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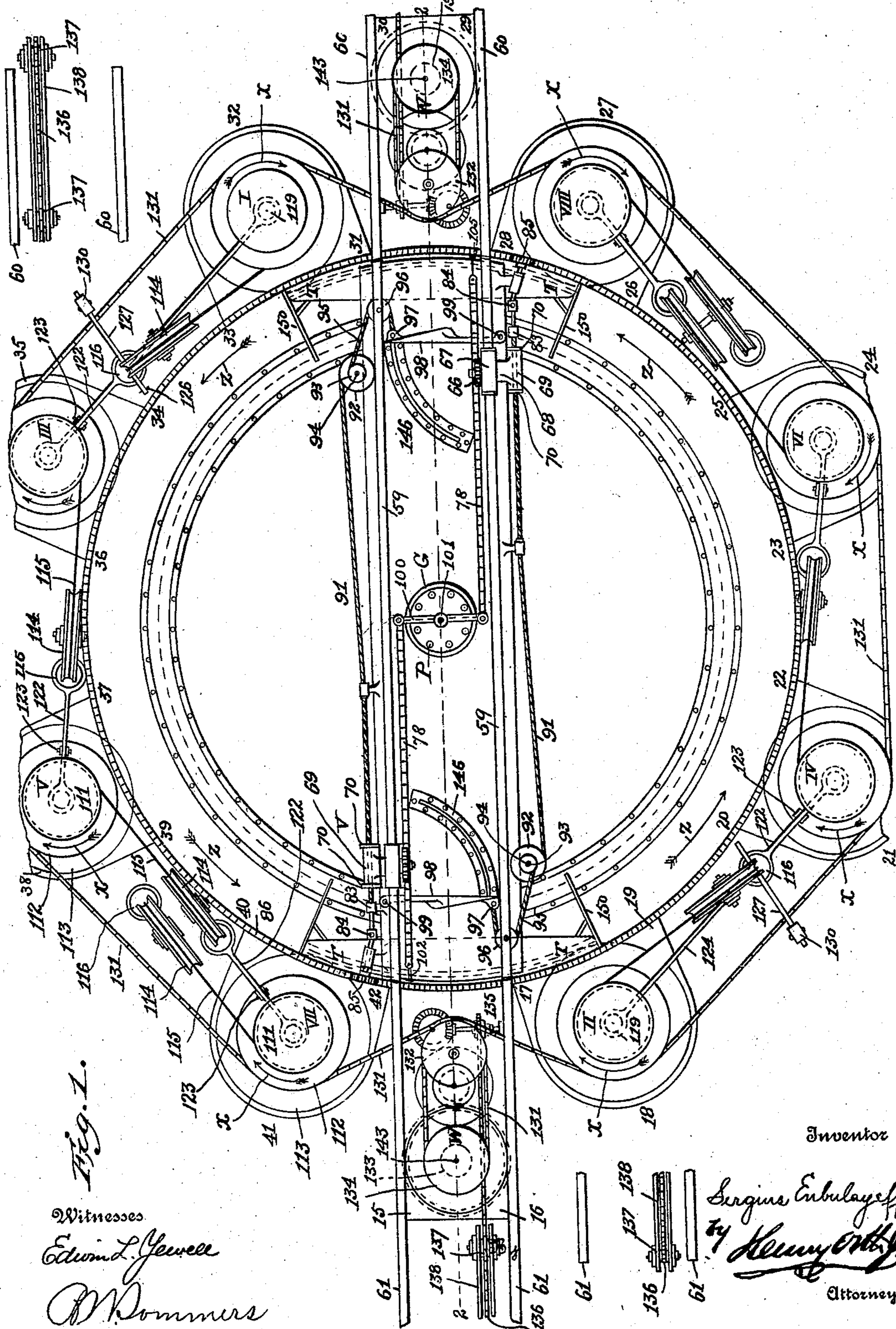
PATENTED JULY 2, 1907.

S. ENBULAYEFF.

METHOD AND APPARATUS FOR AUTOMATICALLY TURNING ROUND RAILWAY VEHICLES.

APPLICATION FILED AUG. 9, 1906.

6 SHEETS—SHEET 1.



Witnesses

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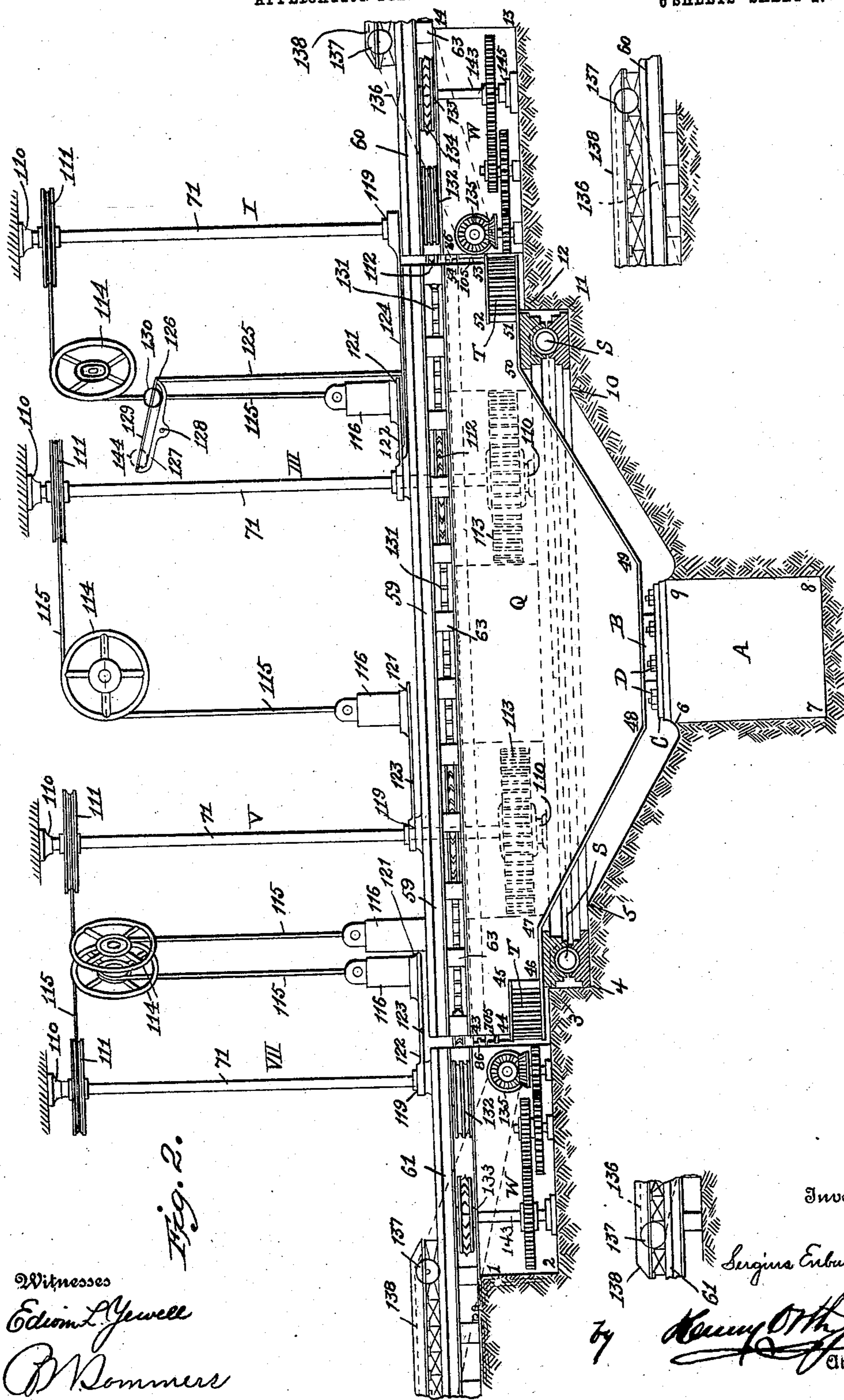
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6 SHEETS—SHEET 2.



