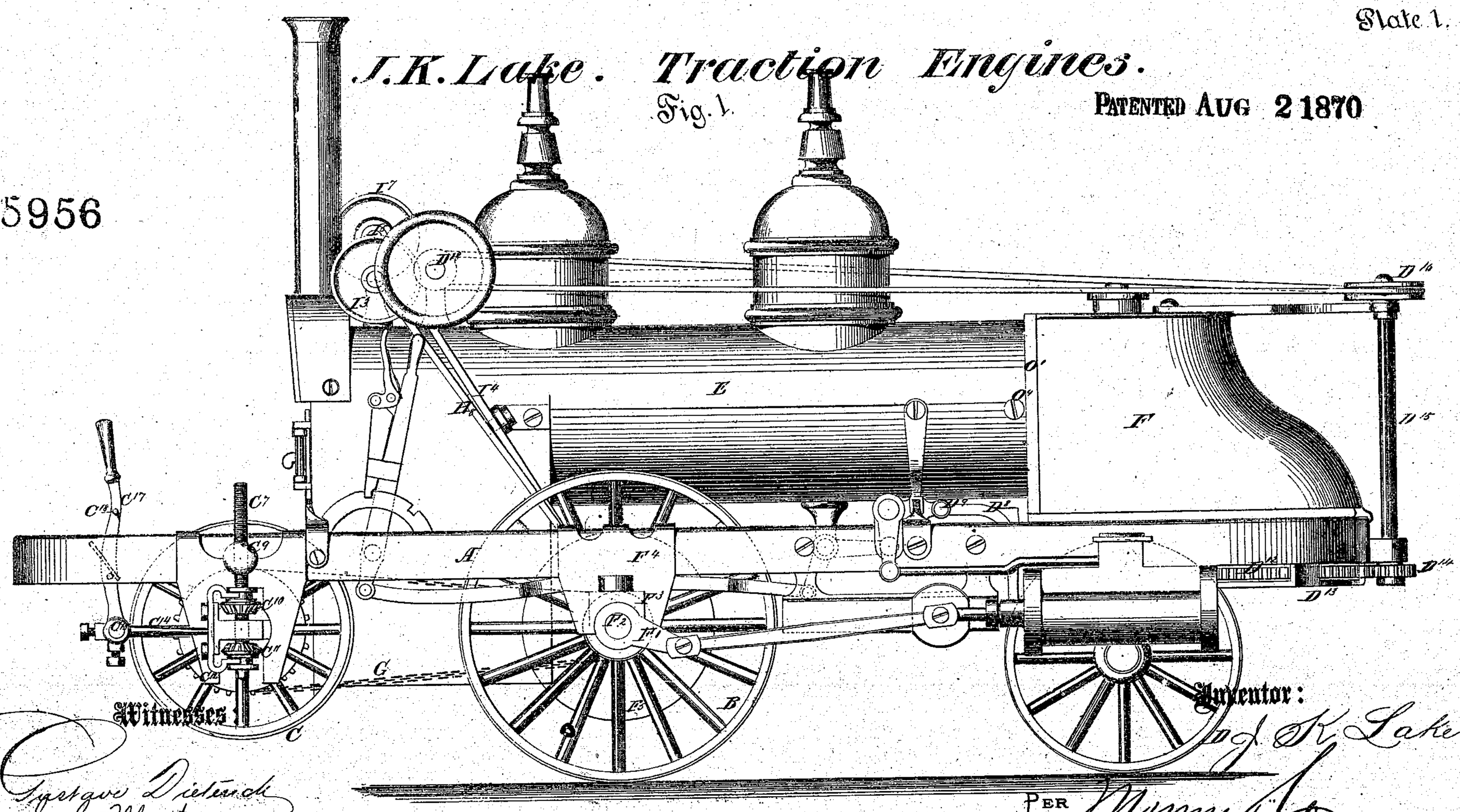
105956

Plate 1.

J. K. Lake. Traction Engines.

Fig. 1.

