(No Model.) 2 Sheets—Sheet 1.

G. T. GLOVER.

TRACTION ENGINE.

No. 342,596. Patented May 25, 1886.

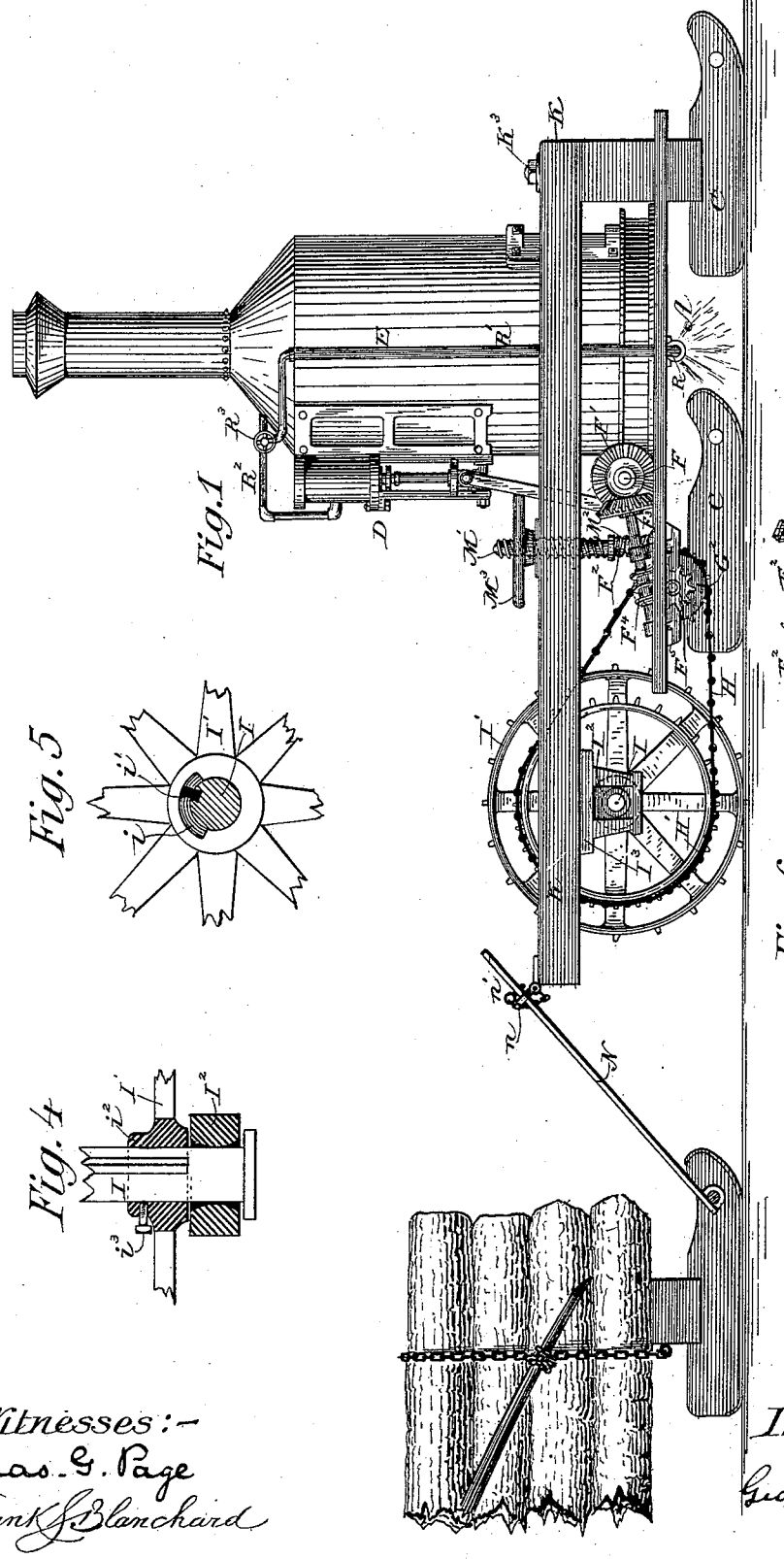

Fig. 1

Fig. 5

Fig. 4

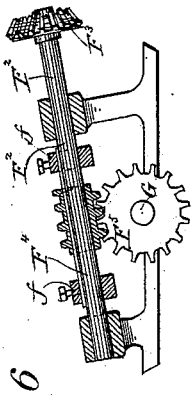

Fig. 6

