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R. KLIEN & R. LINDNER.

LOCOMOTIVE ENGINE.

No. 511,531. Patented Dec. 26, 1893.

Fig. 1.

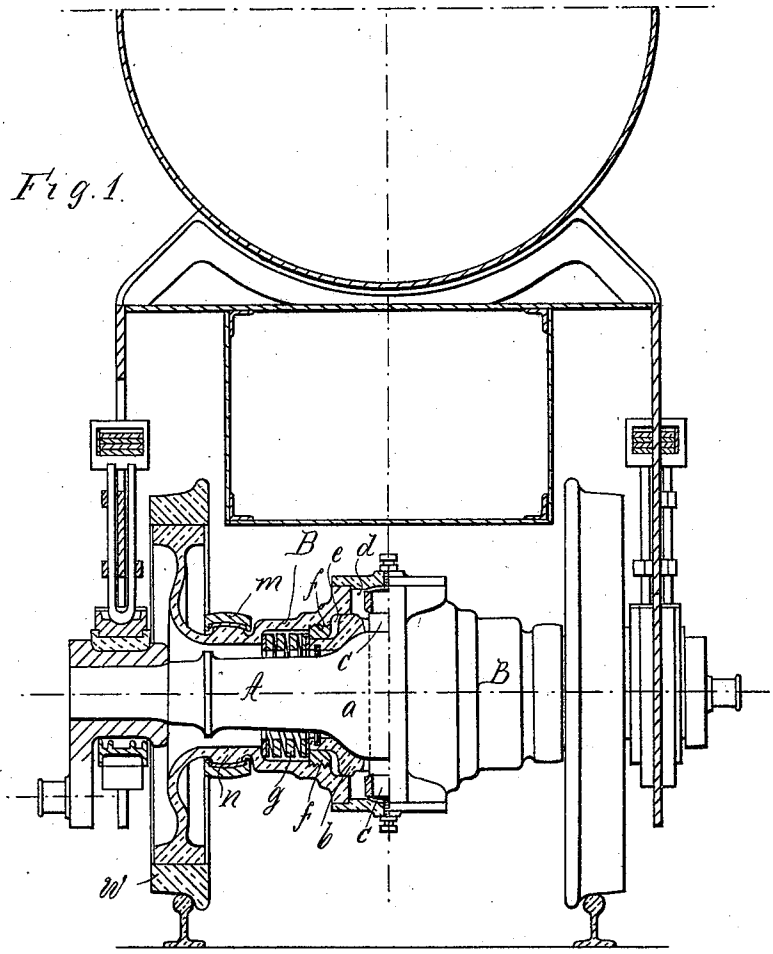
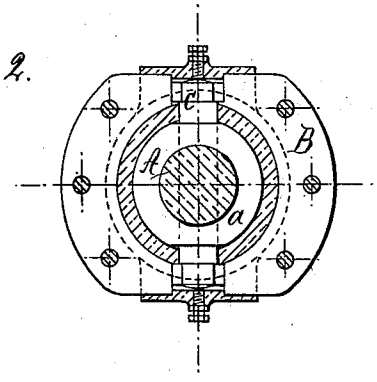


Fig. 2.



