

(No Model.)

3 Sheets—Sheet 1.

C. HAGANS.
LOCOMOTIVE.

No. 501,616.

Patented July 18, 1893.

Fig. 1.

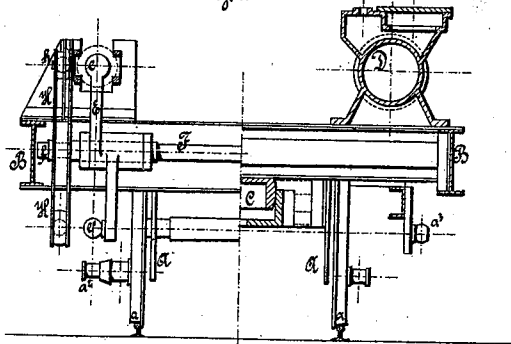


Fig. 2.

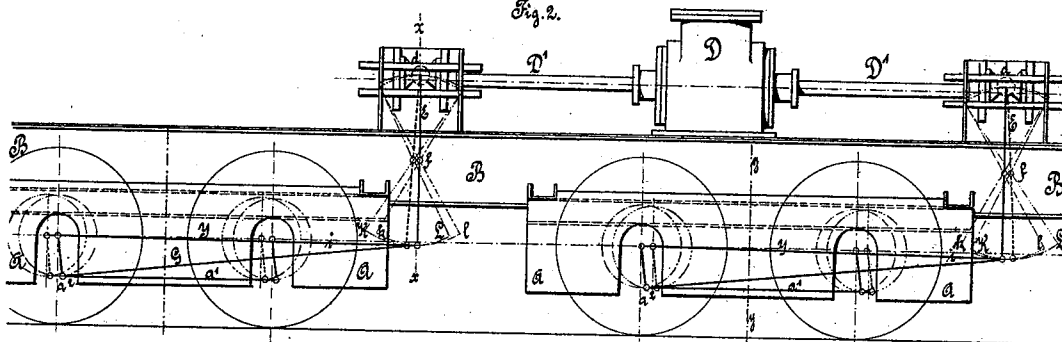


Fig. 3.

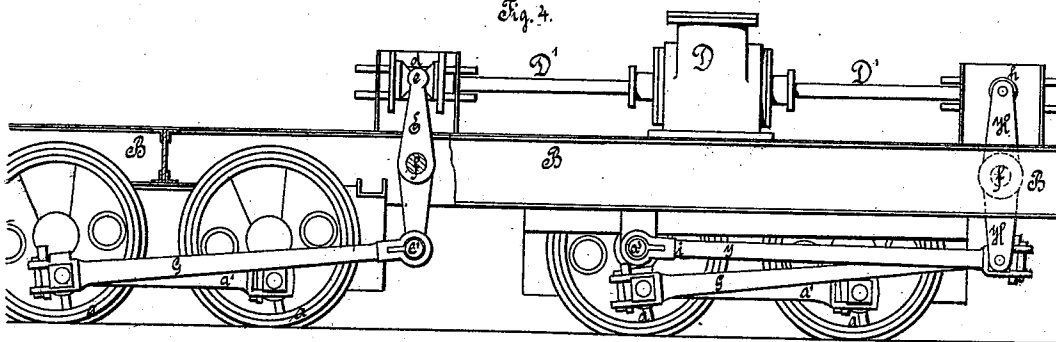
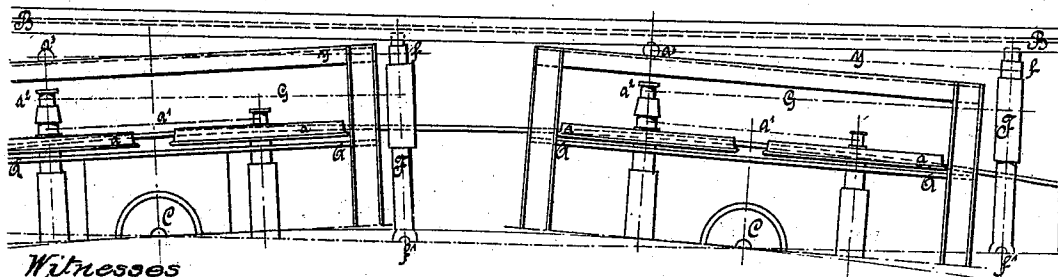


Fig. 5.



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Fig. 5.

Fig. 6.

