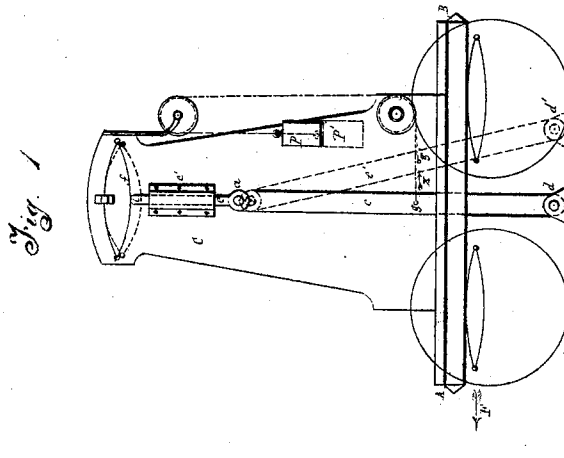
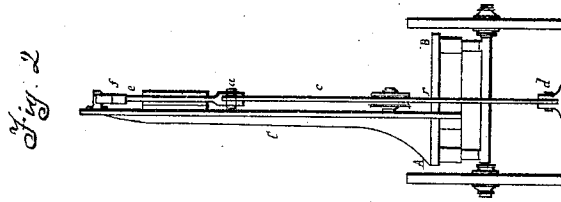


L. A. HERRMANN.

Improvement in Traction-Engines.

No. 128,543.

Patented July 2, 1872.



Witnesses:

1 Emile Duham

Charles Deisner

Inventor:

Donnerstag den 11ten März 1844

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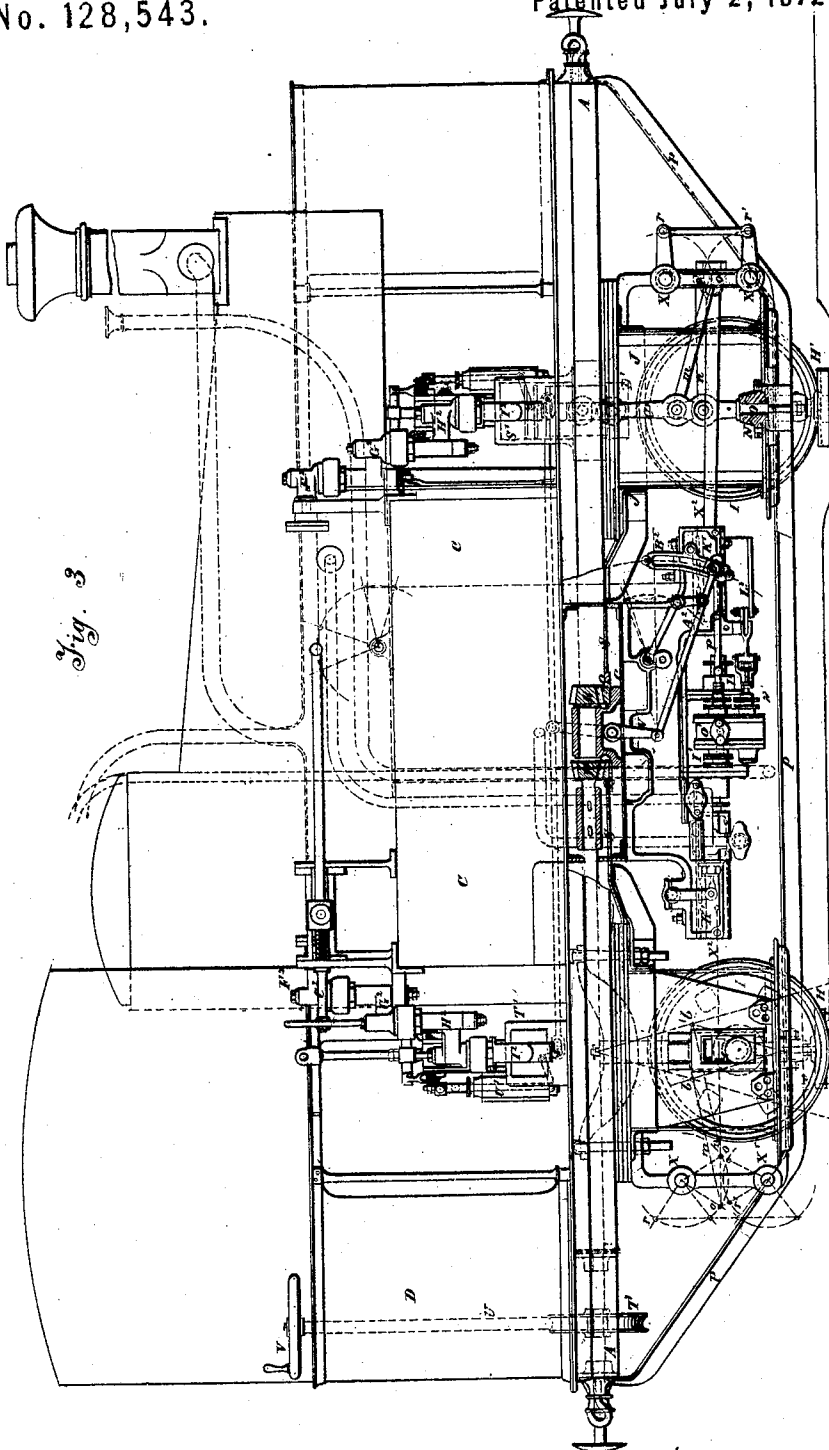