## Witnesses

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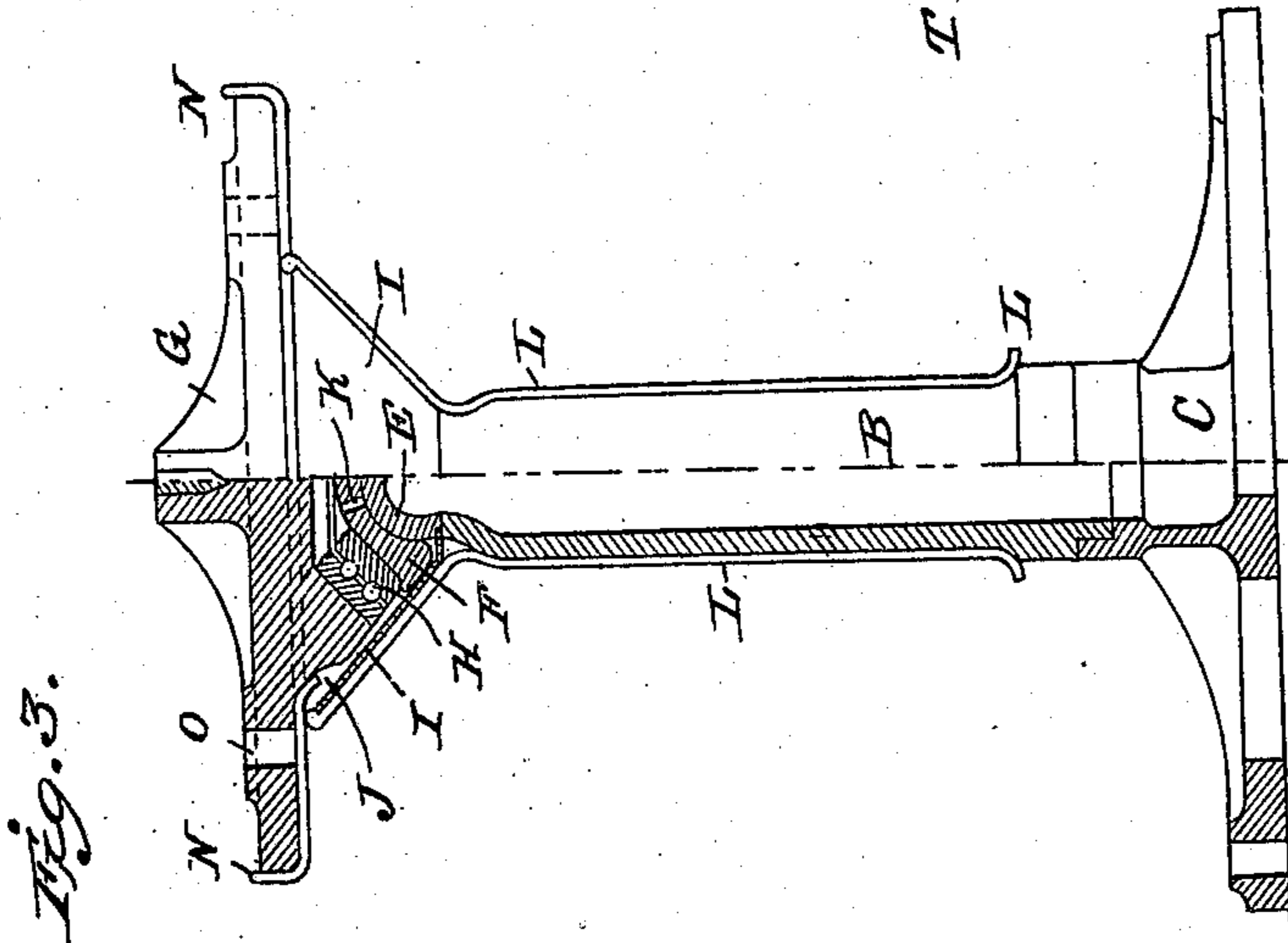
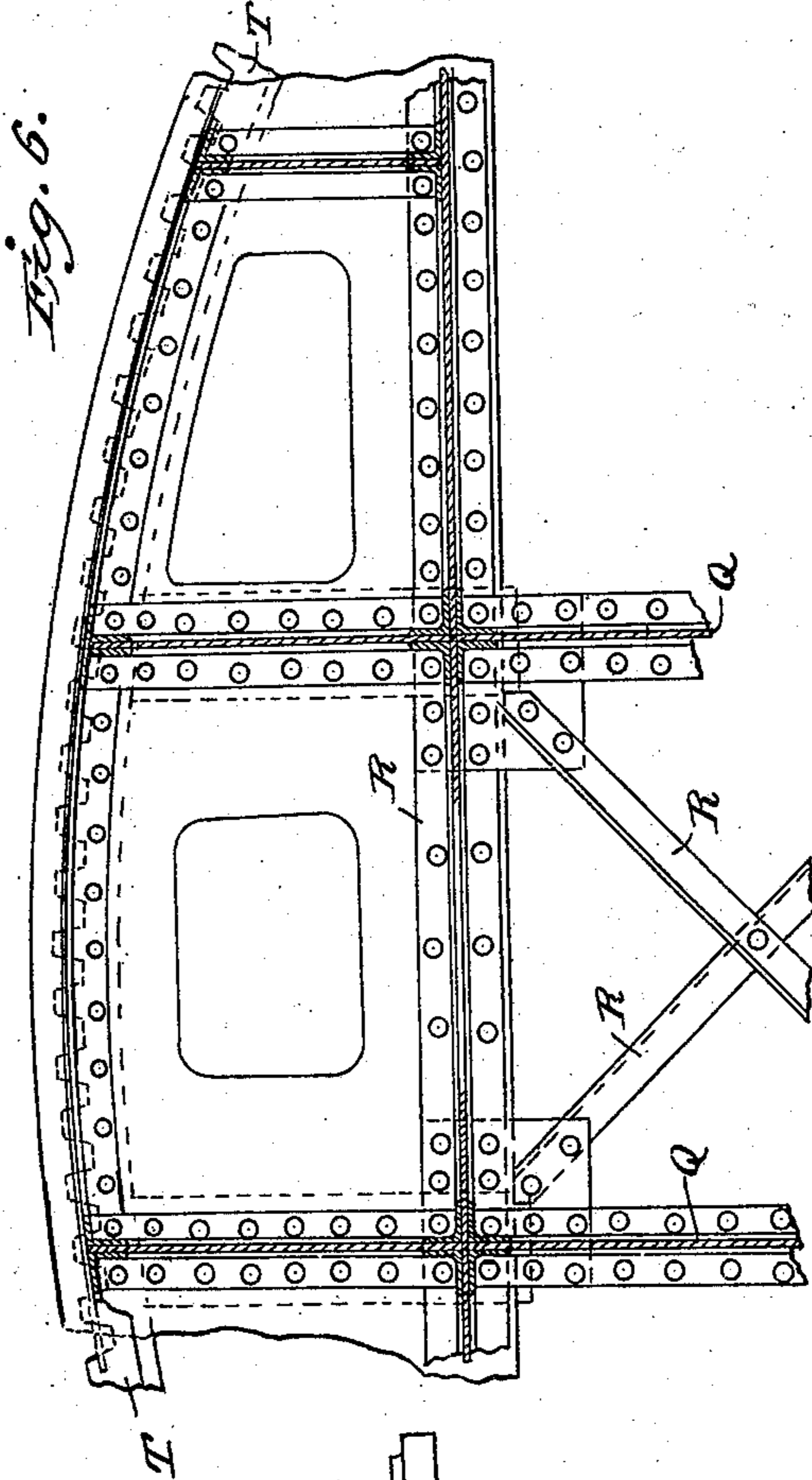