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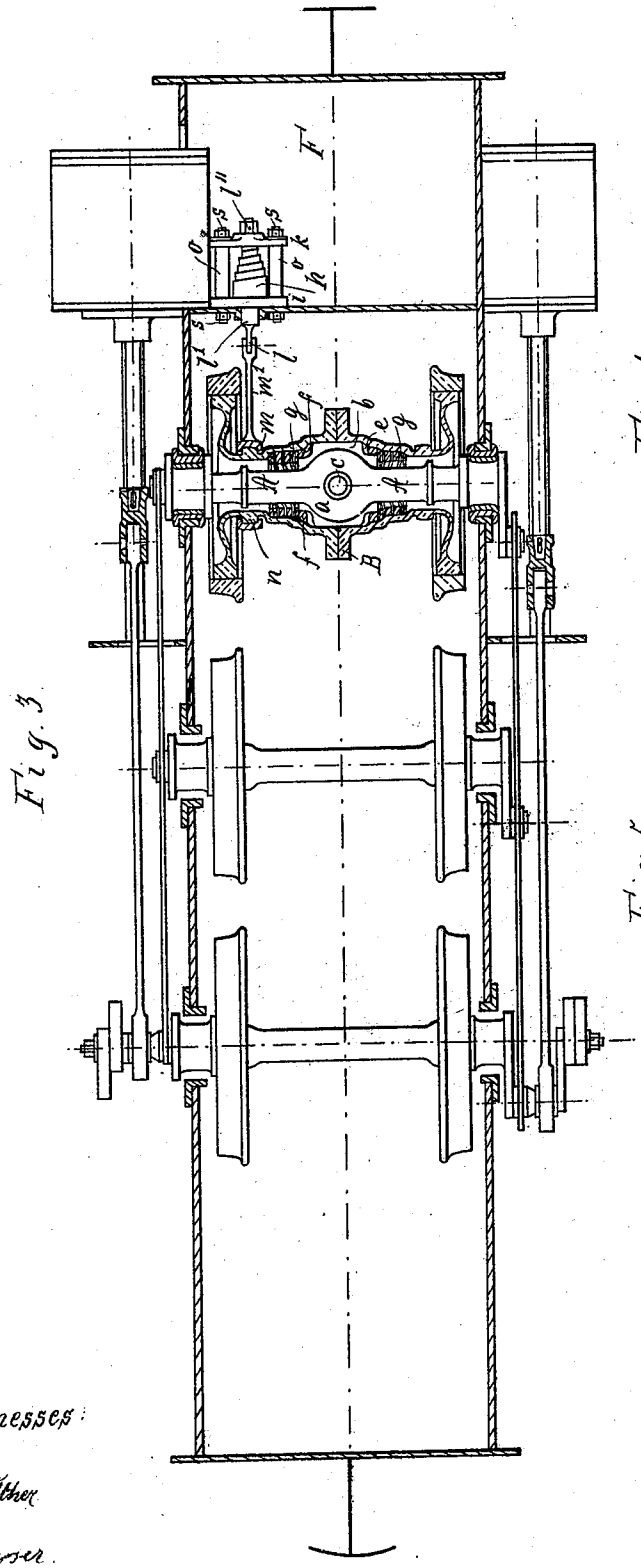