Fig. 3.

Witnesses:
Emile Duhamel
Charles D. Huns

Inventor:
Louis Adolphus Herrmann

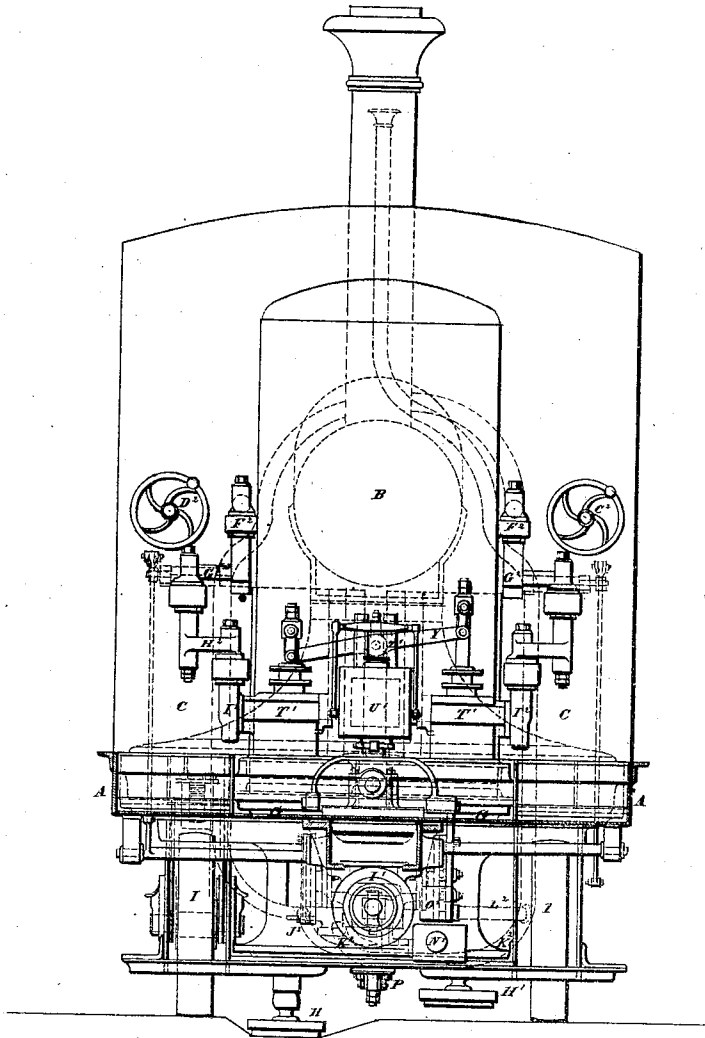
L. A. HERRMANN.

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No. 128,543.

Fig. 4

Patented July 2, 1872.



Witnessed :

1 *Emile Durhan*

2 *Charles D. Mear*

Inventor :