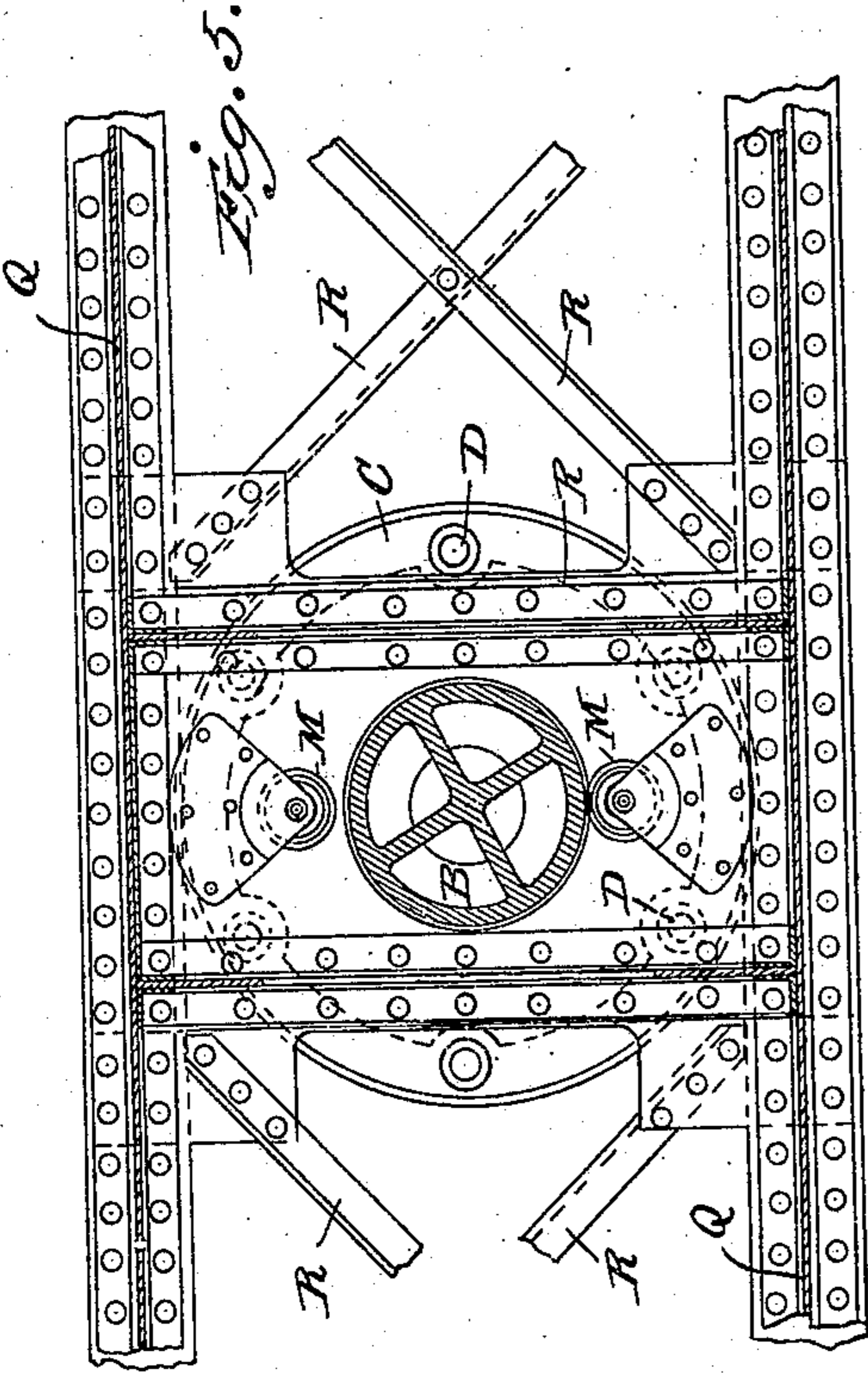
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6 SHEETS—SHEET 3.



