

No. 633,157.

Patented Sept. 19, 1899.

F. H. RICHARDS.  
MOTOR VEHICLE.

(Application filed Oct. 30, 1897.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.

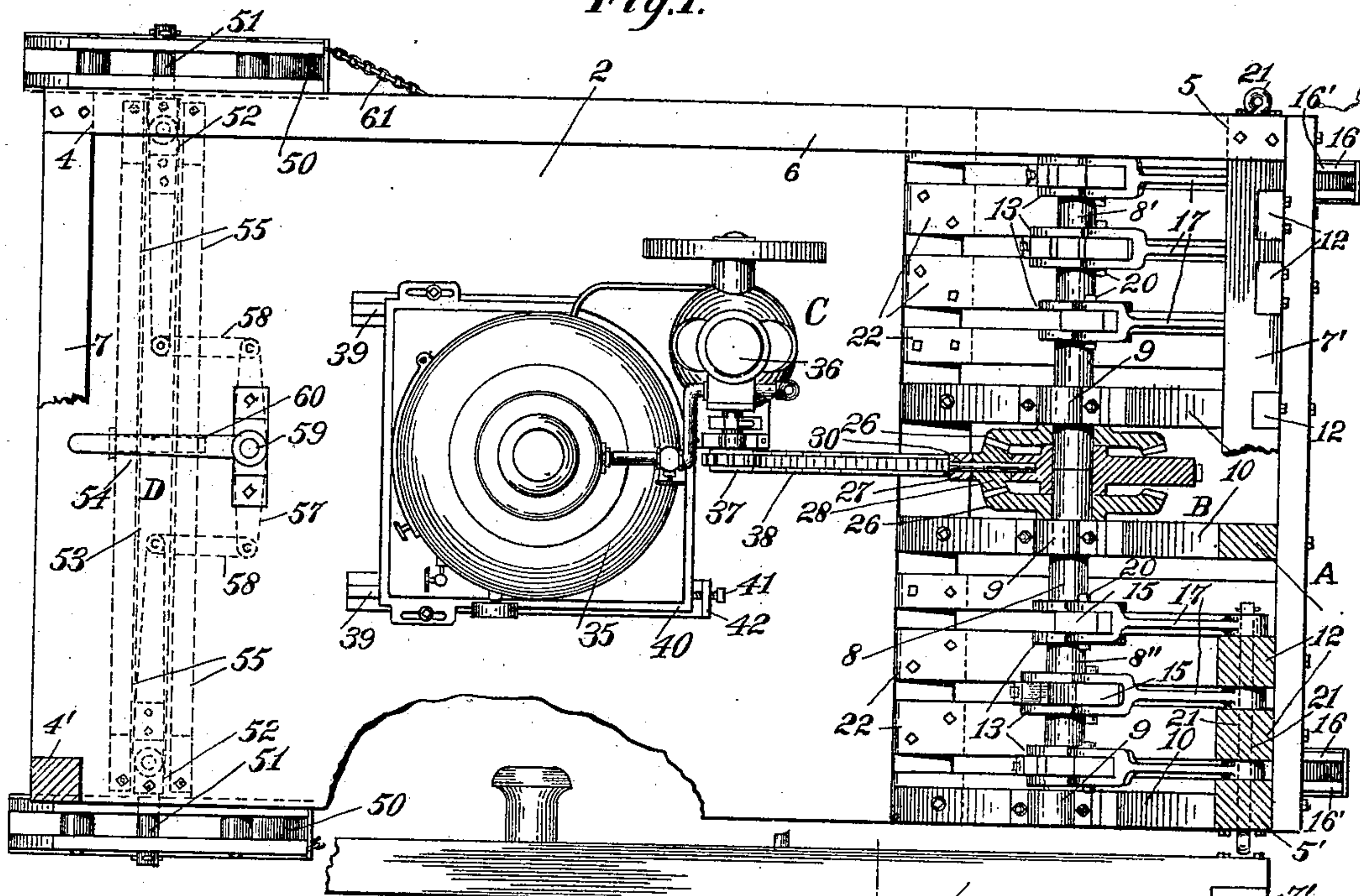
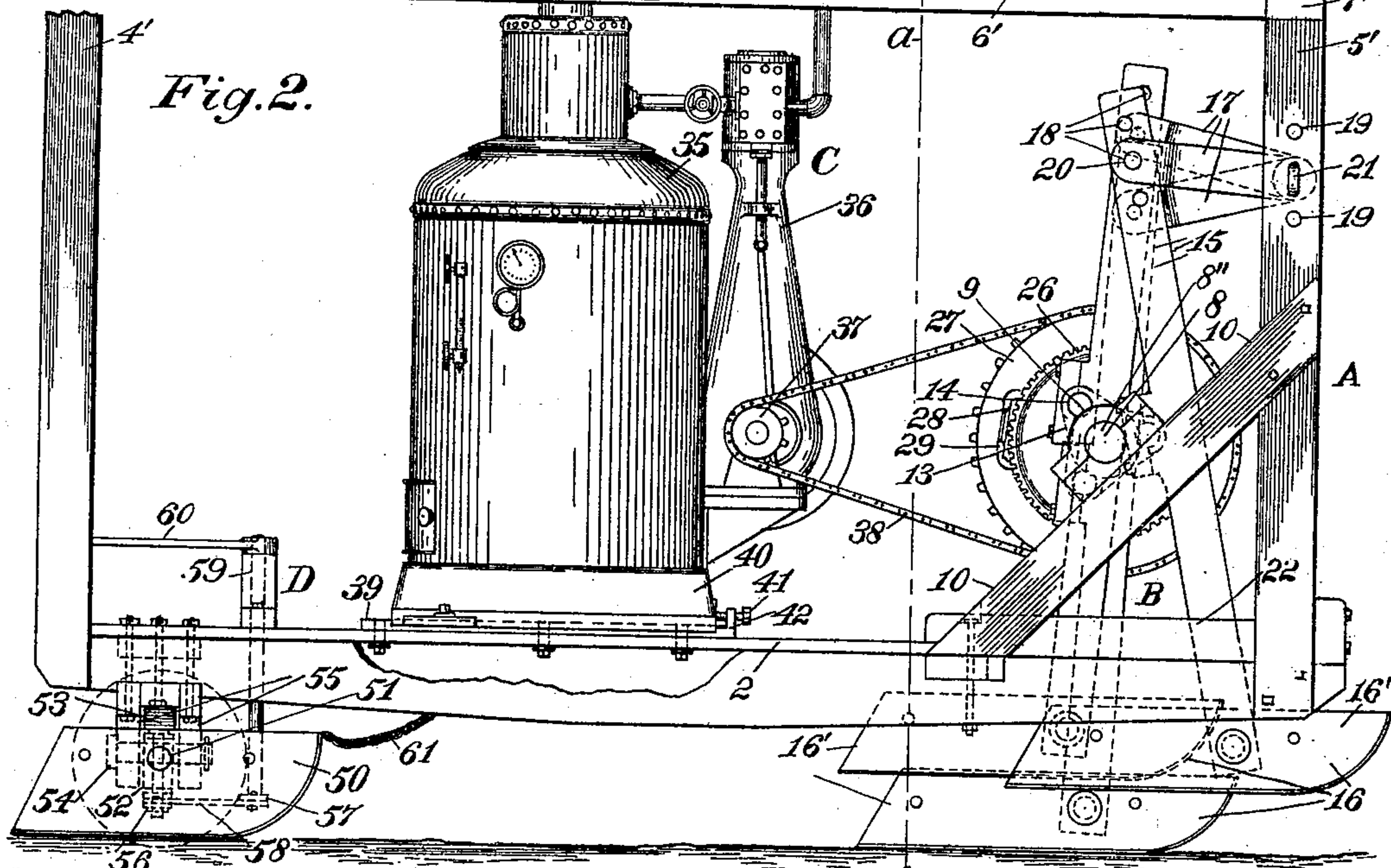