Louis Adolph Herrmann

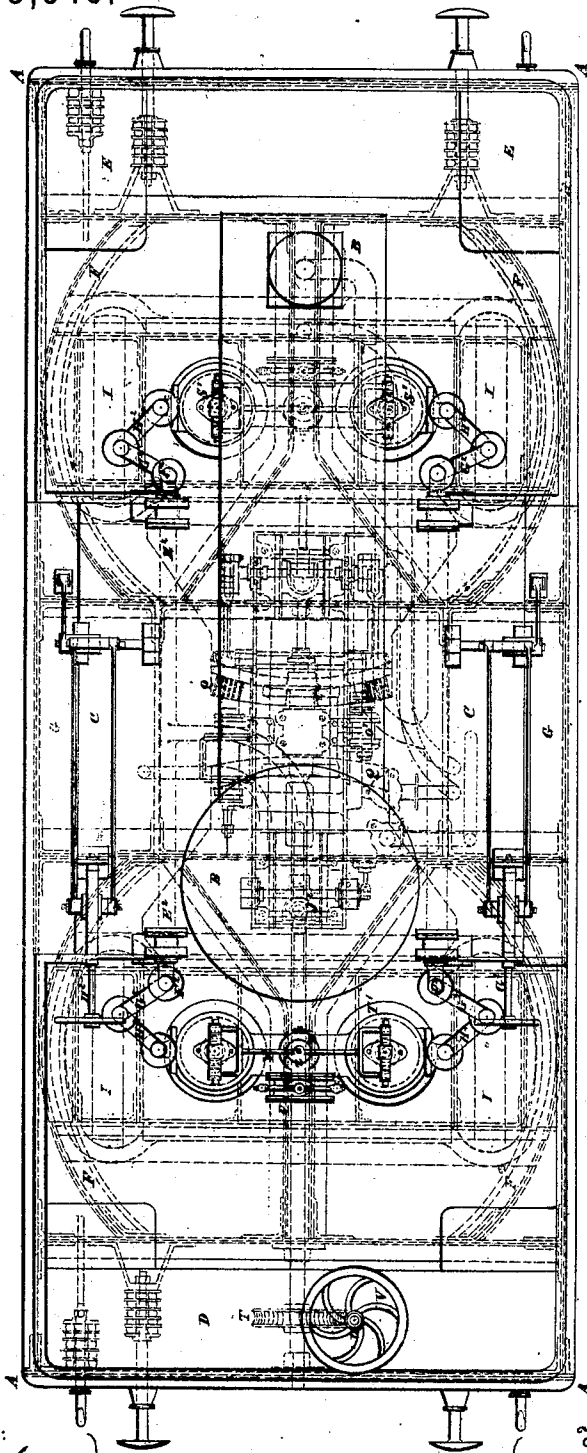
L. A. HERRMANN.

Improvement in Traction-Engines.

No. 128,543.

Patented July 2, 1872.

Fig. 3



Witnesses:

1. *Emile Graham*

2. *Charles L. H. H.*

Inventor:

L. A. Herrmann

L. A. HERRMANN.

Improvement in Traction-Engines.

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Fig. 8

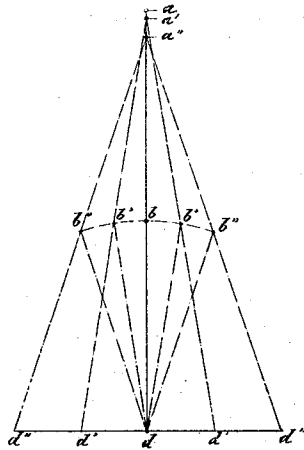


Fig. 7

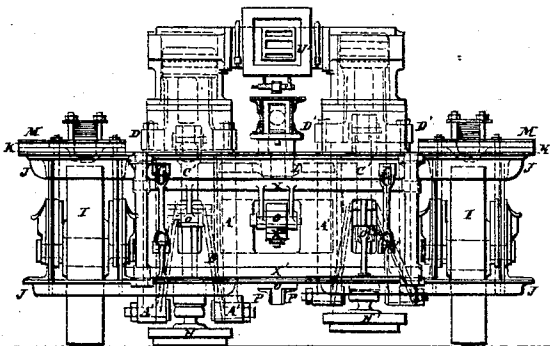
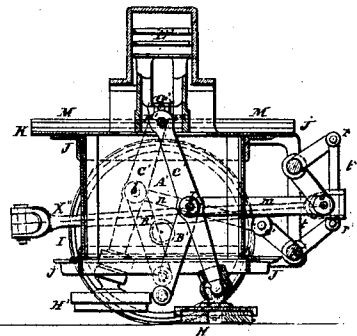


Fig. 6



Witnessed:

1. *Emile Dubois*

2. *Charles Delmas*

Inventor:

Louis Hermann

UNITED STATES PATENT OFFICE.

LOUIS A. HERRMANN, OF PARIS, FRANCE.

IMPROVEMENT IN TRACTION-ENGINES.

Specification forming part of Letters Patent No. 128,543, dated July 2, 1872.

Specification describing an Improved Land Portable Engine, invented by LOUIS ADOLPH HERRMANN, of Paris, France.

The invention will first be fully described in connection with all that is necessary to a clear understanding thereof and subsequently pointed out in the claim.

