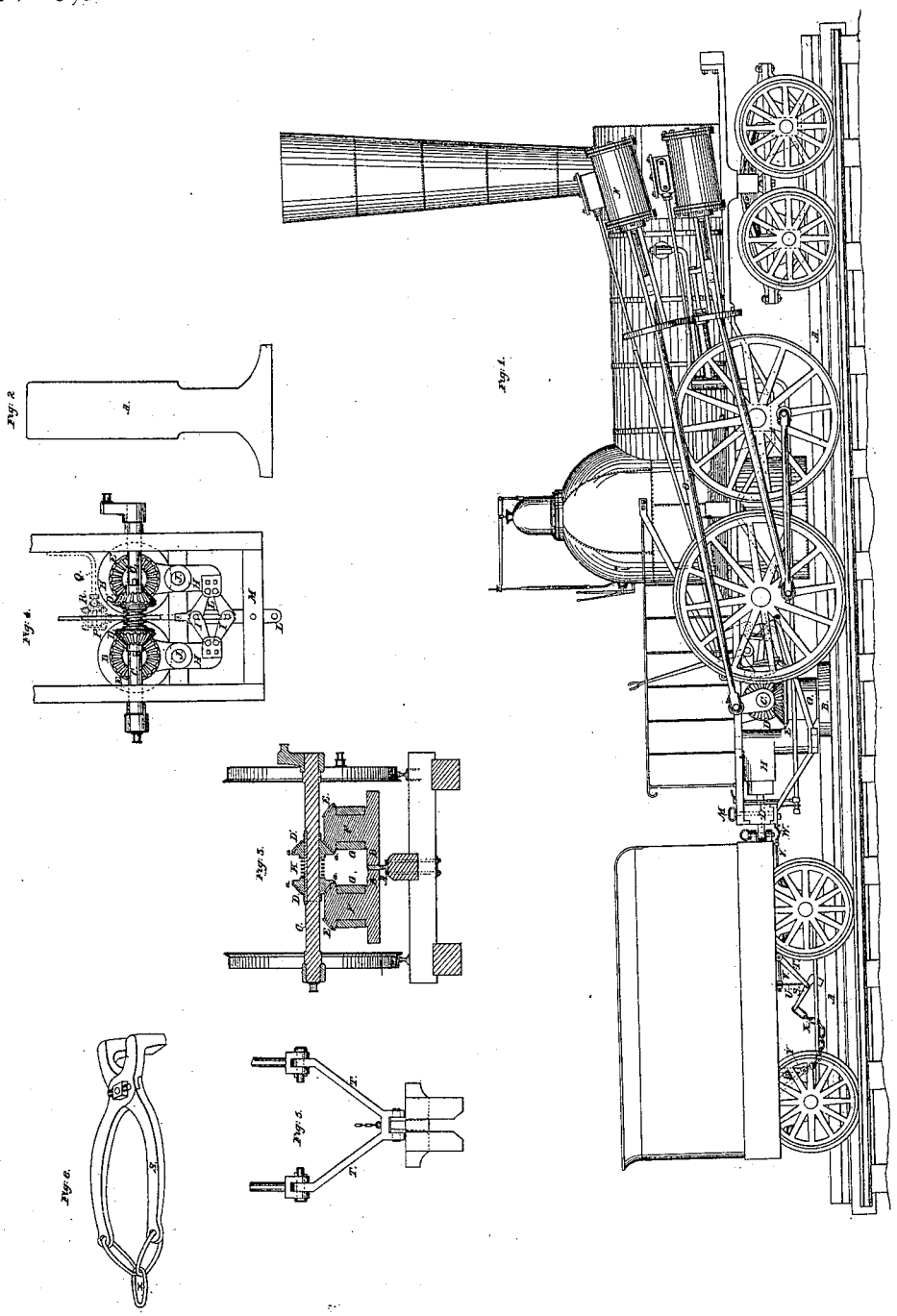
G. E. Sellers,

Steam Brake.

