2 Sheets--Sheet 1.

T. S. MINNISS.

Traction Locomotives.

No. 135,240. Patented Jan. 28, 1873.

Fig. 1.

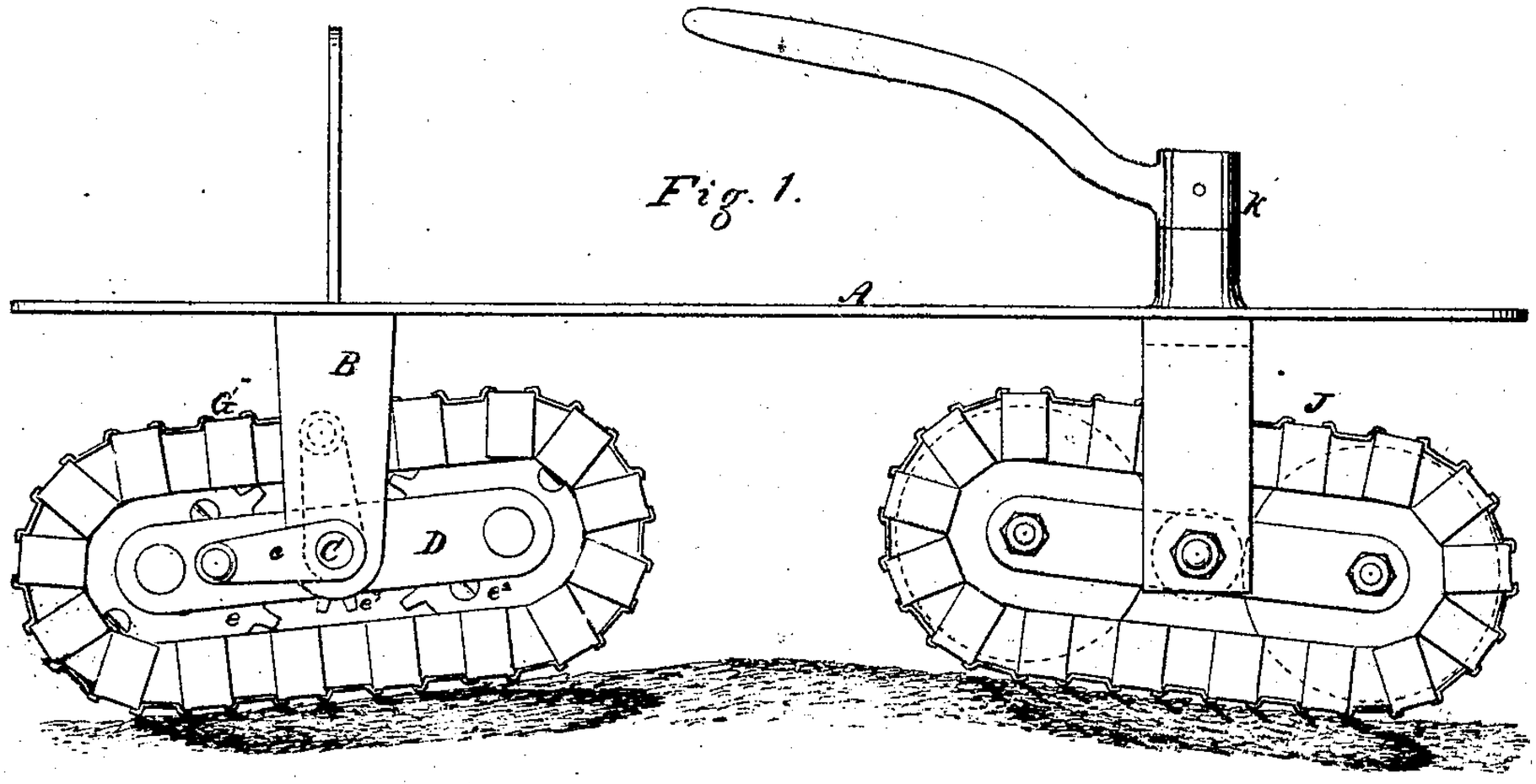
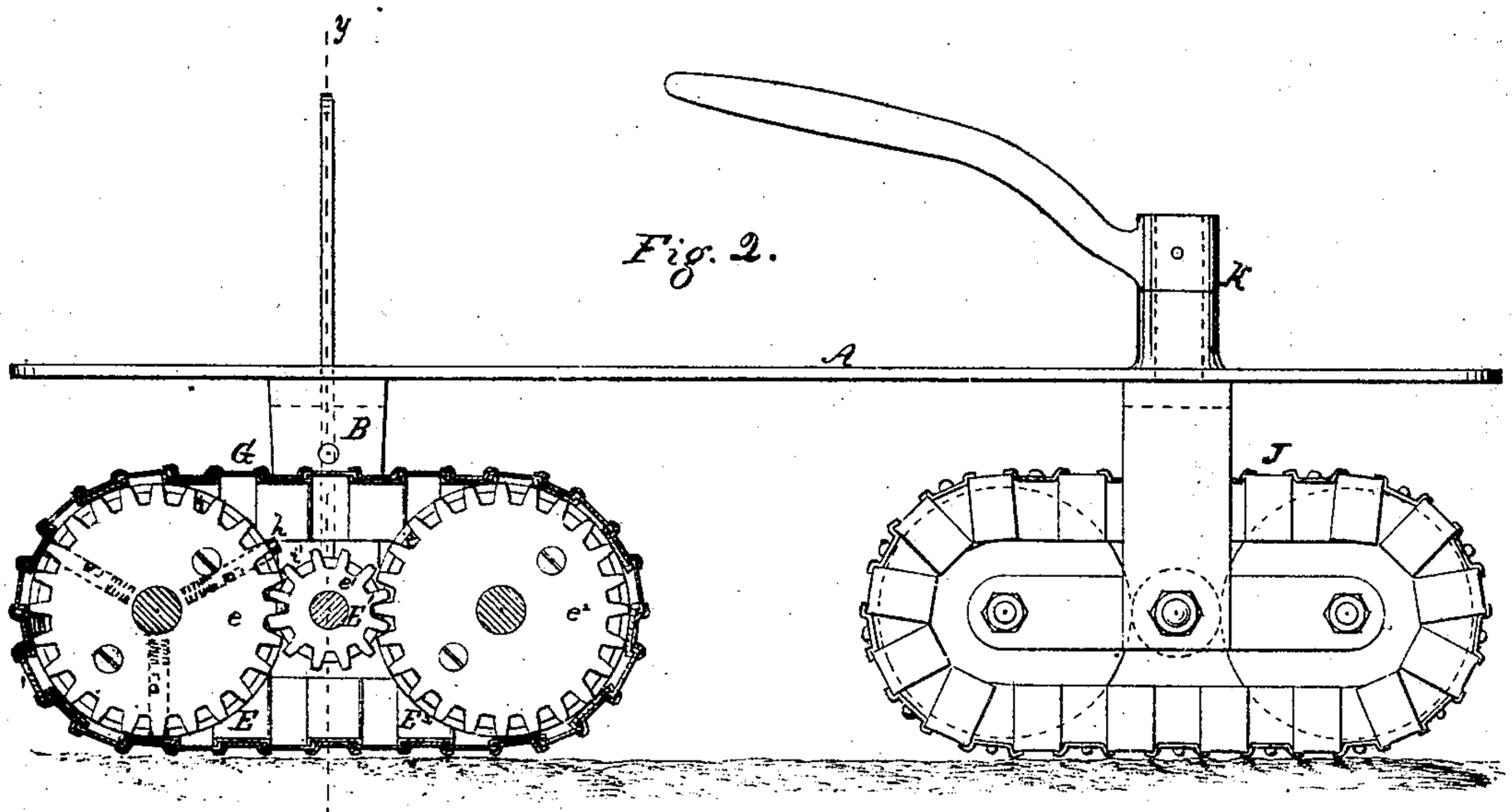


