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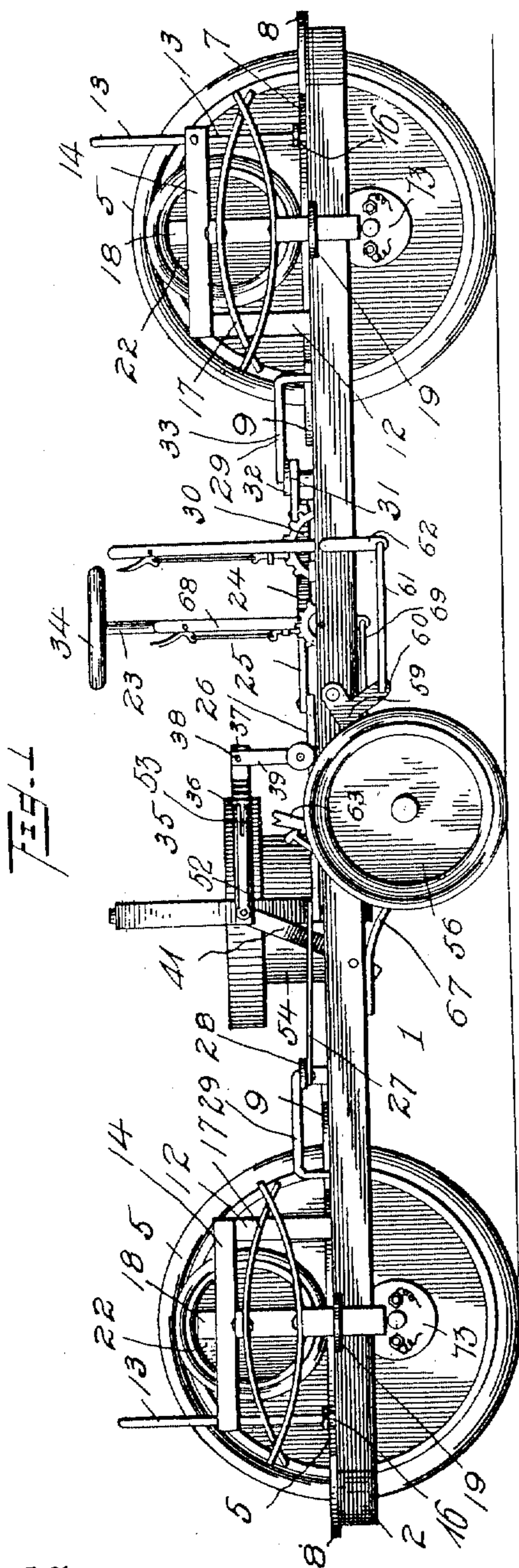
E. N. DARROW.

GYROCYCLE.

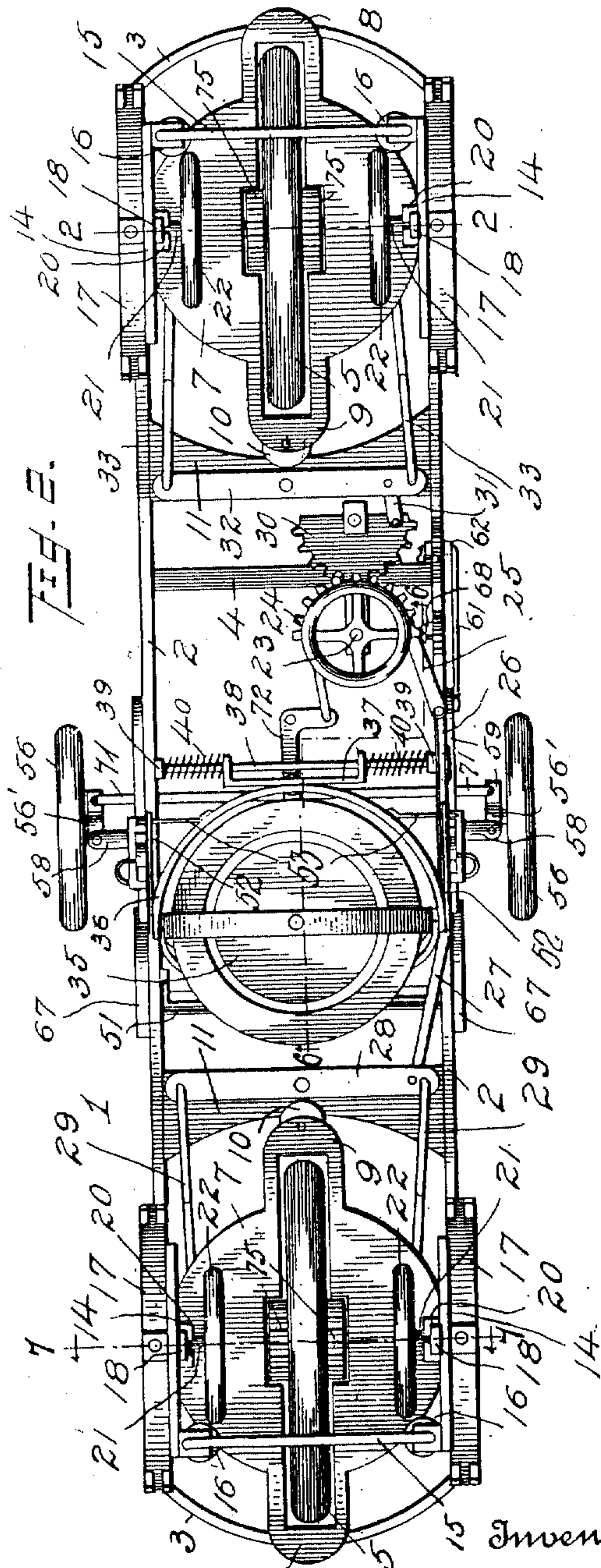
APPLICATION FILED JAN. 31, 1910.

Patented May 9, 1911.