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2

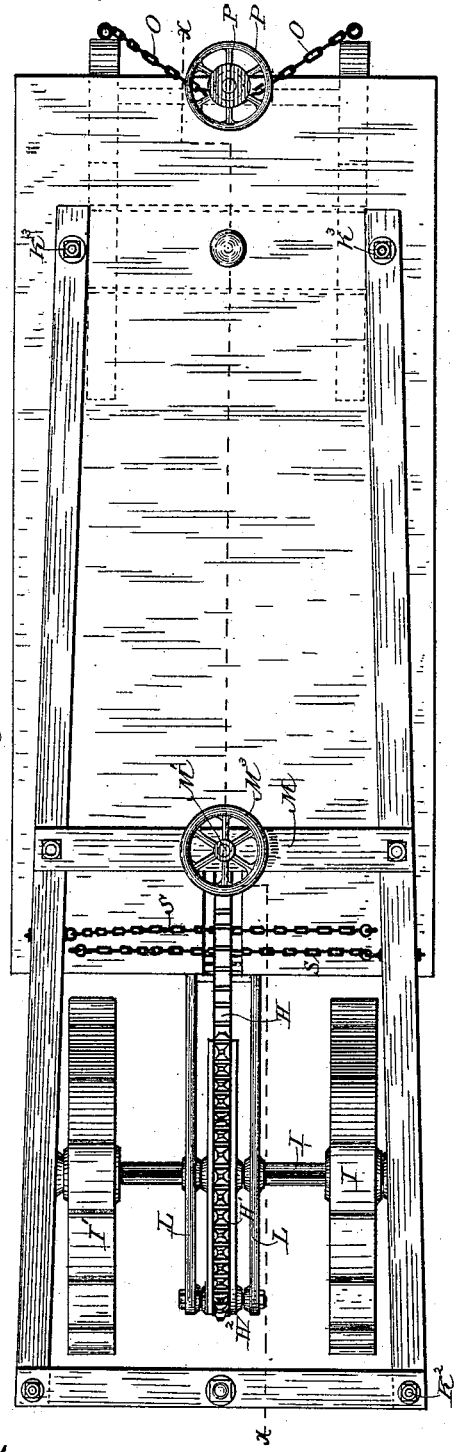
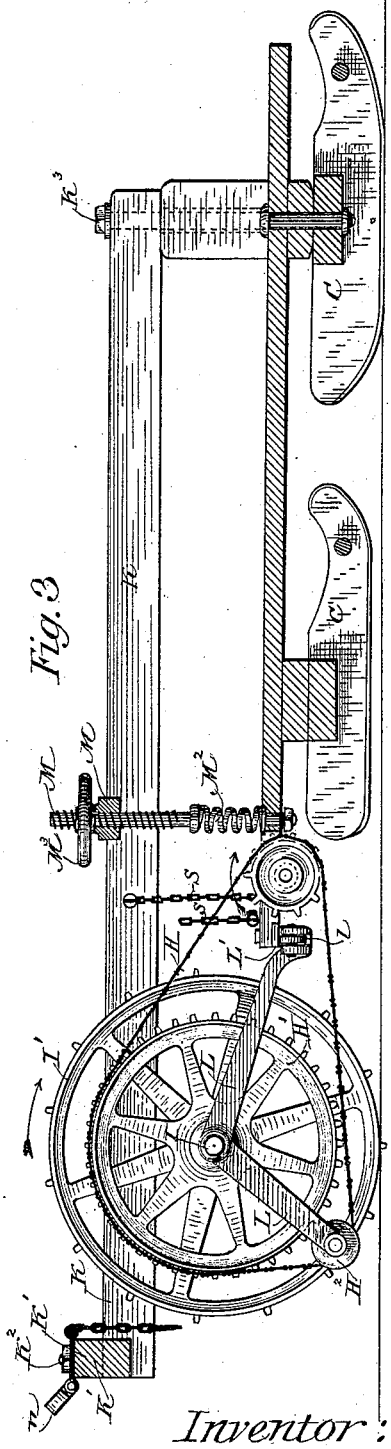


Fig. 3



Witnesses:-
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UNITED STATES PATENT OFFICE.