No. 5,367. Patented Nov. 13, 1847.



UNITED STATES PATENT OFFICE.

GEORGE ESCOL SELLERS, OF CINCINNATI, OHIO.

IMPROVEMENT IN MACHINERY FOR ASCENDING AND DESCENDING INCLINED PLANES.

Specification forming part of Letters Patent No. **5,367**, dated November 13, 1847.

To all whom it may concern:

Be it known that I, GEORGE ESCOL SELLERS, of the city of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful improvements in the manner of constructing and arranging certain parts of railways, locomotives-engines, and cars, so as to enable the engine and cars to overcome the resistance of heavy grades on the road, and to ascend and descend thereon with facility and security; and I do hereby declare that the following is a full and exact description thereof.

The object of my invention is to obtain the requisite adhesion to enable the locomotive-engine and its train of cars to ascend and descend inclined planes with safety and certainty; to avoid the expense of heavy grading or circuitous routes, and to enable the engine to employ the full force of the steam generated in the boiler notwithstanding the reduced motion of the train while ascending inclined planes. The nature of the first part of my invention by which I obtain these important ends consists, first, in the employing of the gravitating force of the train of cars, either in ascending or descending such planes, to give the requisite adhesion in such manner as that the adhesion shall increase in proportion to the inclination of the plane and the weight of the train, this being obtained by the connecting of the train with gripping-wheels on the locomotive that embrace a central rail, which is located on that part of the track only where high grades are to be overcome. These gripping-wheels on ascending or descending inclined planes are made to become driving-wheels, they having their bearings in levers connected together by two opposing toggle-joints that are operated on by the connecting-link of the train, so that in ascending the gravity of the train shall operate on one of the toggles, and thereby cause the wheels to grip the central rails with a force proportioned to the gravitating force to be overcome, and so that in descending the connecting-link shall operate on the other toggle to produce a like effect. To convert the gripping-wheels into driving-wheels, they are operated on by an auxiliary pair of steam-cylinders of such capacity as effectually to work off, in conjunction with the ordinary cylinders, the steam generated in the boiler driving the slow motion of the locomotive and train up the inclined plane.

The second part of my invention consists in the connecting of the levers of the gripping-wheels with a spring in such manner as that its tension shall cause the wheels to grip the central rail, and thus enable the locomotive to ascend and descend inclined planes without a train, or with a train that is too light to produce the requisite adhesion, or in the event of any accident to the connections which might prevent the employment of the gravitating force to effect this end, and also at the same time to admit of the lateral play of the locomotive.

The third part of my invention consists in the manner of communicating motion to the gripping-wheels from a horizontal crank-shaft, the gripping-wheels being affixed to vertical axles, and this is effected by means of bevel-wheels that slide on the crank-shaft, being feathered thereon, and each of them being forced toward the bevel-wheels that are affixed to the upper ends of the shafts of the gripping-wheels by means of a spring or springs, the wheels being kept at their proper pitch by bevel-faced wheels that make a part of or are connected with each of the beveled cog-wheels, by which arrangement the locomotive will be free to vibrate on the track-rails laterally, while the gripping-wheels act on the central rail.

The fourth part of my invention relates to a self-acting brake, which is intended to prevent accidents in the event of the breaking or separating of the links by which the respective parts of the train are connected together. This brake consists of a pair of jointed grippers connected to each car by the longer ends of its levers, and held up clear of the central rail by a chain which is connected with the bolt of an additional link, and which, when the main link separates, liberates the grippers, which then fall, so as to cause their jaws to embrace the central rail, upon which the gripping-wheels of the locomotive operate, said grippers having their bite upon the rail increased in proportion to the descending force of the cars.

In the accompanying drawings, Figure 1 is a side elevation of a locomotive and car, drawn to a scale of one inch to the foot. Fig. 2 is an end view of the central rail, drawn to the full

size of those used on the road. The other figures represent parts of the apparatus in detail, the proportionate size of which is indicated on the drawings.

In each of these figures where the same parts occur they are designated by the same letters of reference.