Witnesses

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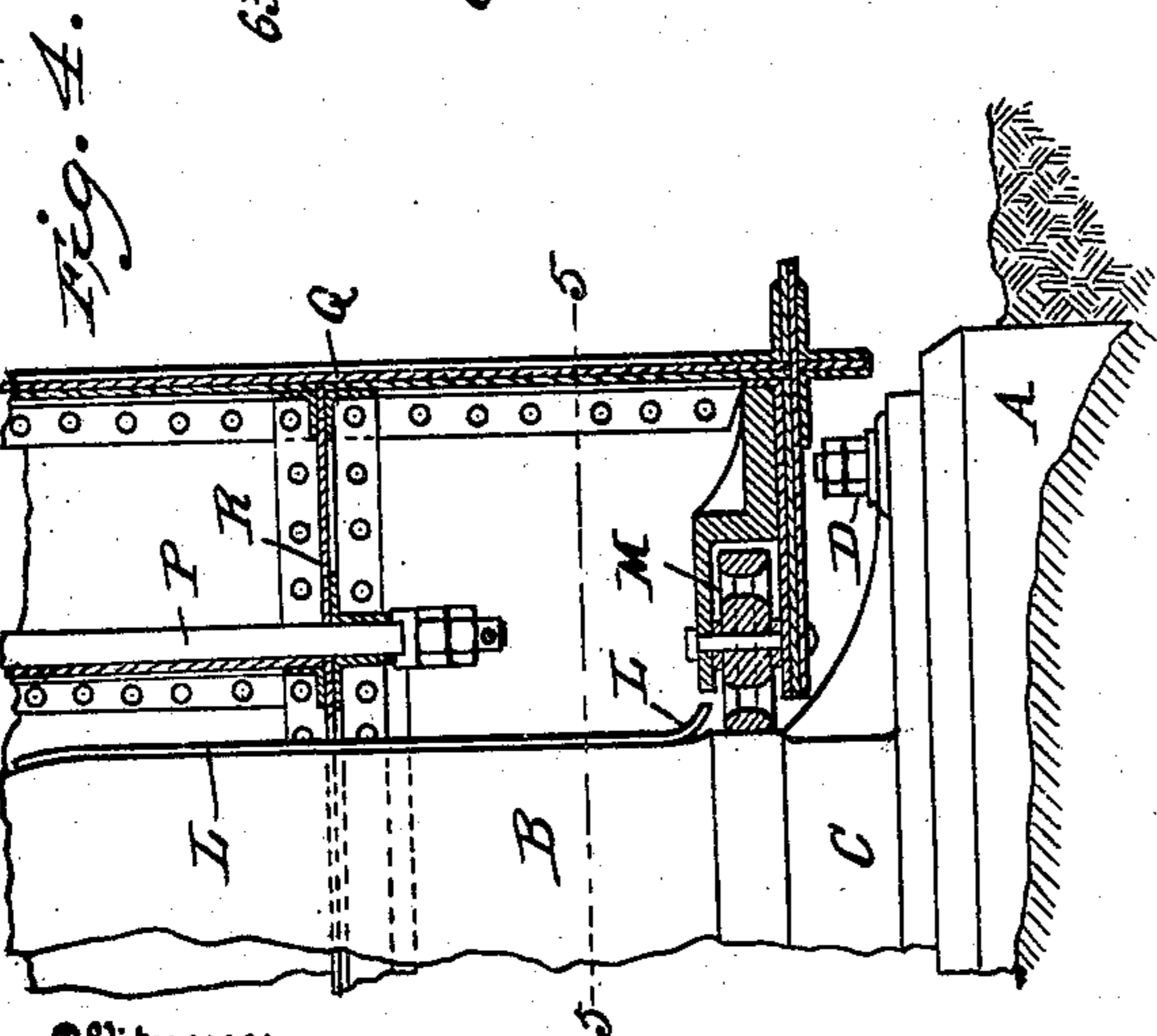
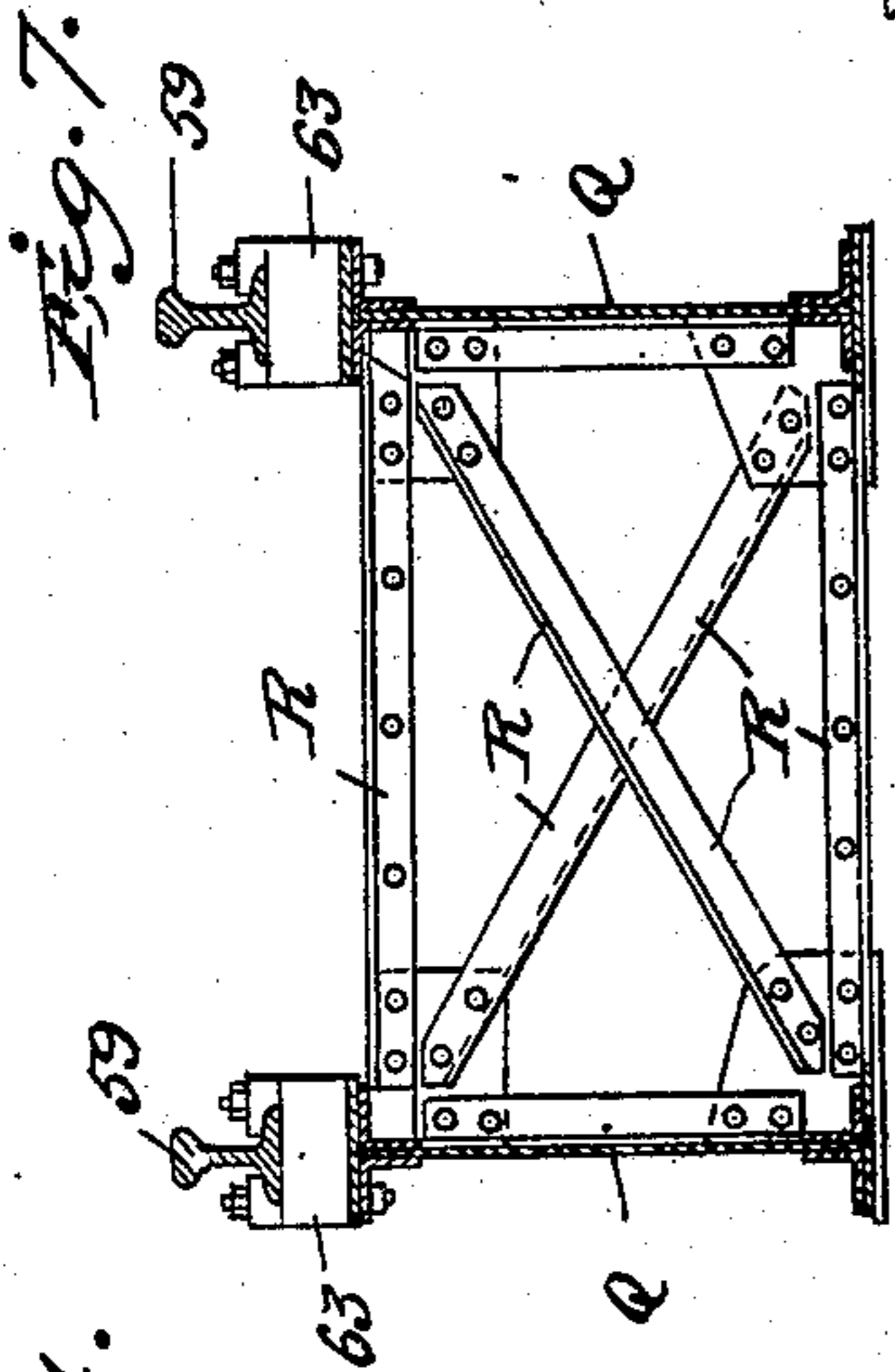
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6 SHEETS—SHEET 4.