4 SHEETS-SHEET 1.



Witnesses
E. C. Duffy
C. H. Gruebauer

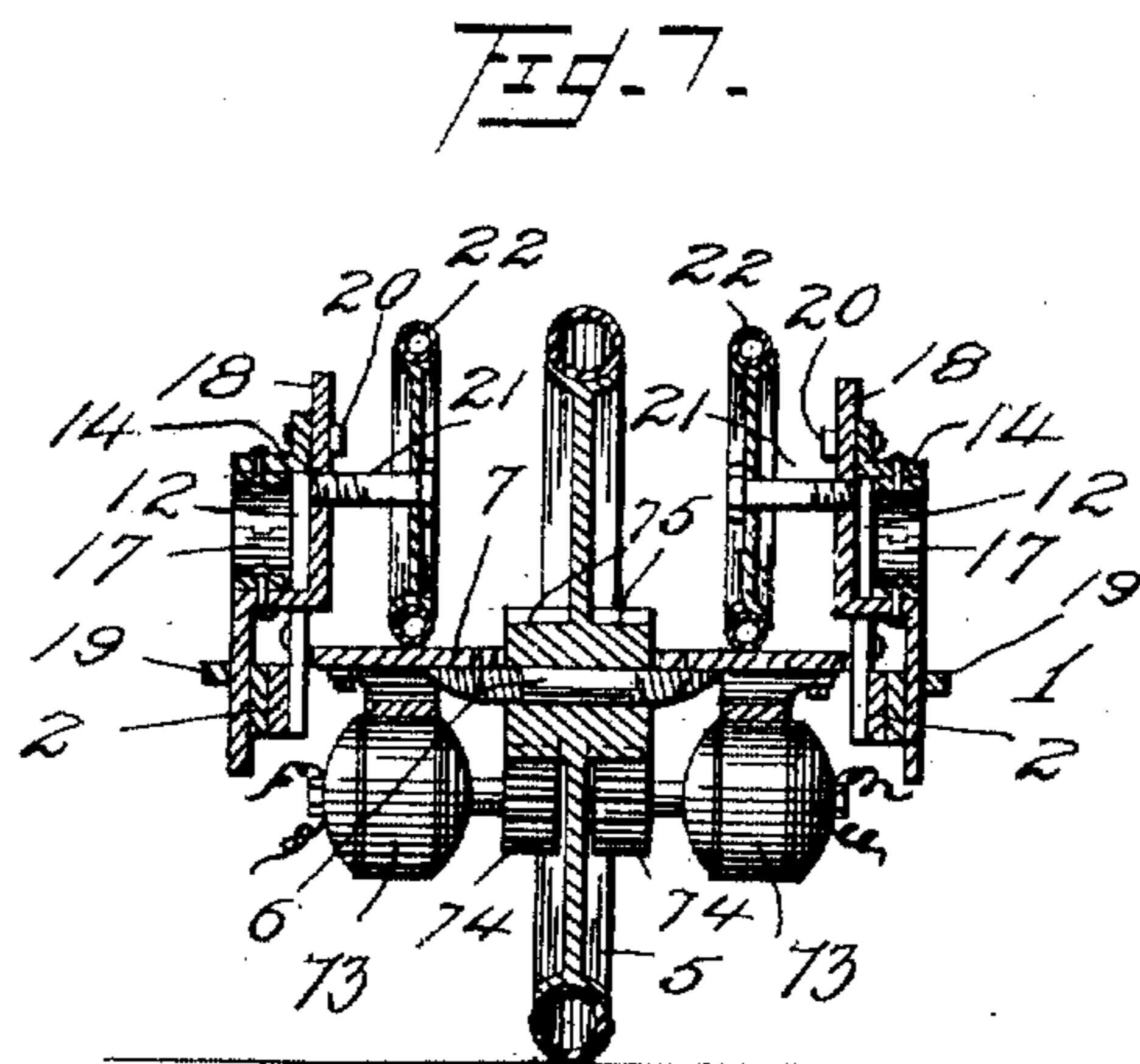