A A is the central rail, which must be secured in place in the firmest manner. It is to rise to such height above the ordinary rails as that its top may be within about two inches of the fire-box, and to accommodate it I make the ash-pan in two parts, so as to pass on either side of it.

B B are gripping-wheels, which are made to press against the opposite sides of the rails A with a degree of force proportioned to the gravitating power of the load which is to be overcome. These gripping-wheels are acted on in the following manner:

C is a shaft that runs in suitable boxes in the frame of the locomotive. These boxes and the part of the frame that sustains them are omitted in the drawings, Fig. 1, for the purpose of showing the gearing and their connections that would otherwise be hidden. The shaft *c* is shown in section in Fig. 3 and a top view of it is given in Fig. 4.

D D′ are two beveled wheels, which I make of wrought-iron, that slide by means of a feather on the shaft C, and these gear into two beveled wheels, E E′, that are connected, by means of shafts F F, Fig. 3, with the gripping-wheels B B, to which they communicate their revolving motion. The shafts F F pass through strong boxes G G, Figs. 1 and 3, on the inner ends of the levers H H, which on their outer ends carry the progressive levers or toggle-joints I I′, Fig. 4. The levers H H work on fulcrum-pins J J in the frame of the locomotive.

In order to cause the teeth of the wheels D and E to gear into each other precisely to the pitch-line, I turn plain surfaces on them, as shown at *a.a*, which coming into contact produce this effect. They are kept in gear by means of a spiral spring, K, that surrounds the shaft C, while they are free to vibrate laterally with the vibration of the levers on their fulcra J J. To prevent the possibility of the bevel-wheels being forced out of gear, their tubular hubs, which surround the shaft C C, are so nearly in contact with each other as to prevent this taking place, no greater space being left between them than is necessary to allow for the unavoidable inequality in the thickness of the center rail.

L is a sliding bar by which the engine is to be drawn and that receives the fulcra of the toggle-joints I and I′, and operates upon one or the other of them, according as the engine is ascending or descending on the inclined plane. When this is not the case and the engine is running on the ordinary grade, a bolt, M, is passed through the frame of the machine and through a corresponding hole in the slide L. The toggle-joints, it will be seen, are in reversed directions, and that marked I is brought into operation when the train is ascending, and that marked I′ when it is descending. When the locomotive has advanced to that part of the road where the central rail is situated and the gripping-rollers have received it between them, the bolt M is to be removed, so as to bring the whole force of the draft onto the slide L, and if the locomotive is ascending the toggle I will press the gripping wheels against the central rail, and if descending a like effect will be produced by the toggle I′. The openings in the slide L, through which the connecting-pins of the toggle pass, are elongated to allow one or the other of them to be brought into action.

In order to apply the steam with the force required for ascending the inclined plane, I employ a second pair of steam-cylinders, one of which is shown at N, Fig. 1. The pistons of these cylinders are to operate upon the shaft C by means of the connecting-rods O, and when the valve is drawn, which is to admit steam into them, the engine will be held to the rails by the whole adhesive power due to the ordinary driving-wheels, and to that of the gripping-wheels, the latter of which will be increased in direct proportion to the resistance from the load. Should the train in this case be made to advance with one-half of its ordinary speed, the quantity of steam expended will not be decreased, but will be used with its whole effective force.

When it is wished to operate upon the gripping-wheels independently of the weight or resistance of the train, a lever may be affixed, so as to operate by hand on the slide L; but I intend in general to provide for this contingency by the employment of a small cylinder, into which steam may be admitted for that purpose. Such cylinder may be situated, as represented by the red lines in Fig. 4, where P is the cylinder, the piston of which need not have a stroke of more than five or six inches. This is connected with the boiler by means of a tube, Q, leading to the steamways R, which may be furnished with a three-way cock, by means of which steam may be let into the cylinder, so as to operate on the piston at either end, and consequently on the toggles, either in ascending or descending, the piston end of the cylinder P being connected with the slide L. By this means the gripping-wheels are pressed against the rail by the elastic medium, steam, and are made to adjust themselves to its inequalities more perfectly than could be effected by a spring of steel or other material.

