kind of gearing and in the case where he would close this valve slowly, there may be applied to the steam engine of the horizontal wheels, as a safety device a centrifugal governor of a customary type, which will close it automatically when the engine tends to acquire an excessive speed.

An automatic distributor supplies steam to the cylinders k' in proportion to the steepness of the gradients. This distributor is formed of a valve x' (Figs. 4 and 7) placed on the pipe m' and subjected to the action of the counterweight y' the rod of which is one of the arms of the angle lever z' ; the swinging movements of the counterweight cause the lever b^2 keyed upon the stem of the valve x' to oscillate, said rod or lever z' being joined to the valve stem by means of the connecting rod a^2 .

The rod of the counterweight y' is vertical both when the locomotive runs on the level and when it travels over inclined tracks. When the engine ascends gradients the counterweight assumes with relation to the said engine, the position shown in dotted lines in Fig. 1; to this position corresponds an opening of the valve x which is the greater the steeper the gradient is.

The two valves q' and x' may be replaced by a single valve which will open proportionately to the steepness of the gradients and finally the closing will be produced by a mechanism combined with those of the roller r and of the counterweight y .

The two valves q' and x' or the single valve replacing them, for which may be substituted taps or slide valves, may be worked by the driver, from his post by means of any kind of gearing.

The automatic air distributor illustrated in Figs. 9 to 13 allows the pressure of the fluid compressed in the gripping cylinders to be varied automatically and proportionally to the declivities without the driver concerning himself therewith and if necessary the exhaust from these cylinders to be gaged in proportion as they are produced. It can easily be regulated according to the loads it is desired to haul over various gradients and according to the state of slipperiness of the rails.

This distributor is composed of a box c^2 supported at its sides by suitable levers and containing a slide valve carrier d^2 terminating in an air piston e^2 ; the carrier having mounted in it a valve f^2 which slides against a plate pierced with two passages g^2 and h^2 and forming one wall of the box.

The passage g^2 opens into a pipe coming from the air reservoir of the locomotive.

The passage h^2 communicates with the atmosphere. The body of the distributor has also a passage i^2 opening into a pipe communicating with the cylinders s of the horizontal wheels of the locomotive.

The apparatus is completed by a pendulum formed by a counterweight j^2 arranged to oscillate in the direction of travel of the locomotive and to operate the slide valve f^2 through the medium of the three-armed lever k^2 which is fulcrumed on the shaft l^2 and of the one-armed lever m^2 which is pro-

vided with two journals n^2 and oscillates about the shaft o^2 . The vertical arm of lever h^2 has the counterweight j^2 fastened to its lower end.

5 The slide valve carrier d^2 is not operated directly by the lever m^2 but through the medium of a graduated block p^2 which fits in a rectangular seat in the lever m^2 to prevent it from turning. The said block is
10 provided with a depending, threaded stem which extends loosely through guide openings in the lever m^2 .

A milled nut q^2 held against vertical movement in either direction by being fitted in a recess in the lever m^2 allows the
15 cursor p^2 to be adjusted vertically for any one of the graduations 1, 2, 3, 4 which it bears; the lock nut r^2 prevents any possible slackening of the milled nut when adjustment has been effected.

20 The weight of the counter weight j^2 is chosen in relation to the surface area of the piston e^2 connected to the valve carrier d^2 and the pressures of the fluid to be distributed to the adhesion cylinders.

25 The position of the two journals n^2 upon the lever m^2 is such that the counterweight j^2 exerts the same force upwardly against the valve carrier d^2 which lifts the slide
30 valve f^2 on the ascent and descent of declivities, that is to say when the counter weight oscillates either to the right or to the left.

The action of the distributor is as follows:—

35 1. When the locomotive runs on the level all the parts occupy the position indicated in Fig. 9 whatever be the division for which the block p^2 has been set, the slide valve f^2
40 uncovers the opening h^2 which puts the cylinders s into communication with the atmosphere. The gripping pressure of the horizontal wheels is zero.

