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G. FRETEL.

LOCOMOTIVE.

No. 301,978. Patented July 15, 1884.

Fig. 1

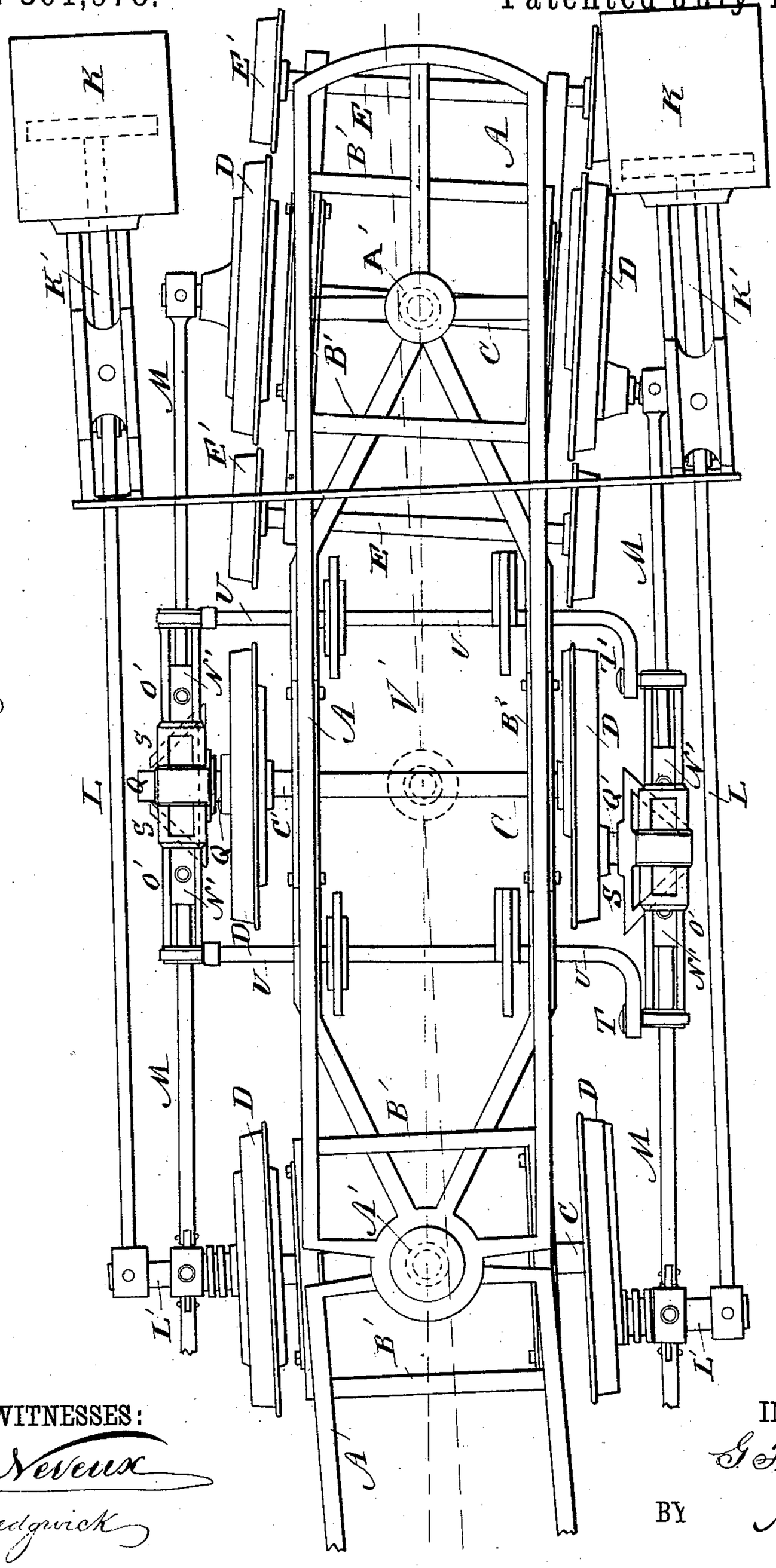

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Fig. 2

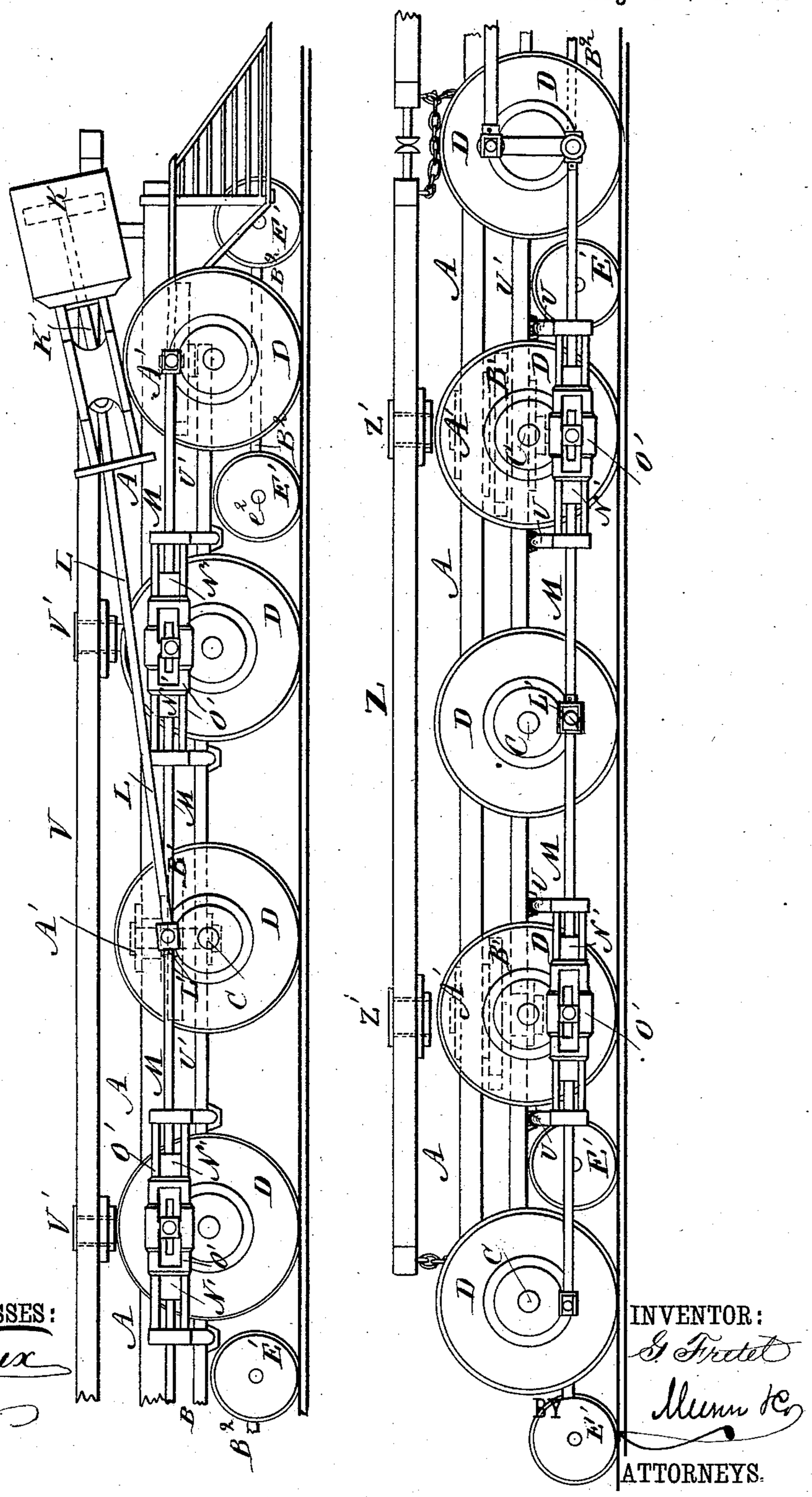

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Fig. 3

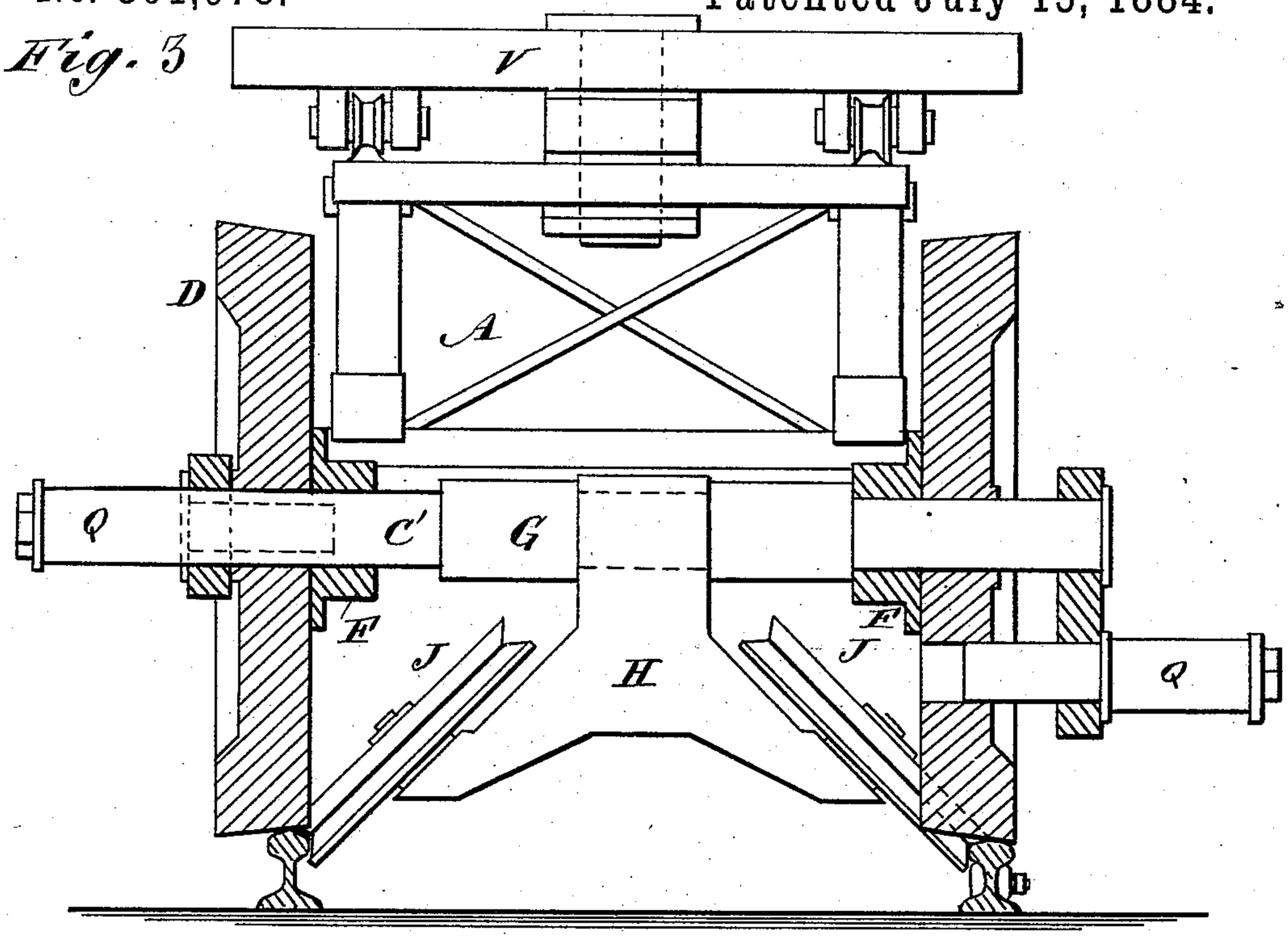

Fig. 4

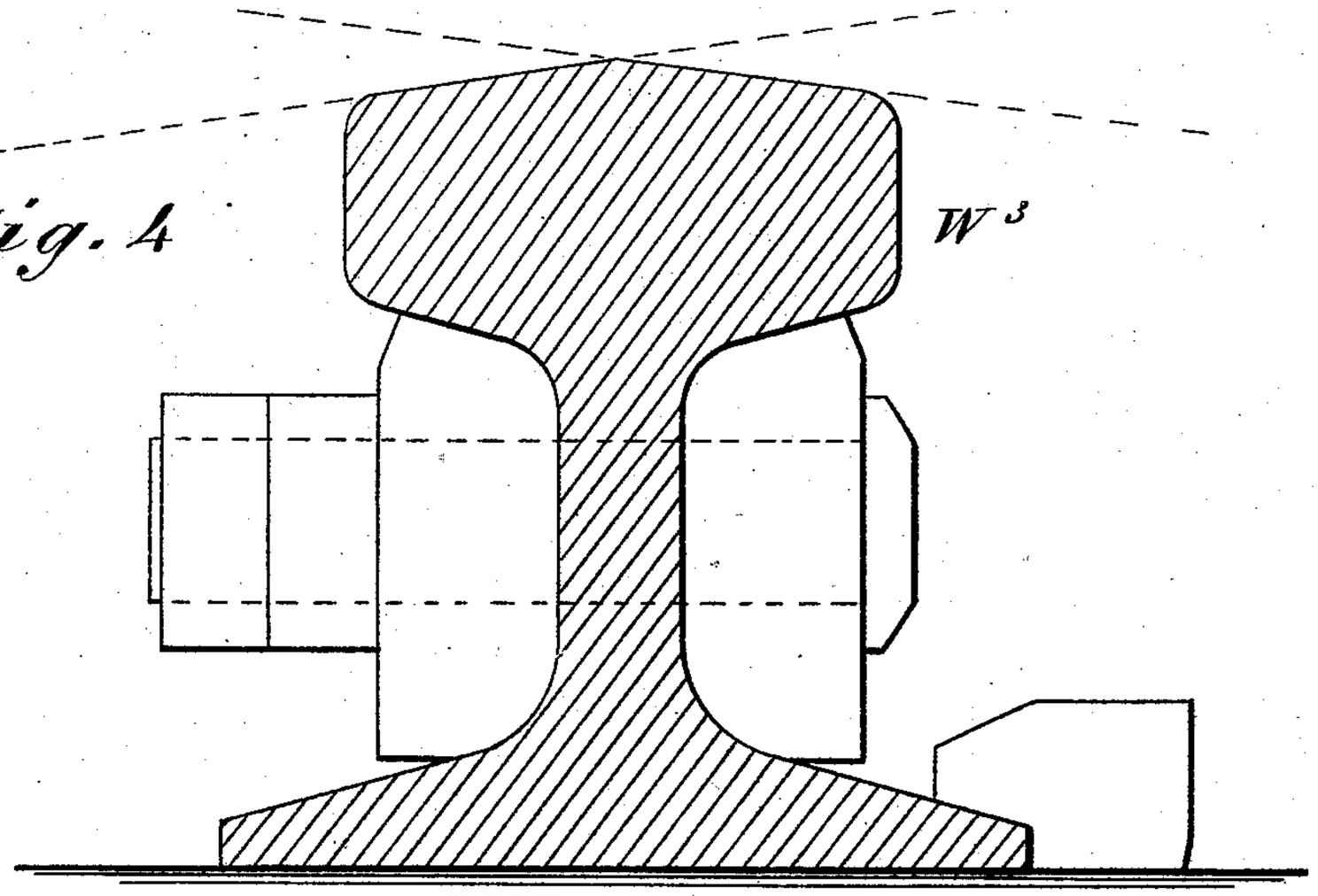

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Fig. 5

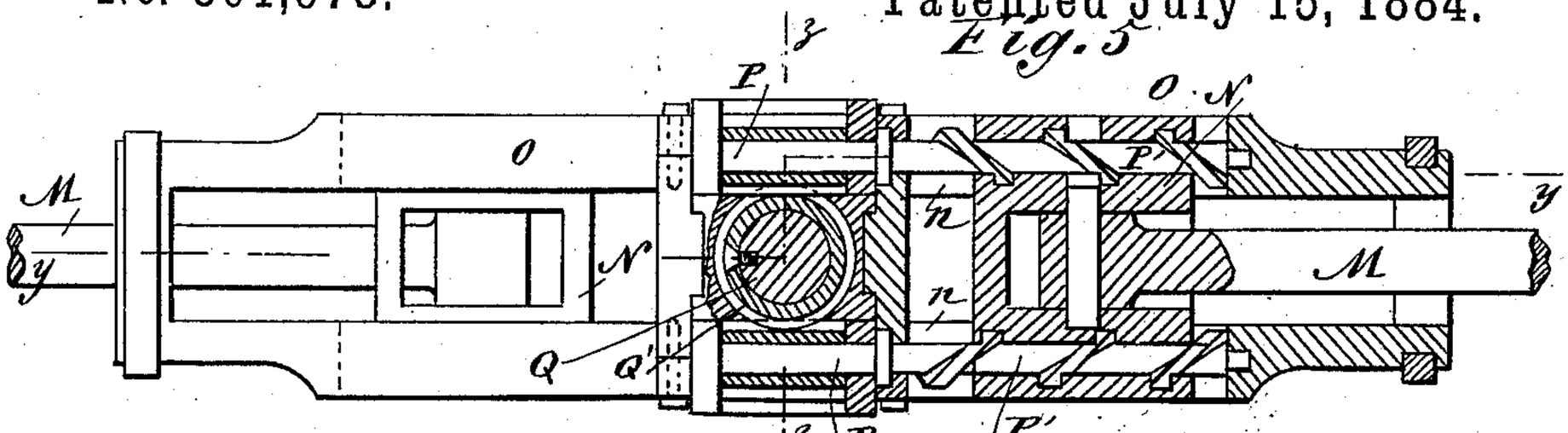

Fig. 6

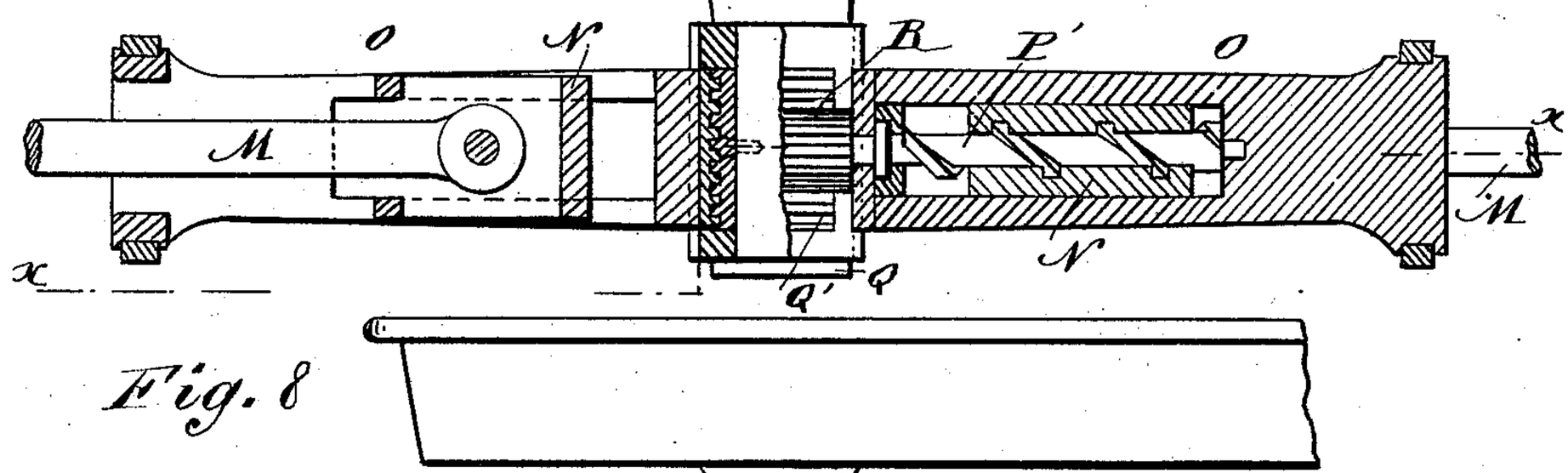

Fig. 8

Fig. 9

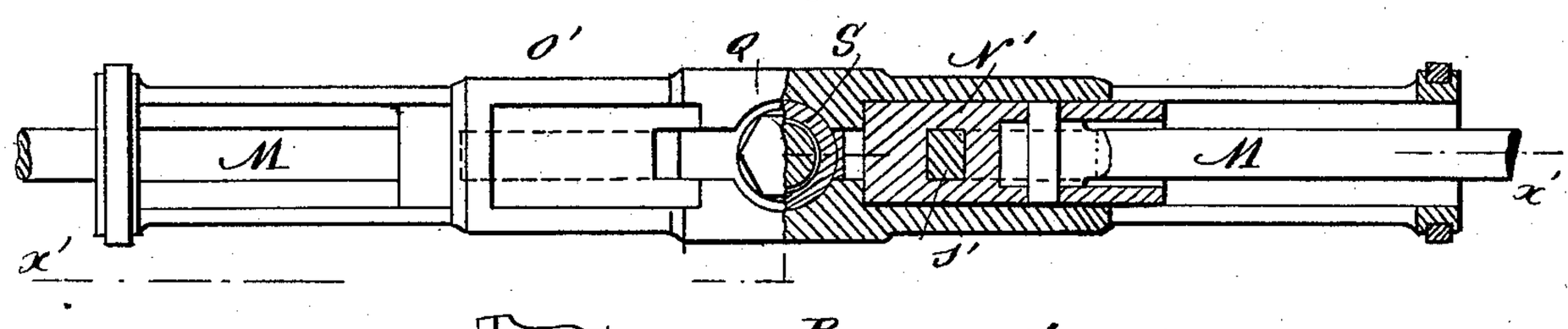

Fig. 7

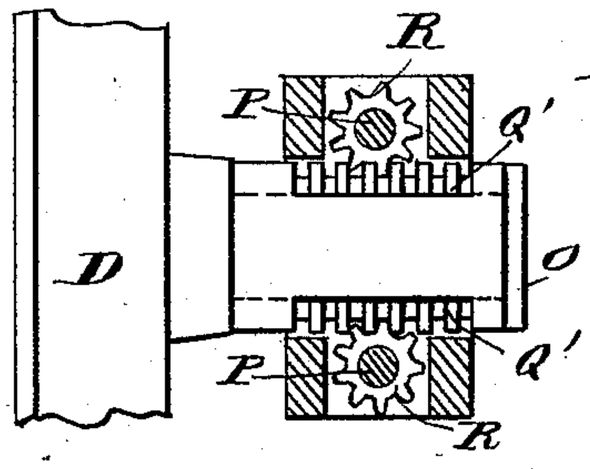

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Fig. 10