Fig. 2.



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3 Sheets—Sheet 2.

Fig. 4.

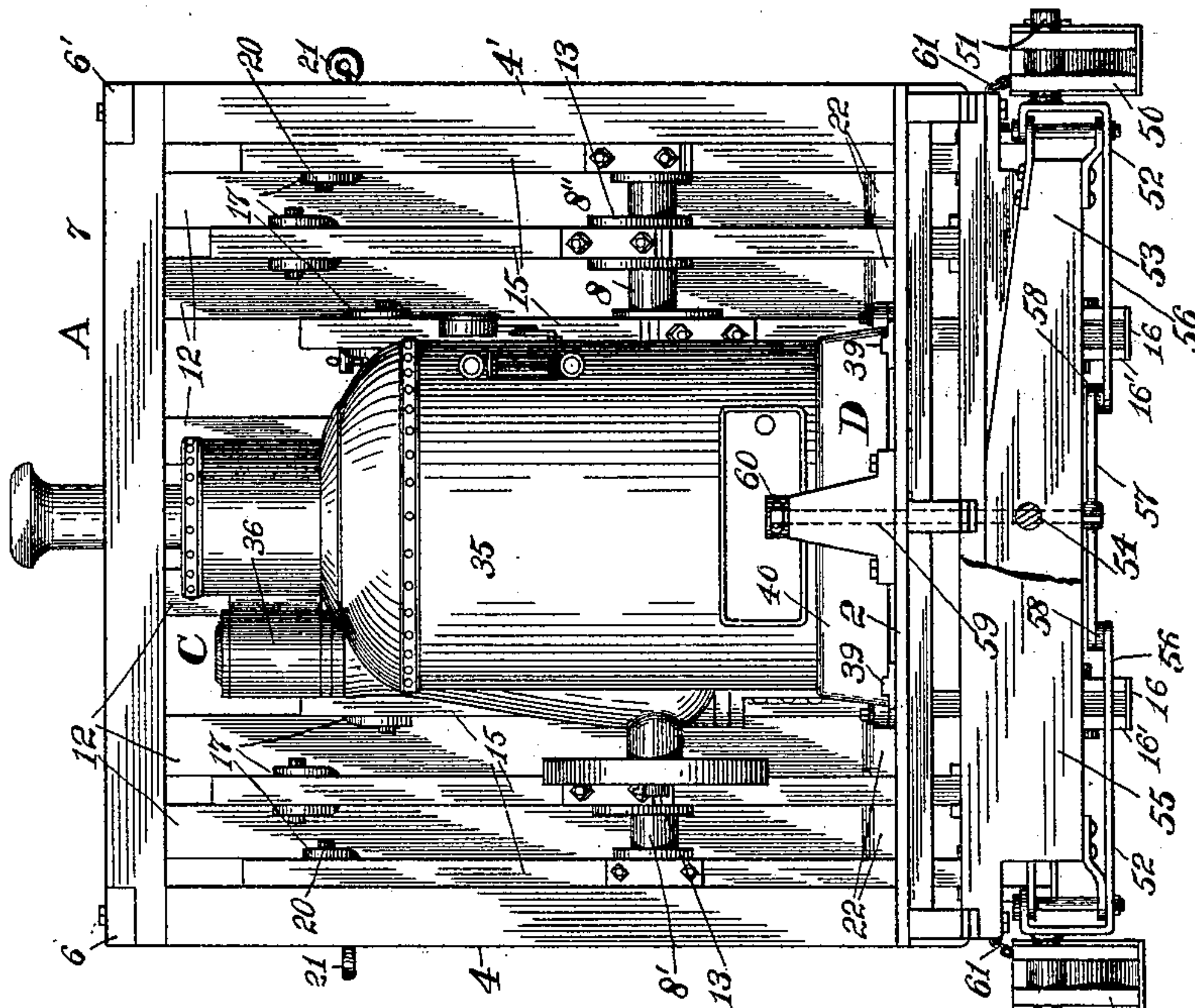
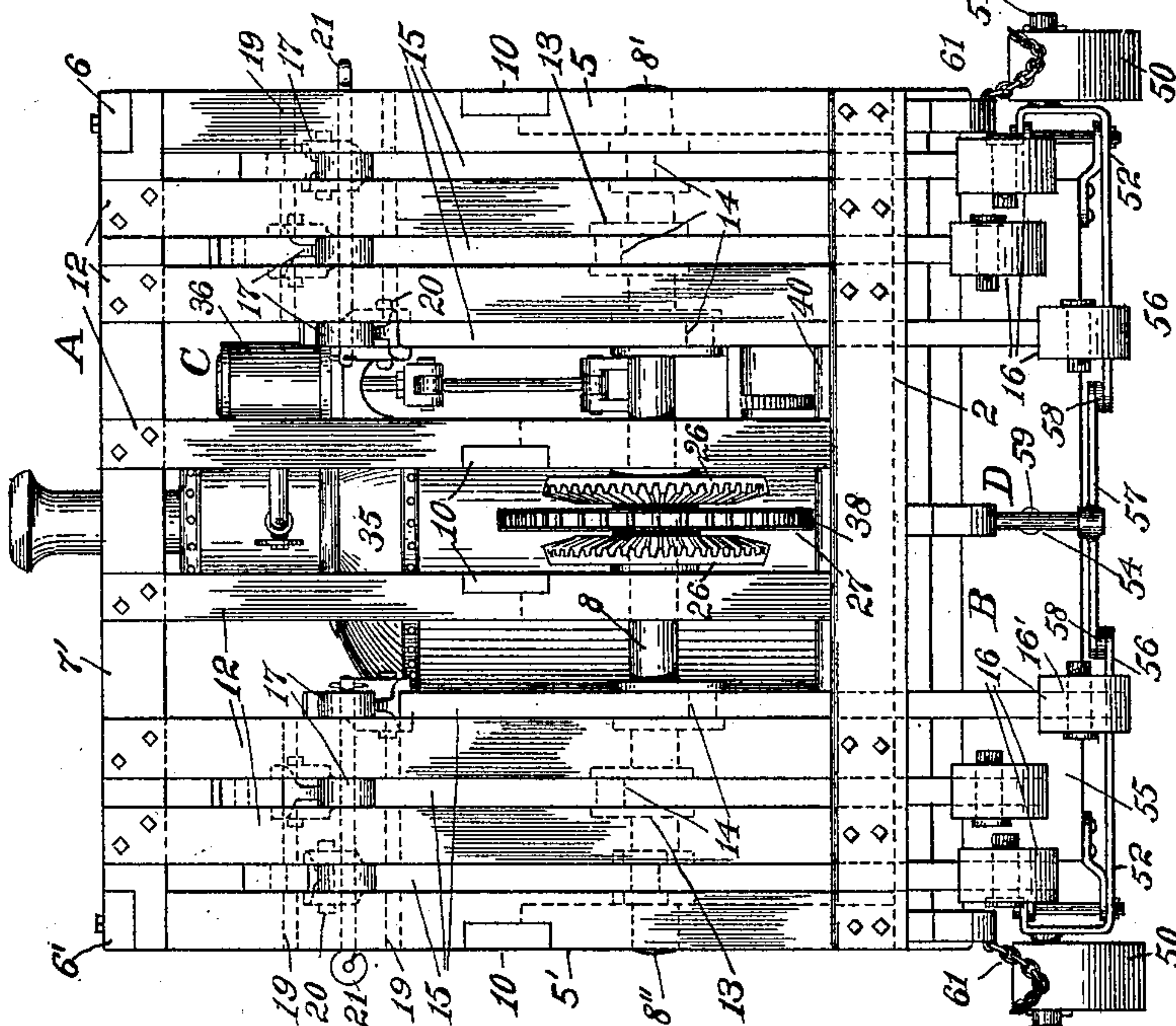