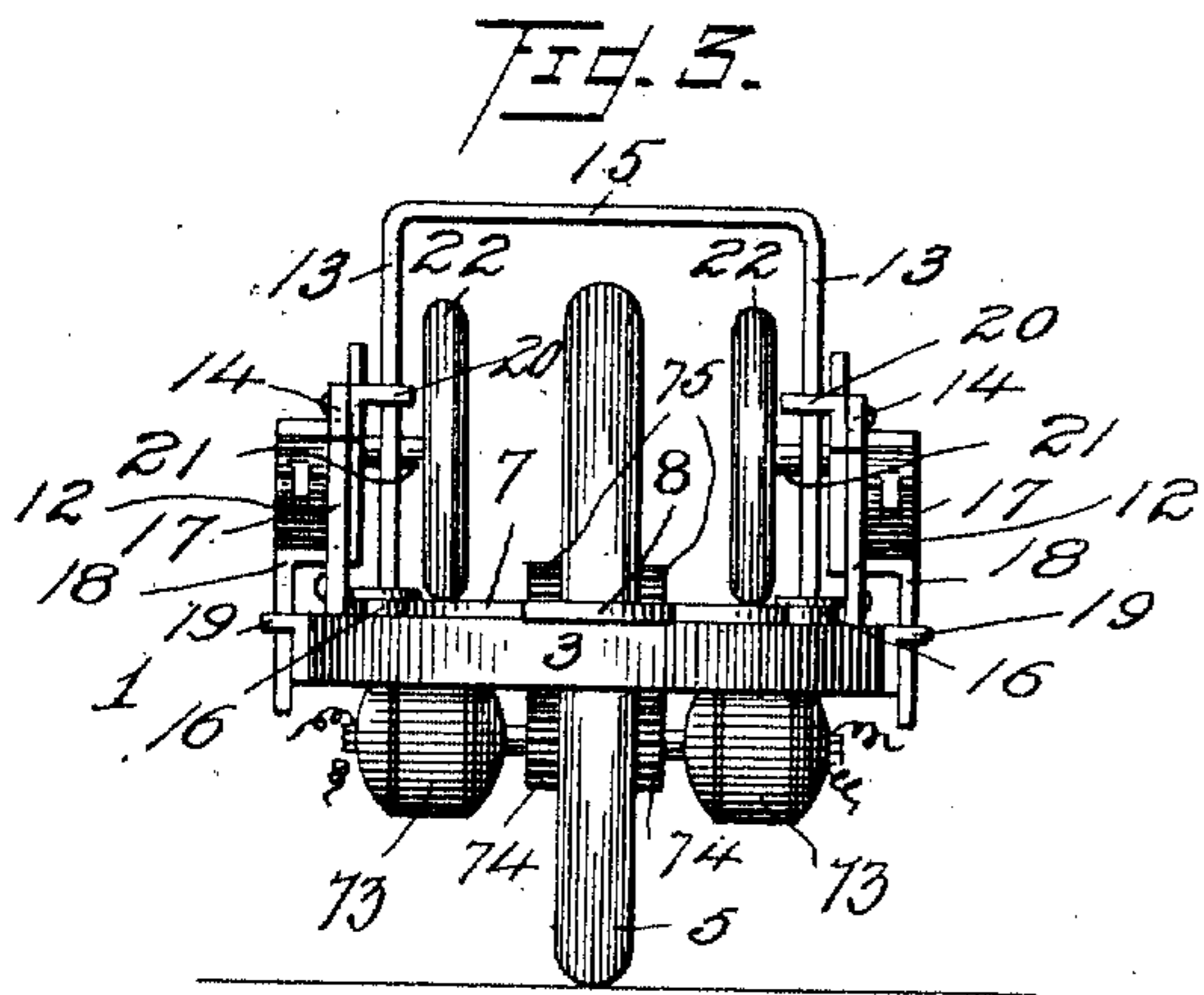
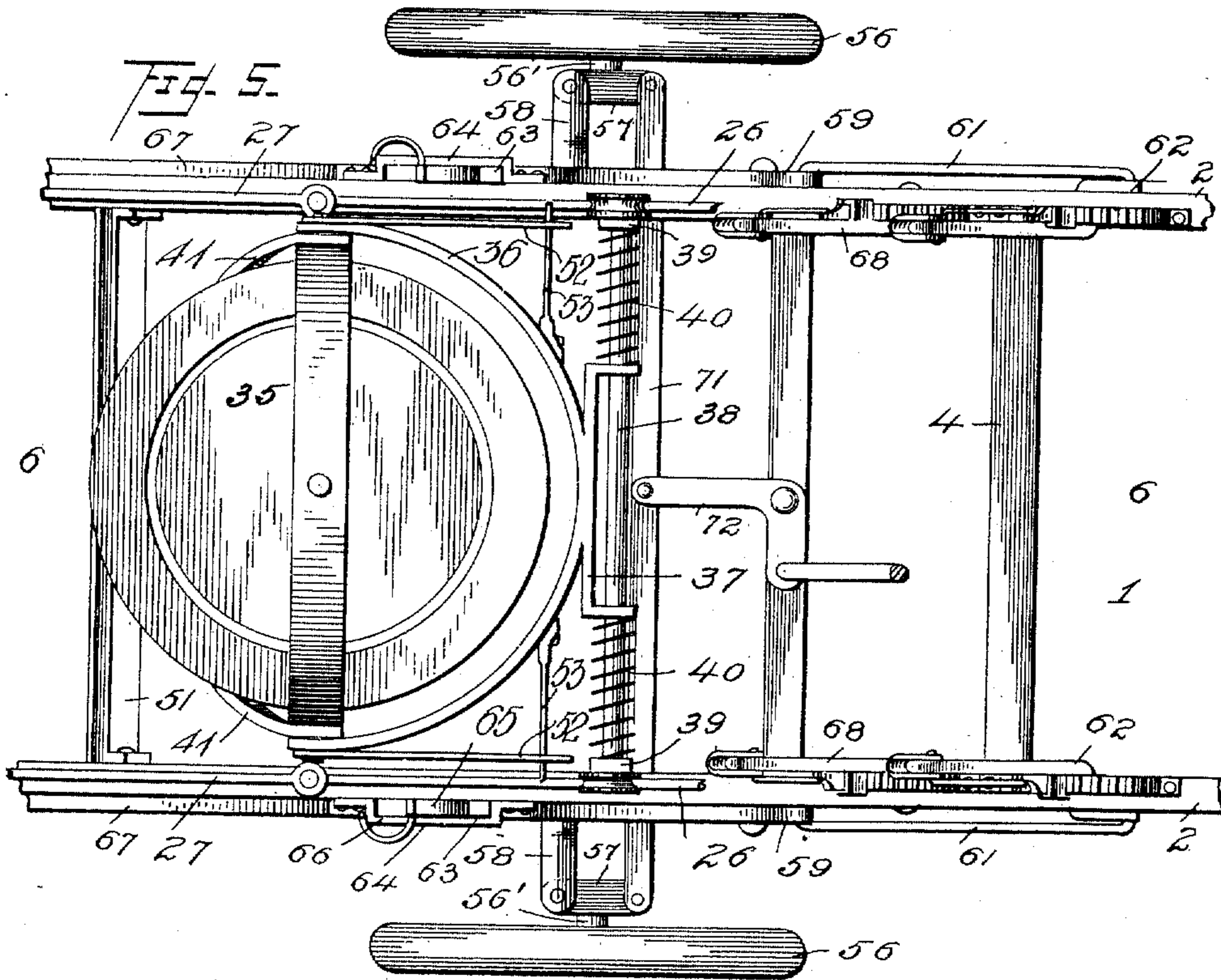