Fig. 3

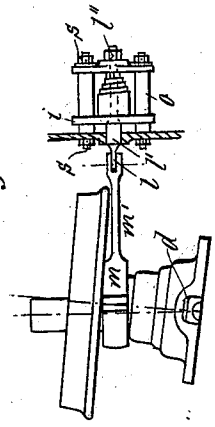

Fig. 4

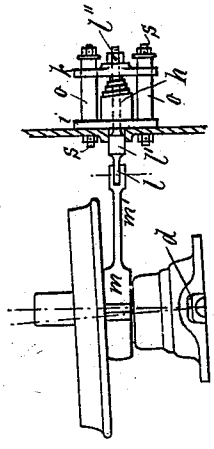

Fig. 5

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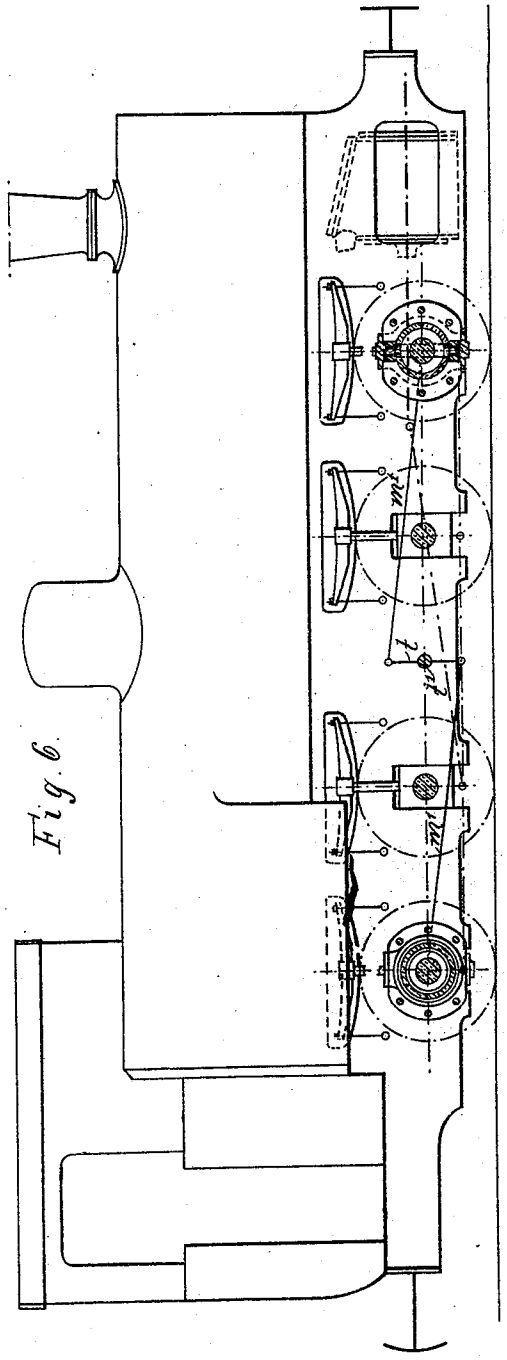

Fig. 6.

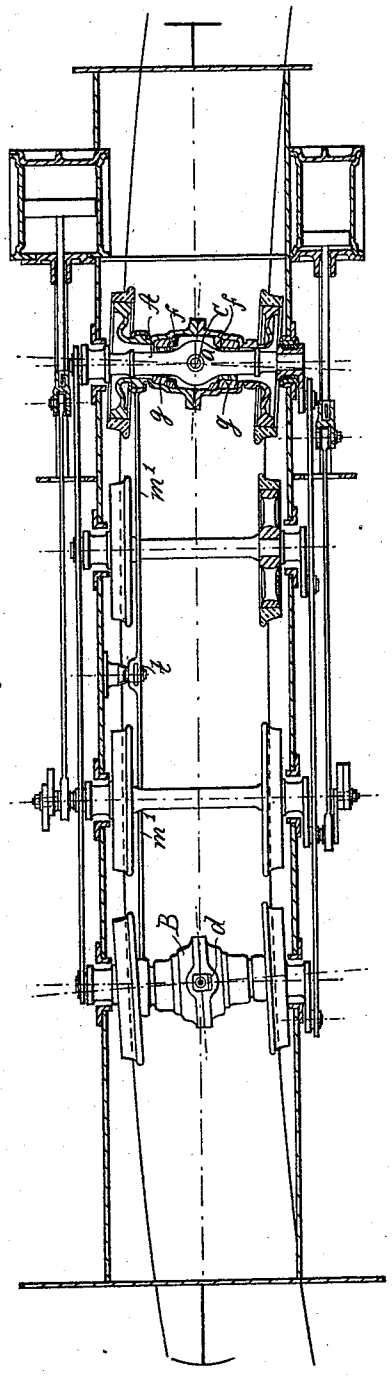

Fig. 7.

