

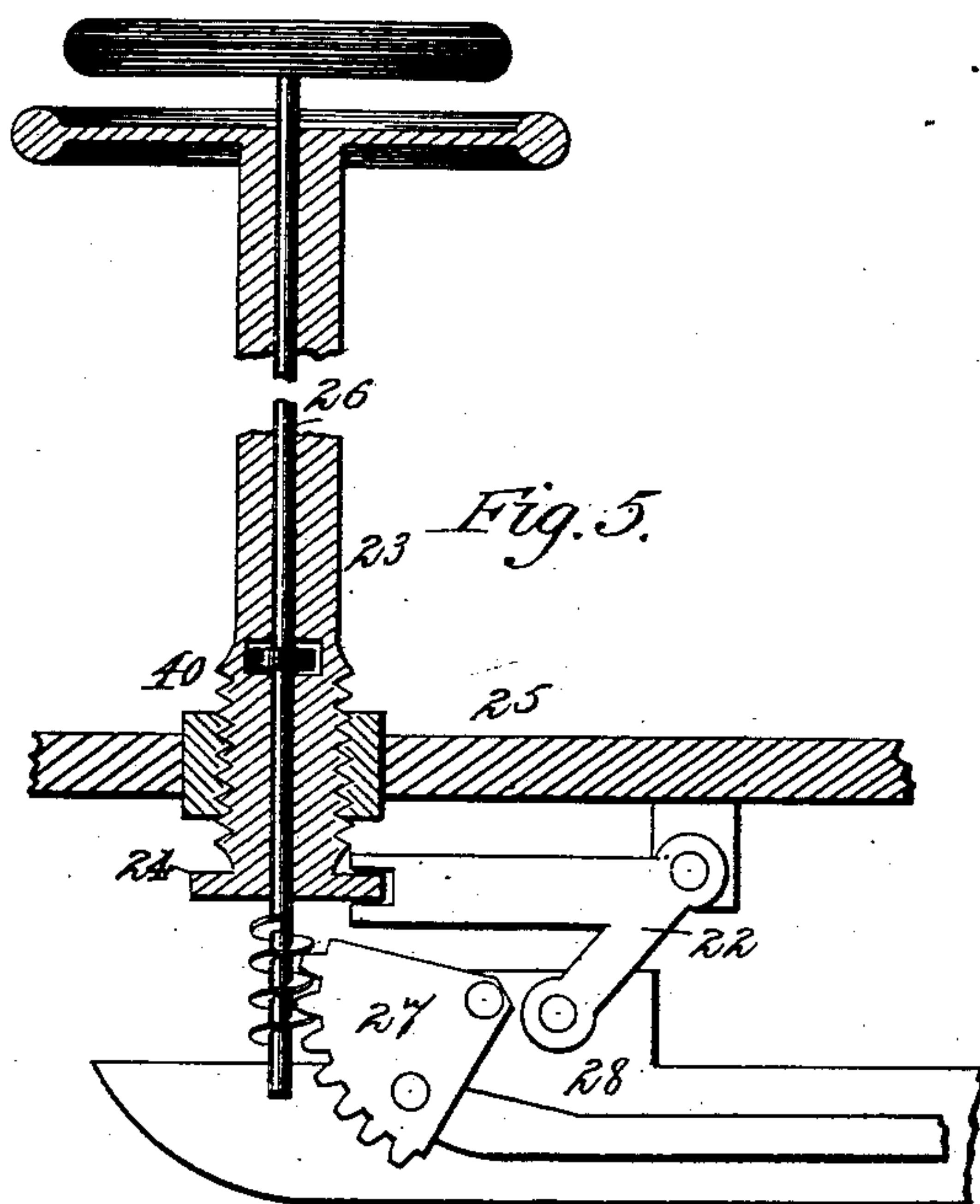
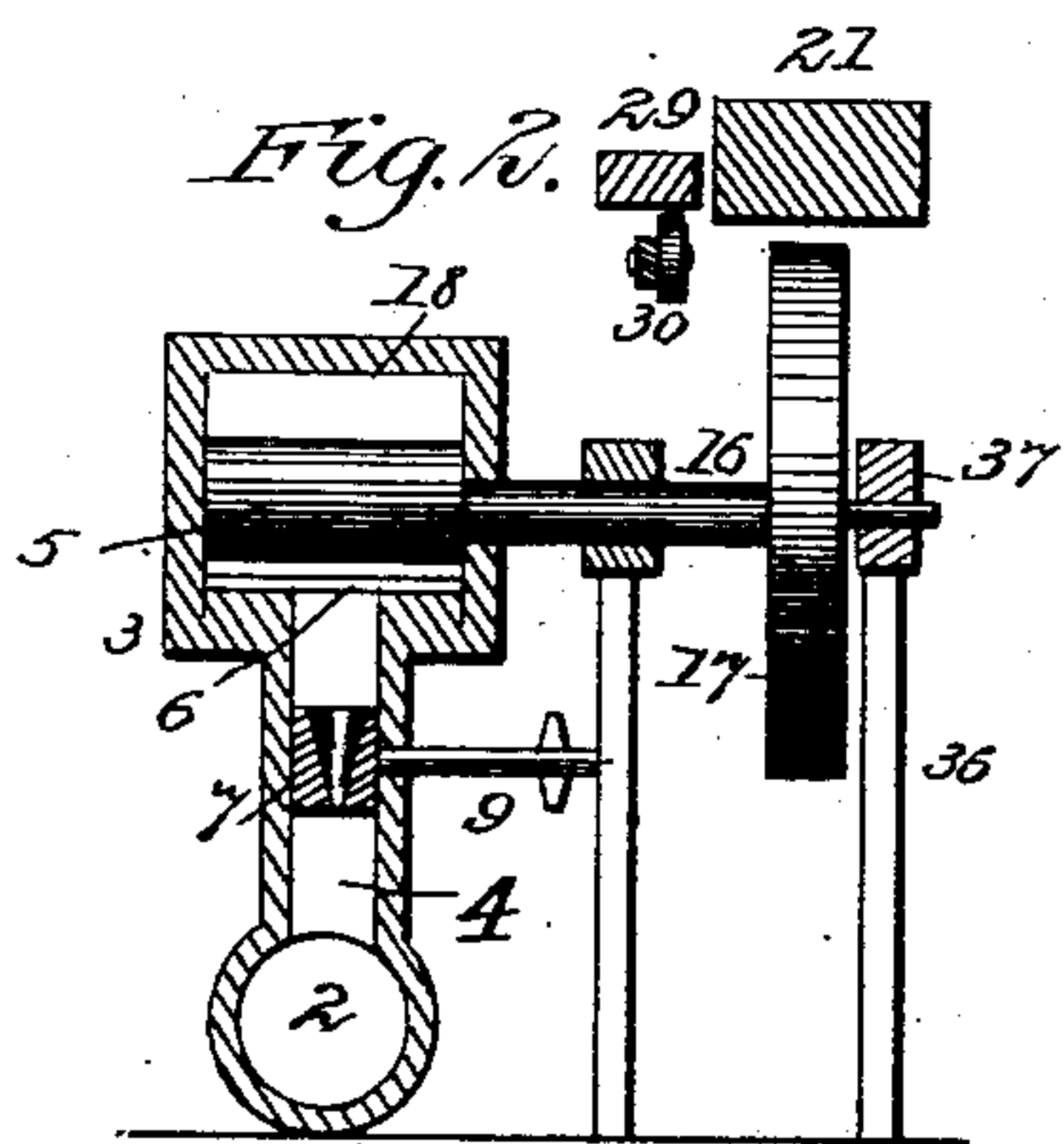