Inventor
Edward N. Darrow
 by *A. B. Wilson & Co.*
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Patented May 9, 1911.

4 SHEETS—SHEET 2.



Witnesses

E. Duffy
C. H. Giesbauer

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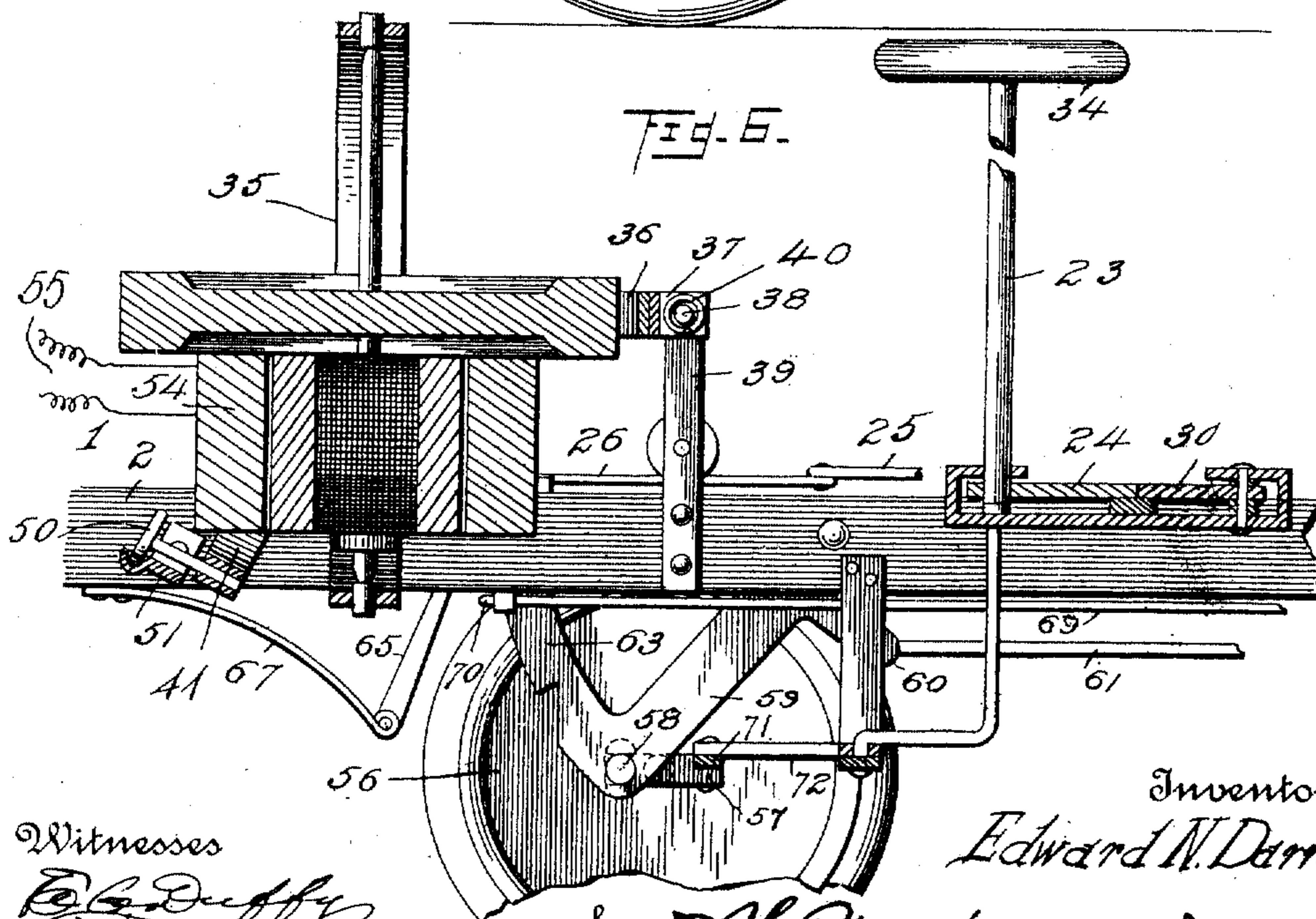
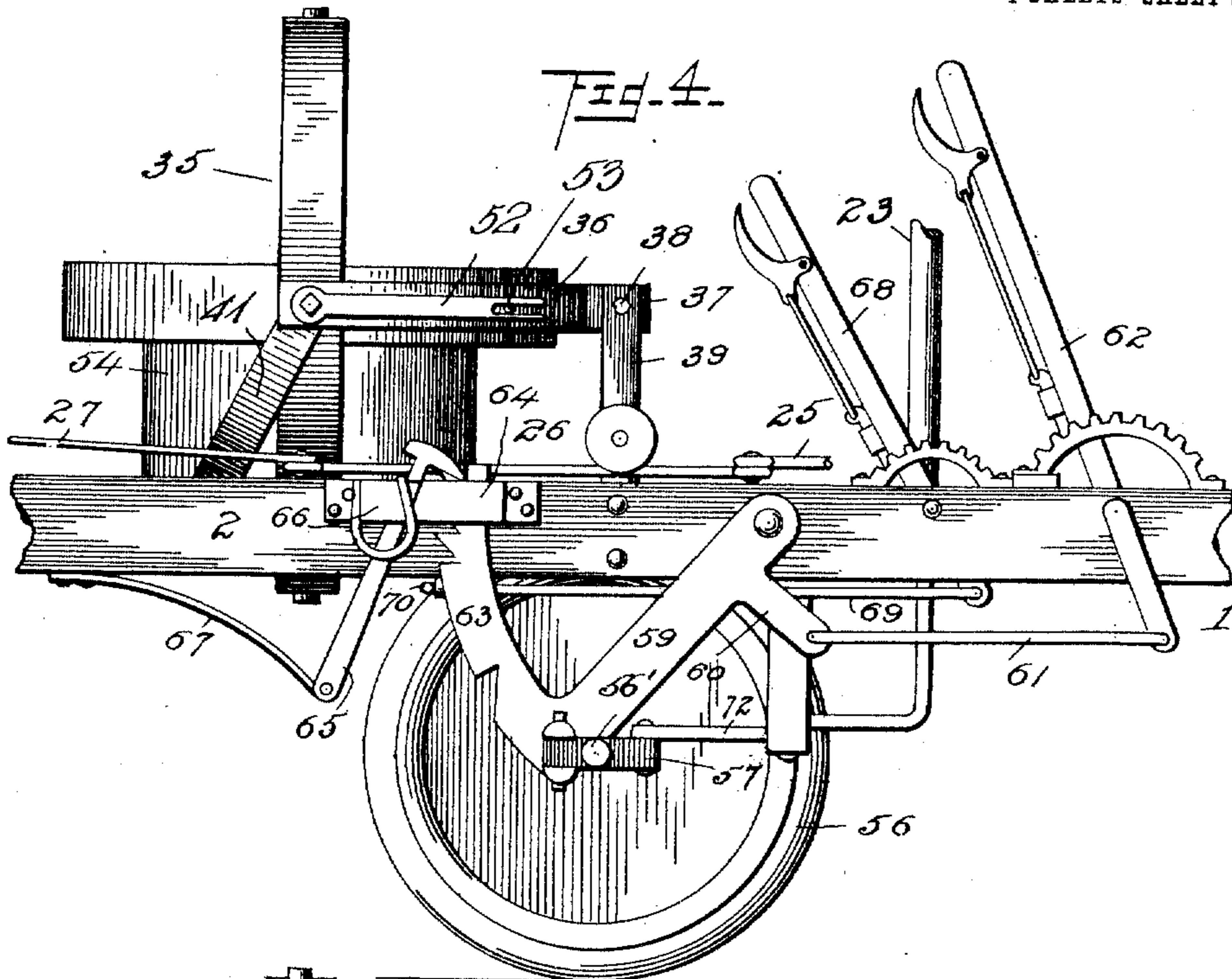
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GYROCYCLE.
APPLICATION FILED JAN. 31, 1910.