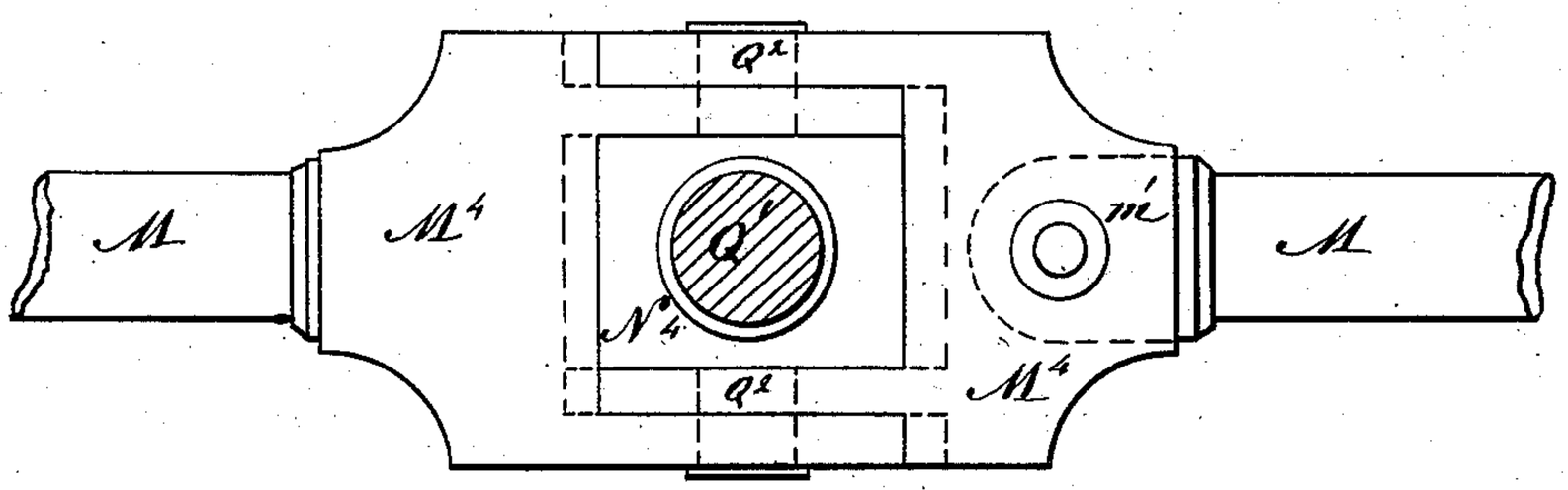


Fig. 11

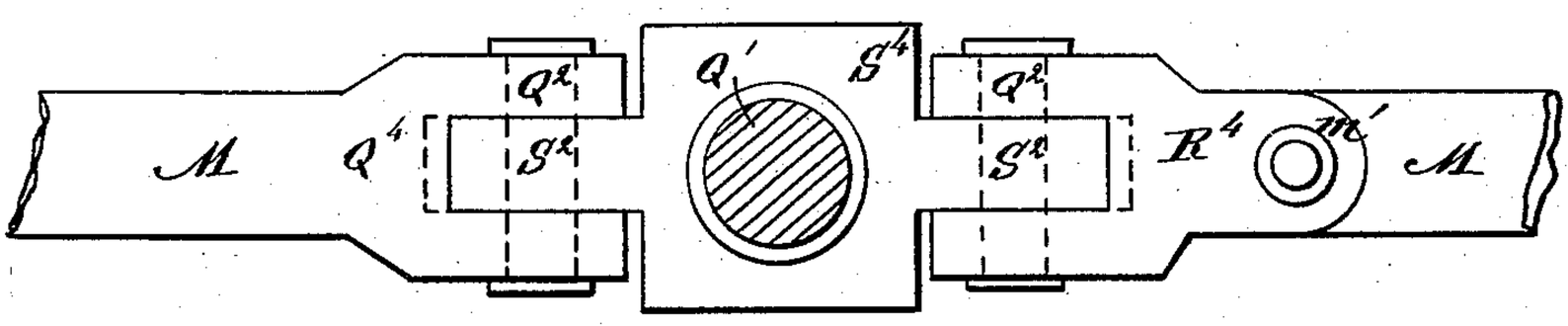
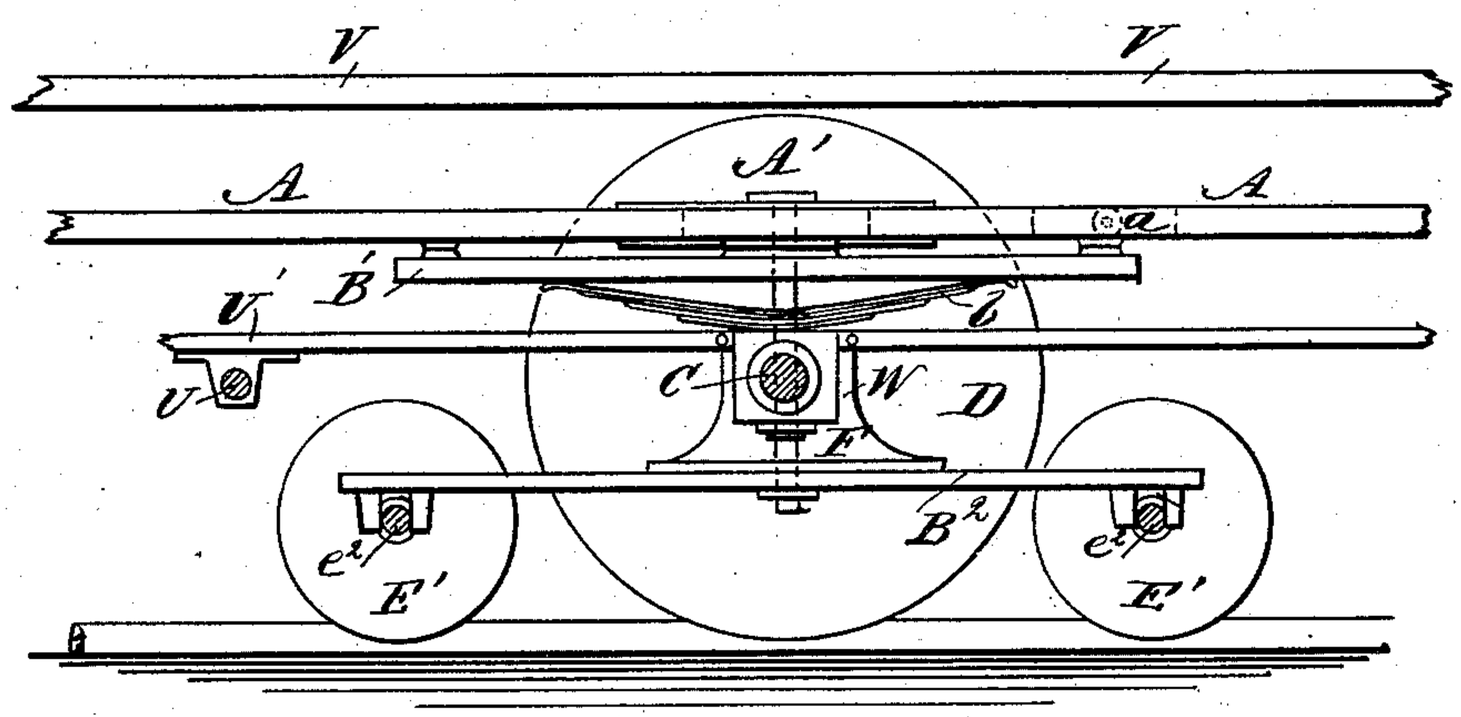


Fig. 12



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UNITED STATES PATENT OFFICE.

GABRIEL FRETEL, OF RIO JANEIRO, BRAZIL.

LOCOMOTIVE.

SPECIFICATION forming part of Letters Patent No. 301,978, dated July 15, 1884.

Application filed February 15, 1884. (No model.)

To all whom it may concern:

Be it known that I, GABRIEL FRETEL, of Rio Janeiro, Brazil, have invented a new and Improved Locomotive, of which the following is a full, clear, and exact description.