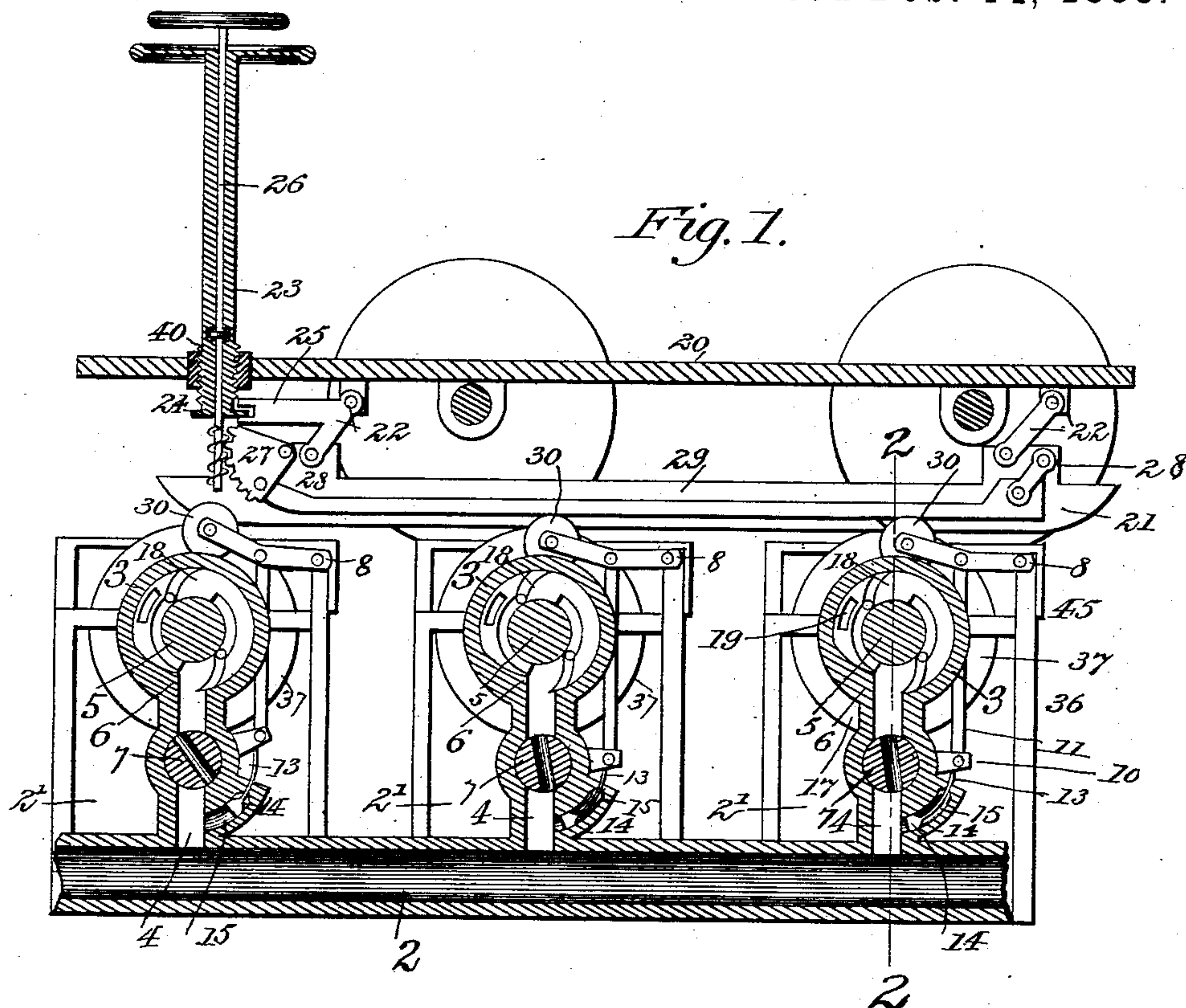
(No Model.)