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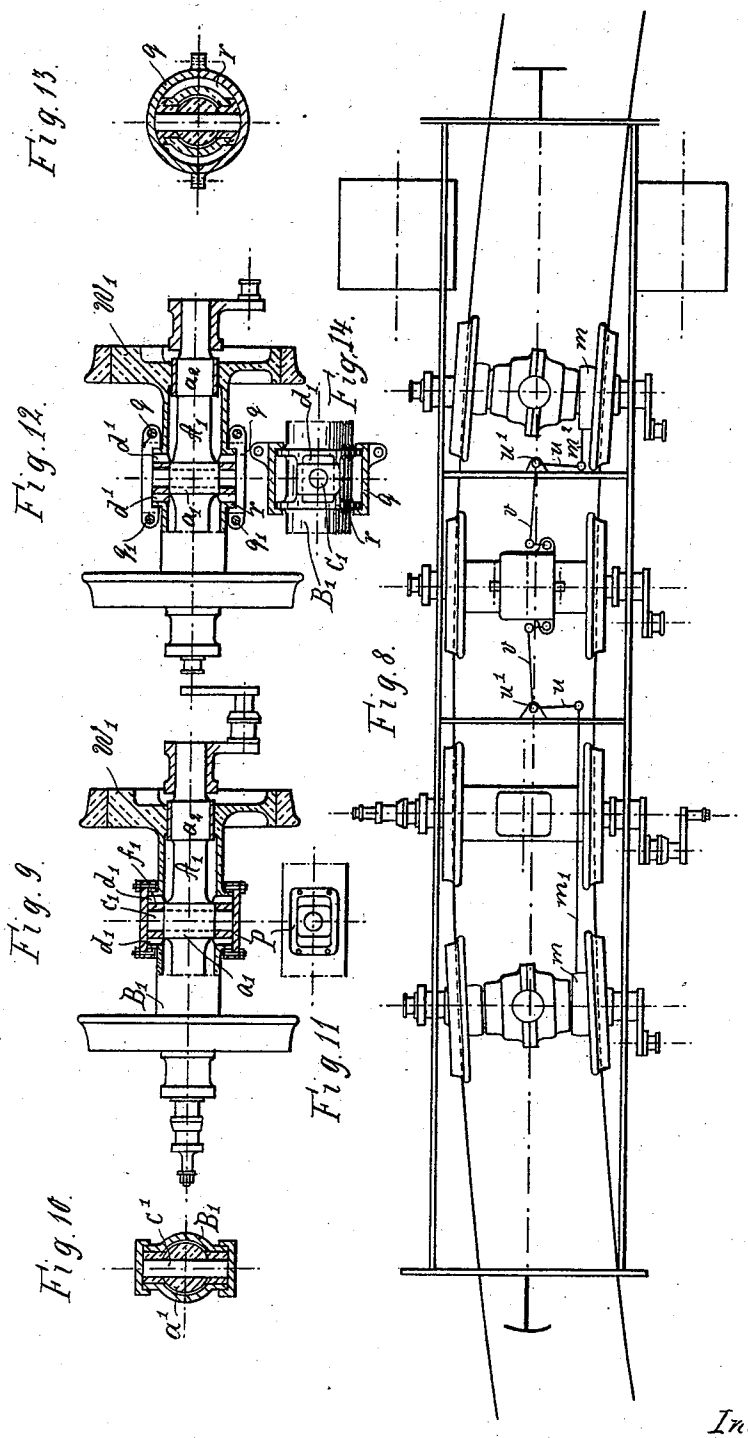

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UNITED STATES PATENT OFFICE.

RICHARD KLIEN AND ROBERT LINDNER, OF CHEMNITZ, GERMANY.

LOCOMOTIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 511,531, dated December 26, 1893.

Application filed January 19, 1893. Serial No. 458,998. (No model.)

To all whom it may concern:

Be it known that we, RICHARD KLIEN and ROBERT LINDNER, subjects of the King of Saxony, and residents of Chemnitz, in the Kingdom of Saxony, German Empire, have invented certain new and useful Improvements in Locomotive-Engines, of which the following is a full, clear, and exact specification.

Our invention relates to a locomotive the front and hind axles of which are movable so as to facilitate the passage of the engine through sharp curves, and our invention also consists in making the middle axles likewise displaceable in order to further increase the faculty of the engine to adapt itself to the curvature of the rails.

Our invention finally relates to the construction of the displaceable axles, which are made of a core on which the cranks are mounted, and of a sleeve to which the wheels are secured, as will be more fully disclosed hereinafter, and pointed out in the claims.