Fig. 3.



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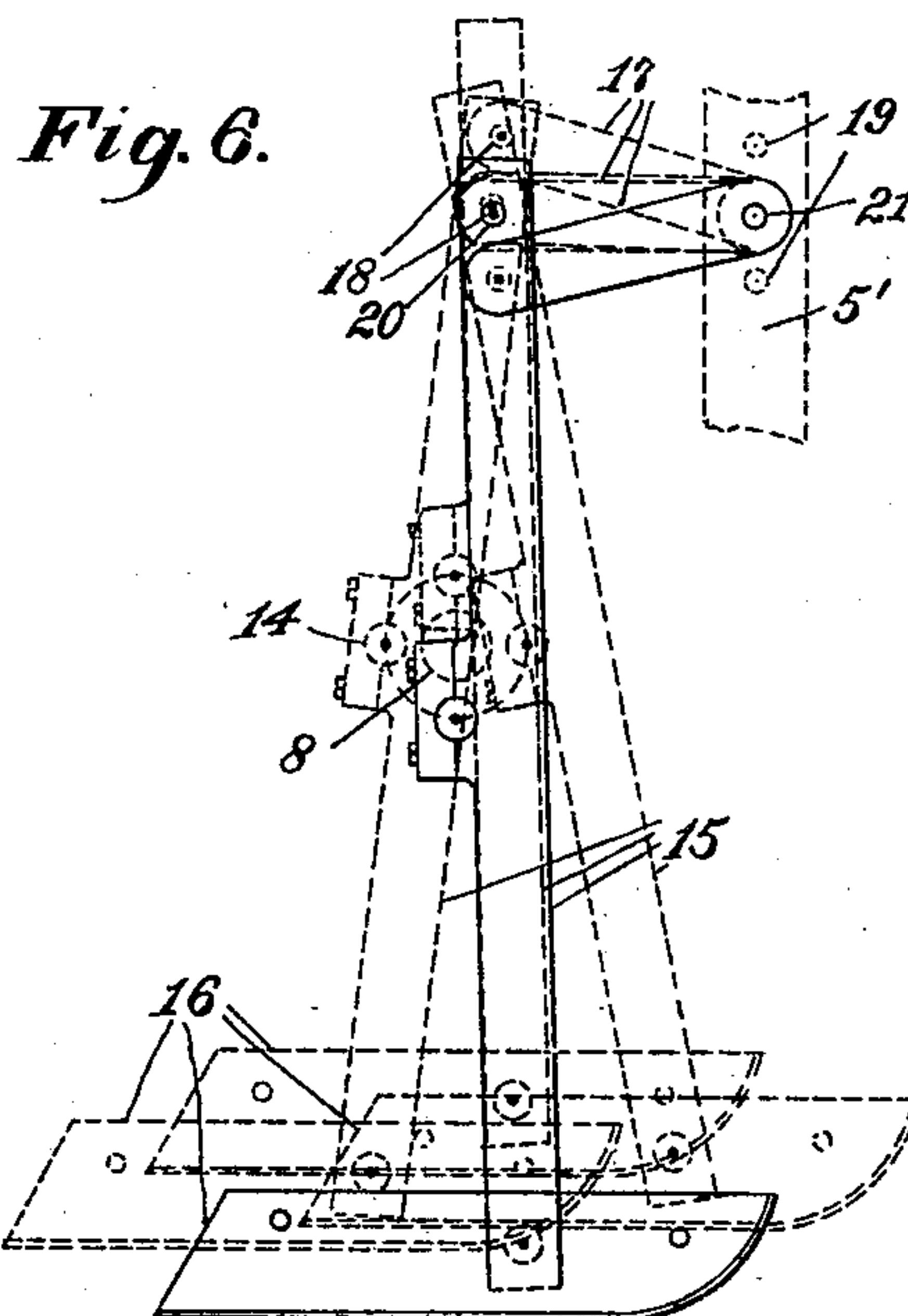
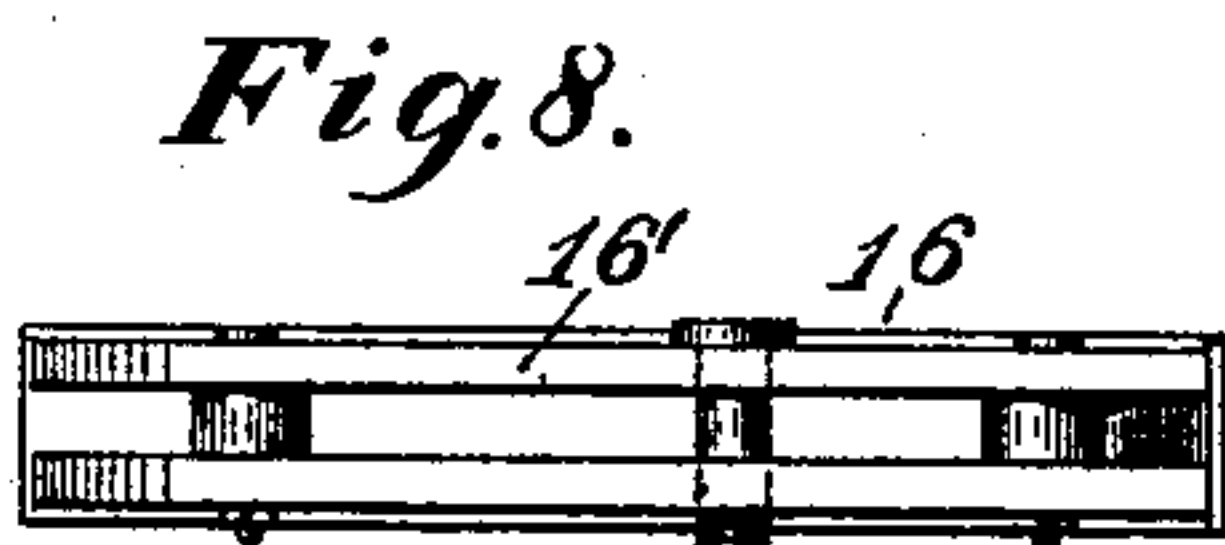