2 Sheets—Sheet 1.

W. M. ECCLES.
STREET CAR ROAD.

No. 377,930.

Patented Feb. 14, 1888.



Witnesses.

R. J. Gardner,
Edm. O. Ellis.

Inventor.
Wm. M. Eccles,
per J. A. Lehmann,
att'y

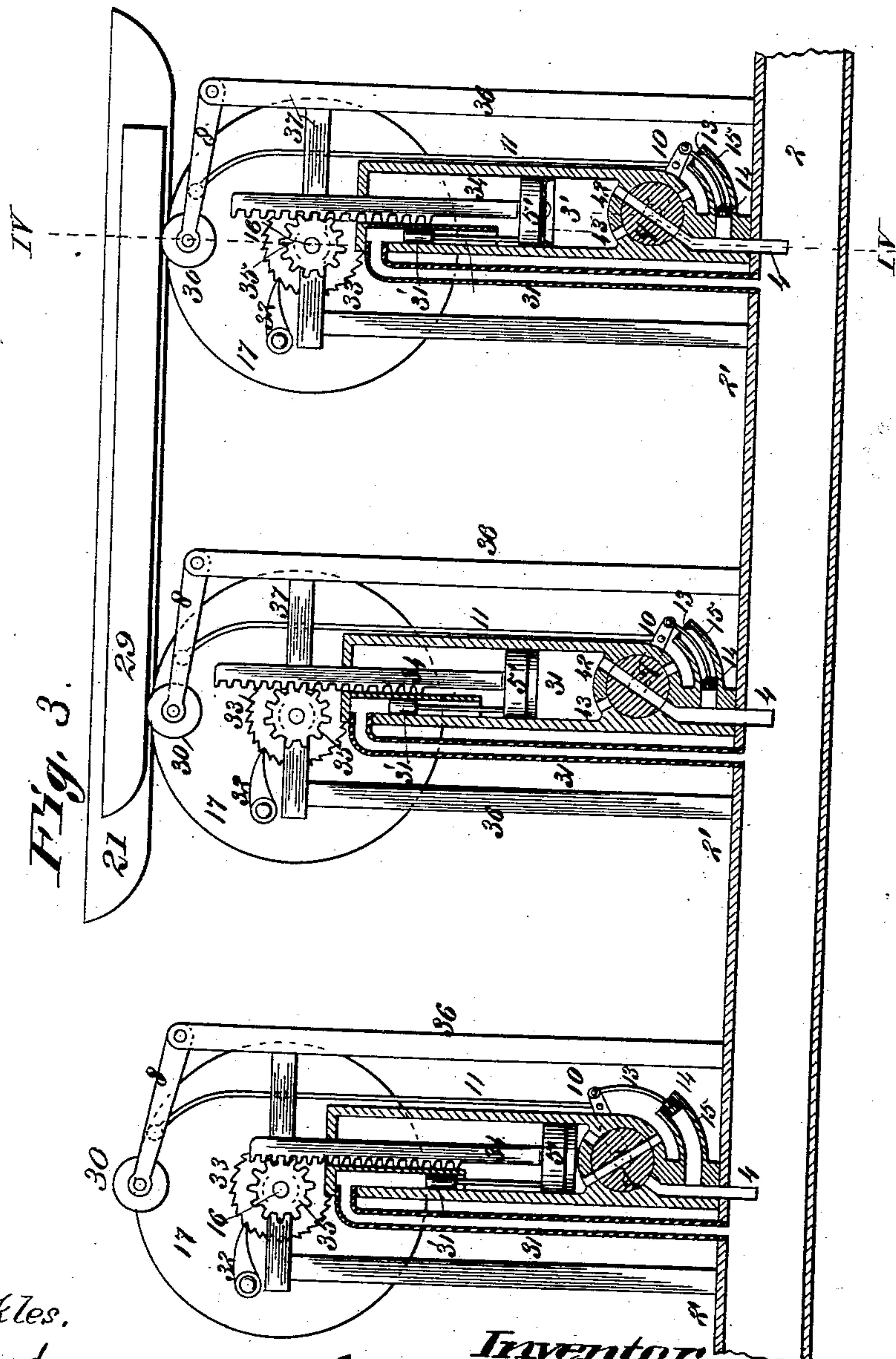
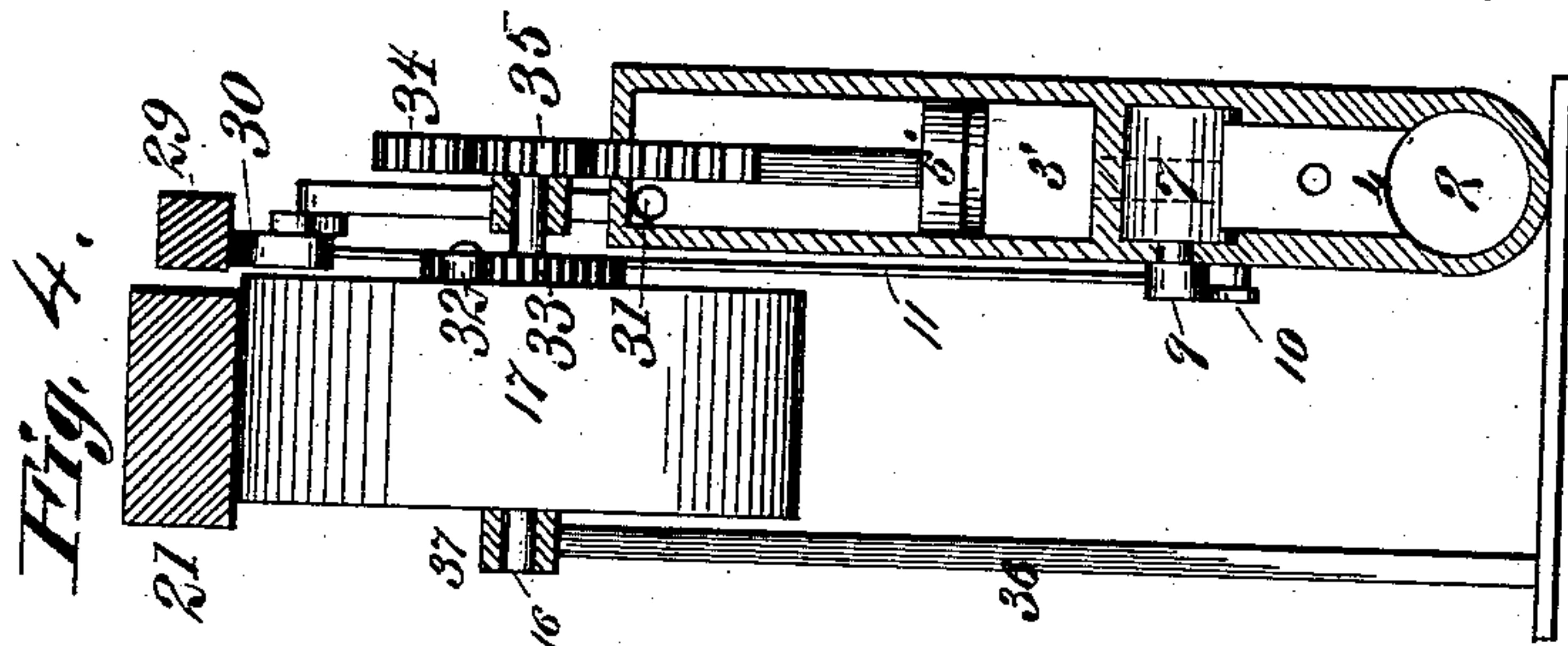
(No Model.)