PATENTED AUG 2 1870



Witnesses

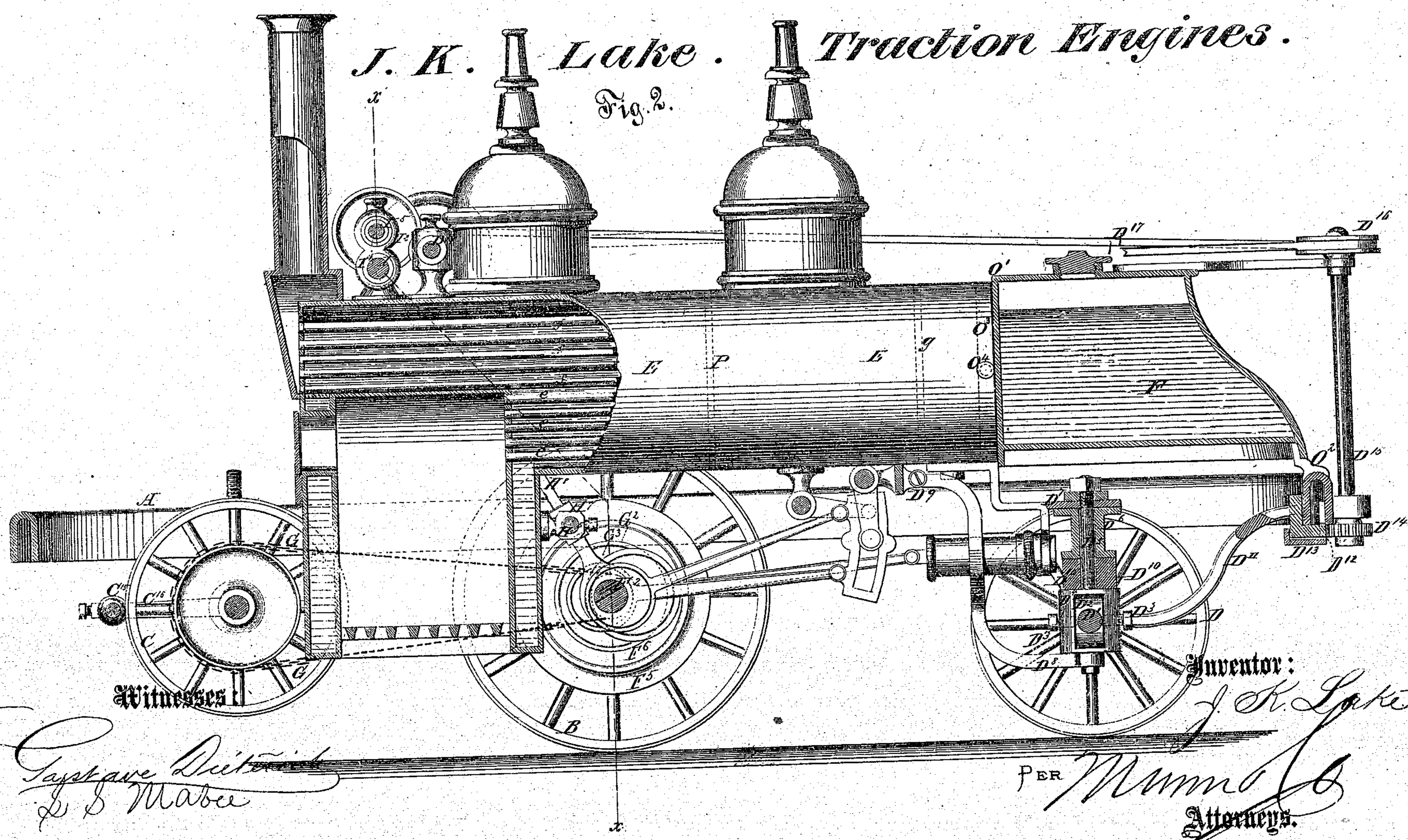
Inventor:
J. K. Lake

PER Munn & Co
Attorneys.

Plate 2.

J. K. Lake. Traction Engines.

Fig. 2.



Witnesses:

Gaylord Dieterich

L. S. Mabee

Inventor:

J. K. Lake

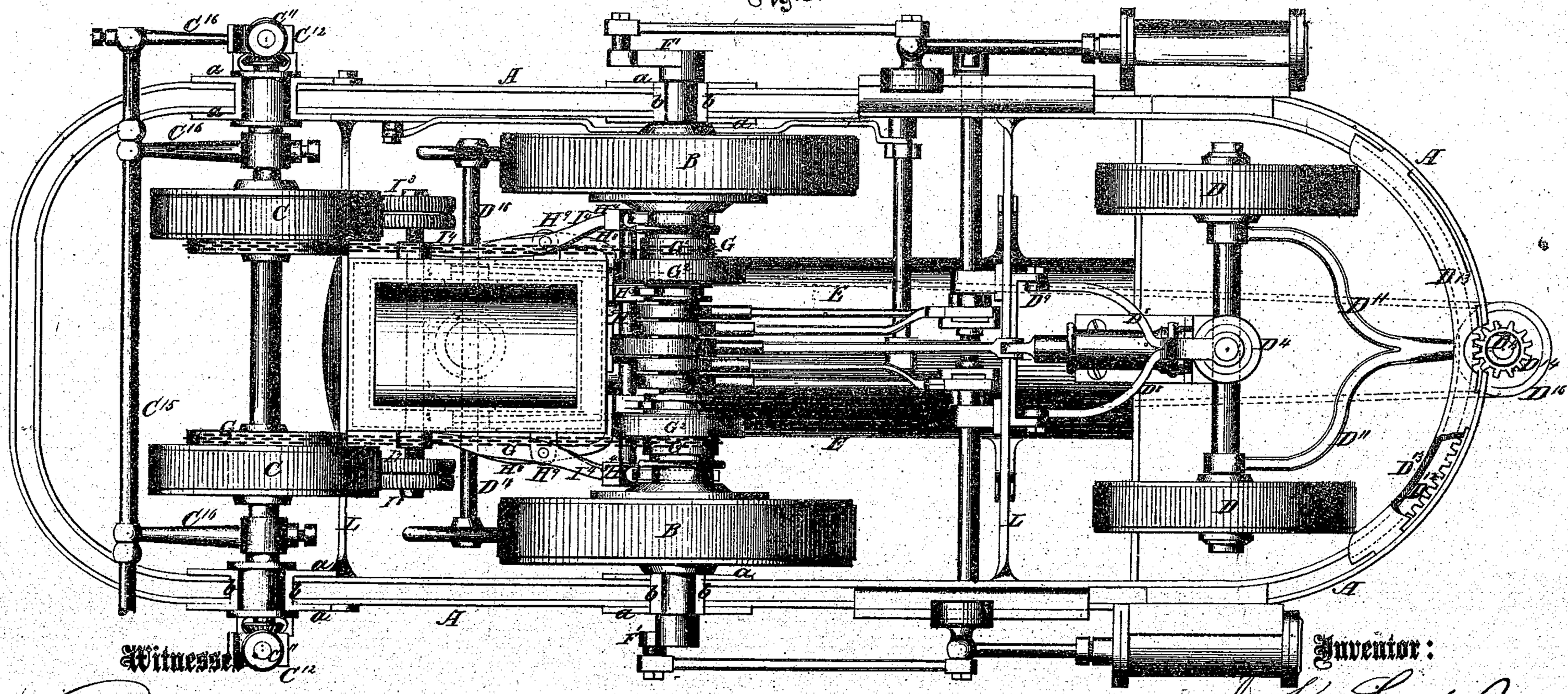
Per Munn & Co

Attorneys.

Plate.3.

J. K. Lake. Traction Engines.

Fig.3.



Witnesses:

Christ aye Dieterich

D. S. Mabee

Inventor:

J. K. Lake

Per Munn & Co

Attorneys.

Plate. 4.

J. K. Lake.

Traction Engines.

Fig. 4.