GEORGE THOMPSON GLOVER, OF CHICAGO, ILLINOIS.

TRACTION-ENGINE.

SPECIFICATION forming part of Letters Patent No. 342,596, dated May 25, 1886.

Application filed July 23, 1885. Serial No. 172,355. (No model.)

To all whom it may concern:

Be it known that I, GEORGE THOMPSON GLOVER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Traction or Road Engines, of which the following is a specification.

My invention, while applicable to traction or road engines generally, is particularly applicable to a traction or road engine adapted for use upon ice roads in the lumber regions as a means for drawing sleds that are heavily loaded with logs.

The objects of my invention are, first, to combine with the engine-truck a propelling attachment operated from the engine by an endless-chain belt, which, when driven in a direction to cause the propelling attachment to advance and push forward the engine-truck, shall also serve as a means for exerting upon the propelling attachment a continuous downward pull or tension in a manner to increase the traction of the same proportionally to the weight and resistance of the loaded engine-truck and the motive force applied to drive the endless-chain belt; secondly, to attain a like result when the chain is driven in a direction to cause the propelling attachment to draw the engine-truck backward; thirdly, to utilize the weight and resistance of one or more sleds or other like vehicles attached to and drawn by the propelling attachment as a means for increasing the traction of the wheels of the latter; fourthly, to permit in the starting up of the engine a limited initial action thereof in advance of the transmission of power therefrom to a driving-shaft employed as a member of a power-transmitting mechanism that is actuated from the engine, whereby the engine may be permitted to get under way before its full power is exerted to drive the power-transmitting mechanism; fifthly, to provide simple and efficient means for preventing the endless-chain belt that is employed to drive the propelling attachment from slipping or working sidewise from off its sprockets; sixthly, to utilize exhaust or waste steam from the engine as a means for melting down rough ice, and for supplying water to form new ice, serving to keep an ice road in constant repair; and, finally, to provide certain novel and improved details tending to promote the general efficiency of the apparatus, as hereinafter set forth.

In carrying out my invention the truck-frame which supports the engine is mounted upon wheels or runners, so that it may be pushed or drawn along the road. The propelling attachment is provided with traction-wheels, and is arranged opposite one end of the engine-truck, its point of location being more desirably in rear of the engine-truck, in which case it is connected with the forward end portion of the engine truck by means of horizontally-arranged arms, that are extended forward from the axle of said traction-wheels, and at their forward ends jointed to the engine-truck. By means of said arms the engine-truck can be pushed forward or drawn back, according to the direction in which the traction-wheels are revolved.

The traction-wheels of the propelling attachment are driven from the engine by means of an endless-chain belt, serving to connect a sprocket upon the engine-truck with a sprocket upon the axle of the said traction-wheels, the sprocket on the engine-truck being included in a power-transmitting device that is driven from the engine. That portion of the chain which passes from the highest portion of the sprocket of the propelling attachment to the highest portion of the sprocket upon the engine-truck inclines downwardly from the former to the latter, this inclination of said portion of the chain being desirably attained by making the sprocket of the propelling attachment the larger of the two and mounting it upon the traction-wheel axle, which is set somewhat higher than the axle of the engine-truck sprocket. Said arrangement permits the chain to exert upon the sprocket of the propelling attachment, and consequently upon the traction-wheels, a downward pull when the chain is driven in a direction to cause the propelling attachment to push the engine-truck forward, in which way the traction of the wheels of the propelling attachment will be increased proportionally to the motive power and the weight and resistance of the engine-truck.

The axle of the propelling attachment car-

ries a tilting support extending both forward from and to the rear of the axle. This support carries at its rear end an idler-pulley, and in front of the axle is provided with one or more rollers. The idler-pulley is situated somewhat below and to the rear of the sprocket of the propelling attachment, and the endless-chain belt, which passes over the sprocket of the propelling attachment, also passes under the idler-pulley, which thereby serves to hold the chain off from the lower portion of the said sprocket. The roller or rollers at the forward end of the aforsaid support bear upwardly against the under side of the engine-platform, so as to limit the extent to which the pulley at the rear end of the support can be drawn down. By such arrangement the chain will exert a downward pull upon the sprocket of the propelling attachment when the chain is driven in a direction to turn the traction-wheels backward. This downward pull serves to increase the traction proportionally to the motive power and the resistance to be overcome at such times as it may be necessary to draw back the engine-truck.