In the accompanying drawings Figure 1 is an end elevation, partly in section, of a locomotive embodying our improvements. Fig. 2 is a cross sectional elevation of the movable axle. Fig. 3 is a sectional plan illustrating the application of our invention to a six-wheel locomotive, and means for restoring the displaceable axle to its normal position. Figs. 4 and 5 are detail views illustrating the operation of this means. Fig. 6 is a side elevation partly in section, of an eight-wheel locomotive fitted with our improvements. Fig. 7 is a cross-sectional plan of the same. Fig. 8 is a plan of a similar engine fitted with additional means for displacing one of the middle axles. Fig. 9 is an elevation of one of the axles of this locomotive, partly in section. Fig. 10 is a cross-sectional elevation of the axle. Fig. 11 is a top view of the center part of this axle. Fig. 12 is an elevation, partly in section, of another axle of the locomotive represented in Fig. 8. Fig. 13 is a cross-sectional elevation of the same. Fig. 14 is a longitudinal sectional elevation of the center part of the same.

Similar letters refer to similar parts throughout the several views.

In carrying our invention into effect, we construct the front and hind axles of the locomotive, or only one of them, in the manner illustrated especially by Figs. 1 and 2. These axles consist of an inner core A to which motion is imparted in the usual manner by means of cranks and of the outer sleeve B, inclosing the core A, and carrying the wheels W. The said core is provided in its center with a ball *a* which is journaled in a spherical bearing *b* made of two parts and secured to the sleeve B. A driving bolt *c* is passed transversely through the center of the ball *a* and fits with its two ends through holes provided in the bearings *b*. The extremities of the bolt *c* are somewhat thicker than its main portion, and are each inclosed in a chamber *d* in such a manner, that they have a certain play transversely to the track and may also turn around their vertical axis, but have no play at all, or but a very small one, in the longitudinal direction of the track. It will be understood therefore, that while the axle proper A may be displaced in the sleeve B in the length of the latter, and both parts made to form an angle with each other, instead of remaining central to one another, yet in no case the core A will be able to rotate without the sleeve B, but both parts will always rotate together. The chambers *d* serve also for receiving the lubricating material. Two rings *f* are inserted within the sleeve B and are firmly secured to the same; these rings inclose and hold part of the bearing *b* and also limit the displacement of the same. A small annular space is left between rings *f* and bearing *b* in order to allow for the displacement of the latter. Two coiled springs *g*, bearing with one end against a shoulder of the sleeve B, and with the other end against ring *f* and the bearing *b*, constantly tend to bring the sleeve B and the wheels W into the normal position shown in Fig. 1. A ring *m* is loosely fitted on a collar *n* of the sleeve B, and to this ring is secured a connecting-rod *m'* (see Figs. 3 to 5) which is jointed to a bolt *l* provided with two burrs *l'* and *l''*. Between these burrs are provided two plates *i k* through which the bolt *l* is passed and which are guided along two rods *o o*. These rods are secured to the frame F of the locomotive and are provided with nuts *s* at their ends. Two of these nuts serve also as stops for limiting the movement of the plate

k. Between the plates i and k a coiled spring h is located which tends to drive said plates apart.

The operation of our improved axles will be easily understood.

When the engine enters a curve, the core A will remain perpendicular to the longitudinal walls of the frame F. The sleeve B however will assume such a position that its axis will be normal to the rails, *i. e.* directed toward the center of the curve. It will be obvious that this adjustment of the sleeve B carrying the wheels will be automatic, the rails acting as guides for the flanges of the wheels and pressing the latter into the position as shown in Figs. 7 and 9. At the same time the sleeve B and core A will be displaced somewhat in relation to each other, transversely to the track, as will be seen in Fig. 7. One of the springs g will be compressed by this movement, and the spring h will likewise be compressed either by the plate i (see Fig. 4) or by the other plate k (see Fig. 5). When the track is again in a straight line, the spring g which has been compressed will expand and bring the sleeve B back to its central position as shown in Fig. 3. The spring h will likewise expand and thereby restore the sleeve B to the position in which its axis coincides with that of the core A. It will be obvious that the running of the engine through sharp curves will be considerably facilitated by the automatic adjustment of the wheels tangentially to the rails.