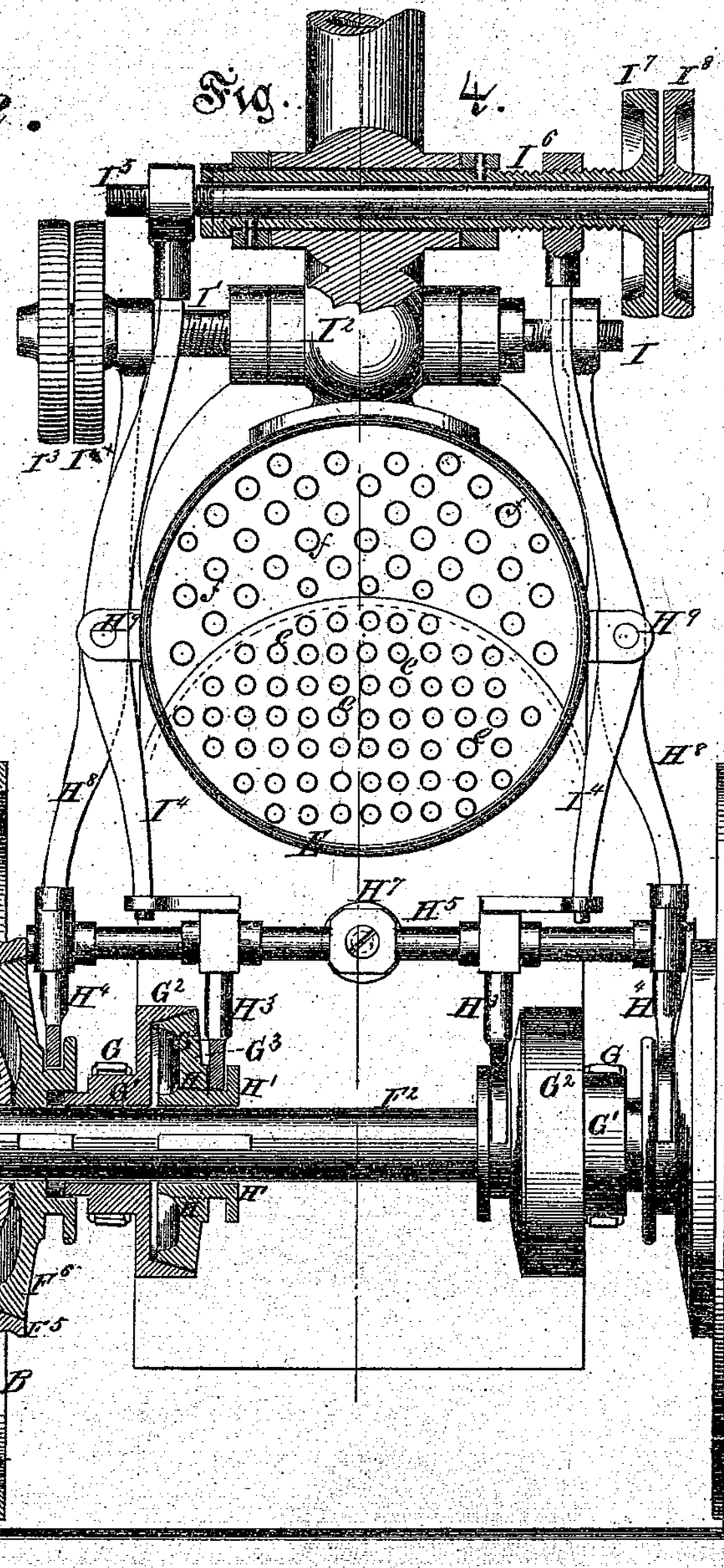


Fig. 6.

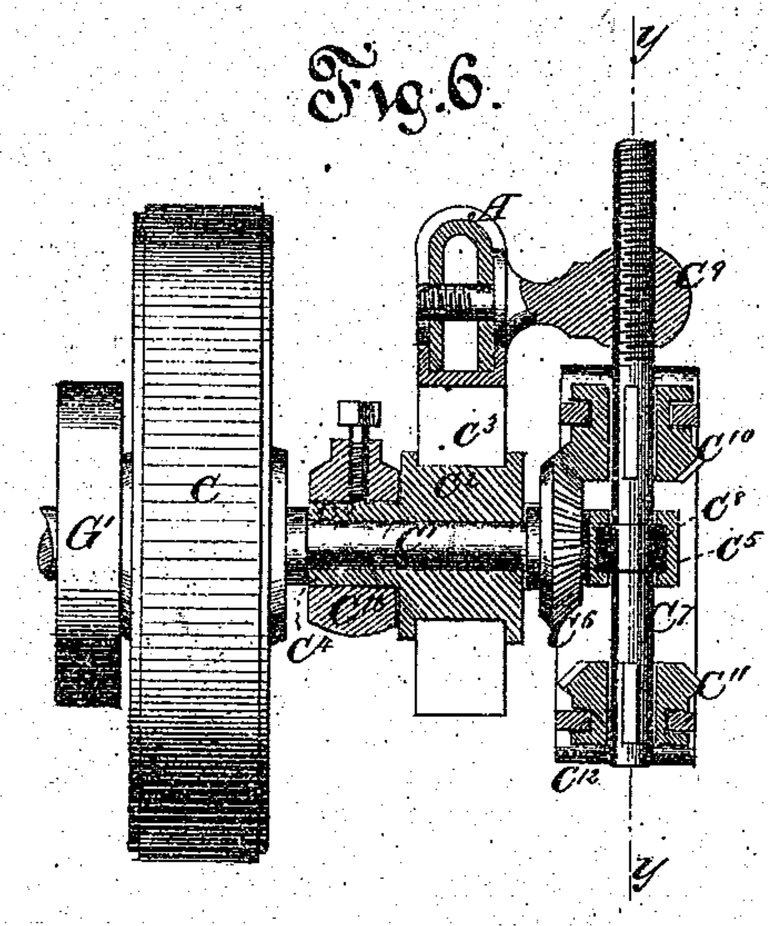


Fig. 5.