W. M. ECCLES.
STREET CAR ROAD.

2 Sheets—Sheet 2.

No. 377,930.

Patented Feb. 14, 1888



Attest:
Charles Pickles,
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Inventor,
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UNITED STATES PATENT OFFICE.

WILLIAM M. ECCLES, OF ST. LOUIS, MISSOURI.

STREET-CAR ROAD.

SPECIFICATION forming part of Letters Patent No. 377,930, dated February 14, 1888.

Application filed September 19, 1887. Serial No. 250,142. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM M. ECCLES, a citizen of the United States, residing in the city of St. Louis, in the State of Missouri, have invented a new and useful Street-Car Road, of which the following is a specification.

My invention relates to improvements in street-car roads; and the object of my improvements is to propel street-cars by means of compressed air or steam conducted in a pipe along the bed of the road; and it consists, chiefly, in a series of wheels placed along the road-bed and having their peripheries impinging upon the car to be propelled, the wheels being caused to revolve by the action of steam or compressed air from a pipe in the road-bed, which causes the car to be propelled forward as the wheels revolve. I attain this object by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section of my invention, showing a section of the road. Fig. 2 is a transverse vertical section drawn on the line 2 2, Fig. 1. Fig. 3 is a longitudinal vertical section of a modified form of my invention with the car detached. Fig. 4 is a transverse vertical section drawn on the line 4 4, Fig. 3. Fig. 5 is a view, partly in section, of the device for raising and lowering the shoe 29.

Similar figures refer to similar parts throughout the several views.

Figure 2 is an air-tight pipe laid in the ground at convenient depth along the road-bed of the street-car road, and is supplied from a powerhouse with either compressed air or steam. This pipe is sufficiently large to supply a sufficient quantity of compressed air or steam to the various engines situated along the line of the road at intervals.