Witnesses

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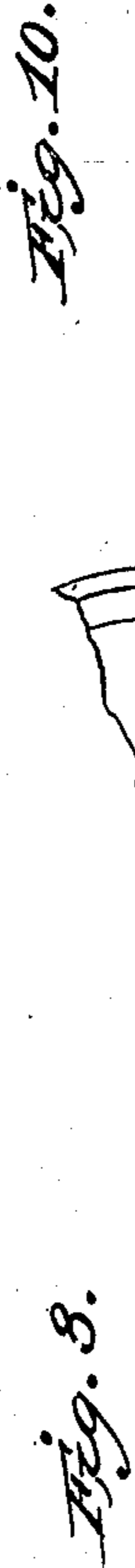
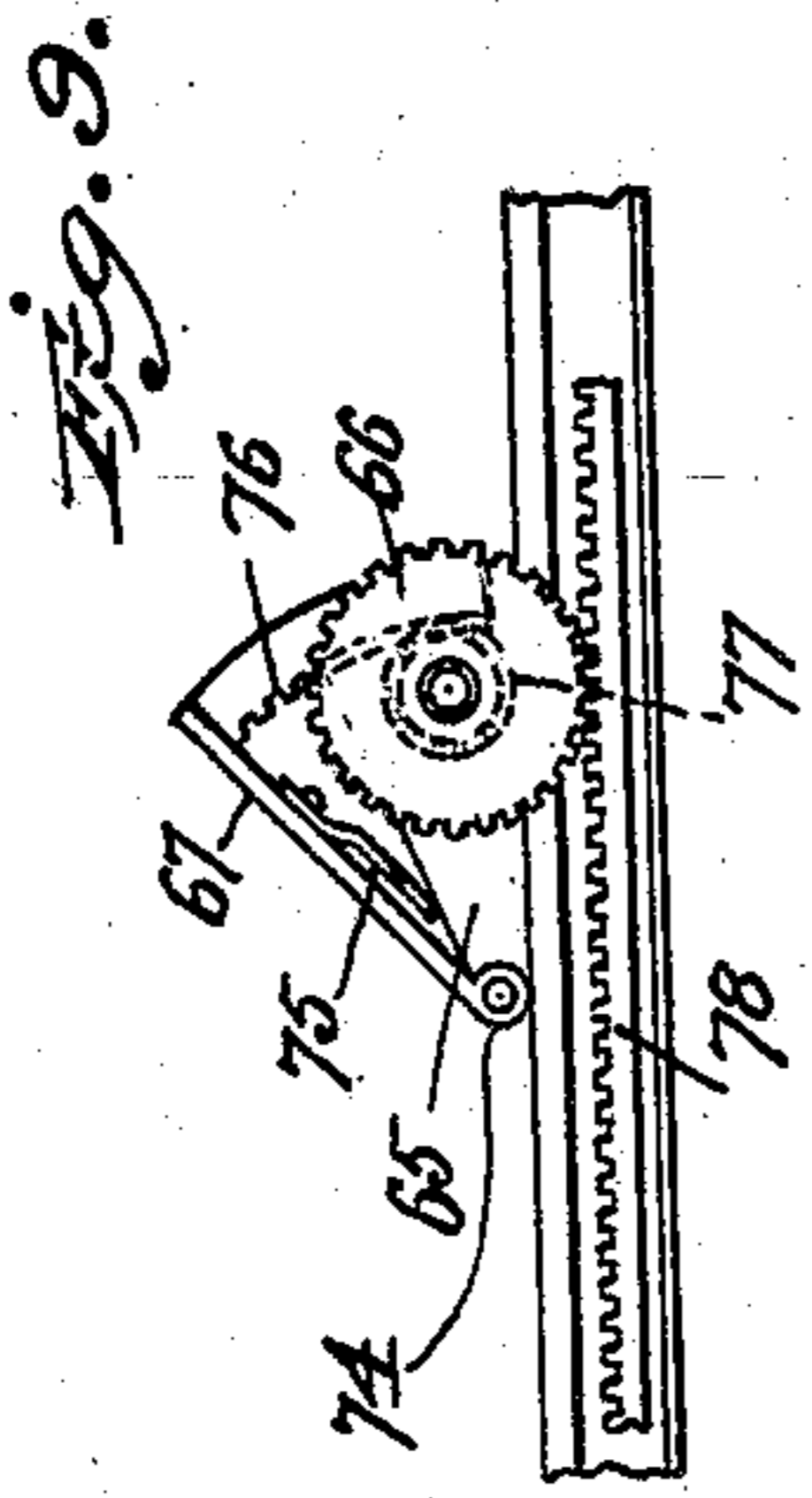


Fig. 8.

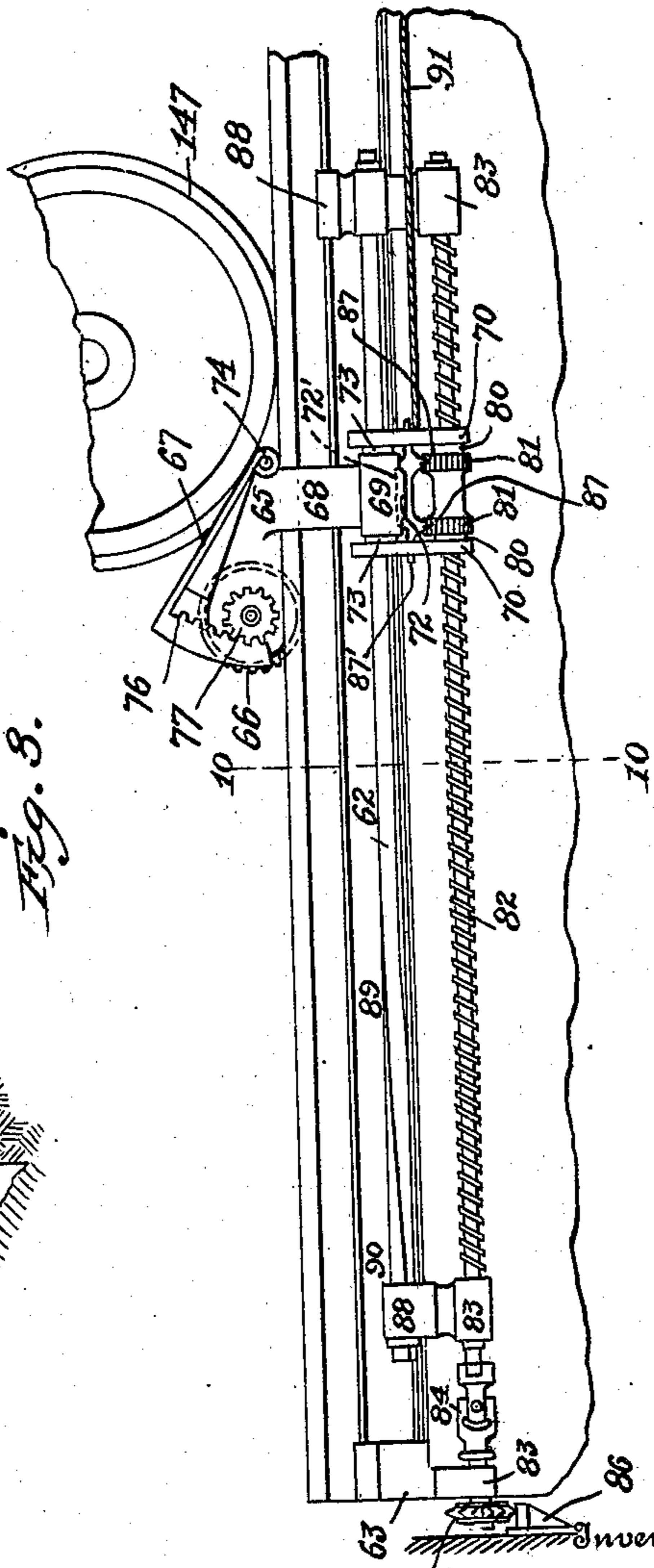


Fig. 10.