Means are provided for directing a steam jet or jets onto the ice road, so as to melt any rough ice thereon, and also water the road, in order that new ice can be formed, and hence the road kept in constant repair.

Chain attachments are provided between the engine-truck and the arms of the propelling attachments, so as to steady the arms and keep the two sprockets in line, in order to prevent the drive-chain from working off either sprocket. Means are also devised whereby, when the engine is first started up, it shall be allowed a limited extent of action before positively actuating a drawing or power-transmitting mechanism.

In addition to the foregoing, certain devices, hereinafter particularly specified, are provided for adding to the general efficiency of the machine or apparatus—for example, means for permitting a limited extent of rotary play of the traction-wheels independent of the axle, to facilitate turning, and a simple arrangement whereby the distance of the wheels apart can be readily varied.

In the drawings, Figure 1 represents in side elevation an engine-truck carrying an engine, a propelling attachment constructed in accordance with my invention attached to the engine-truck, and the forward bob of a log-sled attached to the said propelling attachment. Fig. 2 is a top plan view of the engine-truck and the propelling attachment. Fig. 3 represents a longitudinal vertical section on the line x x, Fig. 2. Fig. 4 is a sectional detail representing, on a somewhat larger scale, a section taken horizontally through the hub of one of the traction-wheels, and also illustrating an end portion of the axle for the same. Fig. 5 is a section taken through the preceding figure on a vertical plane passing through the axle at a point alongside the hub. Fig. 6 is an enlarged sectional detail, mainly illustrating a counter-shaft provided with a bevel-gear and a sliding worm, with the latter in engagement with a worm-wheel.

The engine car or truck A may be of any desired construction suitable for use upon dirt roads, ice roads, or upon traction-rails, and may be supported either upon wheels or upon sled-runners C, as herein shown. The engine D may also be of any well-known or preferred construction, and is preferably secured to an upright boiler, E, which latter is in turn secured to and supported upon an appropriate platform constructed to provide the floor portion of the truck. The rotary driving-shaft F of the engine is in gear with a power-transmitting mechanism which is carried by the engine-truck, and which serves as a means for driving the endless chain that is employed to operate the traction-propelling attachment. Said power-transmitting mechanism comprises in its organization a rotary counter-shaft, F^2, arranged transversely to and driven from the engine-shaft, and a rotary sprocket-wheel shaft, G, which is provided with a sprocket-wheel, G^2, and driven from the counter-shaft, these said shafts being geared together by means of a bevel-gear, F', on the engine-shaft, engaging a like bevel-gear, F^3, upon the counter-shaft, and a worm-hub, F^4, upon the counter-shaft arranged to engage a worm-wheel, F^5, upon the sprocket-wheel shaft G. The worm-hub or worm-sleeve upon the counter-shaft is keyed thereon, so that while compelled to partake of the rotation of the counter-shaft it shall be susceptible of a sliding end movement thereon. This feature of the machine is designed to play an important part in the starting up of the engine, and will be hereinafter more particularly described. The sprocket-wheel shaft, G, is desirably mounted in bearings on the under side of the platform of the engine-truck, so as to set the sprocket G^2 thereon as low down as may be consistent with the construction of the engine-truck. The object of thus arranging the sprocket upon the engine-truck is to place it in a low-down position relatively to the sprocket-wheel H′ of the traction propelling attachment, which is placed in rear of the engine-truck and driven from the engine by means of the endless chain H, arranged to connect together the two sprockets G^2 and H′.

The traction propelling attachment is constructed with a pair of comparatively high traction-wheels, I′, that are arranged upon the axle I to which the aforesaid sprocket H′ is secured.

The traction propelling attachment is connected with the forward portion of the engine-truck by means of a pair of horizontally-arranged arms, K, which at a point somewhat in advance of their rear ends are connected with the axle of the propelling attachment, and at their forward ends jointed to the engine-truck in a manner to permit them to have a limited extent of both horizontal and vertical swing independently of the engine-truck.

These arms may be connected together at their rear ends by a cross-brace, K′, which, when employed, will be pivoted to the arms by bolts K^2 in a manner to admit of a desirable extent of movement between said arms and the cross-bar at their points of connection.