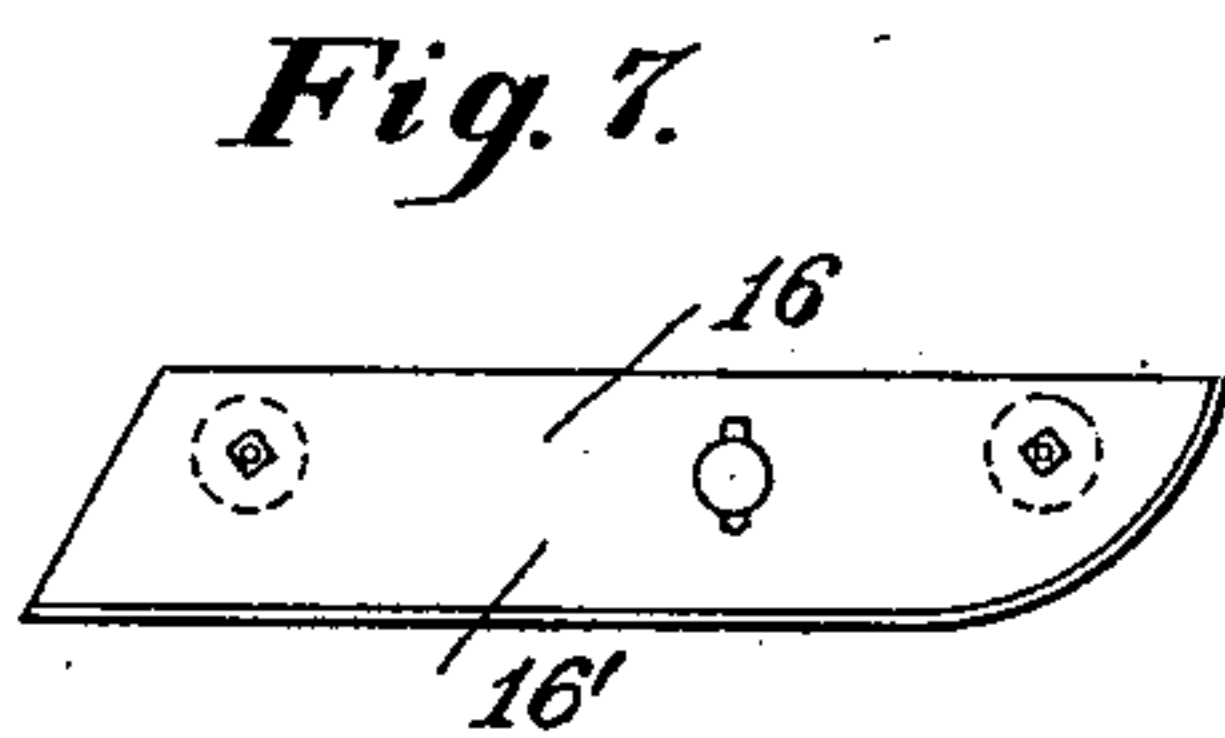
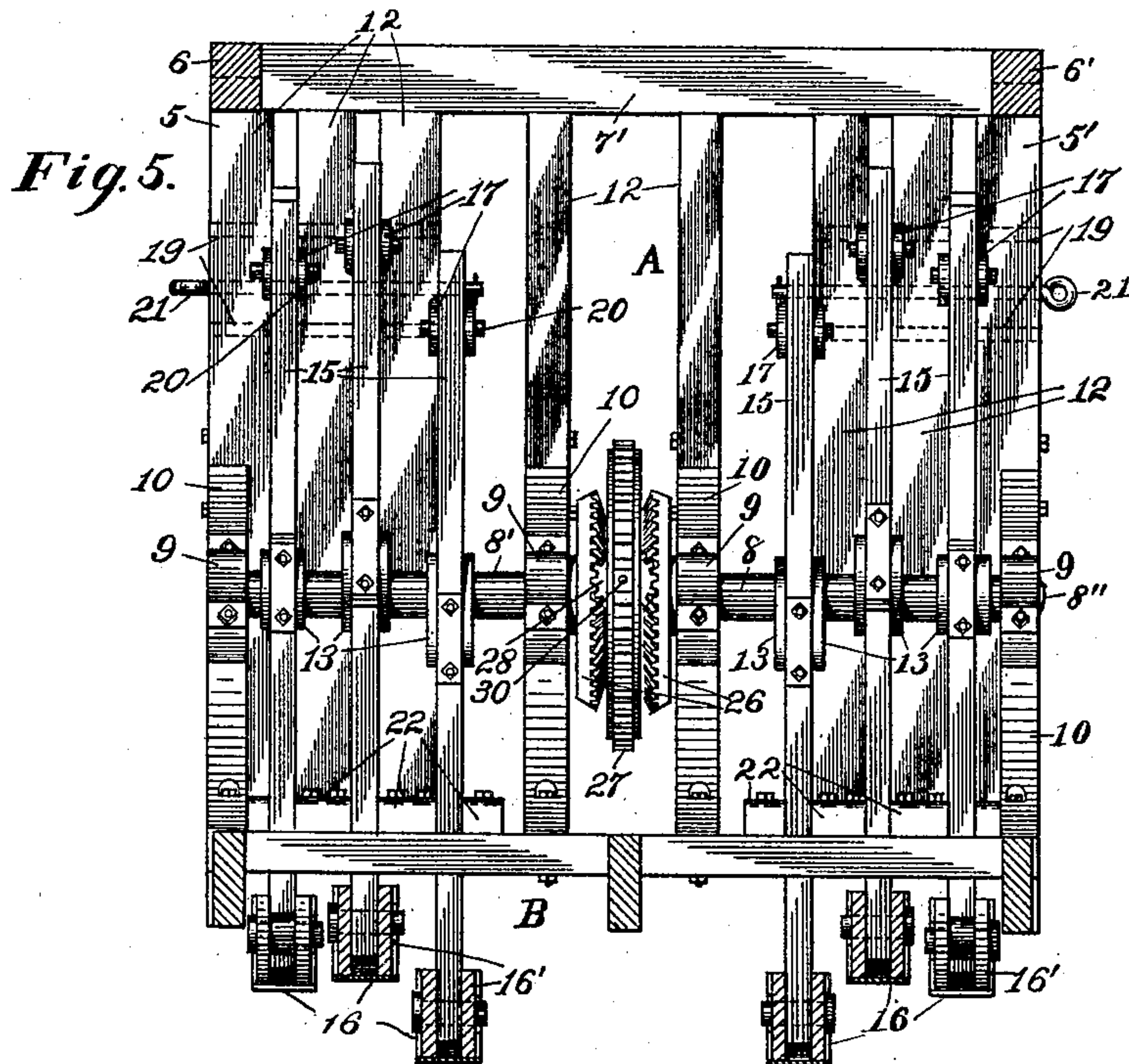
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**3 Sheets—Sheet 3.**