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6 SHEETS—SHEET 5.

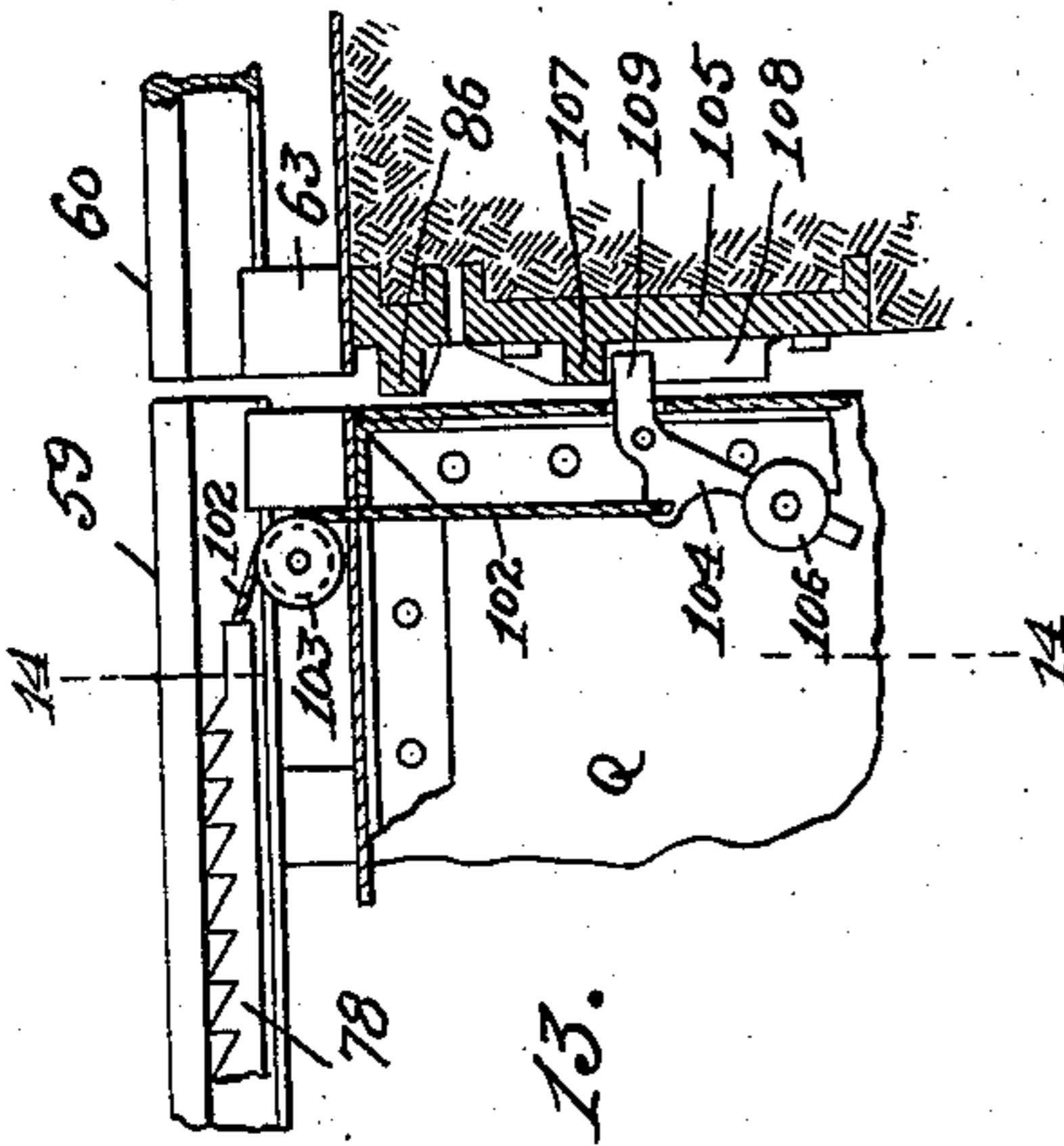


Fig. 13.

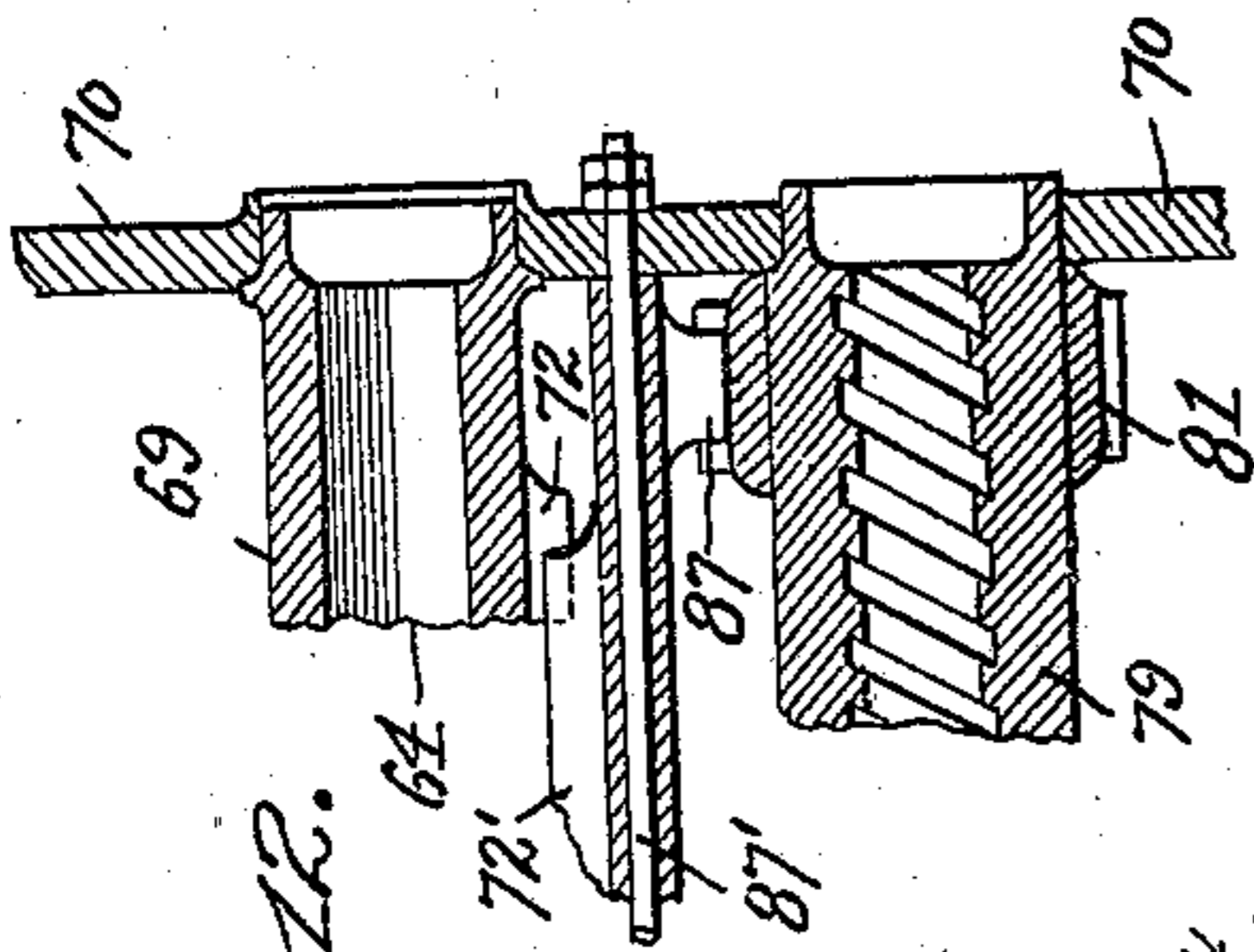


Fig. 12.