As a means for attaching the forward ends of the arms to the forward portion of the engine-truck, the arms can be connected to the truck by bolts K^3, which admit of a desirable extent of lateral swing on the part of the arms, and which are themselves susceptible of rocking to some extent so as to permit a certain latitude of up-and-down swing on the part of the arms, it being observed that for such purpose the bolt-holes (one of which is herein shown in dotted lines, Fig. 3, in a bearing for one of the arms) are somewhat larger than the bolts, and that the blocks or bearings upon which the forward ends of the arms are bolted are somewhat rounded off along their top surfaces. The arms, connected together as set forth, provide in effect a horizontal frame resembling a pair of shafts, which, by reason of its bolt or pivot connections, is susceptible of a certain degree of flexure, when it becomes necessary to turn or cause the engine-truck to deviate from a straight course. This arrangement prevents breakage of the parts, as will be evident without further description.

The bearings I^2 for the axle of the propelling attachment are conveniently supported in pedestal-blocks I^3, and the arms K are desirably bolted to the pedestal-blocks, thus providing a simple and reliable connection between the arms and the axle. The bearings I, which are thus supported in the pedestal-blocks, can be rounded at their front and rear sides, so as to permit them to turn or oscillate within the pedestal-blocks, and thus allow the axle to more readily swing round to either side in turning the traction propelling attachment. The sprocket of the traction propelling attachment is considerably larger than the sprocket on the engine-truck, in which way that portion of the chain which passes from the highest point of the sprocket of the propelling attachment to the highest point of the sprocket on the engine-truck inclines downwardly from the former to the latter, preferably at or about an angle of forty-five degrees.

When power is applied from the engine to drive the chain belt H in a direction to propel the traction propelling attachment forward, as indicated by arrows, Fig. 3, and to thereby cause the traction propelling attachment to push ahead the engine-truck, the chain belt will be pulled by the smaller sprocket of the engine-truck forward and downwardly from the upper portion of the higher and larger sprocket of the traction propelling attachment, in which way the pulling force of the chain will be exerted in a direction to draw down the the traction propelling attachment, and cause the traction-wheels thereof to press upon the road with a degree of force proportional to the weight of the loaded engine-truck and the power exerted by the engine to overcome the resistance; hence the requisite traction is attained without heavily weighting the propelling attachment or making the traction-wheels thereof of undesirable size and weight, it being apparent that as soon as power is applied to drive the chain in a direction necessary to propel the traction propelling attachment forward the downward pull exerted by the chain upon the sprocket of said attachment will insure the traction required to prevent the traction-wheels of said propelling attachment from slipping.

As a means for attaining a like result when the power is applied so as to reverse the travel of the chain and back the traction attachment, I provide an idler-pulley, H^2, arranged at the rear end of a support which is hung upon or over the axle I, and adapted to bring the idler-pulley at a point in rear of but somewhat under the sprocket H′ of the traction propelling attachment. The chain belt H passes under this idler-pulley, which latter is maintained in position to hold the chain off from the lower portion of the sprocket H′, as shown in Fig. 3. To insure such position of the idler-pulley, its support is composed of two bent arms, L, supported intermediate of their ends upon the axle at opposite sides of the sprocket, respectively, and bent downwardly from their respective points of support to their ends. This construction of the arms is desirable in order to bring their forward ends under the rear portion of the engine-platform, and to place the idler-pulley, which is mounted on a short axle connecting together the rear ends of the arms, in the aforesaid position relative to the sprocket-wheel. By such arrangement the pulling force of the chain upon the sprocket H′ in backing is, for the greater part, exerted upon and in a direction downwardly from the top and upper rear portion of the said sprocket, so that likewise in this instance the traction of the wheels I′ will be increased proportionally to the weight of the loaded engine-truck (which latter limits the upward swing of the forward ends of the arms) and the motive power which is applied from the engine to move the load. The forward ends of the arms L are coupled together and carry friction-rollers *l l*, which bear against a metal plate, L′, secured to the under side of the rear end of the platform of the engine-truck, by which means, when the engine-truck is turned to either side, any injury which would be incident to a rigid connection between the arms K and the said truck will be avoided. When it is desired to further increase the traction power of the propelling-wheels I′, the load or weight of the engine-truck may be wholly or partially transferred from the rear wheels or runners of the engine-truck by the following means: A bridge or cross beam, M, is secured to the arms K, and is bored through to provide a passage for a threaded rod or screw, M′, having its lower end connected with the rear