*Witnesses.*

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# UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

## MOTOR-VEHICLE.

SPECIFICATION forming part of Letters Patent No. 633,157, dated September 19, 1899.

Application filed October 30, 1897. Serial No. 656,927. (No model.)

*To all whom it may concern:*

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Motor-Vehicles, of which the following is a specification.

This invention relates to motor-vehicles, and more particularly to that class of vehicles which are especially designed for use on ice and snow and on rough and uneven roads.

A leading object of the invention is to furnish an effective propelling apparatus of this character not requiring the use of driving-wheels for obtaining the traction and adapted to be driven by a motor carried on the vehicle.

A further object of the invention is to provide a motor-vehicle simple in its construction and operation and one which can be produced quickly and easily at a comparatively small cost of material, time, labor, and expense.

In the drawings accompanying and forming part of this specification, Figure 1 is a plan view of a motor-vehicle embodying my present improvements with parts thereof broken away and in section, the rear part of said vehicle being shown herein as supported either by runners or wheels, the latter being shown in dotted lines. Fig. 2 is a side elevation thereof with parts of the vehicle-body also broken away. Fig. 3 is an end or front elevation looking toward the left in Figs. 1 and 2. Fig. 4 is an end or rear elevation looking toward the right in Figs. 1 and 2. Fig. 5 is a transverse sectional view taken in line *a a*, Fig. 2, and looking toward the right in said figure. Fig. 6 is a diagrammatic view illustrating the operation of one of the drivers, and Figs. 7 and 8 are side and top views, respectively, of one part of said drivers or propellers.

Similar characters of reference designate corresponding parts in all the figures of the drawings.

In the structure illustrated in the drawings this improved motor-vehicle is shown organized for use as a sled or sledge, it being provided with supporting runners instead of driving-wheels; but it will be understood that wheels could be used for supporting or carry-

ing one part of the vehicle, if desired, in connection with this improved driving mechanism for propelling such vehicle.

In a general way this improved motor-vehicle comprises framework forming the body portion thereof, (designated in a general way by A,) driving mechanism therefor (designated in a general way by B,) shown herein comprising a series of drivers or propellers embodying runners having traversing and lifting movements or movements in elliptical paths, means such as motor mechanism (designated in a general way by C) for imparting motion to said driving mechanism, and means (designated in a general way by D) for guiding or steering the vehicle, and which in the present construction also constitutes the means for supporting or carrying one part of said vehicle. I desire to state that since the drivers not only have traversing movements, but also upward and downward movements, I have used in the description and claims the term "lifting" for the purpose of defining, in connection with the word "traversing," the movements of said drivers, the term "lifting" being intended to include within its scope the upward and downward movements of said drivers and so avoid a prolix statement.

In the preferred form thereof herein shown and described the framework or body (designated generally by A) of the vehicle comprises a suitable flooring 2, preferably supported by a series of longitudinally-extending beams or bars. In the construction shown in the drawings this flooring is provided with a series of uprights, (shown one at each corner, as 4 and 4' and 5 and 5',) which are connected by longitudinal bars 6 and 6' and transverse bars 7 and 7'. The front end of the vehicle-flooring is also shown provided with a series of upright members or bars 12 for the purpose hereinafter set forth, and which are secured at their upper ends to one of the transverse bars, as 7'. It will be understood that any other suitable construction of framework may be used to form the body of the vehicle and that the framing shown herein or that which may be used could be suitably covered, if desired, thereby to form a covered vehicle.

The driving mechanism (designated generally by B) for this improved vehicle comprises



a plurality of drivers or propellers, each of which in the preferred form thereof herein shown and described comprises a runner and an upright walking-beam, each supported for  
 5 traversing and lifting movements, and means for imparting to said drivers such movements, whereby each operates on one stroke to hold up and carry forward the vehicle and on the other stroke to move freely into position  
 10 ready to begin another working stroke. In the construction shown in the drawings the vehicle is shown provided with two sets of drivers, each set preferably comprising a series of three drivers, such drivers being so  
 15 disposed and operative that a pair of drivers, comprising one of each set, will operate substantially together to drive or propel the vehicle, while the drivers of each set operate in alternation one to propel the vehicle while  
 20 the others are moving into position to commence their working strokes. It will be understood, however, that any desired number of drivers may be used; but in practice it is deemed preferable to employ at least two sets,  
 25 each set comprising a pair of drivers. For supporting these drivers a suitable crank-shaft 8 is carried by the vehicle-body, preferably at the forward end thereof. This crank-shaft is shown herein as a duplex or  
 30 two-part shaft, comprising two members or shafts 8' and 8'' in alinement with each other with their inner ends in juxtaposition, and which shafts are journaled in suitable bearings 9, preferably carried by four inclined  
 35 braces 10, all secured at their lower ends to the vehicle-flooring and at their opposite ends the outer two to the uprights 5 and 5' and the other two to a pair of the upright bars 12. In the present construction each of these crank-  
 40 shafts 8' and 8'' is shown provided with a series of three cranks 13, each for connection with a walking-beam of its respective driver, the cranks of each shaft being disposed at different positions thereon, so that one driver  
 45 of each set will always be substantially in working position to drive the vehicle. The positions of the cranks of one shaft correspond, in the present structure shown, with the positions of the cranks of the companion  
 50 shaft, whereby the drivers (one of each set) will usually have their working strokes substantially together. Secured to each of these cranks by the crank-pin 14 thereof is an upright walking-beam 15, forming a part of the  
 55 driver. Connected to the lower end of each of these walking-beams 15, preferably by being pivotally secured thereto, is a runner 16, which is shown herein comprising a pair of side members 16', suitably bolted together,  
 60 the lower end of the walking-beam projecting into and being overlapped by said side members. Each of these runners is provided with a shoe, such as an ordinary shoe, constructed of any suitable material and secured to the  
 65 runner sides in any desired manner. These runners may be provided, if desired, with