Fig. 2.



Witnesses.
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Ele Davidson

Inventor.
Thos S. Minniss
by his Atty
Wm D. Bolamm

2 Sheets--Sheet 2.

T. S. MINNISS.

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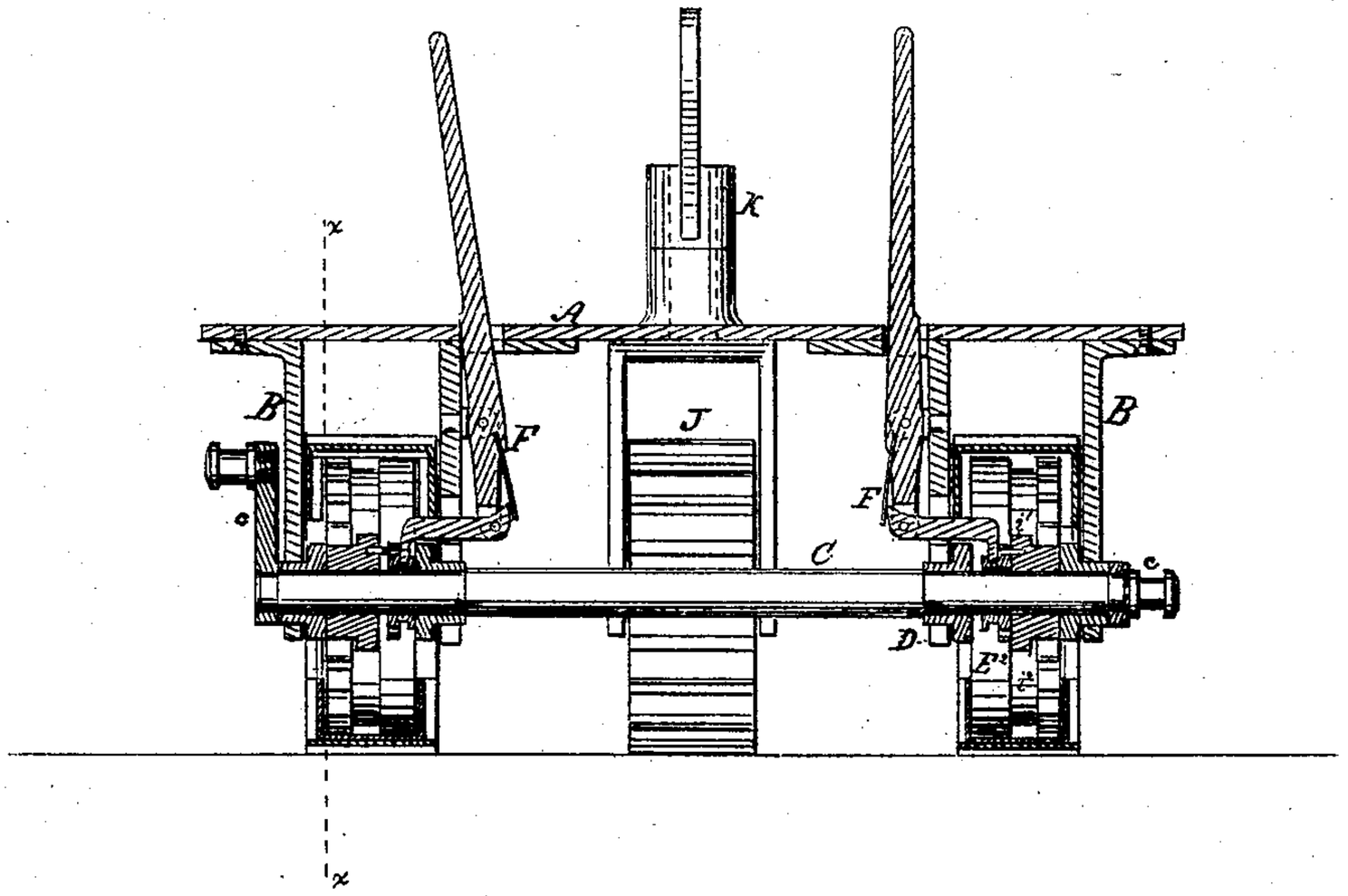
Fig. 3.



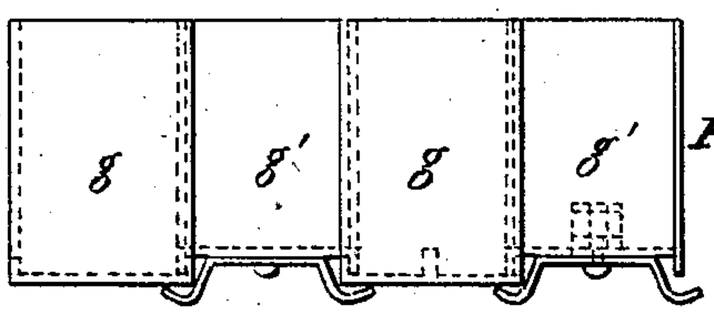


Fig. 4.