Many railroads, especially those in mountainous countries, have numerous curves, and for that reason it is often impossible to use large and heavy locomotives, as the curves are so short that a large locomotive not provided with a joint cannot pass over the said curves, and the rails and rolling-stock are ruined very rapidly and the danger of derailment is very great; but on mountainous railroads very heavy and very large locomotives are a necessity, as the trains to be transported are very heavy and the grades are very steep.

The object of my invention is to provide a new and improved locomotive, which is specially adapted for mountain-railroads and roads having curves of a very small radius, which locomotive is so constructed that neither the rolling-stock nor the rails are injured nor subjected to undue wear, and the danger of the derailment of the train is practically removed and great traction will be obtained.

The invention consists in a locomotive provided with bars for connecting the driving-wheels, which bars are constructed with devices for automatically lengthening or shortening the same when the locomotive runs on curves, thus permitting of coupling a considerable number of driving-wheels, whereby the traction will be materially increased.

The invention further consists in boxes mounted on the crank-pins of the middle wheels—that is, the wheels between the front and the rear wheels—of each frame, which boxes are adapted to slide on the crank-pins in the direction of the length of the pins, the said pins being provided with devices for automatically moving the said boxes in the manner stated, whereby the connecting-bars will be lengthened or shortened automatically, as may be necessary.

The invention also consists in certain parts and details, and various combinations of the same, as will be fully described and set forth hereinafter.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a plan view of the locomotive-supporting frame and the truck-frames. Fig. 2 is a side view of the frame-trucks and wheels of a locomotive and tender. Fig. 3 is an enlarged cross-sectional elevation of part of the locomotive-frame, showing a modified construction of my improvement. Fig. 4 is an enlarged detail cross-sectional view of the rail. Fig. 5 is a longitudinal elevation of the movable joint of the two coupling-rods, parts being shown in section on the line *x x*, Fig. 6. Fig. 6 is a sectional plan view of the same on the line *y y*, Fig. 5. Fig. 7 is a cross-sectional elevation on the line *z z*, Fig. 5. Fig. 8 is a plan view of a modification of this joint, parts being shown in section on the line *x′ x′*, Fig. 9. Fig. 9 is a longitudinal view of the same, parts being shown in section on the line *y′ y′*, Fig. 8. Fig. 10 is a side view of the joint for connecting the coupling or connecting rods with the driving-wheels. Fig. 11 is a side view of a modification of the same. Fig. 12 is a side view of the truck used in my improved locomotive.