A B is a wooden frame, carried by wheels loose on their axle. *c* is a rigid bar hinged at *a* and carrying a shoe, *d*, having a large base. At the joint *a* is fixed a rod, *e*, sliding vertically within a sheath, *e'*, attached to the framing C. The rod or bar *c* vibrates longitudinally (in reference to the framing A B) within a groove, *r*, in the floor. The bar *c* being vertical, if, by the effect of a spring, *f*, fastened to the framing C, a strain on said bar is produced equal to the weight of the vehicle and a traction exerted simultaneously and at right angles thereto by means of a weight, P, the bar *c* will deviate from the vertical and take an oblique position; but rod *e* is held at its point of vibration *a*, the same as at its point of application *d*, on the soil. Therefore it cannot take the inclination *a d'* without the position of engine being changed and it being, consequently, carried forward. In order to continue the motion it is required to suppress the action of spring *f* and of weight P and to carry the leg *c* in the former position at *a d*. It is obvious that, by setting again the forces or powers into action, the same effects hereinabove mentioned will be obtained. In lieu of spring *f*, a steam-cylinder may be fastened to the upper part of the framing C, with the piston-rod *e* sliding within this cylinder. Through a slide-valve, or through a cock, the steam may be introduced above or below the piston, and consequently produces the ascending or descending motion of the "leg" *c*, a motion corresponding to the shoulder-motion of a horse. Thus, the apparatus being disposed so that the "leg" *c* will be in the position *a d*, the steam being compelled to come over the ascending piston, the apparatus will be carried by the "leg" *c*; and if the steam is introduced on the propelling-piston, so as to have the same carried toward B, the "leg" *c* will be carried at *a d'* and the apparatus move forward toward F. Then, if the steam is introduced on the opposite faces of the pistons,

it will produce opposite effects—that is to say, the "leg" *c* will be carried forward after being raised up by the upper piston.

The land portable engine for which I make an application for Letters Patent, is chiefly formed (Figs. 3, 4, 5, Sheets 2, 3, 4,) of a horizontal frame, A, carrying the boiler B, the water-boxes C, the coal-boxes or bunkers D, and the tool-boxes E.

Two driving-engineers stand in the rear and control (by governing-levers) injector, safety-valve, steam-gauge, water-level, and all that is required for the direction and management of the apparatus.

The driver occupies the front of the engine, to regulate and produce any change in direction.

The bearing-wheels and propelling-feet, hereinafter described, are on the fore and rear parts of the framing. Under the framing, and in the middle stands the propelling-engine. The framing is a rectangle, largest length of which is in the direction of the step, and is formed with two girders, six cross-bars, and four circumferential segments, F, (two in front and two in the rear,) which carry friction-surfaces. The extreme cross-bars are provided on the fore part, as well as on the rear, with buffers and coupling-hooks. A central plate, G, fixed underneath the framing, supports a part of the main direction devices of the portable engine and the framing of the propelling-machine. The framing is attached with sheet-iron, T-iron, rivets, and bolts. The four feet, H, are placed side by side, two in front and two in the rear, and are arranged so as to work two and two in the same direction, the fore right foot working with the hind left foot, and vice versa. The engine is carried by four balanced bearing-wheels, I, of the same diameter, two in front and two in the rear. They support the whole weight of the engine and the dead weight. They are bound two and two in the front and in the rear with each one of the two set of feet. The object of this relation between the feet and wheels is to afford all the evolutions, allowed by a motive-power acting by traction on ordinary roads, a perfect accordance between the motions of the feet and wheels, and the direction of the engine, either on a straight line or on a curve, are absolute.

ly essential. This result can only be obtained when the following conditions are observed: The feet must constantly move in planes parallel to those of the wheels, and the feet and wheels constantly tangential with any curve over which they may pass. These conditions being observed, corresponding motions of the feet and wheels will be necessitated, and all slipping of the feet in changing the direction will be avoided. The two feet H H' are placed side by side as closely as possible and equidistant from the vertical axis of the machine. Both wheels I are set outside the feet and equidistant. The apparatus is mounted on a framing, J , entirely constructed of sheet-iron, T -iron, rivets, and bolts. An upper plate, K , carries a socket, L , which engages a bolt fastened to the framing of the platform, and at each one of its extremities is fixed a segment, M , on which rests the corresponding segment F . The pole-bolt is provided with a second socket, N , Fig. 3, in which engages a pin, O , secured to a longitudinal bar, P , that forms a tie between each set and is connected by the ends to the main framing. The fore and back trucks move horizontally around their respective pole-bolts at the same time and to the same extent by means of two circular racks, Q Q , and iron pinions R . The racks are connected to the fore and hind trucks by sheet metal S fixed to the upper part of the sway-bars. They are arranged in such manner that the pinions which actuate them carry both together to the right or left. The effect is, that on curves of any radius the machine will possess an inclination of the fore truck one-half less than if it had only one sway-bar, and the feet and back wheels will, respectively, track after the fore wheels. The direction is regulated by the sway-bars and beveled pinions R , whose shaft extends through the thickness of the framing and toward the rear, beneath the platform of the engineers. At the end of this shaft is mounted a tangential wheel, T , receiving its motion from a vertical screw, U , keyed on a shaft carrying a cranked fly-wheel, V , at its upper part. In order to have the driver in front I have the shaft of the pinions passing underneath the fore platform, where I arrange the screw and tangential wheel. I introduce the steam within the cylinders only on the upper part of the pistons during the lowering period. To effect the raising again of the second foot I arrange a beam, Y , to connect both rods by means of small connecting rods. This beam being pivoted at the center, both feet are perfectly balanced, and when steam is introduced on either one it is depressed and the other raised up. The axis of the beam connecting the piston-rods is mounted on a piston, Z , sliding within a cylinder, Z' . The steam, acting below piston Z , has always a tendency to raise up both feet H H' together. The effect is, that the beam is mounted virtually on a spring which yields.