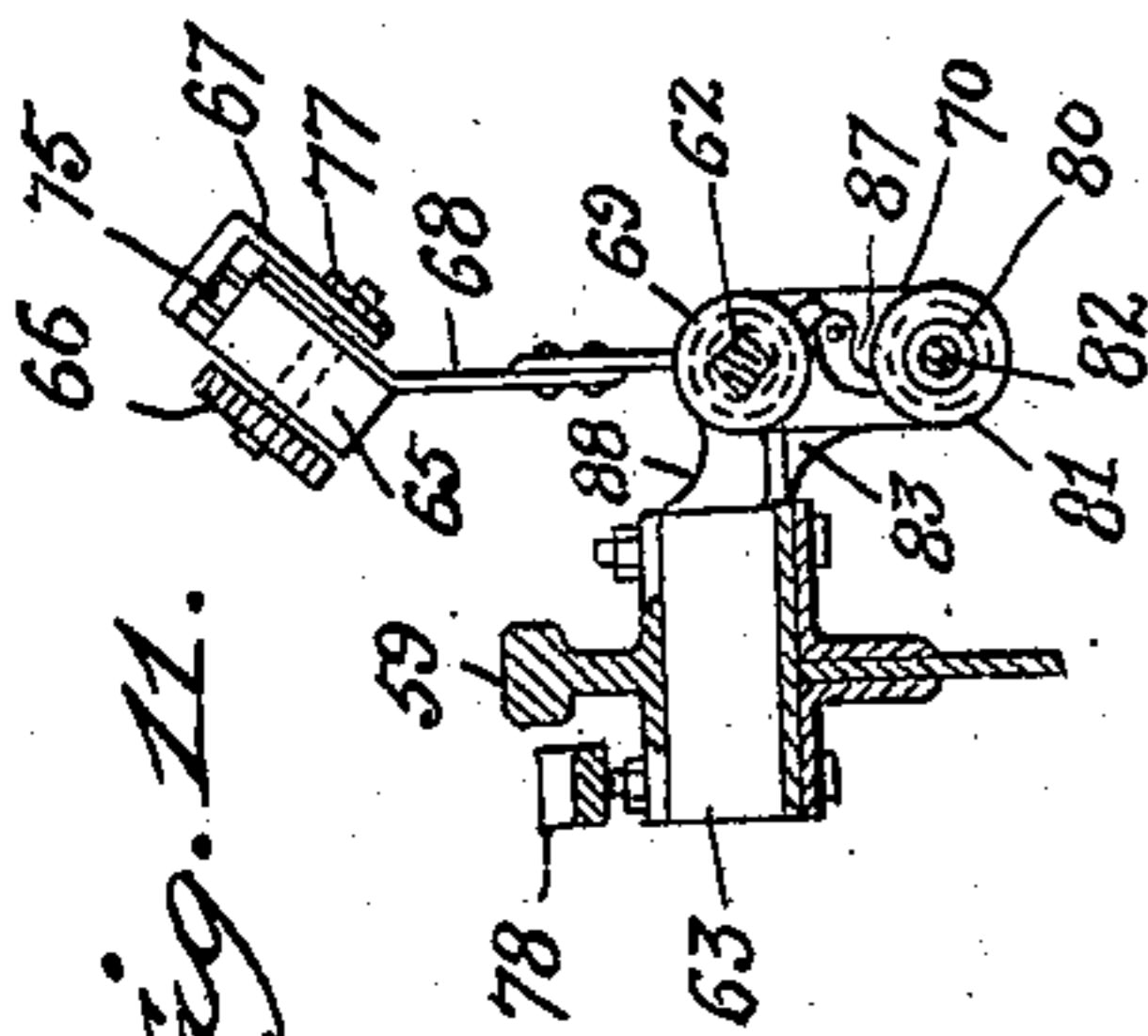


Fig. 11.

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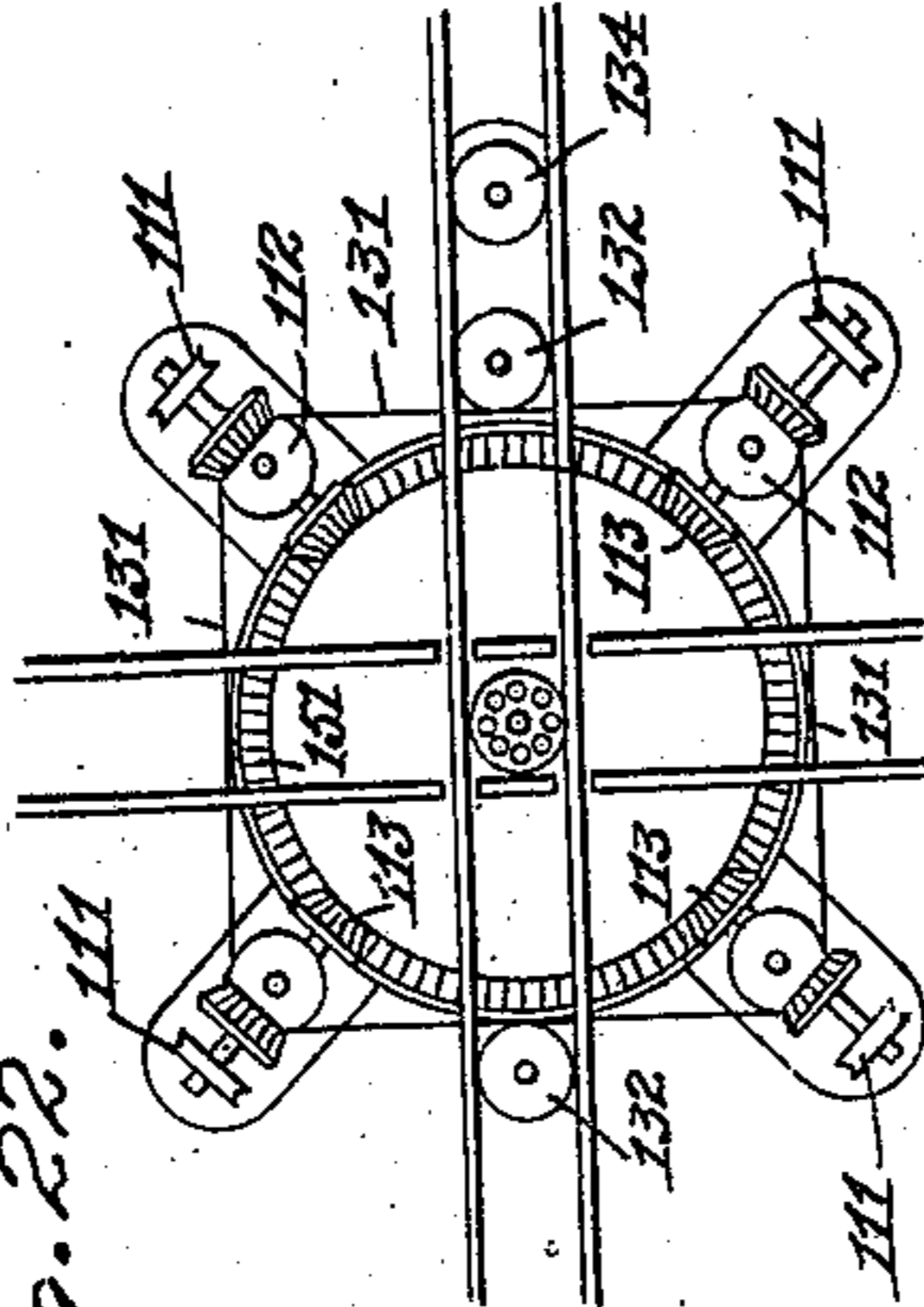