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4 SHEETS—SHEET 3.



Witnesses

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C. H. Grieshaber

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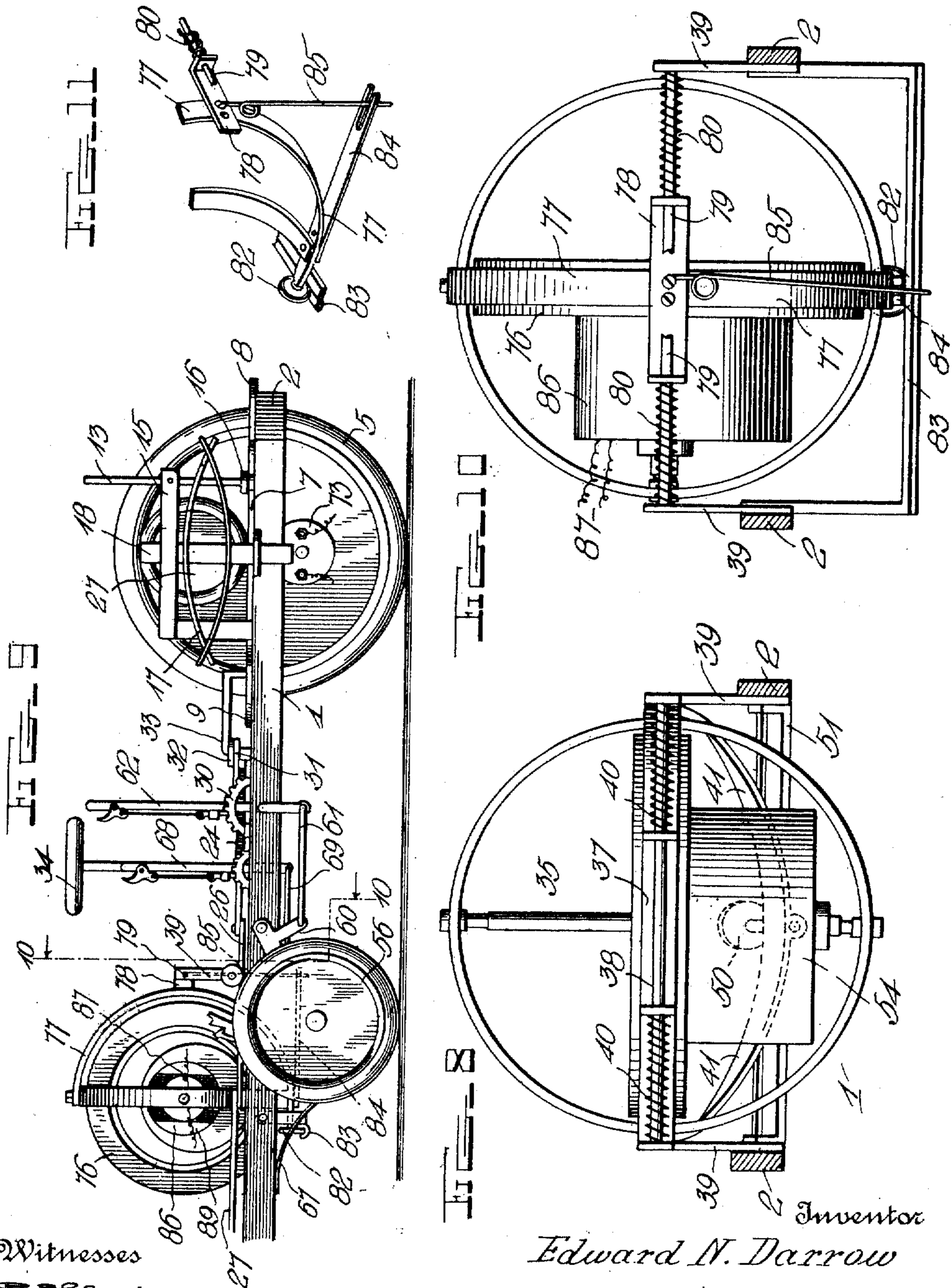
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Patented May 9, 1911.

4 SHEETS-SHEET 4.



Witnesses
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UNITED STATES PATENT OFFICE.

EDWARD N. DARROW, OF CHICAGO, ILLINOIS.

GYROCYCLE.

991,485.

Specification of Letters Patent.

Patented May 9, 1911.

Application filed January 31, 1910. Serial No. 541,127.

To all whom it may concern:

Be it known that I, EDWARD N. DARROW, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Gyrocycles; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in gyrocycles.

One object of the invention is to provide a machine of this character in which the equilibrium is maintained by means of a gyroscope suitably mounted and operated on the machine.

Another object is to provide an improved means for connecting the frame of the machine with its supporting wheels whereby said frame is yieldingly supported and one or both of the wheels permitted to be freely turned for the purpose of steering the machine.

With the foregoing and other objects in view, the invention consists of certain novel features of construction, combination and arrangement of parts as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a side view of a gyrocycle constructed in accordance with the invention; Fig. 2 is a top plan view; Fig. 3 is an end view of the same; Fig. 4 is an enlarged side view of one end of the machine showing more clearly the supporting mechanism and the manner in which the auxiliary supporting wheels are raised and held in an elevated position, one of said wheels being removed to more clearly disclose the operating mechanism; Fig. 5 is an enlarged plan view of the parts shown in Fig. 4; Fig. 6 is a detail longitudinal section on the line 6—6 of Fig. 2 showing the arrangement of the auxiliary wheel operating devices on the inner side of the supporting frame; Fig. 7 is a vertical cross sectional view through the frame of the machine on a line with the center of one of the supporting wheels, the plane of said section being indicated by the dotted line 7—7 of Fig. 2; Fig. 8 is a similar view taken in front of the gyroscope showing the manner in which the same is supported; Fig. 9 is a side view of a portion of the frame and machine showing

a horizontal arrangement of the gyroscope; Fig. 10 is an enlarged sectional view of the horizontally disposed gyroscope shown in Fig. 9 on the dotted line 10—10 of said figure; Fig. 11 is a fragmentary perspective view showing the arrangement of the spring detent or restraining finger for yieldingly holding the gyroscope shown in Figs. 9 and 10 from swinging around in its yoke and also showing the supporting roller and adjacent parts of this form of the gyroscope.