In the horizontal motion of "leg" c , Fig. 1,

if the shoe d is carried to d' , it will describe an arc, and the foot will act on the soil with a steady power only when spring f shall slacken. The steam, introduced within the cylinders of the feet, produces this effect in the most satisfying manner. However, the steam introduced from the moment when the foot is at d until the moment when it is at d' , is liable to be lost. I avoid this loss or waste of steam by an arrangement which allows the foot, when on the soil and at any point of its stroke, to move horizontally and parallel with the soil. For that purpose I have arranged on each side of the "legs" two small columns, A' , which are vertical, parallel, and free to slide in vertical guides. Two vertical connecting-rods, B' , are hinged at their lower part, and connected by the other end to the "leg" c' . The upper parts of the columns are reunited by a cross-bar, D' ; to piston-compressor of the foot. This cross-bar carries two internal and vertical slides, F' , designed to guide the upper part of the "leg," which carries a hinged slide-block, G' . a d is a "leg;" d b , connecting-rod, the heads of which are d and b . a d is equal d b , and a b equal d b . The three points a b d are in a straight line. The mean positions are to the right or to the left. d is the head of a connecting-rod, considered as fulcrum, after the whole set has been depressed. d d' are small connecting-rods; a' d' , a "leg;" a' , new position of joint a ; d is a fulcrum; d b'' , small connecting-rods; a'' d'' , a "leg." If, in the triangle d b' d' , we take d d' as base, and vary the angle by sliding the point d' to the right or to the left from d on the horizontal line d'' d d'' , perpendicular with a d —the point P remaining dead—the result will be that point B will describe an arc of a circle, b'' b' b b' b'' . Then the point a will assume the corresponding positions a' a'' , and these three positions, as well as all the intermediate positions, will be constantly on line a d .

It is obvious, therefore, that with this apparatus, when the steam is admitted within the feet-cylinders, the strain which must be produced to move the apparatus will be reduced to the mere quantity of work required to overcome the inertia, beside the resistance due to friction. Hence the power of traction will be almost entirely utilized.

To change the direction of one leg in reference to the other on the same sway-bar, I have used the following arrangement, Fig. 6, Sheet 5: m and n are the connecting-rods conveying the motion to both "legs," with which they are hinged at point b . X and X' are two horizontal shafts, mounted externally on each one of the two sway-bars. X o is a lever, fixed on shaft X and hinged to the connecting-rod m . X' o' is a lever, fixed on shaft X' and hinged to the connecting-rod n . These two levers, as well as the connecting-rods m and n , stand in the line of motion of the feet. X r X' r' are two other levers, mounted on the same shafts and hinged to a connecting-rod of connection r r' . The shaft X being made, by the connect-

ing-rod X'' , to revolve in the direction of the arrow, it will draw away connecting-rod m , and consequently the corresponding "leg" in the direction t ; while lever $X' r$, connecting-rod r' , and lever $X' r'$, will be drawn away in the direction t'' . Lever $X' o'$, receiving its motion from shaft X' , will revolve in the direction t'' , and, consequently, connecting-rod n will draw away the corresponding "leg" in the direction t' , opposite t .

The fore and hind trucks are naturally reunited by the propelling piston-rods and two connecting-rods, X'' , which are hinged to two ends, fixed to each extremity of this rod. These connecting-rods meet levers, the length of which is equal to that of the two levers $o' X$ and $o' X'$, which levers are fixed on the middle of shaft X . The two points of fixture of these connecting-rods are double joints, in order to follow the motion of the driving-levers of shaft X , and to follow the changes of position of the sway-bars in regard to the direction of the engine.