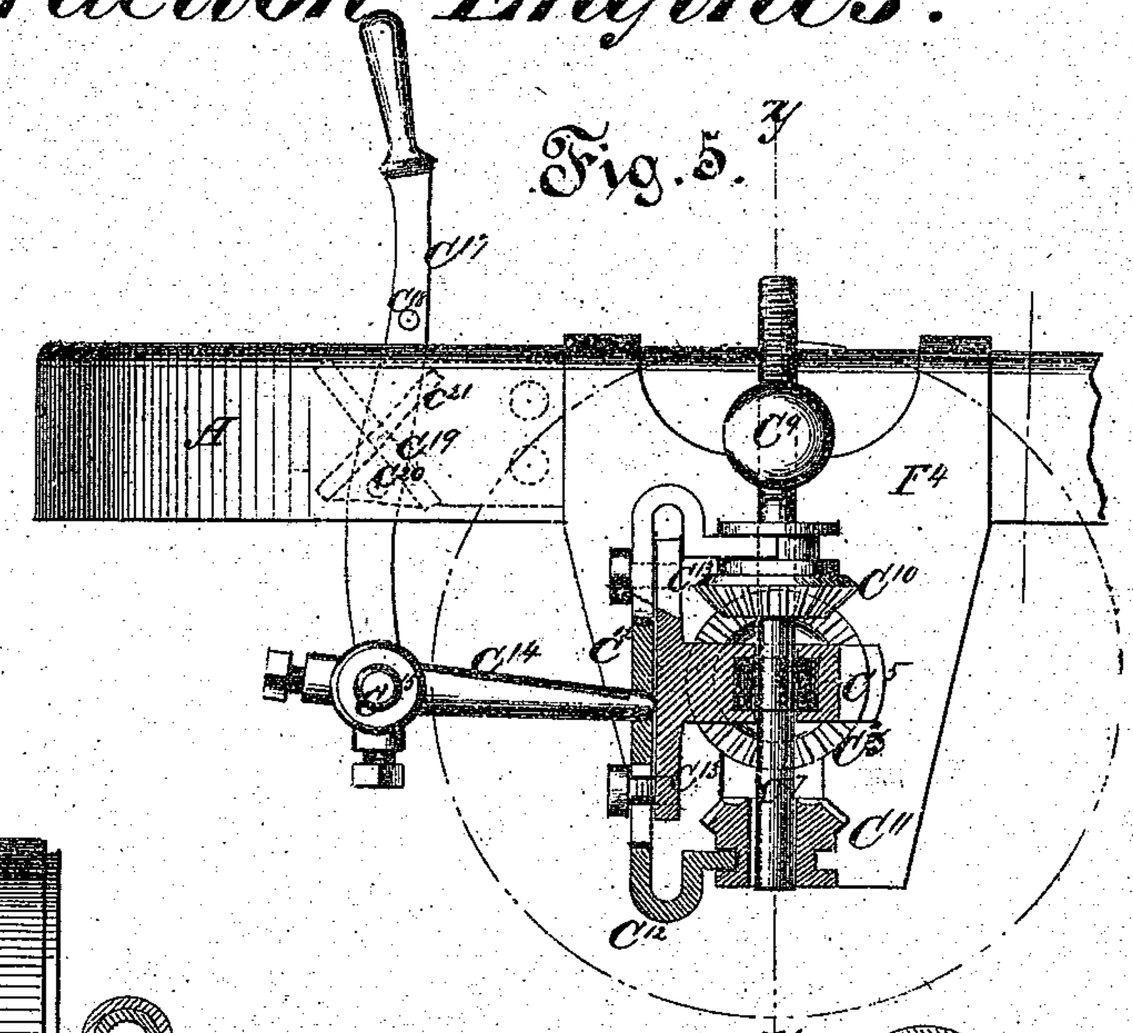


Fig. 7.

Witnesses:

Gustave Dieterich

D. D. Mabee

Inventor:

J. K. Lake.

Per

Attorneys.

United States Patent Office.

JAMES K. LAKE, OF CHICAGO, ILLINOIS.

Letters Patent No. 106,956, *dated August* 2, 1870.

IMPROVEMENT IN TRACTION-ENGINE.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, JAMES K. LAKE, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Traction and Locomotive-Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawing forming part of this specification.

My invention relates to traction-engines, and consists in certain improvements, which will first be described, in connection with all that is necessary to a full understanding thereof, and then clearly specified in the summary or claim.

Figure 1 represents a side elevation of my improved machine;

Figure 2 is a longitudinal sectional elevation of the same;

Figure 3 is a plan of the bottom;

Figure 4 is a transverse section on the line *x x* of fig. 2;

Figure 5 is a section on the line *y y* of fig. 6;

Figure 6 is a section on the line *z z* of fig. 5; and

Figure 7 is a transverse section of a side bar of the frame.

Similar letters of reference indicate corresponding parts.