In the drawings, V and Z are the frames or platforms of the locomotive and the tender, respectively, which are supplied with the pivots V′ V′ Z′ Z′ for supporting them on four frames, A, in the middle of which the pivots are arranged. The frames A are supported by pivots A′ on trucks B^3, formed of the platform B′, supported by springs *b* from axle-boxes W, mounted on the axle C, on the ends of which axle the wheels D are mounted. On the box W a frame, U′, is held, in which a transverse bent shaft, U, is mounted, for a purpose that will be described hereinafter. On the bottom of the box W a frame, B^2, is held, in the ends of which shafts e^2 are journaled, on the ends of which small guide-wheels E′ are rigidly mounted. The load is so arranged that it rests on the axle C entirely, and not on the wheels E′, which simply serve as guides. The axle C, under each pivot V′ or Z′, is provided with the fixed wheels D at the ends, and is so arranged that it can slide in its bearings laterally—that is, toward either side of the car. The cylinders K are suitably supported on the front of the platform V, and their piston-rods K′ are connected by connecting-rods L

with crank-pins L′ on those wheels D mounted on the axles C between the wheels under the pivots V′ and Z′, so that the motion is transmitted direct from the piston-rods to the said wheels by rigid connecting-rods. The motion is then transmitted from the above-mentioned wheels D to the other wheels by extensible connecting-rods—that is, connecting-rods which can be lengthened and shortened, according to the curvature of the road. The automatic lengthening and shortening of the connecting-rods can be accomplished in different ways, of which one is shown in Figs. 5, 6, and 7, and the other in Figs. 8 and 9, the construction shown in Figs. 8 and 9 being also shown in Figs. 1 and 2. The connecting-rods M, Figs. 5, 6, and 7, are pivoted to swing laterally—that is, they are pivoted by means of vertical pins in boxes N, held to slide longitudinally in frames O, into the ends of which frames the ends of the rods M project, the said boxes running in guide-grooves *m* in the frames O, as shown in Fig. 5. In the middle of the frame O two spindles P are arranged at the top and bottom of the frame, so that the spindles pass through the boxes N at the top and bottom. Each end of the spindles is screw-threaded, as shown at P′, or, in other words, the spindles P are each provided with a screw-thread, P′, at each side of the middle of the frame O. The spindles P are so arranged that they can revolve on their longitudinal axis, but cannot move longitudinally or laterally. The crank-pin Q of the corresponding wheel D is journaled in the middle of the frame O, and the said crank-pin is provided with a rack, Q′, at the top and at the bottom, which racks engage with barrel-pinions R, mounted rigidly on the central parts of the spindles P—that is, on the parts above and below the crank-pin. The operation of these devices will be described hereinafter.

In the construction shown in Figs. 1, 2, 8, and 9 a sleeve, S, is mounted on the crank-pin Q of the wheel D in such a manner that the crank-pin can revolve within the said sleeve, on which sleeve triangular frames S′ are formed on diametrically-opposite sides, which frames are to be held in a horizontal position. The frames are each constructed with a shank, *s*, projecting from the inner end of the sleeve parallel with the side of the wheel, and from the free end of the shank *s* a shank, *s′*, is inclined toward the outer end of the sleeve S, which inclined shank or arm *s′* passes through a diagonal slot in the sliding block N′, held to slide longitudinally in a frame or box, O′, mounted loosely on the sleeve S, and adapted to slide on the said sleeve in the direction of the length of the sleeve. The box or frame O′ is provided with slots N^2, through which the shanks *s′* of the frame S′ pass. The connecting-bars M are pivoted to the sliding blocks N′ in such a manner that they can swing in the horizontal plane. The boxes O′ are pivoted at their outer ends by means of ball-and-socket joints T to the bent ends of the shafts U, journaled in the frame U′.

In Figs. 10 and 11 I have shown the manner of coupling the connecting-rods to those wheels located between the wheels under the joints. The rods M are secured to forks M^4, which overlap each other in the manner shown, and surround a box, N^4, mounted on the crank-pin Q′, from which box pivots Q^2 pass through the prongs of the forks. The rods M can be secured to the forks by means of pins *m′*, to permit the connecting-rods to swing vertically.

In the construction shown in Fig. 11, the box S^4 is mounted on the crank-pin Q′, and is provided at opposite ends with projections S^2, on which forks Q^4 are pivoted to swing laterally by pins Q^2. The connecting-rods M are either secured to the forks Q^4 or are pivoted to the same by pins *m′*.

In the modification shown in Fig. 3 the axle C′, on which the wheels are rigidly mounted, is held to slide in a sleeve, G, in a truck, H, provided with inclined wheels J, running on the inner bevel of the rails. The frame A rests on suitable journal-boxes on the axle C′, and the frame slides laterally with the wheels, the sleeve G always running centrally between the two tracks. Those wheels of the locomotive that are to slide laterally on the rails at curves, &c., must be devoid of flanges, as they sometimes project from the inner or outer surfaces of the rails, as circumstances may require. Preferably the first truck of the locomotive only is provided with the wheels E′; but, if desired, the intermediate and last wheels can also be combined with wheels E′.