In the embodiment of the invention I provide a main supporting frame 1 comprising longitudinally disposed parallel side bars 2, which are connected together at their opposite ends by curved bars or yokes 3. The side bars 2 are further connected together intermediate of their ends by cross bars 4.

The frame 1 is supported at its opposite ends upon single supporting wheels 5, each of which is revolubly mounted between the bars 2 upon an axle 6, see Fig. 7, to the opposite ends of which are secured in any suitable manner substantially semi-circular frame supporting plates 7, said plates thus forming practically part of the axle. The wheels 5 are provided with suitable cushion tires as shown. The outer ends of the plates 7 are connected together around the wheels by an outer yoke 8, while the inner ends of said plates are connected together by an inner yoke 9. On the inner yokes 9 of the wheels at the opposite ends of the machine are revolubly mounted grooved guiding rollers 10, which are engaged with segmental track plates 11 arranged across the frame 1 adjacent to the inner portions of the wheels 5 and are suitably connected at their opposite ends to the side bars 2 of the frame.

Secured to the side bars 2 on opposite sides of the wheels 5 at the ends of the frame 1 are hanger frames, each of which comprises inner upright posts 12 secured at their lower ends to the side bars of the frame 1 and outer cylindrical upwardly projecting posts 13 which are also connected at their lower ends to the side bars 2, as shown. The posts 12 and 13 are connected together at their upper ends by horizontal longitudinal bars 14, and the posts 13 at the outer ends of the frame project above said bars and are connected together by cross bars 15. Slidably mounted on the outer cylindrical posts 13 are flanged sleeves or rollers 16 which are engaged the outer ends or edges of the semi-circular axle plates 7. On the

longitudinal bars 14 midway between the posts 12 and 13 are formed laterally projecting lugs to which are secured the upper members of elliptical or other suitable forms of supporting springs 17, the lower members of which are secured to guide bars 18 in which are formed right angular off-sets or shoulders to which the lower sections of the springs 17 are secured, as shown. The lower ends of the guide bars 18 are slidably engaged with guide brackets 19 secured to the outer sides of the bars 2, while the upper ends of the guide bars 18 are slidably engaged with suitable guide loops 20 arranged on the inner sides of the longitudinal bars 14 midway between the posts 12 and 13.

Secured to the guide bars 18 below the longitudinal bars 14 are inwardly projecting stub axles 21, on which are revolvably mounted bearing wheels 22 which are preferably provided with cushion tires and which engage and travel on the semi-circular axle plates 7 adjacent to their outer edges. By thus connecting the ends of the main supporting frame 1 with the supporting wheels 5, the frame will be yieldingly supported on said wheels without interfering in any way with the lateral turning or swinging of the wheels for the purpose of steering the machine. This yielding connection between the frame and the supporting wheels absorbs the shocks and jars occasioned by the machine passing over rough or uneven surfaces and prevents such shocks or jars from reaching the occupants of the machine.

In order to guide or steer the machine in the desired direction, I provide a suitable steering mechanism which may be connected to one or both of the supporting wheels 5 whereby they may be operated to guide the machine. The steering mechanism is herein shown as being connected to both front and rear wheels 5, whereby they may be turned in unison to steer the machine in the desired direction. The steering mechanism is here shown and preferably consists of a suitably mounted steering post 23 to the lower end of which is rigidly secured a toothed segmental gear 24, which is connected at one end by a link 25 to an operating rod 26, which is connected at its opposite end by a link 27 to an operating lever 28 which is pivotally mounted midway between its ends on one of the cross bars of the frame 1 adjacent to the inner portion of the rear supporting wheel, 5. The lever 28 is connected at its opposite ends by operating rods 29 to the lower sides of the semi-circular plates 7 of the rear wheel, whereby when said lever is turned in one direction or the other by the steering post 23 and segmental gear 24, said wheel will be turned in a corresponding direction to steer the machine.

With the segmental gear 24 is engaged a

similar gear 30 which is pivotally mounted on the frame and is connected at one end by a short link 31 to one end of an operating lever 32, pivotally mounted on the adjacent track plate 11, as shown. The lever 32 is connected at its opposite ends by operating rods 33 to the axle plates 7 of the front wheel of the machine whereby said wheel is turned in the desired direction. The steering post 23 is provided on its upper end with a hand wheel 34 whereby the same may be readily turned. By providing a steering mechanism such as herein shown and described, it will be readily seen that the supporting wheel 5 at either end of the machine may be readily disconnected from the steering mechanism and the machine steered by the supporting wheel at the opposite end of the frame.

In order to support the machine in an upright position or maintain the equilibrium thereof while traveling or standing still, I provide a suitably mounted and operated gyroscope 35. The gyroscope 35 may be arranged in the machine in a vertical position as shown in the first figures of the drawings, or in a horizontal position as shown in the last two figures of the drawings. The gyroscope is pivotally mounted in a segmental supporting yoke 36, which yoke in the first figures of the drawings is arranged in a horizontal position midway between the side bars 2 of the main frame and is connected midway between its ends to a guide bracket 37, which is slidably mounted on a horizontal transversely disposed guide rod 38, the opposite ends of which are secured in suitable standards 39 secured to the side bars of the frame as shown. On the rod 38 between the ends of the bracket 37 and standards 39 are arranged coiled springs 40 which yieldingly hold the gyroscope in a central position between the side bars of the frame. The outer ends of the yoke 36 have connected therewith or to its trunnions the upper ends of a supplemental supporting yoke 41, on the lower portion of which is revolvably mounted a guiding and supporting roller 50, which is adapted to travel in a horizontally disposed track bar 51 arranged between the side bars 2 of the frame and secured to said bars at its opposite ends as shown. By means of the roller 50 and track bar 51 and the guiding and supporting rod 38, the gyroscope through said yokes 36 and 41 is yieldingly held in position on the frame of the machine.