end of the engine frame or platform by a spiral spring, M^2, and its upper end provided with a hand-wheel, M^3, which has its hub adapted to form a nut arranged to rest upon the cross-beam. The hub of the hand-wheel is held down on the beam by the weight of the truck, so that by turning the hand-wheel the screw can be raised or lowered, as desired, in which way by raising the screw the weight of the load may be exerted upon the spring, so as to bear upon the arms K, and by them transferred upon the traction-wheels with gradually-increasing force until the power of the spring serves to raise the rear end of the truck and throw the full weight thereof on the traction-wheels.

By arranging the propelling attachment at the rear end of the engine-truck, and extending the arms K back of the axle of the said propelling attachment, the resistance of a loaded sled or of a train of loaded sleds connected in any suitable way with the rear ends of the arms will tend to increase the traction of wheels I′ proportionally to the weight of the load and the angle of the line of draft between the said ends of the arms and the sled that is connected with the same.

As a convenient way of attaching the sled to the arms, a tongue, N, secured to the forward end of the sled, is adjustably connected to the cross-bar K′, which connects the arms of the propelling attachment. Connection may be made between the tongue and the cross-bar by means of a link or staple, *n*, secured to the cross-beam K′, the tongue being inserted through the staple and a pin, *n*′, inserted in one of a line of holes in the tongue, as shown in Fig. 1.

By coupling the rear sled at a greater or less distance from the traction attachment arms the angle of the tongue will be increased or diminished, and the downward tension of the load upon the traction-wheels correspondingly increased or diminished.

When the train is at rest, it is frequently difficult to start the engine under the full resistance of the load, especially when a single cylinder is employed and the piston comes to rest at the end of its stroke.

In order that the engine may be started before the load is brought upon the engine and driving-gear, the worm-hub F^4 is provided with a groove which receives a longitudinal spline or key upon the counter-shaft, so that the worm sleeve or hub may be permitted to slide endwise in either direction thereon to an extent limited by stops or collars *f f*, secured to the counter-shaft at a suitable distance apart. When the engine is started, the worm-hub, met by the resistance of the worm-wheel, will be forced longitudinally along the counter-shaft until arrested by one of the stops, at which juncture its engagement with the worm-wheel will be positive, so that it will then operate the worm-wheel, and hence cause the traction-wheels to be operated so as to move the load.

If desired, the traction-wheels may be capable of a limited rotary play upon and independent of the axle, to which end the axle may have a spline or key, *i*′, to extend through segmental recesses *i* in the hubs of the wheels.

The wheels may be moved longitudinally upon the axle, to be placed more closely together or farther apart, and thus change the gage or tread of the vehicle. To such ends the wheels can be adjusted along the axle, upon which they will be guided by the spline arranged to pass through the hubs, and held at any desired distance apart upon said axle by means of adjustable collars i^2, which fit the axle upon opposite sides of the hubs of the wheels, and are firmly secured in their adjusted position by set-screws i^3, arranged to pass through the collars and bear upon the axle.

The machine may be guided or directed in its course by chains O, secured to the forward ends of the runners and wound spirally around a vertical shaft, P, supported upon the forward end of the truck and provided with a hand-wheel, P′.

When the road has become rough or cut up or slashed by the wheel-tracks, the irregular obstructions may be melted down; or the road can be watered in the first instance, to permit ice to be formed thereon by means of steam-jets directed from a perforated pipe, R, arranged beneath the engine-car and connected by a vertical pipe, R′, with the exhaust-pipe R^2 of the engine. A three-way cock, R^3, arranged at the point of intersection between the pipes R′ and R^2, will allow the exhaust-steam to be directed either through the exhaust-pipe R^2 to the smoke-stack or through the pipe R′ to the perforated pipe R, arranged beneath the engine. In the latter case the steam will melt down the ruts or rougher portions of the roadway to prepare the way to be again covered over with a smooth surface or to supply water to the road to form ice.

The traction-wheel attachment is detachable from the engine truck or sled, and may be applied to any vehicle provided with means for driving the traction-wheels.