The operation is as follows: If the locomotive runs on a curve, the wheels will be about in the position shown in Fig. 1, the wheels of each platform V or Z remaining on the track in the usual manner, but the middle axle slides outward toward that rail having the longer radius—that is, the wheel resting on the rail having the longer radius is a greater distance from the side of the platform than the wheel on the rail having the short radius. Referring to Fig. 1, and assuming that a person looks at the locomotive from the front, the axle C, or middle axle, is moved to the right in relation to the platform, and naturally the right-hand connecting-bar M extending from the front to the rear wheels will have to be lengthened, and the left-hand connecting-bar will have to be shortened. If the connecting-bars M were made rigid, such movement as above described of the middle axle could not take place. As the axle C′ moves to the right in relation to the platform, the sleeves S mounted on the crank-pins of the wheels will move in the same direction, and will move the frames S′ with them. In the right-hand wheel the inclined arms *s′* of the frames S′ press against the sides of the slots in the sliding boxes N and move them toward the ends of the frame O, the said

frames turning on the ball-and-socket joints T, whereby the right-hand connecting-bars M will be lengthened. At the left-hand end of the axle the wheel will also be moved toward the right, and the inclined arms *s'* of the frame S', acting on the opposite sides of the grooves, will draw the sliding blocks N' toward the middle of the frame O, and will draw the connecting-bars M inward, whereby the connecting-bars will be shortened. In this manner the connecting-bars M are lengthened or shortened, as circumstances may require. It will be observed that the box or frame O' containing the sliding blocks to which the sections of the connecting-bars are pivoted are held on the crank-pins of those wheels which are capable of lateral movement in relation to the platform.

Referring to the construction shown in Figs. 5, 6, and 7, the operation is somewhat different, although the same result is accomplished. The crank-pin Q is moved outward at the right-hand side, and the rack Q' on the crank-pin revolves the pinions R, and thereby turns the screw-threaded parts P' of the spindles P in such a manner that the sliding blocks N' are moved toward the ends of the boxes O, whereby the connecting-bars will be lengthened. At the left-hand side the crank-pin is moved inward, and the screw-spindles are turned in the reverse direction, and the screw-spindles will be turned in such a manner as to draw the sliding blocks N' inward, whereby the connecting-bars will be shortened. The rail W^3 has the top of its head beveled toward both sides from the middle, as shown in Fig. 4, so that the rims of the wheels can rest on the outer bevel, and the rims of the peripherically-grooved wheels J can rest on the inner bevel, and on the inner side of the head. However, I do not limit myself to the use of these rails, as any other rails may be used.

As has been shown, the middle wheels of each platform V or Z can move laterally in relation to the platform, and thus much shorter curves can be made than with a locomotive on which the middle wheels are not capable of such lateral movement. The end wheels need not be capable of such lateral movement. The locomotive can be built with a single platform, or with two or more platforms pivoted to each other, and the platforms may be made of greater or less length, according to the curves in the road. The above-described devices for adjusting the connecting-bars do not in any way interfere with the direct transmission of the motion to the crank-pins and to the other wheels.

A very great advantage is obtained by coupling a great number of driving-wheels, as the traction is increased materially, and that is of importance in locomotives for mountain-railways, as the traction must be as great as can possibly be obtained. A number of driving-wheels could not be coupled by means of the ordinary rigid connecting-bars, but only by means of automatically-adjustable connecting-bars.

I am aware that locomotives have been built in which a considerable number of traction-wheels were coupled; but in all such cases the connecting-bars coupling the driving-wheels were made rigid, and short curves had to be avoided, which often caused the expenditure of large sums of money for viaducts, bridges, &c.

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

1. A locomotive provided with a driving-wheel connecting-bar consisting of two sections united, so as to be automatically adjustable at the connected ends, substantially as herein shown and described, and for the purpose set forth.

2. A locomotive having driving-wheel connecting-bars formed with two sections each, the inner ends of which sections are held in sliding blocks on frames or boxes mounted on the crank-pins of the wheels between the two wheels, on which the outer ends of the connecting-bars are pivoted, substantially as herein shown and described, and for the purpose set forth.

3. A locomotive having a connecting-bar constructed with two sections, the inner ends of which are pivoted to sliding blocks mounted on a frame held on the crank-pin of the wheel between the end wheels, to which the outer ends of the connecting-bar sections are pivoted, which crank-pins on the middle wheels have devices for moving the sliding blocks longitudinally in the boxes, substantially as herein shown and described, and for the purpose set forth.

4. The combination, with the end and middle driving-wheels of a locomotive, of connecting-bar sections pivoted to crank-pins on the end wheels, and to blocks sliding in boxes mounted on the crank-pins of the middle wheels, which crank-pins are provided with devices for moving the boxes in the direction of the length of the crank-pins, the outer ends of the said boxes being held by universal joints to the ends of crank-shafts, substantially as herein shown and described, and for the purpose set forth.

5. In a locomotive, the combination, with the pistons and piston-rods and three driving-wheels on each side of the locomotive, or one section of the frame thereof, of connecting-bars connecting the piston-rods with the rear set of driving-wheels, and connecting-bars connecting the rear set of driving-wheels with the middle and front sets of driving-wheels, the front connecting-bars being formed with two sections pivoted to the front and rear set of driving-wheels, and to blocks held to slide in boxes mounted on the crank-pins of the middle driving-wheels, which crank-pins are provided with devices for moving the said boxes in the direction of the length of the crank-pins, substantially as herein shown and described, and for the purpose set forth.

6. The combination, with a locomotive driving-wheel, of a crank-pin provided with racks,

a box mounted loosely on the crank-pin, and screw-spindles journaled in the box and provided with pinions engaging with the racks of the crank-pin, which screw-spindles pass through sliding blocks to which the driving-wheel connecting-bar sections are pivoted, substantially as herein shown and described, and for the purpose set forth.

7. The combination, with the crank-pin of a locomotive driving-wheel, of a box on the crank-pin, and of connecting-rods having forked ends pivoted to the box in such a manner that the connecting-rods can turn laterally on the pivots on the box, substantially as herein shown and described, and for the purpose set forth.

GABRIEL FRETEL.

Witnesses:

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JOSE CASTRO Y GARCIA.