projections or spurs of any desired construction whereby they will not slip in use.

In order to change or vary the effective leverage of the drivers, suitable mechanism is  
 70 provided, and which mechanism in the structure shown in the drawings also constitutes a means for maintaining said drivers in their proper working positions. In the preferred  
 75 form thereof herein shown and described the walking-beams are connected at their upper ends by adjustable connectors 17, such as links, with the upright bars 12. For this purpose each of the walking-beams is provided  
 80 with a series of apertures or openings 18, preferably corresponding with a like number and disposition of openings 19 formed in the upright bar 12 adjacent thereto. Each of these  
 85 links is shown having a bifurcated end and removably secured by a removable pin 20 to its respective walking-beam and extending in position to be engaged by a removable bolt  
 90 21, which projects through a series of aligned apertures 18 in the upright bars 12, whereby a number of said links may be secured in position by one bolt. On adjusting these con-  
 95 nectors the strokes of the drivers will be regulated—that is to say, by connecting the links with the lower series of holes 18 and 19 in the walking-beams and upright bars, respectively, the strokes of the drivers will be rela-  
 100 tively greater than would be the case if said links were connected with the upper series of holes in said walking-beams and bars. This change in the effective leverage or stroke  
 105 of the drivers, it will be seen, may be effected without interference with the connection intermediate the crank-shafts and such drivers, so that the length of stroke of such shaft-  
 110 cranks does not have to be varied. For the purpose of guiding the lower ends of the walking-beams should there be any lateral, vibratory, or shifting movement thereof the  
 115 vehicle-flooring may be provided with longitudinal slots for the passage of the walking-beams; but in the construction shown the front part of the flooring is cut away and a series of longitudinally-extending guide-bars  
 120 22 secured in position, one at each side of each of the walking-beams, whereby said beams are maintained in proper working position against lateral movement. In some cases, however, this guiding means may be  
 125 dispensed with, as under ordinary circumstances the connections between the walking-beams and crank-shafts and between said walking-beams and bars 12 are sufficient to maintain such beams against lateral play. For rotating these crank-shafts, thereby to  
 130 operate the drivers, suitable mechanism is provided, which in the preferred form thereof herein shown comprises gearing, one part of which comprehends an equalizer, by means of which one set or a part of the drivers may  
 continue in operation should another part of the drivers or the other set become temporarily inoperative through any cause, such as



an impediment in the road, and which equalizer will also permit the stoppage of either set of drivers without injury thereto or breakage thereof and without injury to the other parts of the driving mechanism. Fixedly secured to each crank-shaft adjacent to the inner end thereof is a bevel-gear 26. Intermediate these bevel-gears is an equalizing and driving gear, which is shown herein as a sprocket-wheel 27, loosely mounted on said shafts, the hub of said wheel receiving a part of each crank-shaft. Carried by the sprocket-wheel is a pinion 28 in mesh with said bevel-gears 26. For supporting this pinion the sprocket-wheel is shown provided with an opening 29 intermediate its periphery and hub for the reception of said pinion, which is secured in position therein by a spindle 30, extending through said periphery and into said hub, whereby the pinion extends in a plane transversely of the plane of rotation of said sprocket-wheel.

From the above it will be seen that should the working driver of one set meet with an impediment whereby it is prevented from operating, the rotation of the sprocket-wheel 27 would not be retarded, as the pinion would then rotate and slip over the inoperative bevel-gear and continue to operate the companion bevel-gear and the other set of drivers. In other words, when both sets of drivers are working the pinion revolves, without rotating on its own axis, with the sprocket-wheel to impart motion to both bevel-gears; but when one of said bevel-gears becomes fixed against movement, as on the cessation of movement of one of its drivers, the pinion rotates simultaneously with its revolution with the sprocket-wheel, and thereby slips over the inoperative bevel-gear. By this construction it will be readily seen that injury or breakage of the driving mechanism is avoided when one part thereof becomes inoperative. To impart motion to said sprocket-wheel 27 and by means of the pinion 28 to the bevel-gears 26, thereby to rotate the crank-shafts and operate the drivers to propel the vehicle, suitable means (designated generally by C) is provided, which may be of any desired construction; but in the form shown herein it comprises a steam-generator 35, to which a motor 36 is shown attached. This motor is provided with a sprocket-wheel 37, connected with the sprocket-wheel 27 by a suitable driving connection, such as a sprocket-chain 38, whereupon when said motor is in operation the drivers will be operated in a similar manner to that shown in Fig. 6 and will be given traversing and lifting movements whereby the runners thereof move in substantially elliptical paths and during one stroke thereof support and carry forward the vehicle and during the other stroke thereof move into position in readiness to begin another working stroke. In the present construction the steam-generator and its motor is shown adjustably mounted