A represents the main part of the frame;

B, the main driving-wheels;

C, the secondary wheels;

D, the steering-wheels;

E, the boiler; and

F, the engines.

The engines are connected to cranks F^1 on the driving-axle F^2, which is arranged in bearings F^3, in the housings F^4, suspended from the side rail A.

The driving-wheels B are fitted to the axle to work loosely thereon, and carry on their arms or spokes the female parts F^5 of a friction-clutch, the male parts of which, F^6, are splined or feathered to the axle F^2, so as to be revolved by it, yet slide thereon to and from the parts F^5, for applying the power of the said driving-wheels or not, as required, also for relieving the engines at first starting, to let them attain a high speed and corresponding measure of power, to be applied gradually by forcing the clutches together, so that they will slip to some extent until the carriage attains sufficient motion to admit of forcing them wholly together, to make the connections complete and positive.

It will be seen that the hubs of the wheels B bear against the bearings F^1 of the axle, which in turn bears against the inner faces of the cranks, which are so firmly connected to the axle that the end pressure on the clutch to produce the friction cannot possibly move the female part out of its true position; but to avoid the friction on the cranks I may place collars on the shaft next to the hubs of the wheels.

These main driving-wheels B are intended to be used mainly when the carriage is running along a level or nearly level road, and at the highest rate of speed or thereabouts, for which it is geared when connected with them; but for going up steep gradients, over heavy roads, or for drawing heavy loads, when it is desirable that the carriage should proceed slowly, it is necessary, in order to admit the engines to run at their maximum speed, which they must do to maintain their maximum power, to reduce the motion of the driving-wheels relatively to the engines. In some cases it is desirable to do this without stopping the machine. For effecting this change I employ a secondary set of supporting-wheels, *c*, preferably of smaller diameter than the wheels B, and arranged for moving up and down on the frame to shift the support of the carriage from the main wheels to these secondary wheels, or back again to the main wheels. I operate the secondary wheels by reducing gear connecting with the main axles F^2, so that they will be set in motion by friction-clutches in the same manner that the wheels B are, the latter being disconnected simultaneously with the connection of the said secondary wheels.

For imparting the motion to the secondary set and reducing it I employ secondary friction-clutches and chains G, working over the drums G^1 of the female parts G^2 of the secondary friction-clutches, placed on the main axle, inside of the clutches of the main wheels, G^3 being the male parts of the said secondary clutches. Other connections, for example, cog-wheels, may be used in place of the said chains. Like the arrangement of the clutches for the wheels B, the parts G^1 of the auxiliary clutches are free to revolve on shaft, but not to slide while the male parts G^3 slide to and from the others, but are feathered to the shaft.

These clutches being provided with suitable means for shifting them readily, it will be seen that the shifting for connecting the power or disconnecting from the main shaft may be effected while the engines are in motion, so that not only for starting, but in case such bad roads are encountered as to overcome the power and gradually stop the machine, the engines may be relieved and allowed to attain high speed and momentum, as before described, for starting, and then be brought into connection again so as to force the wheels over temporary obstructions.

To make it possible to employ friction-clutches in

this manner, it is necessary to construct the friction surfaces upon such an angle or pitch as to insure the greatest possible measure of adherence, while in contact, without offering too much resistance to the shifting-bar when releasing or disconnecting the parts; and, while affording the necessary amount of adherence, they must also be protected from grinding and cutting, and be capable of slipping, to let the engines overcome the inertia of the wheels without injury to the parts. Therefore, I make the bearing surfaces of these friction-clutches on a pitch of one inch rise to six or eight inches in breadth of face, or within the angles of from 7 degrees to 10 degrees from the line parallel with the shaft, and run them in oil or other lubricating substance, and have found, by practical demonstration, that clutches constructed within these limits possess a very much greater holding power, when used in oil, than others of the same size used dry, as in the common way; also, that the end pressure on the male part, to cause the adherence and the force required for separating the parts, are very much less than in the common clutches.

I propose, in practice, to make the male parts of the clutches in two parts, divided on the dotted lines H, and connected by screwing the part H^1 into the other part, and securing them by set-screws or otherwise, so that the lost motion in the grooves for the crotched shifting-bars H^3, due to the wear, may be taken up when required by screwing the parts H^1 further in, or so that new parts may be substituted when they become worn.

The crotched bars H^3 and H^4 are fitted on a shaft, H^5, supported in a stud, H^7, attached to the boiler, so that they may move parallel with the axle F^2, to have less wearing effect on the walls of the grooved hubs.