2' 2' 2' are small engines situated along the road at short intervals, and each have an inlet-pipe connected with the main pipe, from which they receive their compressed air or steam to operate them. These small engines in Figs. 1 and 2 consist of an outside cylinder or shell, 3, which is provided with an inlet-pipe, 4, which serves to admit the compressed air from the pipe 2 into the cylinder, and also to permanently attach the cylinder to the main pipe 2. This cylinder is made cylindrical on

the inside and fitted to a rotating head, 5. It is also provided on the inside with a shoulder or offset, 6, which projects inward and impinges on the outside periphery of the rotating head 5, which forms a base or shoulder for the air-pressure, so when the compressed air is admitted it will cause the rotating head to revolve. This cylinder or shell 3 is provided, between it and the main pipe, with a graduated valve, 7, which is incased in the body of the inlet-pipe 4. This valve is an ordinary round valve with an orifice passing through its center transversely, which meets at one side an opening in the inlet-pipe and at the other an opening leading into the interior of the cylinder, so that when the valve is fully turned on there is an uninterrupted passage for compressed air into the interior, and when only partly turned on there is only a partial passage for compressed air into the interior of the cylinder. This valve is tightened by the ordinary screw in its end, as seen at Fig. 4, and is operated by the lever 8. This valve is provided with a stem, 9, Figs. 2 and 4, to which is attached a crank, 10. This crank is connected to the lever 8 by an ordinary connecting-rod, 11, and when the lever 8 is pressed down the connecting-rod shoves the crank down and turns the valve on just in proportion as the lever is pressed down. To the end of this lever is attached a friction-roller, 30, which is pressed down by an elongated movable shoe, 29, situated under the bottom of the car, as the car passes. At the end of this crank 10 is also attached a piston-rod, 13, which communicates with a piston-head valve, 14, in the cylindrical tube 15. This piston-head valve fits air-tight in the cylindrical tube 15, which communicates with the main tube 2, and has a valve ground on its back surface to fit in a V-shaped seat made on the inside and at the end of the cylindrical tube 15. (See Fig. 3.) This piston-head valve serves the purpose of closing the valve 7 after it has been thrown open by the action of the air in tube 15, and of preventing the possible escape of compressed air after the valve has been closed by the piston-head valve falling back on the seat in the cylindrical tube 15. The rotating head 5 is attached to one end of a shaft, 16, Fig. 2, and a wheel or drum, 17,

is attached to the other end, both in a permanent manner, so that when the rotating head revolves it will revolve the wheel or drum 17. This rotating head 5 is an ordinary cylinder made to fit closely and rotate in the cylinder or shell 3. It is provided with wings 18 18, which are hinged at one side to the periphery of the rotating head 5, and the other side impinges upon the inside of the shell 3 as the head revolves. These wings serve to catch the compressed air and, as the air presses upon them, to cause the rotating head 5 to revolve from right to left, thus causing the wheel or drum 17 to revolve when the compressed air is let into the cylinder or shell 3. The cylinder or shell 3 is also provided with escape-holes 19 19 19, through which the used air or steam escapes to the open air. Thus it is obvious from the above description that if the main pipe 2 is full of compressed air or steam the wheel or drum 17 will revolve when the lever 8 is pressed down and the valve 7 opened, and with force in proportion to the amount of air or steam let on.

20 is the body of a common street-car, which is provided with an adjustable elongated shoe, 21, attached to its under side. The undersurface of this shoe may be plain or corrugated to engage corrugations in the wheels 17; or they may both be provided with cogs; but for light cars and where each car is provided with a shoe, and whole trains are not to be drawn by one car, the plain surface on drum and shoe, as shown in the drawings, will be sufficient. This shoe is straight on the under side and turned up at the ends. This shoe is swung on movable pendants 22 22', of equal lengths, hinged in the shoe at their lower ends and to the car at their upper ends, operating to allow the shoe to move through a succession of plains as it moves up and down. This shoe is operated by an upright stem, 23, with a hand-wheel or lever at the top and a screw at the lower portion, where it passes through the body of the car. The thread of the screw at the bottom of the stem engages a female thread made fast to the body of the car. The stem at the bottom is provided with a projecting shoulder or rim, 24, which moves between two jaws in the end of the lever 25. This lever 25 is a part of the pendant 22, so that when the jaws of the lever 25 are moved upward by the revolution of the stem 23 the shoe 21 will be elevated in all of its parts alike and lifted from the wheels or drums 17 17. This stem 23 is hollow, and through it from end to end passes another stem, 26, which is also provided with a hand wheel or lever at its top and a screw-thread at its bottom. This stem is also provided with a shoulder or projecting ring, 40, which works in a groove in the inside of the hollow stem 23, adapted so as to allow the stem 26 to turn around in the hollow stem 23, but not move up or down in it, but to move up and down with the stem 23. The thread at the bottom of this stem 26 engages cogs or threads in the