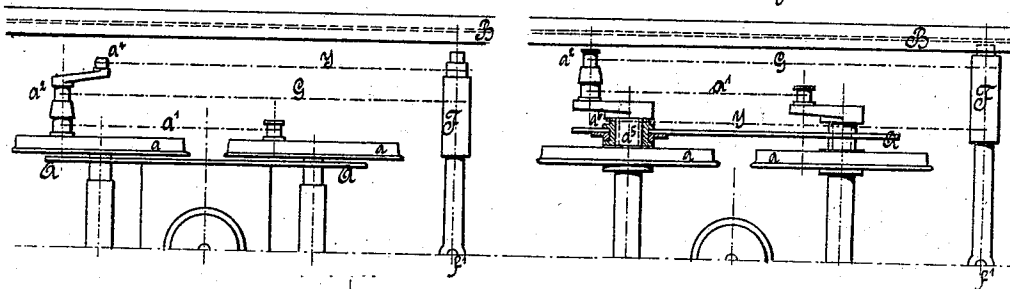


Fig. 7.

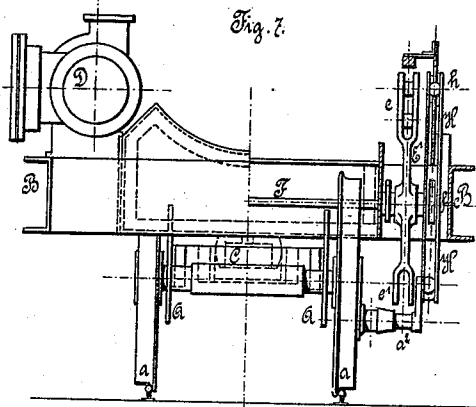


Fig. 8.

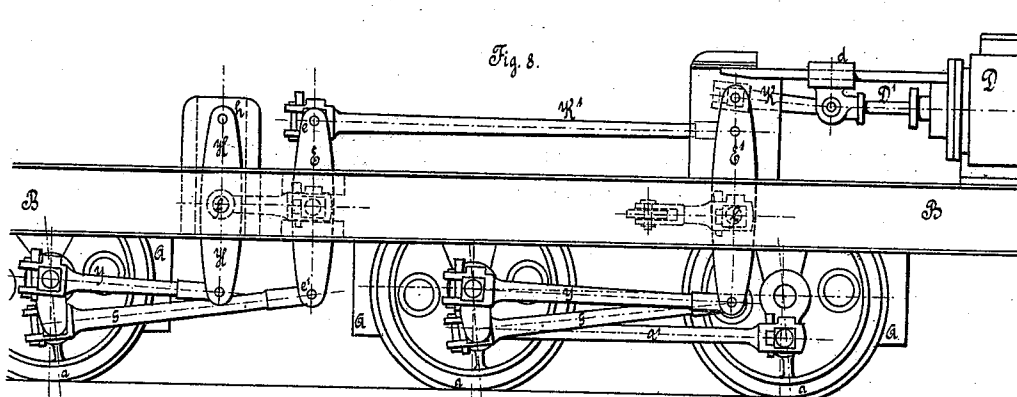
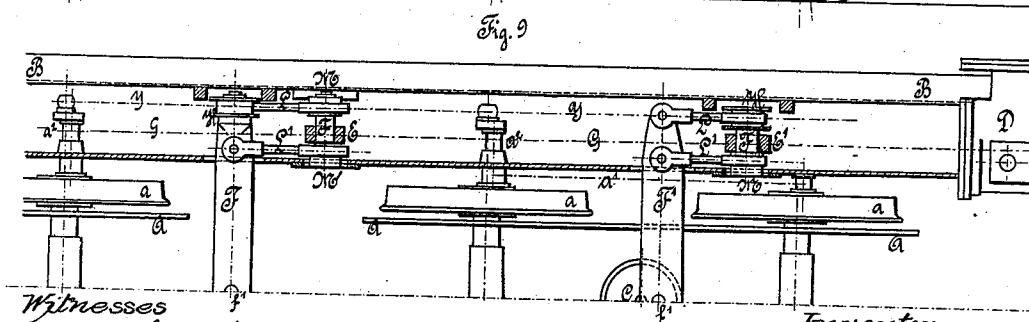


Fig. 9.