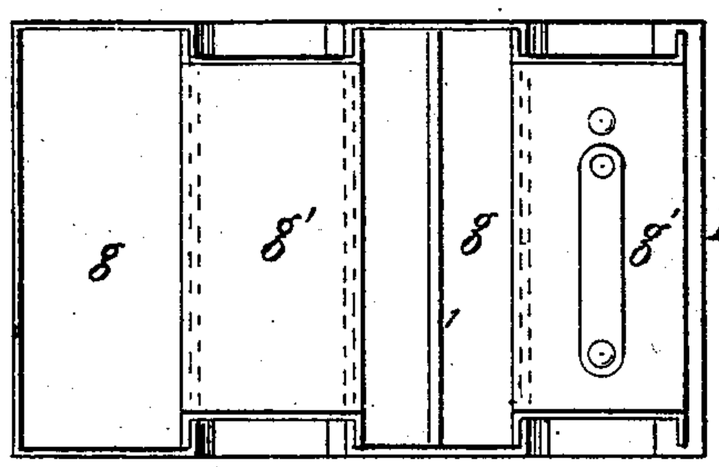


Fig. 5.

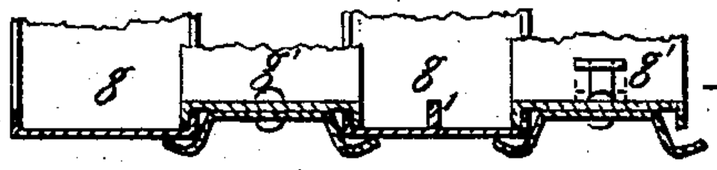


Fig. 6.

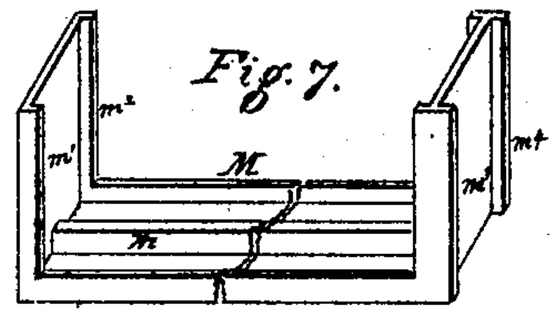


Fig. 7.

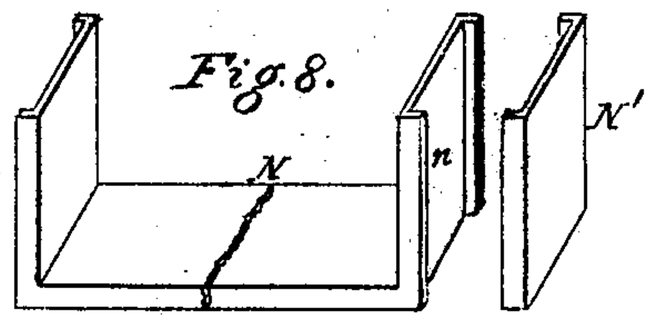


Fig. 8.

Fig. 9.

Witnesses.
Baltis Dr Long
Ellsworth Davidson

Inventor.
Thos S. Minniss
by his Atty
Wm D. Baldwin

UNITED STATES PATENT OFFICE.

THOMAS S. MINNISS, OF MEADVILLE, PENNSYLVANIA, ASSIGNOR OF TWO-THIRDS HIS RIGHT TO EVANS W. SHIPPEN, OF SAME PLACE.

IMPROVEMENT IN TRACTION-LOCOMOTIVES.

Specification forming part of Letters Patent No. **135,240**, dated January 28, 1873.