Shafts X and shaft X' being laid at a certain distance in front, passing through the axis of the sway-bars and through the axis of the feet and wheels, the middle points of the shafts X , where are fastened the levers connected with the main connecting-rods, describe, in the horizontal plan, arcs of circles. The radius being equal to distance from the pivot of the sway-bars, the large connecting-rods take an inclination that increases as the radius of the curve diminishes. Hence they deviate externally from the pole-bolts to a certain extent.

The second object of this engine is to produce the several changes or alterations convenient for the stepping forward and back, and to allow the introduction of steam at a higher or lower pressure or in different quantities.

The engine is formed with a horizontal cylinder, L , fixed under the framing at the intersection of the longitudinal transversal plans, passing through the general axis of the engine. Therefore, this cylinder occupies the middle of the apparatus, and the piston-rod passes through both covers in order to carry the motion to each sway-bar. Both ends of rod are provided with an end, J' , sliding within slides K' . To these ends are hinged the large connecting-rods X'' , carrying the power to the feet. All the intermediate levers being equals, between the connecting-rods and the "legs" the stroke of the piston is equal to the half of the "leg." Under one of the ends of the propelling-piston is fixed a cam, L' , intended to produce the same effects as the ordinary rotating eccentrics. This cam actuates one of the arms of a square, M' , moving in the horizontal plane, while the second arm actuates a distributor, N' , designed to move a special piston within a cylinder, o' . In order that the piston may not strike on the bottom of the cylinder the openings or apertures of introduction are wide open when the piston reaches the end of its stroke. To the rod of the driving or mov-

ing piston is hinged a connecting-rod, P' , actuating a lever, Q' , keyed on a vibrating-shaft, R' , laid at the extremity of the framing of the propelling-engine. This shaft possesses thus a to-and-fro reciprocating motion corresponding with that of the propelling-pistons. Both fore-cylinders, $S' S'$, as well as the hind ones, $T' T'$, are cast in one piece, and are entirely open underneath.

The distribution of steam is effected in the same manner as in ordinary engines, except that more overlapping has been effected at the outlet. This arrangement has for its object to produce the descending motion of the raised foot faster than the ascending motion of the foot lying on the soil, so as to lessen—even to prevent—vertical concussions.

The small compensating-cylinder Z' is constantly in communication with the boiler by means of a special channel branched on the inlet-steam channel before its outlet within the box U' of the slide-valves. Each one of these two sets is connected above the platform by the medium of a connecting-rod to a vibrating beam, V' , crossing the thickness of the framing. The lower end of this beam is actuated by a movable connecting-rod, A'' . On one end of the vibrating shaft R' is fixed, by the middle of its length, a slide, B^2 , having the form of an arc of a circle, the radius of which is equal to the length of the connecting-rod A^2 , connected with the beam crossing the framing. This connecting-rod, connected to a slide-block, goes through the whole length of slide B^2 either above or below the center of the vibrating shaft R' . It is carried and held in the position desired by the driver by means of a step-changing screw, c^2 .

If I take, as a starting-point, the middle of slide B^2 , it is obvious that there will be no displacement whatever of the connecting-rod. The slide-valves will stand in their mean position while the steam is being introduced and diffused below the compensating cylinder, and will raise the fore feet, but, remaining inclosed within the distributing-boxes without being diffused in one or the other cylinders of adherence, neither one nor the other foot will rest on the ground. Hence, even if the propelling engine is working there will be an effective stop. If, by means of the step-changing screw c^2 , the connecting-rod is displaced so as to occupy one end of the slide—the propelling engine being at work—the slide valves will be moved, and the steam introduced will actuate one or the other foot in proportion. The lower part of the slide produces the forward stepping, and the upper part the back stepping, because the feet, stepping inversely, one from the other, the depressed foot carries the machine forward, while the raised foot moves it in the opposite direction. Therefore, by reversing the engine, it will be the latter which will receive the pressure of adherence, and, consequently, carry the engine to the rear.

It is by means of a second step-changing

screw, D^2 —analogous to that of the feet-distributor, and set to the left of the engineer—that I effect the operations relating to the propulsion of the engine and to the inverted steam.

It is obvious that, as in the distribution of adherence the mean position of the slide corresponds with the mean position of the slide-valve, and that the inlet being thus suspended on the propulsion, the engine will not move forward whether the steam is or is not introduced within the cylinders of adherence of the feed.