The brakes on the tender or cars are so constructed and arranged as to be made to embrace the center rail should the link by which they are connected with the locomotive or with each other be broken when ascending the inclined plane, and the said brakes are thus necessarily combined with the apparatus required for the ascent of the locomotive. In Fig. 1 one of these brakes and its appurtenances are shown as attached to a car, and in Figs. 5

and 6 they are represented on a scale of two and a half inches to the foot.

S is a pair of gripping-tongs that are hung to the bottom of the car by a jointed link, T, upon which they are free to vibrate laterally to a short distance, but not so far as to prevent their embracing of the center rail when they are allowed to fall upon it.

U is a chain or link by which they are sustained so long as the ordinary connection of the cars with the train remains perfect.

V is a rod sliding through staples and its inner end holding the link U, its outer end being connected to the locomotive or car by a chain, W. Should the link of the train separate, the rod V will be drawn forward and the gripping-tongs will fall and embrace the rail A. The shanks or longer arms of these gripping-tongs are attached to a chain, X, and this at its opposite end to a stanchion, Y, made fast to the bottom of the car, and under this arrangement the train will be kept from descending on the road by the grip of the jaws of the gripping-tongs, which is produced by the draft of the car pulling on their longer arms. As they begin to act at the moment of the separation and before the cars have attained any considerable degree of downward motion, they have, therefore, scarcely any momentum to overcome.

It will be obvious from the foregoing that some parts of my invention may be advantageously employed without the others, as, for example, the wheels may be made to grip the central rail by the gravitating force or resistance of the train without the employment of the two toggles by simply bending the ends of the two levers in which they turn, and connecting these levers with the train by the link; and various other modifications of this connection may be made, as will be evident to engineers; but by the use of the two toggles the desired end is attained more effectively than under any other arrangement which I have been able to devise.

Instead of making the two gripping-wheels drivers, one only may be used as such, and the other be allowed to turn freely on its shaft and simply answer the purpose of a gripper. An important object to attain is the so connecting of the two gripping-wheels as to admit of the lateral play of the locomotive between the track-rails, while the central rail is gripped by the wheels; and therefore the mechanical arrangement employed may be varied by the substitution of their equivalents and this desired end be still attained.

It is to be distinctly understood that I do not limit myself in the second part of my invention to the use of the elastic property of steam as a spring to operate on the gripping-wheels, so as to cause them to grip the center rail, as springs of other kinds may be made to answer the same purpose; but I have described the steam spring, as I deem it the most effective and the best in all respects.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The method, substantially as herein described, of increasing the tractive power of the locomotive-engine by the resistance or gravity of the train to be drawn thereby by connecting such train with the driving-wheels that grip the central rail, as described.

2. The connecting of the wheels that grip the center rail, and which act thereon as drivers, with a spring, substantially as described, whereby the required adhesion can be obtained when the locomotive is ascending or descending an inclined plane without a train of cars, or when by accident or other cause the resistance or gravity of the train cannot be employed for this purpose.

3. The forming of the connection between the gripping-wheels and the train by means of two opposite toggle-joint levers connected with the levers of the gripping-wheels, substantially as described, whereby the train is made to act on the gripping-wheels either in ascending or descending inclined planes, as described.

4. The connecting of the two gripping-wheels with the frame of the locomotive by means of levers, substantially as described, whereby the locomotive is left free to vibrate between the track-rails while the gripping-wheels are acting on the central rail, thereby relieving the central rail from being affected by the surging of the locomotive from side to side.

5. The combining of the gripping tongs with a railroad car or cars by means of the arms of its levers and by chains or jointed rods, substantially as described, whereby the pull of the cars on running down an inclined plane in the event of the breaking of the connection with the locomotive or of the cars with each other will act on the tongs and cause them to grip the rail, as described.

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Witnesses:
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