45 2. When the locomotive enters an inclined section of the track the box c^2 of the distributor, fixed rigidly to the locomotive, inclines. The counter weight j^2 by the force of gravity lifts the slide valve f^2 which uncovers the opening g^2 as shown in Fig. 12.
50 The fluid from the reservoir is admitted to the box c^2 and to the adhesion cylinders at a pressure slightly greater than that produced by the counter weight. This excess of pressure corresponds to the resistance
55 arising from the different friction of the joints, the slide valve, etc.

The piston e^2 worked by the pressure of the air overcomes the action of the counterweight and moves the slide valve f^2 along
60 into the position shown in Fig. 13. This pressure is maintained in the box c^2 and in the gripping cylinders, if there is no leakage in the apparatus, and if the declivity of the track remains constant.

65 3. When the air pressure diminishes in

the box c^2 owing to leakages, or when the declivity of the track increases, the counter weight j^2 overcomes the action of the piston the slide valve assumes the position shown in Fig. 12, and air from the reservoir is admitted into the box c^2 and into the cylinders.
70

4. When the air pressure increases in the box c^2 owing to leakage at the opening g^2 or when the declivity of the track
75 diminishes, the piston e^2 worked by the air pressure overcomes the force of the counter weight j^2 . The slide valve assumes the position shown in Fig. 9 and the air contained in the cylinders begins to escape to the outside of the box c^2 . As soon as the air pressure diminishes the counter weight again becomes preponderant over the piston and carries the slide valve into the position shown in Fig. 12.
80 85

To sum up there is an automatic admission of air under pressure to the cylinders each time the force exerted by the counter weight exceeds the air pressure acting on the piston, whether the declivity of the track increases or the cylinders or their
90 pipes leak.

There is an automatic exhaust to the outer air of the air contained in the cylinders each time the air pressure on the piston overcomes
95 the action of the counter weight, whether the declivity of the track diminishes or the slide valve is not perfectly tight, and allows air to enter the box c^2 by the opening g^2 from the reservoir of the locomotive.
100

The counter weight j^2 oscillates in a vessel containing a liquid (preferably a viscous one) intended to relieve the air distributor of the effects of inertia which may possibly arise from abrupt changes of speed
105 of the locomotive and pitching movements.

It is only necessary to use the supplementary gripping action or friction of the horizontal wheels when the natural friction of the locomotive becomes insufficient; and even in such case the pressure of the said horizontal wheels against the central rail must not be uselessly excessive. On the other hand the coefficient of friction varies according to the seasons and according to
110 the country through which the railway passes. It is therefore necessary to be able to regulate the covering of the slide valve f^2 upon the lower end of the passage g^2 according to the loads which have to be hauled, according to the declivities, and according to the state of slipperiness of the rails, seeing that the locomotive being on the level, this covering is at its maximum and the greater it is the steeper is the declivity at which the horizontal wheels begin to grip the central rail.
115 120 125

This adjustment of the covering of the slide valve is easily and very rapidly effected by the use of the milled nut q^2 which
130

works the graduated block p^2 the divisions 1, 2, 3, 4 of which correspond to those of a table of calculations indicating the different loads which can be hauled on various inclines in two hypotheses, viz: that of a high coefficient of friction and that of a low coefficient of friction.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In a locomotive, the combination of vertical driving wheels adapted to engage the usual track rails; horizontal driving wheels disposed at opposite sides of a supplemental rail located between the track rails; a vertical drive shaft for each horizontal wheel; horizontal supports carrying said shafts; driving means for said shafts; and means for moving said horizontal wheels and their shafts and supports alternatively toward and from each other, so as to engage and disengage the horizontal wheels with and from the supplemental rail, said means exerting a force against said wheels which acts in the common horizontal plane thereof, thereby to maintain them in equilibrium during their travel along said rail irrespective of the degree of pressure of such engagement.