on the vehicle-flooring, and for this purpose said flooring is provided with a pair of ways or tracks 39, carrying an adjustable base 40, supporting the generator. A suitable adjusting device, such as a screw 41, is carried by a projection 42 at one end of one of said tracks and engages said base, whereupon on the adjustment thereof the generator and its motor may be moved longitudinally of the vehicle, thereby to regulate the tension of the driving-chain. In practice suitable means may be provided or the gearing so supported whereby such gearing may be readily changed for the purpose of regulating the speed of the vehicle in accordance with the character of the country in which the vehicle is used. In practice, if desired, this improved motor-vehicle may be supported at the rear part thereof by wheels, (see dotted lines Fig. 2;) but in the preferred form thereof herein shown and described the vehicle is supported at this point by runners 50, which may or may not be similar to those above described. These rear runners or trailers 50 are preferably disposed one at each side of the vehicle-body, and in the present construction form means for steering the vehicle. For this purpose the runners are carried by a pair of axles 51, each preferably forming a part of an angle-iron 52. These angle-irons are pivotally bolted to the ends of a beam 53, which is shown supported centrally of its length for adjustment in a perpendicular or upright plane by a pivot-bolt or spindle 54, carried by a pair of cross bars or beams 55, one at each side of said beam 53, and which are fixedly secured to the vehicle-flooring at the under side thereof and preferably cut away adjacent to their ends to permit sidewise or lateral movement of the runners. By having this beam 53 adjustable in the manner set forth the runners can adjust themselves to inequalities in the road-bed. One member of each of these angle-irons is shown as a relatively long arm 56, extending at the under side of the beam 53 and connected at its inner end to a shiftable lever 57 by a link 58. This lever 57 is shown carried at the lower end of a relatively long spindle 59, which projects upwardly through the flooring of the vehicle and is provided with a lever or handle 60 at its upper end for shifting said lever 57, and thereby simultaneously swinging or shifting both of the axles on their pivot-bolts, and thereby the runners, laterally to steer the vehicle. To limit the movement of the rear runners, they may be connected with the vehicle-body by chains 61. By having the driving-runners 16 pivoted to the walking-beams 15 and the rear supporting and steering runners 50 carried by axles which act as pivots for said runners they can readily adjust themselves to inequalities in the road. If desired, springs or other suitable means may be used to return the runners into their normal positions when the same have been shifted.



From the foregoing it will be seen that this improved motor-vehicle is peculiarly adapted for use on rough and uneven roads and for travel over soft ground and frozen rivers, as well as over ground covered with ice and snow. For the latter service, however, the driver-shoes may be made of unusual length and width, so as to cover a large area and thus be able to support the machine without appreciably sinking into the snow. It will also be seen that the major portion of the vehicle may be made of timber, so as to be especially adapted for use in winter and in cold countries, this mode of construction also facilitating the making of quick and necessary repairs by ordinary workmen.

In operation, on imparting motion to the sprocket-wheel 27 the pinion 28 will be revolved therewith, thereby to rotate the bevel gear-wheels 26 and so rotate the duplex crank-shaft 8, whereby each driver of each set after its working stroke will be carried rearwardly and upwardly and thence forwardly and downwardly into position to again engage the roadway, and then during its working stroke to the rear will propel the vehicle forward in a manner that will be readily understood without a more explicit description.

I claim as my invention—

1. In a vehicle of the class specified, the combination of a plurality of drivers each supported in position for traversing and lifting movements; means for actuating said drivers; and equalizing means for permitting the operation of part of said drivers when another part thereof is thrown out of operation.

2. In a vehicle adapted for use on snow and ice, the combination, with a vehicle-body, of a plurality of drivers each supported in position thereon for traversing and lifting movements and embodying sleigh-runners pivotally secured intermediate their ends and of a length adapted to permit their use on snow without sinking thereinto, and means for actuating said drivers thereby to propel the vehicle.

3. In a vehicle of the class specified, the combination of a plurality of drivers each supported in position for traversing and lifting movements; means for actuating said drivers thereby to propel the vehicle; and means for changing the stroke of said drivers, thereby to increase or decrease the length of step thereof.

4. In a vehicle of the class specified, the combination, with a crank-shaft, of a plurality of drivers supported in position for movement and having runners; means for actuating said crank-shaft, and thereby the drivers, to propel the vehicle; and means for changing the effective leverage of said drivers without changing the location of the connection between said cranks and drivers.

5. In a vehicle of the class specified, the combination of a plurality of drivers each

supported in position for traversing and lifting movements, and equalizing means for permitting the operation of part of said drivers when another part thereof are thrown out of operation.

6. In a vehicle of the class specified, the combination of a plurality of drivers supported for traversing and lifting movements and embodying runners, and equalizing means for permitting the operation of part of said drivers when part thereof are thrown out of operation.

7. In a vehicle of the class specified, the combination, with a vehicle-body, of a plurality of drivers supported in position thereon for traversing and lifting movements and embodying runners, and means for actuating said drivers to propel the vehicle, a part thereof comprising equalizing means for permitting the operation of part of said drivers when part thereof are thrown out of operation.

8. In a vehicle of the class specified, the combination of a plurality of drivers supported in position for movement; equalizing means for permitting the operation of part of said drivers when part thereof are thrown out of operation; and means for changing the stroke of said drivers.

9. In a vehicle of the class specified, the combination of a plurality of drivers supported in position for traversing and lifting movements and embodying runners; means for actuating said drivers to propel the vehicle, a part thereof comprising equalizing means for permitting the operation of part of said drivers when part of the drivers are thrown out of operation; and means for changing the effective stroke of said drivers.

10. In a vehicle of the class specified, the combination of a crank-shaft; a plurality of drivers carried thereby and operative to propel the vehicle on the rotation of said crank-shaft; and equalizing means for permitting the operation of part of said drivers when part of the drivers are thrown out of operation.

11. In a motor-vehicle, the combination, with a crank-shaft, of a plurality of drivers carried by the cranks of said shaft for traversing and lifting movements; means for actuating said crank-shaft thereby to operate said drivers and propel the vehicle; and means for changing the effective leverage of said drivers without varying the length of stroke of said cranks.

12. In a motor-vehicle, the combination, with a duplex crank-shaft supported in position, of a plurality of drivers mounted on the cranks of said shafts, and means for changing the effective leverage of said drivers.

13. In a motor-vehicle, the combination, with a plurality of drivers supported in position for traversing and lifting movements, of means for actuating said drivers and including connections secured to said drivers, and means for changing the stroke of said drivers without varying the position of said drivers



or of said intermediate connections relatively to each other.

14. In a motor-vehicle, the combination of a vehicle-body; a crank-shaft journaled thereon; a plurality of upright drivers secured to said crank-shaft; means for operating said shaft to actuate said drivers and propel the vehicle; and means for changing the effective strokes of said drivers and comprising adjustable connectors secured to said vehicle-body and drivers.

15. In a motor-vehicle, the combination of a vehicle-body; a crank-shaft journaled thereon; a series of walking-beams secured to said crank-shaft for traversing and lifting movements; runners secured to said walking-beams; means for operating said crank-shaft; and means for changing the effective stroke of said walking-beams and thereby the runners, and comprising links adjustably secured to said vehicle-body and to the walking-beams.

16. In a motor-vehicle, the combination of a vehicle-body, a part thereof having a series of openings; a crank-shaft journaled thereon; a series of drivers carried thereby and comprising walking-beams having runners connected thereto, said walking-beams having openings corresponding with the openings in said vehicle-body; a link connecting each of said walking-beams with said body; and removable means projecting into the openings of said body and beams for removably connecting the links therewith.

17. In a motor-vehicle, the combination of a crank-shaft; a plurality of drivers carried by said shaft and operative to propel the vehicle; gear mechanism carried by said shaft and embodying equalizing means for permitting the operation of part of said drivers when part thereof is thrown out of operation; and means for imparting motion to said gear mechanism, thereby to operate the drivers.