The gyroscope may be driven in any suitable manner, the same being here shown and is preferably operated by a suitable electric motor 54, the armature magnets of which are fixedly mounted on the shaft of the gyroscope wheel, while the field of the motor is rigidly secured to the supporting frame of the wheel in any suitable manner, preferably

on the lower axis of the gyroscope whereby the weight of the motor acts as a brake to the swinging forward or backward of the gyroscope, and a further resistance to such swinging action may be had by providing a stop arm 52 applied at one or both trunnions and having engaged therewith a spring restraining finger 53 secured to the guide bracket 37 or yoke 36, similarly as shown applied to the horizontally disposed gyroscope 76, shown in Figs. 9 and 10 of the drawings and hereinafter more fully described, thus maintaining the gyroscope in proper operative position in the frame of the machine. The electricity is conveyed to the motor by suitably connected current conducting wires 55, which are connected to a storage battery, or other suitable source of supply (not shown). By means of a gyroscope mounted and operated as herein shown and described, the machine will be held in an upright position of equilibrium when moving or standing still.

In order to support the machine in an upright position when the gyroscope is not running, I preferably provide a pair of auxiliary supporting wheels 56, which are here shown as being revolvably mounted on short crank axles 56' pivotally mounted in the bifurcated outer ends of supporting shafts 58. The inner ends of the shafts 58 are secured to adjusting levers 59, the inner or forward ends of which are pivotally connected to the outer sides of the side bars 2 of the frame as shown. The adjusting levers 59 are provided with short crank arms 60 which are connected by links 61 to hand levers 62, pivotally mounted on the side bars 2 of the frame and having suitable pawl and ratchet holding mechanism, whereby the levers are secured to hold the adjusting levers 59 and the wheels 56 carried thereby in the raised positions. On the ends of the adjusting levers 59 are fixedly secured segmental, frame supporting, ratchet bars 63, which are held in sliding engagement with the side bars 2 of the frame 1 by suitable guide blocks 64. The side bars of the frame 1 are adjustably secured to the ratchet bars 63 by means of spring projected pawls 65 which are held in sliding engagement with the side bars 2 by guide blocks 66 and which are pivotally connected at their lower ends to flat springs 67 secured to the lower edges of the side bars 2 as shown. The pawls 65 are provided on their upper ends with a beveled tooth which is swung into engagement with the teeth on the ratchet bars 63, whereby when said bars are swung downwardly the frame will be supported thereby, through the engagement of the teeth on the pawls 65, as clearly shown in Fig. 4 of the drawings.

In order to swing the adjusting levers 59 and the supporting wheels 56 carried thereby upwardly to an inoperative position by

means of the hand levers 62, I provide a suitable pawl releasing mechanism by means of which the pawls 65 may be disengaged from the ratchet bars 63, thus permitting said adjusting levers and wheels to be swung upwardly to an inoperative position. The releasing mechanism for the pawls 65 comprises hand levers 68 which are pivotally secured to the inner sides of the bars 2 of the frame adjacent to the hand levers 62. To the lower ends of the levers 68 are connected pawl releasing rods 69 which are slidably mounted in suitable bearings secured to the lower edges of the bars 2 and which are provided on their free ends with pawl engaging lugs 70, whereby when the levers 68 are operated in the proper direction, the rods 69 and lugs thereon will be forced against the pawls 65, thus disengaging the same from the teeth of the ratchet bars 63, thereby permitting the adjusting levers 59 and the supporting wheels carried thereby to be swung upwardly by the hand levers 62, as hereinbefore described.

The auxiliary supporting wheels 56 may be mounted on axles rigidly secured to the adjusting levers 59, or as herein shown, said wheels may be mounted on the pivotally supported crank axles 57, and said axles may be connected together by a connecting bar 71, which is attached by a suitable operating mechanism 72 with one of the segmental gears operated by the steering post and drive wheel of the main steering mechanism. The auxiliary wheels 56 are mounted for steering and connected up with the main steering apparatus when the latter is arranged for steering only one of the main supporting wheels.

The machine may be propelled by any suitable power and in any suitable manner. The form of propelling mechanism herein shown comprises a series of electric motors 73 which are suitably secured to the underside of the semi-circular axle plates 7 on each side of the wheels 5 at the opposite ends of the frame as shown. On the shaft of the motors are fixedly mounted spur gear pinions 74, which are operatively engaged with annular racks or gear rings 75, which are secured to the hubs or opposite sides of the wheels 5, whereby the motion or power of the motors will be imparted to the wheels 5 to drive the same in the proper direction, thus propelling the machine. By thus arranging the motors, all or part of them may be operated at the same time. The motors when attached to the axle plates and connected with wheels 5 as herein shown and described will not interfere with the steering movement of the wheels in any manner, and while I have shown and described this form of driving mechanism, I do not wish to be understood as limiting the propulsion of the machine to this form and arrangement of

mechanism, as it will be readily understood that other forms of propelling mechanism may be employed and operatively connected with the supporting wheels of the machine.

5 In Figs. 9 and 10 of the drawings is shown a modified arrangement of the gyroscope wherein the same is supported in the frame of the machine in a horizontal position. The gyroscope 76 shown in Figs. 9 and 10
10 has its frame pivotally mounted in a vertically disposed yoke 77, secured to the guide bracket 78 which is slidably mounted on a guide member 79 between coiled springs 80 in the same manner as described in connection with the gyroscope 35 shown in the first
15 figures of the drawings. To the lower end of the yoke 77 is secured a guiding and supporting roller 82, which is adapted to travel in a grooved track bar 83 arranged across and secured to the opposite side bars 2 of the
20 frame 1 below the gyroscope, as shown. By means of the roller 82, track bar 83 and guiding or supporting member 79 acting through yoke 77 and guiding bracket 78, the gyroscope 76 is yieldingly held in position on
25 the frame of the machine. To the lower trunnion by which the gyroscope is pivotally mounted in the lower end of the yoke is secured a longitudinally extending stop arm 84 having a bifurcated outer end which is engaged with a spring detent or restraining
30 finger 85, which is secured to the bracket 78 or other part of yoke 77, and is adapted to yieldingly hold or restrain the gyroscope from swinging around in its yoke, thus maintaining the gyroscope in proper operative position in the frame of the machine, in similar manner as gyroscope
35 35 is held in proper operative position by weight of motor thereon or spring arm and detent, as before mentioned. The gyroscope 76 is provided with an electric motor 86 which is arranged thereon and connected thereto in the same manner as
40 motor 54 is connected to gyroscope 35, and to said motor are secured suitable current conducting wires 87, whereby the electric current is supplied from storage batteries or other source of electric supply (not shown).
45 It will thus be seen that the gyroscopes may be arranged in the frame of the machine in different positions, and while I have herein shown and described the preferred manner of securing the gyroscope to the
50 frame of the machine for operation, it is obvious that the gyroscopes may be secured to the frame in other ways without departing from the scope of the invention, and that if desired a plurality of gyroscopes
55 may be arranged in the frame of the machine and suitably connected thereto for operation.