2. In a locomotive, the combination of vertical driving wheels adapted to engage the usual track rails; horizontal driving wheels disposed at opposite sides of a supplemental rail located between the track rails; a motor for driving the horizontal wheels; and mechanism for moving said horizontal wheels and independently of the vertical wheels alternatively into and out of engagement with the supplemental rail; said mechanism including means for regulating the degree of pressure with which the horizontal wheels grip said supplemental rail, and acting to prevent the motor from influencing such pressure after it has been regulated and from interfering with the free movement of the horizontal wheels transversely of the track.

3. In a locomotive, the combination of vertical driving wheels adapted to engage the usual track rails; horizontal driving wheels disposed at opposite sides of a supplemental rail located between the track rails; driving means for the horizontal wheels; mechanism for moving the horizontal wheels alternatively into and out of engagement with the supplemental rail; and brake mechanism for said horizontal wheels comprising shoes adapted to engage a fraction of their treads, and means for applying said shoes against said wheels, said means exerting a force which acts in the common horizontal plane of said wheels.

4. An improved locomotive having vertical driving wheels designed to engage the usual trackway and supplementary horizontal driving wheels operable independently

of the vertical wheels designed in ascending and descending gradients to be brought into engagement with the sides of a supplementary track rail, and means whereby the driving motor actuating the horizontal wheels is automatically started, speeded up and stopped as the horizontal wheels pick up, traverse and leave a section of the auxiliary track rail.

5. An improved locomotive having vertical driving wheels designed to engage the usual trackway and supplementary horizontal driving wheels operable independently of the vertical wheels designed in ascending and descending gradients to be brought into engagement with the sides of a supplementary track rail, and means for automatically supplying motive fluid to the motor actuating the horizontal wheels in proportion to the degree of ascent or descent of the gradients.

6. An improved locomotive having vertical driving wheels designed to engage the usual trackway and supplementary horizontal driving wheels designed in ascending and descending gradients to be brought into engagement with the sides of a supplementary track rail by air pressure, and means for automatically controlling the supply of air to the pressure operating device for increasing and decreasing the frictional engagement of the horizontal wheels with the sides of the auxiliary track rail in proportion to the degree of ascent and descent of the gradients.

7. An improved locomotive having vertical driving wheels designed to engage the usual trackway and supplementary horizontal driving wheels designed in ascending and descending gradients to be brought into engagement with the sides of a supplementary track rail by air pressure, means for automatically controlling the supply of air to the pressure operating device for increasing and decreasing the frictional engagement of the horizontal wheels with the sides of the auxiliary track rail in proportion to the degree of ascent and descent of the gradients, and means for adjusting the automatic controlling device from time to time according to the load to be hauled and the state of slipperiness of the rails.

8. An improved locomotive having vertical driving wheels designed to engage the usual trackway and supplementary horizontal driving wheels designed in ascending and descending gradients to be brought into engagement with the sides of a supplementary track rail by air pressure, and means for automatically controlling the supply of air to the pressure operating device for increasing and decreasing the frictional engagement of the horizontal wheels with the sides of the auxiliary track rail and supplying air to the brake cylinder of the said

horizontal wheels in proportion to the degree of ascent and descent of the gradients.

9. An improved locomotive having vertical driving wheels designed to engage the
5 usual trackway and supplementary horizontal driving wheels designed in ascending and descending gradients to be brought into engagement with the sides of a supplementary track rail by air pressure, means auto-
10 matically controlling the pressure of the horizontal wheels on the sides of the supplementary track rail and the supply of air to the brake apparatus of the supplementary wheels, means for regulating the controlling
15 device according to the load to be hauled and the slipperiness of the track, means for

operating the horizontal wheels independently of the vertical wheels, and means for automatically controlling and regulating the operating motor of the supplementary horizontal wheels according to the degree of
20 ascent and descent of the gradients of the track, substantially as hereinbefore described.

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

JULES ETIENNE HANSCOTTE.

Witnesses:

GEORGE LOISE,
JOHN F. SIMONS.