The bars H^4 are connected to levers H^8, pivoted at H^9 to supports attached to the boiler, and they are connected at their upper ends, the one to the screw-shaft I and the other to the screw-threaded sleeve I^1, mounted on the top of the boiler, near the front end, in the support I^2.

The shaft I works in the sleeve I^1, and each has at one end a hand-wheel, I^3 I^4, placed side by side, so that they can both be turned together by one hand, or one may be turned independently of the other. The screw-threads of the said shafts and sleeve are pitched in opposite directions, so that, by turning them in one direction, the levers H^8 will be moved toward each other at the top and from each other at the bottom, in which case they will force the male clutches F^6 into the female parts F^5, and when the shafts are turned the other way the clutches will be disconnected.

The bars I^4 of the other clutches are provided with a similar shaft, I^5, and sleeve I^6, mounted in the top of the support I^2, and provided with hand-wheels I^7 I^8, for operation in like manner.

The axle c^1 of the secondary set of wheels c is mounted in bearings c^2, fitted to slide up and down in slots, and they are provided with extensions c^4 at the inner ends, and c^5 at the outer ends; the latter are slotted for the application of the bevel-pinions c^6, on the ends of the axle, and they are supported on the vertical shafts c^7, passing vertically through them, and having collars c^8 within hollow spaces in the said extensions, or below them, for supporting them.

These shafts are screw-threaded at the upper ends, and screw through strong stud c^9, projecting from the frame, by which and the screws the said frame is supported on the bearings of the axle c^1, when the wheels c are down upon the ground, for the purpose, and by which and the bearings the axles and the wheels c are in turn suspended from the frame when raised out of action.

For effecting this shifting of the wheels c, to assume the load, or to deliver it again to the other wheels, the screw-shafts c^7 are provided with two bevel-pinions, c^{10} and c^{11}, one above the pinion c^6 and the other below, both feathered to the screw-shafts, and capable of sliding up and down, for gearing with the pinion c^6 or not. They are mounted in a bent plate, c^{12}, arranged on vertical extension of the extension c^5 of the bearings c^2, to slide up and down, so that either pinion may be geared with pinion c^6, the other being disconnected.

For shifting the plate c^{12}, they are connected to arms c^{14}, of a shaft, c^{15}, (or it may be the ends of the said shaft suitably bent for the purpose,) mounted so as to oscillate freely in the ends of arms c^{16}, attached to the extension c^4 of the bearings c^2.

The shaft c^{15} is provided with a shifting-lever, c^{17}, by which it may be oscillated to shift the plates c^{12} to gear either of the pinions with the pinions c^6, or adjust them so that neither will gear with them.

One of the screw-shafts has a right-hand thread and the other a left-hand, so that when gearing with the axle and screwing in their respective studs, c^9, they will move in the same direction.

The operation of this apparatus for raising or lowering the wheels c is as follows:

The clutches for working the chains G being brought together, and motion being imparted to the wheels c and the axle c^1, which we will suppose it is designed to move down upon the ground to take the load, the attendant will move the bar c^{17} in the right direction, (which may be supposed to be from the boiler), to gear the screws, so that they will be screwed down; this will bring the lower pinion c^{11} up into gear with the pinion c^6, and the wheels c will be carried downward; also the arms c^{16}, shaft c^{15}, and shifting-lever c^{17}, along with them, until a pin, c^{18}, on the bar c^{17}, comes in contact with a cam-plate, c^{19}, on the frame, which will shift the bar c^{17} backward enough to disconnect the wheels c^{11}, and throw the shafts c^7 out of gear. In the meantime the attendant will shift the clutches of the main driving-wheels, so as to disconnect them, and they will be raised above the ground, so that the load will be supported on the others.

The pin c^{18} and the cam-plate will be arranged relatively to each other, so that the frame shall be raised as high as required on the wheels c, before the bar is shifted.

For shifting the load back from the wheels c to the wheels B, the attendant will move the bar c^{17} in the other direction, say toward the boiler, bringing the upper wheels into gear with the pinions c^6, by which the screw-shafts will be turned in the direction to raise the wheels, until a pin, c^{20}, comes in contact with the under side of the cam-plate c^{19}, and throws the bar back to the middle position. While this is taking place, the attendant will again gear the large wheels with the engines, by means of the clutches.

If it be designed to effect these changes when the carriage is running backward, when the motion of the pinions c^6 would be reversed, and to trip the bar c^{17} by the cam-plate c^{19}, the cam-plate should be arranged so that it may be shifted to the opposite inclination; that is to say, to the dotted, line c^{21}.