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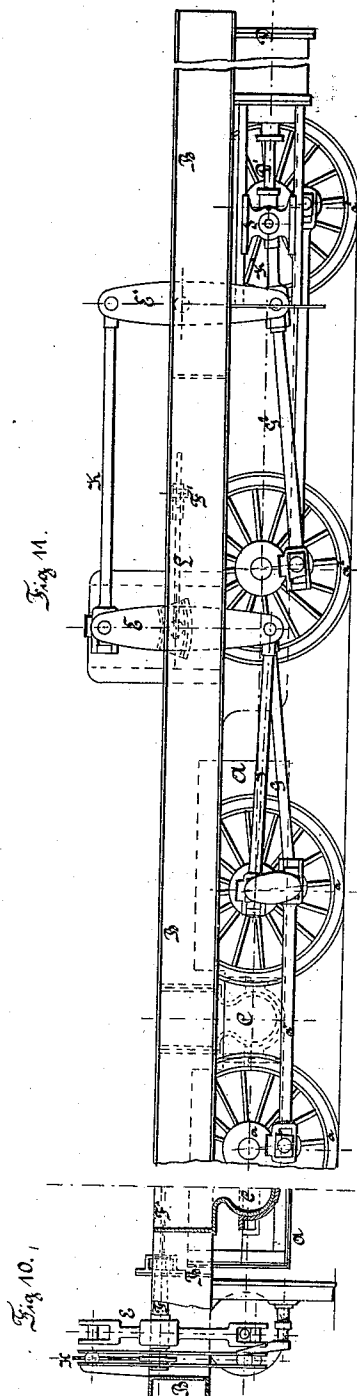
(No Model.)

3 Sheets—Sheet 3.

C. HAGANS.
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No. 501,616.

Patented July 18, 1893.



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UNITED STATES PATENT OFFICE.

CHRISTIAN HAGANS, OF ERFURT, GERMANY.

LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 501,616, dated July 18, 1893.

Application filed February 4, 1892. Serial No. 420,364. (No model.) Patented in Germany January 11, 1891, No. 58,845; in France January 15, 1891, No. 210,814; in Switzerland February 16, 1891, No. 3,257; in Austria-Hungary February 17, 1891, No. 9,263; in Belgium March 10, 1891, No. 94,072; in Italy March 31, 1891, No. 29,248, and in England April 3, 1891, No. 5,776.

To all whom it may concern:

Be it known that I, CHRISTIAN HAGANS, a subject of the German Emperor, residing at Erfurt, Germany, have invented certain new and useful Improvements in Locomotives, (for which I have obtained Letters Patent in England April 3, 1891, No. 5,776; in Germany January 11, 1891, No. 58,845; in France January 15, 1891, No. 210,814; in Switzerland February 16, 1891, No. 3,257; in Austria-Hungary February 17, 1891, No. 9,263; in Belgium March 10, 1891, No. 94,072, and in Italy March 31, 1891, No. 29,248;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the propelling mechanism of locomotives and its object is to so construct and connect the same with the driving wheels of the locomotive that it will be enabled to run on very sharp curves or curves having a small radius. This object I attain by and my invention accordingly consists in providing the locomotive with a compensating or reversing gear or gears interposed between the main frame and the swiveled truck or trucks on one or both sides of the locomotive, the said compensating gear being connected with a shifting part of the driving connections of the engine. And my invention more particularly consists in providing the locomotive with one or two bogie-frames or trucks swiveled to the main frame preferably having coupled wheels and connecting one or several of these wheels with the piston rod of the cylinder located on the main frame by a two-armed lever or levers, and a connecting rod or rods, the two-armed lever being preferably fulcrumed on a shifting fulcrum. This shifting fulcrum whose position is governed by the position which the truck or bogie-frame occupies relatively to the main-frame of the locomotive is preferably formed by pivoting a weigh-shaft or weigh-shafts to the bottom of the main-frame and connecting their ends or other suitable portions thereof with a link pivoted to and suspended from the main-frame, the said link being connected at its end with the truck or bogie-

frames by a controlling-rod which at its other end is connected to some part of the swiveled truck, in any suitable and convenient manner.

My invention moreover consists in such further features, details and combinations of parts as will be hereinafter set forth and covered in the claims.

In the drawings accompanying this specification, Figure 1 represents a vertical transverse section partly on line $x-x$ and partly on line $y-y$, Fig. 2, of so much of a locomotive-engine embodying my invention as is necessary to explain the same; Fig. 2 a side elevation, and Fig. 3, a bottom plan of the same, while Figs. 4, 5, 6, 7, 8, 9, 10, 11, and 12 represent detail-views of modified forms of construction.

Referring first to Figs. 1 to 3 it will be observed that the running gear of the locomotive there shown in illustration of my invention consists of two trucks or bogie-frames, A, each connected to the main-frame B of the locomotive by the usual swivel joint, C, the wheels, a on each truck being preferably coupled by links or coupling-rods, a' . The steam-cylinder, D, of any desired form and construction is mounted on the main frame and imparts motion to a piston rod, D', whose ends are guided in suitable guide-boxes, d , d .