Another advantage of our improved construction is that each of the wheels connected to one sleeve B carries exactly the same load, as the entire load borne by one axle rests upon the center of the sleeve.

In Figs. 6 and 7 we have shown an arrangement which may be employed in conjunction with the construction of axles already described, and which consists in making the displacement of the hind axle dependent on that of the front axle. The rods m' are in this case continued to the middle of the locomotive and linked to each other by means of a rod t fulcrumed in its center at t'. The rods m' being of equal length, and the construction of the front and hind axles substantially identical, it will be obvious that the displacement of said axles will be absolutely analogous when the engine is running in a curve.

When there are very sharp curves on the road, and especially if the locomotives employed have eight or ten wheels, it will be preferable to make the middle axles, or one of them, similar to the above described construction of the front and hind axles. The construction of such a middle axle is shown in Figs. 9 to 11. The sleeves B′ which are formed in one with the wheels W′ are connected by means of bolts and plates P. Within the sleeves is located the core A′, provided with a cylindrical part a' in its center, and with collars a^2, in contact with the wheels W′ and serving as bearings for the same. A bolt c' is passed through the center of core A′ and causes the sleeves B′ to rotate together with the core. The sleeves B′ fit closely around the cylindrical portion a' of the core A′. A free space d' is left between the inner ends of the sleeves B′ and the square plates f' into which the ends of the bolt c' are inserted. This space d' forms at the same time a chamber for the reception of the lubricating oil or grease.

The operation of these axles will be obvious without further explanation the motion being imparted to the core A′ in the same manner as described with reference to Figs. 1 to 3.

In Figs. 8, 12 and 13 we have shown a mechanism which may be employed with great advantage when the conditions are similar to those above stated. The front, hind, and one of the middle axles are constructed according to our hereinbefore described improvements. The connecting rods m' and m^2, fitted to the rings m of the front and hind axles, are secured with their free ends to bent levers u, fulcrumed at u' and linked, by means of rods v, to a ring q which slides on collars r of sleeves B′. This ring is provided with two rims q' outside the collars r, so that the ring q and sleeves B′ must move together when the ring is displaced by the rods v. The operation of this mechanism will not require any further explanation, as it will be obvious that the displacement of the front and hind axles, and the middle axle connected to them, will occur simultaneously and in a corresponding manner.

What we claim as our invention, and desire to secure by Letters Patent of the United States, is—

1. In a locomotive-engine, an axle comprising an inner core having its bearings in the truck-frame, and an outer sleeve carrying the wheels, said sleeve being displaceable longitudinally on the core, and capable of forming angles therewith, for the purpose as described.

2. In a locomotive-engine, an axle comprising an inner core, having its bearings in the truck-frame, and an outer sleeve carrying the wheels, said sleeve being displaceable longitudinally on the core, and capable of forming angles therewith, springs being arranged between core and sleeve adapted to restore the latter to its normal position, for the purpose as described.

3. In a locomotive-engine the combination with the inner core A having its bearings in the truck-frame and having the spherical central portion a with the transverse bolt c, of the outer sleeve B carrying the wheels, and of the bipartite spherical bearing $b\,b$ holding the core within the sleeve, the cylindrical springs $g\,g$ surrounding the core and resting at one side against the bearing $b\,b$, at the other against flanges of the sleeve, the latter being displaceable longitudinally on the core and capable of forming angles therewith, the spring being adapted to restore the sleeve to

its normal position, for the purpose as described.

4. In a locomotive-engine, the combination with the inner core A having its bearings in the truck-frame, of the outer sleeve B carrying the wheels, said sleeve being displaceable longitudinally on the core and capable of forming angles therewith, rings *m* fitting around the sleeve and connecting the latter with other movable parts of the truck, adapted to restore the sleeve to its normal position, for the purpose as described.

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

RICHARD KLIEN.
ROBERT LINDNER.

Witnesses:
CHARLES H. DAY,
R. E. JOHN.