The inlet of the steam is effected, as in ordinary engines, on the face of the piston near the cover, and at the end of its stroke, at the same time that the outlet of the steam is on the opposite side of the piston.

In order to moderate the speed without brakes, I use the reversing-screw, so situated that the slide-valve and connecting-rod occupy the lower part of the slide. If the engineer manages the screw so as to bring back the connecting-rod in the opposite extreme position, the slide-valve will necessarily take the opposite position also. Steam, proceeding from the boiler, will be diffused on the opposite face of the piston, and hence the piston will have a certain resistance to overcome to accomplish its stroke. If the engine possesses a sufficient impulse, the piston will cause such steam to flow back within the boiler, while on the opposite face the cylinder will fill up with air brought by the outlet-pipe. This air will mix with new steam proceeding from the boiler. If the movable connecting-rod is at the middle of the slide, the slide-valves are in the mean position, and if the connecting-rod is advanced little by little, so as to make it run to all the intermediate points between the center and the end of the slide, the slide-valves will advance in the same proportion. Hence it will uncover the inlet-orifice when the center of the slide-block of the movable connecting-rod will beat a distance from the center of the slide corresponding with the overlapping of the slide-valve. L represents the length of the slide from the center as far as the extreme position of the slide-block; R , the overlapping at the inlet; and c , the complete stroke of the slide-valve; hence the section (of opening) of the orifices may be increased or decreased at pleasure, and by this means a decrease or increase in the quantity of the wasted steam obtained. In the reversal of the stepping this advantage has more importance, because, the friction opposing resistance to a certain valve, it will not be necessary (especially in slopes slightly inclined) to carry the slide-block to the extreme stroke; consequently, it will be easy to introduce only just the quantity of steam to obtain the resistance required. Moreover, as the overlapping at the outlet is weaker than at the inlet overlapping, the outlet-orifice will always be open to a greater distance, and the introduction of steam then rendered of no effect. Each steam-propelling cylinder, or cyl-

inder of adherence, is provided with safety-valves, while blow-off cocks are set at every low point calculated to receive condensations. Special or auxiliary brakes, designed to produce the stopping, or to moderate the speed on slopes, are arranged on both sides of the engine. They are fixed to the girders of the framing. Their principle is the friction on the soil of a flat iron shoe mounted on one of the branches of an iron square pivoted in a vertical plane. The second arm is actuated by a screw and by a fly-wheel placed within the reach of the engineer. I arrange two shoes on each square, giving to this square the aspect of an inverted T. The latter, designed to work for the fore part, is arranged on the rear, and the second opposite, so that the working is always in the direction of the traction on the arms of the square, and so that no stopping can be produced. To render the action of the brakes still lighter, one of the arms is constructed with steel of the best kind, so as to spring when pebbles or other obstacles are met during the working of the brakes. The boiler is formed with a vertical cylindrical fire-box, and the ash-box with two lateral openings, allowing the evacuation of the residuum at the outside of the platform. The steam-dome forms the prolongation of the fire-box. The boiler has also a horizontal tubular body, analogous to that of locomotives. The tubular body is formed of a conoidal frustum fixed to the fire-box by its large base, so that the lower part of the cone may be tangential to a horizontal plane passing above the distributing parts of the feet. The diameter of the large base is proportioned, so that on very inclined slopes the upper part of the body of the boiler may be still inclined from the rear to the front, so as to allow the steam evolved at the fore part to pass without obstruction to the dome of the boiler. An injector is set on the left of the engineer, in order to feed at the stations. A feeding-pump, actuated by the second end of the propelling-engine, is set on the right, and designed to constantly feed in proportion to the waste effected during the stepping. This pump has clack-valves, which are double—that is to say, formed of two distinct parts. Thus, on the seat of the box is the first clack-valve, which is a ring or crown, the annular surface of which, bearing on the seat, has only a width of one twenty-fifth of an inch. This crown possesses a stroke of one-fiftieth of an inch only. An ordinary clack-valve, with a conical seat, bears on the upper part of the crown arranged to receive it. The water-boxes are two in number, set one on each side of the boiler, and situated on the middle of the platform. Below the boiler they leave between them the free space required for the passage of the driving-rod of the feet slide-valves. A pipe reunites them below the framing, and it is on this pipe that are branched the feeding-mouths of injector and pump. At the origin of each one of the connecting-tubes

of both water-boxes is fixed a wire-gauze basket or fringe which is very fine, and which has a wide surface, so as to remove from the water all the impurities which may be in suspension.