The arrangements for imparting motion to the truck-wheels from each end of the piston rod are exact duplications of each other, one of which may be omitted in many cases. It will be necessary to describe the same only in connection with one of the trucks.

The end of the piston-rod, D', is connected in any suitable and convenient way with a two-armed lever, E, on each side of the engine, comprising the arms, e and e' and fulcrumed on a movable or shifting fulcrum-piece or weigh-lever, F', presently to be described. The two-armed lever, E, in turn is connected with the wrist or crank-pin, a^2 , on one of the truck-wheels by a pitman, G. The lever, E', piston-rod, D', and pitman, G, may be briefly termed the "driving gear." The fulcrum-piece consists preferably in a weigh-lever, F', pivoted at f' to the bottom of the main frame, B, (or if desired to separate weigh-levers so pivoted and whose ends extend to

opposite sides of the locomotive) and connected at each end with a depending link, H, pivoted to the main frame, B, at h , and preferably extending beyond the fulcrum or point of connection, f , with the weigh-lever, F' , and connected at its end with one end of a directing or controlling rod, I, whose other end is connected at i with some convenient portion of the truck, A, preferably in the manner shown, that is to say by attaching the same to the bracket, a^3 , fixed on the said truck-frame. Other ways of connecting the end of the controlling-rod, I, may readily be devised to suit various constructions of trucks and arrangement of the propelling and other parts. Thus, for example in Fig. 5, I have shown the end of the controlling-rod, I, attached to the wrist-pin of a counter-crank, a^4 , on the truck-wheel, a , whereby the end of the controlling-rod is always kept in a fixed position opposite the center of the truck-wheel.

Still another mode of connection is illustrated in Fig. 6, in which the guide-rod is connected directly to the axle bearing, a^5 , by being provided at its end with a sleeve, a^6 , encircling the same. It is obvious that this sleeve, a^6 , might directly encircle the axle of the truck-wheel. This arrangement is peculiarly adapted to cases where the links, H, for reasons of construction are arranged inside of the two-armed lever, E, as shown. I preferably arrange this system of levers and links for shifting the fulcrum of lever, E, which I will briefly term the "compensating-gear" on both sides of the locomotive and one pair of compensating-gears for each truck, though in many cases one compensating-gear may be sufficient.

Figs. 7, 8, and 9 represent another method of carrying my invention into effect. In this modification the cylinder, D, is mounted at one end of the main frame, B, of the locomotive. This cylinder by means of piston-rod, D' , and pitman K, directly actuates the lever, E' , located near the cylinder, D, while the remote lever, E, is connected with the same by the coupling-rod, K' . The other parts of the driving-mechanism are the same as already described above. For constructive reasons I however, employ two kinds of compensating-mechanism, differing from that heretofore described.

The compensating-mechanism nearest to the cylinder consists in shiftably fulcruming the lever E, upon the short shaft, F, which at one end is held by the hanger or depending link H, above described, which is adjusted relatively to the truck, in the known manner by the controlling rod I. A draw-rod, L, is also arranged upon the journal of the shaft, F, which serves as a point of attachment for the hanger, H, the said draw-rod, connecting the weigh-lever or fulcrum-plate F' with F. The weigh-lever, F' , is fulcrumed at f' , to the bottom of the main frame, and serves to transmit the motion of the outer end of F, caused

by the hanger H, to the inner end of F, by virtue of its connections with, F' , by the draw-rod, L, and is journaled in a slide-box, M, adapted to slide horizontally in the truck-frame. The compensating-mechanism arranged remotely from the cylinder also consists in a shiftable fulcrum of the lever E, upon a short shaft, F, which in this case is journaled at each end in a sliding journal-box M, M' , horizontally guided in the main frame and is connected at both ends by the two draw-rods, L, L' , with the weigh-lever, F' , fulcrumed in the bottom of the main frame. The outer end of F, is carried in the known manner by the hanger H, and the matrix is transmitted to the short shaft, F, and the lever E, by the draw-rods, L, L' . It is to be observed also that the cylinders may also be mounted laterally or below the main frame, as illustrated in Figs. 10, 11, and 12. Here A, is the double truck-frame connected with the main-frame B, B, by the ball-pivot, C. The wheels, a , are connected by coupling-rod, a' . The pitman, G, of the lever, E, and the coupling-rod, K, constitute the parts of the driving mechanism, already referred to.

The compensating gear is formed of the controlling rod, I, the hanger, H, carrying the short shaft, F, the same being connected with the weight-lever, F' , by the draw-rods, L, L' , so that the same may turn on the fulcrum, f' , on the main frame in the known manner.