To all whom it may concern:

Be it known that I, THOMAS S. MINNISS, of Meadville, in the county of Crawford and State of Pennsylvania, have invented certain new and useful Improvements in Traction-Locomotives, of which the following is a specification:

My invention relates to traction-locomotives of the class having endless driving-tracks or bearing-belts, and constitutes an improvement on the devices shown in Letters Patent No. 107,702, granted to me September 27, 1870.

The object of the first part of my invention is to enable the machine easily to ride over rough ground, and readily to conform to its irregularities of surface; and the improvement consists in mounting an endless traversing-track in a frame rocking on a central transverse axis, so that either end may rise or fall without disarranging the driving mechanism. Second, my improvement further consists in combining two or more such rocking traversing-tracks, arranged one in advance of the other, to give freedom of motion to either end of the machine independently of the other. Third, the object of the next part of my invention is to prevent the slipping of the track upon the wheels which carry it; and the improvement consists in combining an endless track running over wheels with spring-cogs taking into recesses in the track, and capable of endwise motion radially to the wheel to conform to the movement of the track. Fourth, the object of the next part of my invention is to obtain great driving-power; and the improvement consists in combining the wheels that carry the belt with an interposed driving-wheel, each wheel having cogs and also a friction-surface—thus combining the advantages incident to both cog and friction gearing. Fifth, the object of the next part of my invention is to adapt the machine to traverse soft ground without sinking; and the improvement consists in constructing the endless track of links so articulated to each other that the track, while free to yield outwardly to conform to the wheels over which it traverses, is rigid in the opposite direction—thus forming a truss to sustain the locomotive.

The accompanying drawing represents so much only of a traction-locomotive as is necessary to illustrate the invention herein claimed, which drawing represents all my improvements embodied in the best way now known to me; obviously, however, some of my improvements may be used without the others, and in machines of a construction different from that therein shown.

Figure 1 is a side view of the machine moving over undulating ground; Fig. 2, a similar view of the same on level ground, with one of the driving-tracks in section on the line *x x*, Fig. 3, which latter is a section through the machine on the line *y y* of the preceding figure. Fig. 4 is a side view; Fig. 5, a plan; and Fig. 6, a vertical longitudinal section of the endless track. Figs. 7, 8, and 9 show details of the track on a scale larger than that of the preceding figures.

An engine and boiler, with the usual appurtenances of approved machines of this class, are mounted on a frame, A. Stirrups B depending from this frame support an axle or axles, C, driven by cranks *c*, connected with the engine, or by gearing, or driving-belts, or chains, as preferred. A frame, D, rocking on this axle, or in bearings or on journals concentric therewith, supports wheels E E^2, and also a central wheel, E^1, interposed between the other two, and mounted concentrically with the driving-axle. The driving-wheel E^1 turns, by preference, loosely on the axle, being connected therewith or disconnected therefrom by suitable clutch mechanism F, too well known to need description here. An endless track, G, encompasses the wheels traversing the ground and forming the bearing-surface of the machine; the construction of this track will be hereinafter described. The belt fits snugly over the wheels, and is tight enough to exclude dirt, although flexible in its joints. I am thus enabled to use gear-wheels *e* e^1 e^2 of a diameter nearly as great as that of the wheels E E^1 E^2 themselves.

While the gear-wheels and tracks by themselves would answer a good purpose, I find the efficiency of the machine to be much increased by combining with them friction-wheels *i* i^1 i^2, respectively forming part of or concentric with the wheels E E^1 E^2. The diameter

of these friction-wheels is such that their peripheries coincide with the pitch lines of the teeth. These wheels not only give increased driving-power by their frictional contact, but serve to relieve the gearing from the strain of the track, which may thus be made very tight. The axles and bearings are likewise relieved of much friction.

The drawing shows one set of gears on each wheel; obviously, however, a double set might be used on each wheel, with the frictional surfaces between them; or a friction-wheel might be arranged on each side of the gear-wheels.

To prevent the slipping of the track spring-cogs *h* are inserted in or secured upon the wheels. (See Fig. 2, where the cogs are shown in the form of bars moving endwise in radial holes in the wheels and pressed outward by a spiral spring.) The cogs might, however, be put upon the track and take into recesses in the wheel. (See Fig. 5.) I prefer the form shown, however, having found it the best in practical use. These cogs, at intervals, take into the recesses of the track, and not only prevent its slipping, but form a positive fulcrum, upon which the power of the wheel is exerted in traversing the track. The cogs, by their elasticity, are enabled to yield and to retire within the wheels as the track traverses them.