The right-hand box carries the step-changing mechanism, and the left-hand-side box the reversing mechanism. The bottom and cover of the right-hand box are bored with corresponding openings, and connected by a tube, which is water-tight and designed to give passage to the outlet-pipe of the propelling-engine. The steam-inlet pipe passes within the left-hand box by means of an analogous arrangement. The space confined between the inlet-pipe and the water-tight sheath is filled with felt or other non-conductor of heat. This precaution being useless on the side of the escapement or outlet, the pipe may be free within the sheath; but, in order to derive advantages of the steam-heat expelled, I make the outlet-pipe to pass immediately through the water within the right-hand reservoir at the same time that several communications are established at different heights between both boxes, allowing the heating again of the water (contained in the left-hand reservoir) by circulation.

A coal-bunker is set quite in the rear of the platform, of which it occupies the whole width, its height being equal to that of the fence of the engine.

The changes of positions of the feet-cylinders during the inclination of the sway-bars require special arrangement of piping. We will take, for instance, the inlet-pipe. It starts from the governor, mounted on the dome of the boiler, descends by the front part, and turns round to the left of the tubular body, to be divided in two branches, E^2 , along the boiler, one carrying the steam forward and the other backward. These two branches stop before getting to the extreme point of travel of the feet-cylinders. As far as that point the pipe is fixed on the boiler and on the cover of the water-boxes by means of small collars. The pipe is continued by a joint formed of a piece fixed to the extremity of the pipe, two movable pieces, and a fourth one fixed to the cylinder. The first piece F^2 turns below vertically, and carries a rotating stuffing-box, designed to receive the second piece, G^2 . This one, which is movable, turns twice, first horizontally, then vertically below, presenting to the third piece, H^2 , which is similar, the opening of a second stuffing-box lid similar to the first one. This third piece is, in its turn, brought back horizontally under the second, and then vertically above the fourth, I^2 , while it presents to the latter a third stuffing-box lid, by means of which they are connected together. The distance of the axis through the centers of the vertical parts of these pieces is such that (seen horizontally) this arrangement always presents an angle, the apex of which is the center of the stuff-

ing-box lid, connecting both movable intermediate pieces. This angle decreases about thirty degrees when the sway-bar is inclined to its maximum toward the pipe, and increases about one hundred and twenty-five degrees when the sway-bar is inclined at its maximum toward the opposite side. The delivery-pipe passes around the cylinder with which it is cast and debouches inside of the distributing-box on side of the slide-valve seat.

In order to avoid the taking off of the handle of the stuffing-boxes' lids by the pressure of the steam, I have introduced, inside the pipes, vertical bolts forming inter-ties; these bolts allow rotary motion to all the parts, their heads being countersunk, and the leakages avoided by means of corks. The fore steam-joint is entirely similar.

The escapement outlets only differ from the inlets in that the pipes of the joints are of a larger diameter.

A common pipe is fixed on the right-hand water-box, and runs along the boiler. The inlet-pipe starts from the second regulator, passes around the dome and the boiler, and goes to the engine-distributing box, after running through the water-box placed on the left-hand side of the platform.

A special mouth, J^2 , provided at the inlet of the main distributing-box brings the steam within the box of the slide-valve of the small driving-piston of the general distributor.

The steam outlet-pipe K^2 , starting from the propelling-engine, turns horizontally, passes under the cylinder, reascends to the right, runs across the water-box, and then goes to the fore part of the boiler, where it rises up again along the chimney.

The outlet-pipe L^2 of the small driving-piston branches itself on the main outlet-pipe.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The shoes d , deriving their adhesive power from steam and the weight of the engine, substantially as hereinabove specified.

2. The mechanism of direction, consisting of two sway-bars to turn the engine on curves, the pinions, and racks, arranged substantially as hereinabove described.

3. The arrangement of the "legs" and wheels in relation to the engine, as and for the purpose described.

4. The arrangement of the hinged parallelogram described, as and for the purpose set forth.

5. The combination of small shafts and levers mounted on each sway-bar, as and for the purpose described.

6. The propelling-engine, combined with the means for producing direct traction, as herein set forth.

7. The arrangement of the motion-reversing slide in a portable land-engine, as herein specified.

8. The arrangement of the parts, slides, le-

vers, and connecting-rods that produce the back-stepping and the forward-stepping, as hereinabove described.

9. The compensating cylinders and pistons combined with the beams, as hereinabove specified.

10. The arrangement of the inlet steam-pipes, the feet-cylinders, the joint or articulation, the stuffing-box lid, and inter-tied bolts, as hereinabove described.

11. The arrangement of the brakes, having for object friction on the soil, as hereinabove specified.

LOUIS ADOLPH HERRMANN.

Witnesses:

EMILE DUHAN,
CHARLES DETMOS.