The coupling-rod, K, of the driving-gear is actuated as follows: K is connected with the upper end of a lever, E' , mounted on a short shaft F^2 , journaled in fixed bearings. At the lower end E' , is connected with a short coupling-rod K' , which by connection with cross-head, d , of the piston-rod, D' , transmits one-half of the piston-pressure in cylinder, D, to the lever E' . The other half of the piston-pressure is transmitted to two coupled axles, a^7 , a^8 , by the lower end of lever, E' , through the pitman, G^2 . The latter two axles are journaled in fixed bearings in the main-frame.

My invention for the actuation of truck-frames, or guide-axles, &c., on locomotives is here arranged in connection with axles journaled in fixed bearings in the main-frame. The fixed axle or axles may be arranged either in front or in the rear of the locomotive. The same is true of the operation of my compensating gear which is as follows:—When the locomotive is running on a straight track the parts occupy a middle position and the levers, E, swing from the point K to L, as indicated by dotted lines. When, however, the engine rides over a curve, the truck, A, will turn with respect to the main-frame in one or the other direction and the controlling-rod, I, will push or draw the link, H, and with it the end of the fulcrum or weigh-lever to one side or the other of the intermediate position, as indicated at f^2 . The lever, E, which is now fulcrumed at f^2 , will now swing from k to l , as indicated by dash-lines, instead of from K to L. The con-

necting-point for the pitman with the lever, E, is thus shifted sufficiently to compensate for the changed position of the trucks, A, relatively to the main-frame, B. In all cases
 5 the amount of movement will be exactly sufficient to adapt the propelling parts to automatically adjust themselves to the changed relative position of these parts.

The rear truck as well as the front-truck
 10 may be provided with two cylinders, as indicated in Fig. 4, or only two cylinders for the two trucks may be provided, or there may be two cylinders on one side and one cylinder on the other side. In the last two cases one compensating or reversing gear, only, is necessary.
 15

The two-armed lever may have arms of equal or unequal lengths.

It is to be borne in mind that the essence
 20 of my invention consists in connecting the driving wheels of a locomotive, journaled on swiveled trucks, with the cylinder located on the fixed main-frame of the locomotive by connecting rods, or, levers connected to fixed
 25 journals or wrist-pins on the driving wheels and on the cylinder-piston the said connecting rods or levers being connected with each other by an interposed shifting compensating-gear, preferably consisting, as shown, of a lever
 30 fulcrumed on a shifting fulcrum. This construction enables me to connect the pitman with the wrist-pin on the driving wheels and the two-armed lever with the piston rod in the ordinary manner without allowing for
 35 any lateral play, which would involve complicated connecting devices at these points and seriously interfere with the direct transmission of power from the cylinder piston to the driving wheels.

It is manifest that the propelling device described in illustration of my invention may be greatly modified without departing from the essence of my invention. Thus I have shown various forms of modifications that
 40 may be carried out in Figs. 4, 5 and 6. Besides this, the driving gear, as well as "the compensating-gear" may be extensively modified

and many other things not especially referred to may be carried out. I do not therefore desire to be limited to the exact details of construction shown and described by me, but
 50

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

1. In locomotives the combination of the main-frame carrying the cylinder or cylinders, 55 with a swiveled truck or trucks, driving connections between the cylinder or cylinders and the truck wheels, and shifting compensating gear interposed between the main-frame and the trucks, substantially as set forth.
 60

2. In locomotives the combination with a truck of a lever, having equal or unequal arms pivoted on a shifting fulcrum and connected with the piston and a truck wheel at
 65 its respective arms, substantially as set forth.

3. In locomotives the combination with a swiveled truck of a two-armed lever pivoted on a shifting fulcrum, a cylinder-piston and a pitman, the two-armed lever being connected
 70 with the cylinder-piston and the pitman at its opposite arms and the pitman being connected to one of the truck-wheels, substantially as set forth.

4. In locomotives a swiveled truck and a 75 main-frame provided with a cylinder and piston of a weigh-lever pivoted to the main-frame, a two-armed lever, pivoted on the weigh-lever, a link pivoted to the main-frame and engaging the ends of the weigh-lever and a
 80 controlling lever between and connecting the truck and the link, substantially as set forth.

5. In locomotives with swiveled trucks, the levers, E, interposed between the cylinders and the driving axles, in combination with
 85 the weigh-lever, F', connected to the swiveled truck by the controlling rods, I, and the depending links, H, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

CHRISTIAN HAGANS.

Witnesses:

CARL BORNGRAEBER,
 GEORG POPPE.