18. In a motor-vehicle, the combination of a plurality of sets of drivers having traversing and lifting movements, and equalizing means for permitting the operation of one set of said drivers while another set thereof is thrown out of operation.

19. In a motor-vehicle, the combination of a vehicle-body; a motor adjustably mounted thereon; a plurality of upright drivers supported by said body for traversing and lifting movements to propel the vehicle; means operatively connecting said motor and drivers; and means for adjusting said motor relatively to the vehicle-body, thereby to regulate the tension of one part of said connecting means.

20. In a motor-vehicle, the combination of a vehicle-body; a motor adjustably mounted thereon; a crank-shaft journaled on said body; a series of walking-beams connected to said crank-shaft for traversing and lifting movements; a runner connected to each of said walking-beams; driving means connecting said motor with said shaft; and means

for adjusting said motor longitudinally of the vehicle-body, thereby to regulate the tension of said driving connecting means.

21. In a motor-vehicle, the combination of a vehicle-body; a pair of crank-shafts journaled thereon; drivers connected to said crank-shafts and embodying runners; a sprocket-wheel loosely mounted on said crank-shafts and carrying a pinion; a bevel-gear fixedly secured to each of said crank-shafts and meshing with said pinion; an adjustable motor mounted on the vehicle-body; and means connecting said motor with said sprocket-wheel.

22. In a motor-vehicle, the combination of a vehicle-body; a two-part crank-shaft journaled thereon; a plurality of drivers carried by said crank-shaft for propelling said vehicle; a sprocket-wheel loosely mounted on said crank-shaft; a pinion carried by said sprocket-wheel intermediate its hub and periphery; a bevel-gear fixedly secured to each crank-shaft and in mesh with said pinion; and means for imparting motion to said sprocket-wheel.

23. In a motor-vehicle, the combination of a vehicle-body; a duplex crank-shaft comprising a pair of aligned crank-shafts journaled thereon; a series of drivers carried by said crank-shafts and embodying runners; a sprocket-wheel loosely mounted on said crank-shafts and carrying a pinion; a gear fixedly secured to each crank-shaft and in mesh with said pinion; a motor; a driving-belt connecting said motor with said sprocket-wheel; and means for changing the effective stroke of said drivers.

24. In a motor-vehicle, the combination, with a vehicle-body embodying a series of guides extending longitudinally thereof; a crank-shaft journaled on said body; walking-beam driving members connected to said crank-shaft and extending between said guides; runners carried by said walking-beams; means for rotating the crank-shaft; and guide-links adjustably connected to said driving members for controlling the upper ends of said walking-beam driving members.

25. In a vehicle adapted for use on snow and ice, the combination, with a vehicle-body, of a crank-shaft; a plurality of drivers connected to said shaft for traversing and lifting movements and embodying sliding runners of a length adapted to permit their use on snow without materially sinking thereinto; and means for actuating said shaft thereby to propel the vehicle.

26. In a motor-vehicle, the combination of a vehicle-body; steering means therefor; a plurality of drivers carried by said body; means for modifying the length of step of said drivers; and means for imparting movements in elliptical paths to said drivers.

27. In a motor-vehicle, the combination of a vehicle-body; a pair of runners secured to said body for lateral or sidewise movement and for movement transversely of their lateral



plane of movement; means for shifting said runners laterally, thereby to steer the vehicle; and means having traversing and lifting movements for propelling said vehicle.

5 28. In a motor-vehicle, the combination of a vehicle-body; a beam pivotally secured thereto for movement in an upright plane; a pair of axles pivotally secured to said beam, one at each end thereof for movement inde-  
10 pendently of said beam; a pair of runners secured to said axles; means for shifting said runners laterally relatively to said beam, thereby to steer the vehicle; and means hav-  
15 ing traversing and lifting movements for propelling said vehicle.

29. In a motor-vehicle, the combination of a vehicle-body; a beam pivotally secured thereto for movement in an upright plane; a pair of axles pivotally secured to said beam,  
20 one at each end thereof for movement independently of said beam; a runner pivotally secured to each axle; means for shifting said axles and thereby the runners laterally, there-  
25 by to steer the vehicle, and comprising a pair of arms secured to said axles, a shiftable lever, links connecting said lever with said arms, a spindle connected at the lower end to  
30 said shiftable lever, and means connected to said spindle for operating the same and thereby shift the runners; and means having trav-  
ersing and lifting movements for propelling said vehicle.

30. In a vehicle of the class specified, the combination of a vehicle-body; a motor  
35 mounted thereon; a crank-shaft journaled thereon; a plurality of drivers secured to said crank-shaft and embodying runners opera-  
tive in elliptical paths; means connecting said crank-shaft with said motor; a pair of  
40 runners connected to said body for sidewise shifting movement; and means for shifting said runners, thereby to steer the vehicle.

31. In a vehicle of the class specified, the combination of a vehicle-body having ways;  
45 a motor adjustable on said ways; means for adjusting said motor; a pair of aligned crank-shafts journaled on said body; a set of up-

right drivers carried by each crank-shaft and comprising walking-beams having runners pivotally secured thereto; guiding means for  
50 said walking-beams; means for changing the effective stroke of said walking-beams and comprising links adjustably secured to said walking-beams and to said vehicle-body; a  
55 sprocket-wheel loosely mounted on said crank-shafts and carrying a pinion; a bevel-gear fixedly secured to each crank-shaft and meshing with said pinion; a sprocket-belt  
connecting said motor with said sprocket-wheel, thereby to impart movement to said  
60 runners; a cross-beam pivotally secured to said vehicle-body for movement in an upright plane; a pair of axles pivotally secured to said beam, one at each end thereof; runners  
65 carried by said axles; and means for shifting said runners independently of the movement of said beam, and comprising a pair of arms rigid with said axles, an oscillatory lever, links  
70 connecting said lever and arms, and means for oscillating said lever, and thereby the run-  
ners, to steer the vehicle.

32. In a vehicle of the class specified, the combination of a duplex crank-shaft; a set of  
drivers carried by each crank-shaft, each set comprising a series of three drivers each em-  
75 bodying a runner having traversing and lifting movements, the drivers of each set being operative in alternation with each other; and a pair of drivers, one of each set, being opera-  
tive substantially together; and means for  
80 imparting motion to said drivers.

33. In a vehicle of the class specified, the combination of two sets of drivers, each set  
comprising a plurality of drivers operative in  
85 alteration with each other, and means intermediate said sets of drivers for actuating the same simultaneously and operative to permit one set of drivers to be temporarily thrown out of operation during the operation of the other set thereof.

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Witnesses:

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