The side arms, K, may be coupled or hitched onto any car or vehicle provided with means for operating the traction propelling attachment, and as the load is pushed forward or in advance of the driving-wheels a most effective arrangement is secured for climbing upgrades.

Steady-chains S, arranged over the rear end of the engine-truck, connect the platform of said truck with the said arms K of the traction propelling attachment, and prevent said arms and truck from shifting away from each other. This connection is strong and simple, and, while admitting of the vertical adjustment of the arms, serves to so steady the arms in their connection with the engine-truck as to avoid any tendency of the chain-belt to slip or work sidewise from either one of the sprockets.

What I claim as my invention is—

1. In a traction or road engine, the engine-truck carrying an engine, and provided with the small sprocket G^2, driven from the said engine, in combination with the separate propelling attachment constructed with a pair of traction-wheels, horizontal arms K, extending forward from the axle of said wheels and jointed to the engine-truck, and the larger sprocket H′, mounted between the wheels of the propelling attachment and standing higher than the sprocket G^2 of the engine-truck, substantially as set forth, the two sprockets being connected by a chain belt which inclines downwardly from the upper portion of the propelling attachment to the upper portion of the sprocket of the engine-truck, whereby when the traction-wheels of the propelling attachment are driven, through the medium of the chain and sprockets, in a direction to advance the engine-truck the traction of said traction-wheels shall be increased proportionally to the weight of the engine-truck and the opposition thereof to the forward movement of the propelling attachment.

2. The combination, with the engine-truck carrying a sprocket that is driven from the engine, of a traction propelling attachment provided with a sprocket, H, that is driven by a chain belt from the sprocket of the engine-truck, and an idler-pulley carried by the traction propelling attachment and held in position to hold the chain belt off from the lower portion of the sprocket of the said traction propelling attachment, substantially as described.

3. The combination, with the engine-truck carrying a sprocket that is driven from the engine, of the traction propelling attachment provided with arms L, supported from the axle thereof and supporting in rear of and somewhat under the sprocket H of the propelling attachment an idler-pulley that holds off from the said traction-wheel a chain belt which is employed to connect the latter with the traction-wheel of the engine-truck, said arms being arranged to bear at their forward ends upwardly against some portion of the engine-truck, substantially as described.

4. The combination, with the engine-truck carrying the engine and the traction propelling attachment driven from the engine and arranged in rear of the engine-truck, of the horizontal arms connecting the traction propelling attachment with the forward portion of the engine-truck, an adjusting-screw supported from said arms at a point over the engine-truck, and a spring placed between and connecting the lower end portion of the adjusting-screw with the engine-truck, substantially as described.

5. The combination, with the engine-shaft, of the counter-shaft driven therefrom, a worm keyed to the counter-shaft to rotate therewith, but to slide thereon with an end movement, stops arranged upon the counter-shaft to limit the extent of slide in either direction on the part of said worm, and a worm-wheel engaged and driven by the worm, substantially as described.

6. The combination, with the engine-truck adapted to move upon ice roads, of the steam engine and boiler, the perforated jet-pipe R, arranged below the truck, the steam-pipe R′, connecting the jet-pipe with the exhaust of the engine, and a three-way cock arranged between the steam and exhaust pipe, substantially as and for the purpose described.

7. The combination, with the engine-truck and the appended traction propelling attachment driven by a chain belt from a sprocket upon the engine-truck, of the horizontal arms K, connecting the traction propelling attachment with the forward portion of the engine-truck, and the chains S, arranged to connect the said arms with the engine-truck, substantially and for the purpose described.

8. The combination, with the engine-truck carrying a sprocket, G^2, driven from an engine upon the said truck, of a propelling attachment consisting of a sprocket, H′, and a pair of traction-wheels secured upon an axle, a chain belt, H, connecting the sprocket of the engine-truck with the sprocket of the traction propelling attachment, in the manner described, arms K, connecting the traction propelling attachment with the forward portion of the engine-truck, and an idler-pulley, H^2, supported from the axle of the traction propelling attachment, substantially as set forth, said members being organized for operation as specified.

9. The combination, with the engine and its truck, of the propelling attachment provided with a pair of traction-wheels, I′, and a sprocket arranged upon an axle having a spline, *i*′, which passes through segmental recesses *i* in the hubs of the traction-wheels, substantially as described.

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