To obtain the universal motion required for the axle of the grinding-wheels D, I provide the axle D^1, at the center, with a disk or central enlargement, D^2, above and below the shaft, of the same thickness, and fit it onto centers D^3, to oscillate vertically within a slotted enlargement, D^4, of a vertical spindle, D^5, passing up through a support, D^6 D^7, attached to the frame, or to the boiler, which is permanently connected to the frame, and down through a brace, D^8, crotched at the upper end and hinged to the frame at D^9.

Between the bottom of the support D^6, and the top

of the enlargement D^4 of the spindle, is placed an India rubber or other spring, D^{10}.

The upper end of the spindle is provided with a nut, to prevent too free action of the spring.

A crotched tongue or hounds, D^{11}, are connected by the ends of the crotched part to the axle near each wheel, and at the swinging end to a toothed segmental rim, D^{12}, fitted in a case, formed partly by the curved front end of the frame, and partly by a curved plate, D^{13}, suspended from the frame, so that it may slide back and forth in a circular path, and this segmental wheel is worked for steering the carriage by a pinion, D^{14}, shaft D^{15}, pulley D^{16}, belt D^{17}, and a winding-shaft, D^{18}, the latter mounted on the boiler near the front part, in convenient reach of the attendant, and provided with a hand-wheel for turning it. The belt passes on opposite ends of the steam-dome, and winds on a pulley or roller at one side, while it winds off a similar roller on the other side.

It will be seen that this arrangement of the guiding-axle and the guiding apparatus permits the axle to turn freely in any direction that may be required by the most uneven road, while it furnishes a very strong and reliable support for it. Also, that it will work freely and uniformly, no matter what may be the position of the axle, and also that the oscillations of the axle will not cramp the frame or interfere in any way with the driving-wheels.

I prefer to construct the frame mainly of one or more bars, forming the sides and ends, made from strips of sheet metal or boiler-plate, bent into the U-form, represented in cross-section in fig. 7, and inverted, also connected at the edges at suitable intervals by the cross-stays K, secured by rivets or bolts K'.

I propose to bend these bars at the ends on true circles, or nearly so, and connect the opposite sides by transverse bars.

The housings may be cast in the form shown in the plan view of the bottom, fig. 3, with side plates *a* to fit the outsides of the bar A, and joined below the bar by the cross-plates *b*, which form the bearing surfaces for the boxes, and strengthen the side plates laterally.

The housings may be slipped on the bars before they are bent to form the ends, or before the bar A, which may be made in two parts and joined together at the center of the sides, is joined together.

This construction of the frame and housings affords the greatest possible strength, with the least weight, and makes besides a most convenient form for the attachment of the boiler and other parts.

My improvement in the construction of the wheels consists in the attachment of two rows of the socketed cups or ferrule M, by riveting or otherwise to the inner face of a broad thin metal rim, so that the spokes may be fitted into them, at the outer ends, and project obliquely from each side across the vertical plane of the center of the wheel. Also, in the application to the spokes at the other ends, of the nuts N, to screw against the hubs, by which the rims may be kept at all times in any required degree of tension, and the wheels will be very firmly braced laterally.

It is obvious that my improved mode of applying the power and shifting from one set of driving-wheels to another is applicable alike to driving street cars, or to locomotives on steam roads.

It is also obvious that the secondary set of wheels which I employ add to the complete machine superior facilities for use as a portable engine, as either set of the driving-wheels may be employed for working the driving-belts, while the other set supports the machine, the different sets affording different speed, suited for different purposes.

Having thus described my invention,

I claim as new and desire to secure by Letters Patent—

1. The combination in a traction-engine of two sets of driving-wheels, relatively constructed, arranged, and operated as and for the purpose described.

2. Providing a traction-engine with one or more pairs of auxiliary supporting-wheels, made vertically adjustable, so that the weight of the machine may be thrown upon or taken from the said wheels, substantially as described.

3. The construction of the clutches in two parts, and the connection of the same by the one screwing into the other, and by a set-screw, substantially as specified.

4. The crotched arms, for working the sliding parts of the clutches, arranged to move on the support H^5, in a line parallel with the axle F^2, and connected to the levers H^8 and I^4, substantially as specified.

5. The combination with the pairs of clutch-shifting levers of the right and left screw-threaded shafts I I^1 and I^5 I^6, arranged for joint and simultaneous or independent action, substantially as specified.

6. The combination with the shifting-lever c^{17} and the shifting-plate c^{12}, reversing pinions, and the screw-rods c^7, of a cam-plate, for automatically disconnecting the reversing-pinions, substantially as specified.

The above specification of my invention signed by me this 18th day of March, 1870.

JAMES K. LAKE.

Witnesses:

GEO. W. MABEE,

ALEX. F. ROBERTS.