end of a lever, 27, which is made fast to and is a part of a pendant, 28. This pendant 28 has a mate, 28', of equal length. One end of each is hinged in the upper part of the shoe 21, and the lower end of each is hinged in the elongated shoe 29, which is a long bar straight and smooth on its lower surface, except at its front end, where it turns up in a curve, so as to run on top of the friction-rollers 30 30 30 and compress them when the shoe is lowered. When the stem 26 is turned in one direction, the shoe 29 is lowered equally throughout its entire length, and is pressed down upon the friction-rollers 30 30 30, which in turn open the valve 7 and let the steam or compressed air into the chest 3 and start the wheels 17 17 to revolving and propel the car forward. If the operator wishes to stop the car or move it slower, he has but to turn the stem 26 in the opposite direction and raise the shoe slightly and partially close the valve 7, and the car will move slower or stop, as the compressed air is wholly or partially shut off, or he can turn the handle of the stem 23, and thus raise or lower both shoes at once, as he desires, with like effect.

The modified form of my invention, as shown at Figs. 3 and 4, consists only in substituting a piston-head, 5', for the rotating head 5, a piston-chest, 3', for the cylinder or shell 3, adding a piston-rod with cogs made to engage a spur-wheel on the shaft 16, whereby the power is communicated to the wheel 17, also by adding a pressure-tube, 31, adapted to force the piston back in place when its force is spent and the shoe 29 has released the lever 8 and a common pawl and ratchet-wheel, 32 and 33, respectively.

3' is the piston-chest, which is connected to the main pipe 2 by the inlet-pipe 4. It is cylindrical in shape and incases a piston, 5'. It is provided at the bottom with two orifices—one an inlet-hole, 42, and the other an outlet-hole, 43. Also on a line with the hole in the valve from the outlet-hole is another hole communicating with the outside, so that when the valve is thrown back, as seen in the left-hand engine of Fig. 3, the two outlet-holes, with the hole in the valve, form a continuous passage for the escape of the compressed air from the piston-chest 3' when the car has passed or the shoe 29 has been lifted from the wheel 30. This piston-chest is also provided with a press-tube, 31, which is a small tube running from the main tube 2 and entering the top of the piston-chest 3', and bending down into the piston-chest and having that part in the piston-chest provided with a small piston-head, 31', which is connected with the top of the large piston-head 5' by a small piston-rod, and operates to admit compressed air to press the piston back into position when the valve 7 is thrown back, as seen in left-hand engine, Fig. 3. The piston-head 5' fits closely in the interior of the piston-chest 3', and is packed with a saucer-shaped piece of leather, which presses

against the walls of the chest when the compressed air is let into the piston-chest through the valve 7. This piston-head is supplied with a piston-rod, 34, which passes through the top of the chest 3'. This piston-rod is supplied with cogs, which engage cogs in the cogged wheel 35, which is permanently fastened on the end of the shaft 16. To this shaft is permanently attached a ratchet-wheel, 33, and next to this ratchet-wheel is hung the wheel 17, so that it will revolve on the shaft. To this wheel is attached a pawl, 32, which engages the ratchet-wheel 33.