The steering-track J, it will be observed, runs over smooth pulleys and has no gearing, as it does not drive the machine. It is mounted on a vertical shaft, K, controlled by a handle or other well-known steering-gear. Its construction and operation is similar to that of the driving-tracks, with only the modifications incident to this difference of function.

It is a great desideratum in machines of this class to have a track rigid against bearing strains, flexible to conform to the contour of the wheels around which it travels, and yet tight enough to prevent dirt from clogging the wheels. To attain this object I construct the endless track G of links of the form shown in Figs. 4 to 9, both inclusive, of the accompanying drawing. The links *g*, it will be observed, are both shorter and of less depth than the alternate ones *g*, so that when the former are slipped down upon the latter they interlock in such manner as to leave them free to flex inwardly by their overlapping ends sliding past each other, while their flanges prevent them from yielding to external pressure. The links may be constructed with longitudinal strengthening-ribs 1, if desired.

Figs. 7 and 8 show a modified form of link. The link M has a central internal strengthening-rib, *m*, internal side flanges m^5, and both internal flanges m^1 m^2 and external flanges m^3 m^4 on its ends. The link N is constructed with an external double flange, *n*, on each end. This link is slipped down upon the other, with the flanges of their adjacent edges interlocking, as in the other chain shown in Figs. 4, 5, and 6. The outer piece N′ is bolted to the outer upturned ends of the piece N by a rivet. The links are thus securely held together, while free to flex, as described, the piece N′ preventing dirt from clogging the links, and also materially strengthening the chain, while allowing it to flex freely, as before. The piece N′ may also be provided with a horizontal inwardly-projecting lip on its upper end, to overlap the joint between the links and exclude dirt.

Fig. 9 shows clearly the mode of locking the links together at the bottom. The interlocking flanges have square edges on their abutting inner faces, while their outer edges are rounded to suit the curve of the bottom clamp O, which is securely riveted to the link, between which and it the adjacent links are clamped. The curve of the ends of the links is such that they can freely turn inward to pass around the wheel, while their square edges are rigid against upward or inward thrusts, thus enabling the machine to run easily over soft ground. These links, by preference, are formed of sheet-steel.

Where a long bearing-surface is required, with wheels of small diameter, a series of bearing-wheels with interposed friction-wheels may be employed. The length of bearing is thus greatly increased, as with two bearing-wheels half the sum of their diameter is lost, while the full diameter of the additional wheels is utilized.

For running on soft ground a track the full width of the machine may be used.

I have described the apparatus as adapted to a locomotive; but obviously the machine may be drawn by horses or by a rope from a stationary engine. The uses of the machine are obvious.

The operation of the mechanism will be apparent from the foregoing description.

I do not broadly claim an endless traversing-track, friction driving-wheels, or a steering-wheel or roller, as these have been shown in the patent of September 27, 1870, heretofore granted to me.

I claim as my invention—

1. The combination of an endless traversing-track, its supporting-wheels, and a frame rocking on a transverse axis, substantially as set forth, to enable the track to conform to undulations of surface.

2. The combination, with a traction-locomotive, of two endless traversing-tracks, arranged one in front of the other, and each rocking on an independent central transverse axis, substantially in the manner set forth, to allow either end of the machine independent conformity to the surface over which it passes.

3. The combination, in a traction-locomotive, of an endless track, wheels upon which it traverses, and spring-cogs to lock together the wheels and track, substantially as set forth.

4. The combination, in a traction-locomo-

tive, of an endless traversing-track with driving-wheels constructed with both frictional surfaces and cog-gearing, substantially as set forth, to obtain increased driving-power and to prevent undue strain on the wheels by the track.

5. An endless traversing-track for traction-locomotives, constructed, substantially in the manner set forth, of articulated interlocking links *g g'*, flexible outwardly, to traverse the wheels, but rigid against inward thrusts, to secure a broad bearing-surface.

In testimony whereof I have hereunto subscribed my name.

THOMAS S. MINNISS.

Witnesses:

REUBEN C. FREY,

FRANK L. GRANT.