60 From the foregoing description taken in connection with the accompanying drawings, the construction and operating of the inven-

tion will be readily understood without requiring a more extended explanation.

Various changes in the form, proportion and the minor details of construction may be resorted to without departing from the
70 principle or sacrificing any of the advantages of this invention as defined in the appended claims.

Having thus described my invention, what I claim is:—

75 1. In a gyrocycle a main frame, a supporting wheel arranged at the front and at the rear end of said frame, segmental axle plates secured to the axles of said wheels, means to yieldably and rotatably connect
80 said plates with the main frame of the machine, bearing wheels connected with said frame and adapted to travel on and engage said axle plates and yieldably support said main frame on said supporting wheels, the
85 latter being permitted to turn in said frame and steer the machine.

2. In a gyrocycle a main frame, a supporting wheel arranged at the front and at the rear end of the said frame, segmental
90 axle plates secured to the axles of said wheels, means to yieldably and rotatably connect said plates with the main frame of the machine, bearing wheels connected with said frame and adapted to travel on and en-
95 gage said axle plates and yieldably support said main frame on said supporting wheels, the latter being permitted to turn in said frame and steer the machine, a gyroscope arranged and operated in said main frame to
100 maintain the equilibrium of the machine, a guide track arranged in the frame of the machine, a support and guide rail adapted to engage and travel in said guide track, a
105 stop member secured to said gyroscope, a spring detent adapted to be engaged with said stop and means for driving the gyro- scope.

3. In a gyrocycle, a main frame, a supporting wheel arranged at the front and at
110 the rear end of said frame, segmental axle plates secured to the axles of said wheels, means to yieldingly and rotatably connect said plates with the main frame of the machine, hanger frames arranged on the oppo-
115 site ends of the main frame, bearing wheels having a sliding and yielding connection with said hanger frames and adapted to travel and engage on said axle plates whereby said main frame is yieldingly supported
120 on said supporting wheels and the latter permitted to turn in said frame to steer the machine, and a gyroscope arranged and operated in said main frame whereby the equilibrium of the machine is maintained.
125

4. In a gyrocycle a main supporting frame, a supporting wheel arranged at the front and at the rear end of said frame, horizon-
130 tally arranged plates secured to the axles of said wheels, means to yieldably and rota-

ably connect said plates with the main frame of the machine, bearing wheels connected with said frame and adapted to travel on and engage said plates to yieldably support the main frame on said supporting wheels, a steering mechanism, means to connect said mechanism to said supporting wheels for turning said wheels in the proper direction for steering the machine, a gyroscope mounted in the frame of the machine, means to operate said gyroscope and adjustable means for supporting said frame when the gyroscope is out of operation.

5. In a gyrocycle, a main supporting frame, a supporting wheel arranged at the opposite ends of said frame, means to yieldingly connect the ends of the frame with the axles of said wheels whereby the latter may be turned laterally for the purpose of steering the machine, a gyroscope, means to operatively connect said gyroscope with said supporting frame, said means comprising a yoke, means to pivotally connect the frame of the gyroscope with said yoke, a guide track arranged in the frame of the machine, a suitably mounted supporting and guiding roller adapted to engage and travel in said guide track, a stop arm secured to one of the trunnions of said gyroscope, a spring detent adapted to be engaged with said arm whereby the gyroscope is yieldingly held against turning in said yoke, and means whereby said gyroscope is driven.

6. In a gyrocycle, a main supporting frame, a supporting wheel arranged at the opposite ends of said frame, means to yieldingly connect the ends of the frame with the axles of said wheels whereby the latter may be turned laterally for the purpose of steering the machine, a gyroscope, means to operatively connect said gyroscope with said supporting frame, said means comprising a yoke, means to pivotally connect the frame of the gyroscope with said yoke, a guide rod secured to the frame of the machine, a guide bracket secured to said yoke and having a sliding engagement with said guide rod, springs arranged on said rod and adapted to engage the opposite ends of said bracket, a guide track arranged in the frame of the machine, a supplemental supporting and guiding yoke, and a supporting and guiding roller mounted on the lower part of said supplemental yoke.

7. In a gyrocycle, a main frame, a supporting wheel arranged in the opposite ends of said frame, means to yieldingly connect said ends of the frame to the axles of said

wheels, a gyroscope mounted and operated in the frame of the machine, a pair of auxiliary supporting wheels arranged one on either side of the frame and adapted to hold the frame in an upright position when the gyroscope is not running, means to adjustably and yieldingly connect said auxiliary supporting wheels to the frame, said means comprising pivotally mounted adjusting levers, wheel supporting shafts secured to said levers, crank axles mounted on said shafts and adapted to receive said wheels, ratchet frame supporting bars arranged on the outer ends of said adjusting levers, spring projected pawls slidably mounted on said supporting frame and adapted to be engaged with the teeth of said ratchet bars, whereby the auxiliary supporting wheels are held down in an operative position to support said frame in a yielding manner, a releasing mechanism adapted to disengage or release said pawls from said ratchet bars, and hand levers connected with said adjusting levers whereby the latter may be swung upwardly when the pawls are disengaged from said ratchet bars, thereby raising and holding said supporting wheels in an inoperative position.

8. In a gyrocycle, a main frame, a supporting wheel arranged at each end of said frame, axles arranged in said wheels, segmental axle plates secured to the outer ends of said axles, inner and outer yokes to secure the opposite ends of said plates together, segmental guide tracks secured to the main frame, guide rollers carried by the inner yokes of said axle plates and adapted to engage said guide tracks, hanger frames arranged on the opposite sides of said wheels at the ends of said main frame, guide rollers slidably mounted on said frames and adapted to receive the edges of said segmental axle plates, bearing wheels adapted to engage and travel on said plates, a spring connection between said wheels and said hanger frames, whereby said main frame is supported on said axle plates and supporting wheels, and a gyroscope operatively mounted and operated in the main frame whereby the equilibrium of the machine is maintained.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

EDWARD N. DARROW.

Witnesses:

MYRON H. NICHOLS,
RAYMOND C. SMITH.