The uprights 36 36 and cross-pieces 37 37 constitute the frame-work which supports the machinery, and 45 is an ordinary cap or covering for each engine. Now, when the lever 8 is pressed down by the action of the shoe 29 on the wheel 30, the compressed air is admitted into the chest 3', and the piston is forced up, the cogs on the piston-rod will engage the cogs on the spur-wheel and cause it to revolve, which in turn causes the ratchet-wheel to revolve, and it engages the pawl 32, which causes the wheel or drum 17 to revolve, which engages the shoe 21 when it is pressed down upon it by the operator, and thus propels the car along the track until the car has passed over and onto the next wheel, or until the shoe 29 releases the wheel 30, and by the action of the compressed air on the piston-head valve the valve 7 is thrown back and shut, as seen in the left-hand engine in Fig. 3, and an outlet made for the compressed air through the outlet-holes. When this is done, the pressure of the air from the small press-tube 31 on the top of the piston-head 31' causes the piston-head 5' to be thrown back in position at the bottom of the chest, thus placing it in position for another action.

The engines 2' 2' 2' are situated along the entire track at proper intervals to always engage the car at some point. From the foregoing part of this specification it is obvious that a car can be operated at any desired speed; that the road can cross and recross other roads or itself without hinderance; that the road can be run with less loss of power, there being little or no friction; that it is perfectly noiseless, all the machinery being underground; that it will be no impediment to travel over the street where it is placed, there being nothing protruding above the surface but a small part of the periphery of the wheels 17 and wheels 30, which can be stepped upon without injury to the animal or to the road or run upon by a wagon with like effect.

Now, what I claim, and for which I ask Letters Patent of the United States to be granted to me, is—

1. A street-car road having a series of wheels in the road-bed, a continuous steam or compressed-air tube along the line of the road, and a series of suitable engines automatically operated, whereby the wheels are caused to revolve and the car propelled.

2. In a street-car road, a series of wheels situated in the road-bed and operated upon by compressed air or steam from a continuous air or steam tube operating to cause the wheels to revolve and to propel cars, substantially as above described.

3. A shoe running laterally along the bottom of the car and attached thereto by movable parallel arms set at an acute angle with the bottom of the car, in combination with an upright stem passing through the frame-work of the car and having screw-threads engaging female threads in the frame-work; and a ring at its lower end and a hand wheel or crank at the top, said ring engaging lips in one of the parallel arms, whereby the shoe is elevated or depressed upon the wheels in the road-bed and the car is propelled along the track.

4. In a street-car road, a shoe running laterally along the bottom of the car and attached thereto and adapted to be raised from or depressed upon wheels in the road-bed, in combination with another elongated shoe running laterally along the bottom of the car and adapted to move up and down in parallel planes with the bottom of the car and adapted to open valves along the compressed-air or steam pipe, all operating to cause the steam or compressed air to act on the rotating head and cause the wheels to revolve, and at the same time to impinge the shoe upon the revolving wheels and cause the car to move along the track, substantially as described.

5. In a street-car road, a series of outlet-valves placed along the main air or steam pipe and communicating therewith, in combination with an elongated shoe attached underneath the bottom of a car and moving along with the car, and adapted to be moved up and down through successive parallel planes with the bottom of the car equally throughout its entire length, so as to press uniformly on the arms of the valves as the car moves along, operating to open the valves in proportion as the shoe is depressed and the car is passing and allow the valves to close when the car has passed.

6. In a street-car road, a cylinder communicating with a main compressed-air tube and receiving compressed air or steam therefrom, and incasing a rotating head and provided with an escape-hole for the escape of compressed air, in combination with a wheel or drum impinging upon a shoe attached to a car, operating to move the car along the track by the action of the compressed air in the main tube pressing upon the rotating head in the cylinder.

7. In a street-car road, the combination of a stem having a screw on the end engaging a female thread in the body of a car and a projecting ring or shoulder engaging jaws of a lever, in combination with a shoe attached to a car by pendent arms, said stem, when turned, operating to raise the shoe or lower the same equally in all its parts from end to end.

8. In a street-car road, the combination of

an upright stem situated inside of a like stem,
and provided at the lower end with a screw
and in the body of the stem with a flange or
projecting ring engaging a groove in the out-
5 side stem and adapted to turn in the outside
stem, but not move up or down, in combina-
tion with an adjustable shoe running along
the car longitudinally and attached thereto,

all operating to raise and lower the shoe
equally in all its parts from end to end. 10

In witness whereof I have hereunto set my
hand on this 15th day of September, 1887.

WM. M. ECCLES.

Attest:

WALTER C. CARR,

W. C. CARR, Jr.