Fig. 22.

Fig. 15.

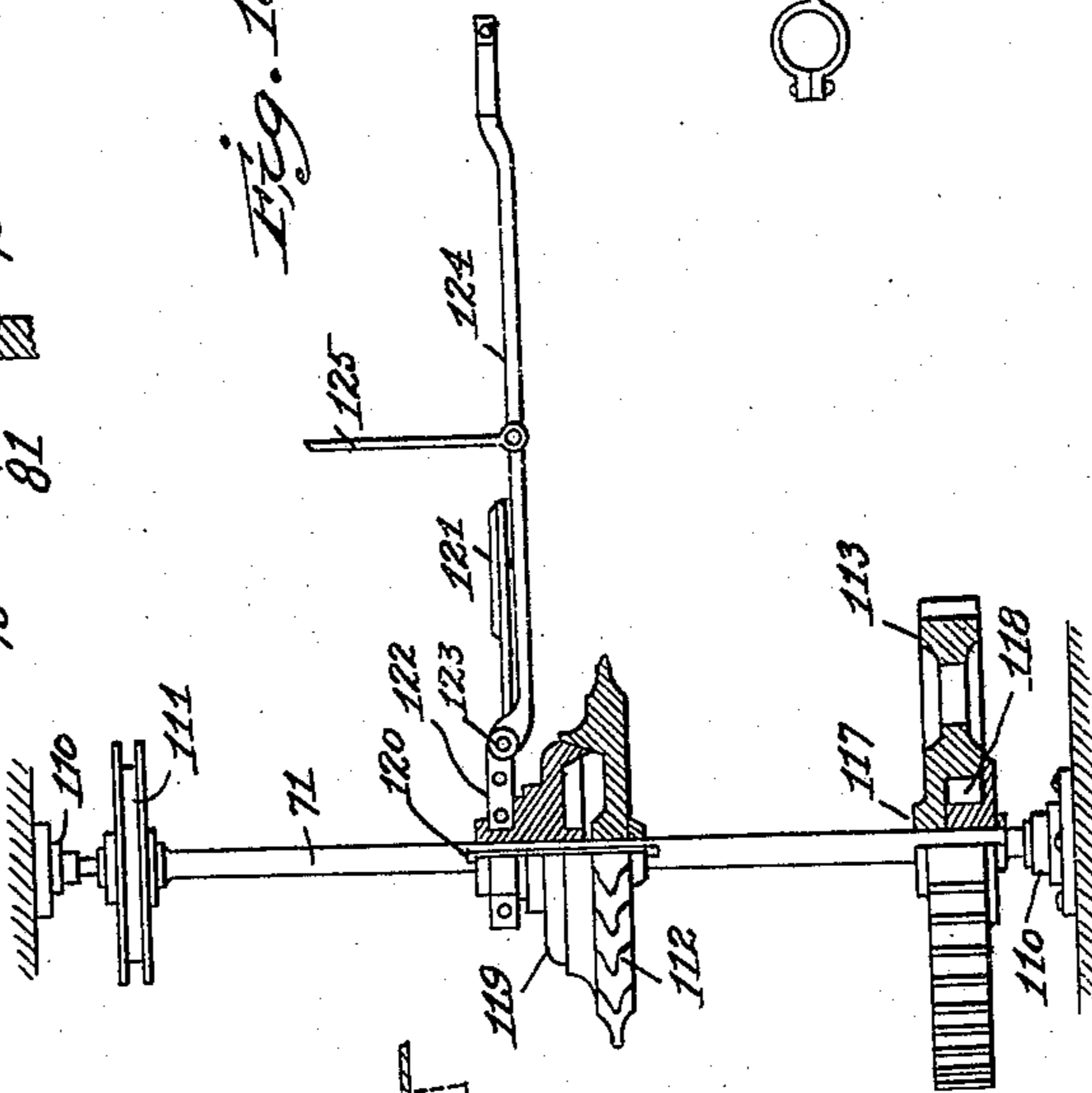
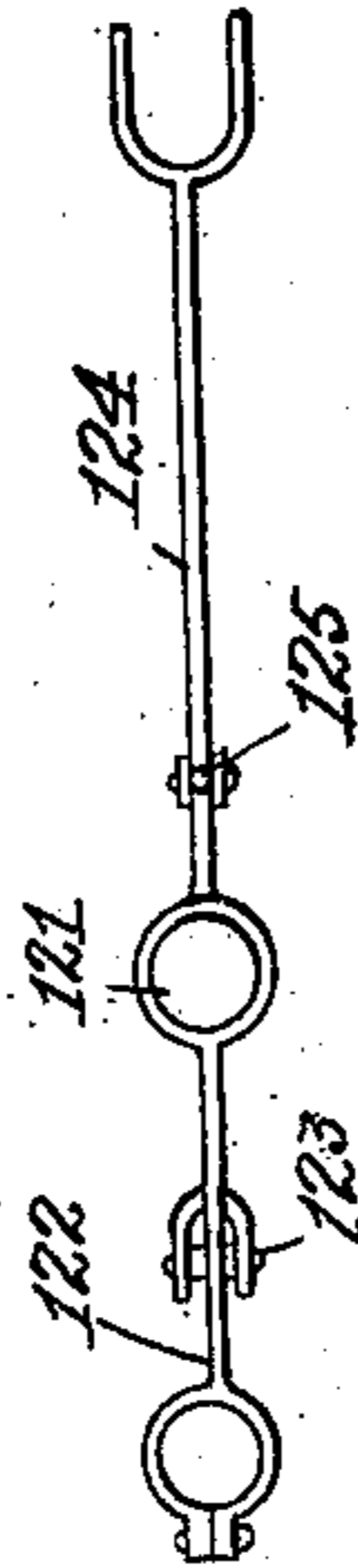


Fig. 14.

Fig. 16.



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6 SHEETS—SHEET 8.

Fig. 20.

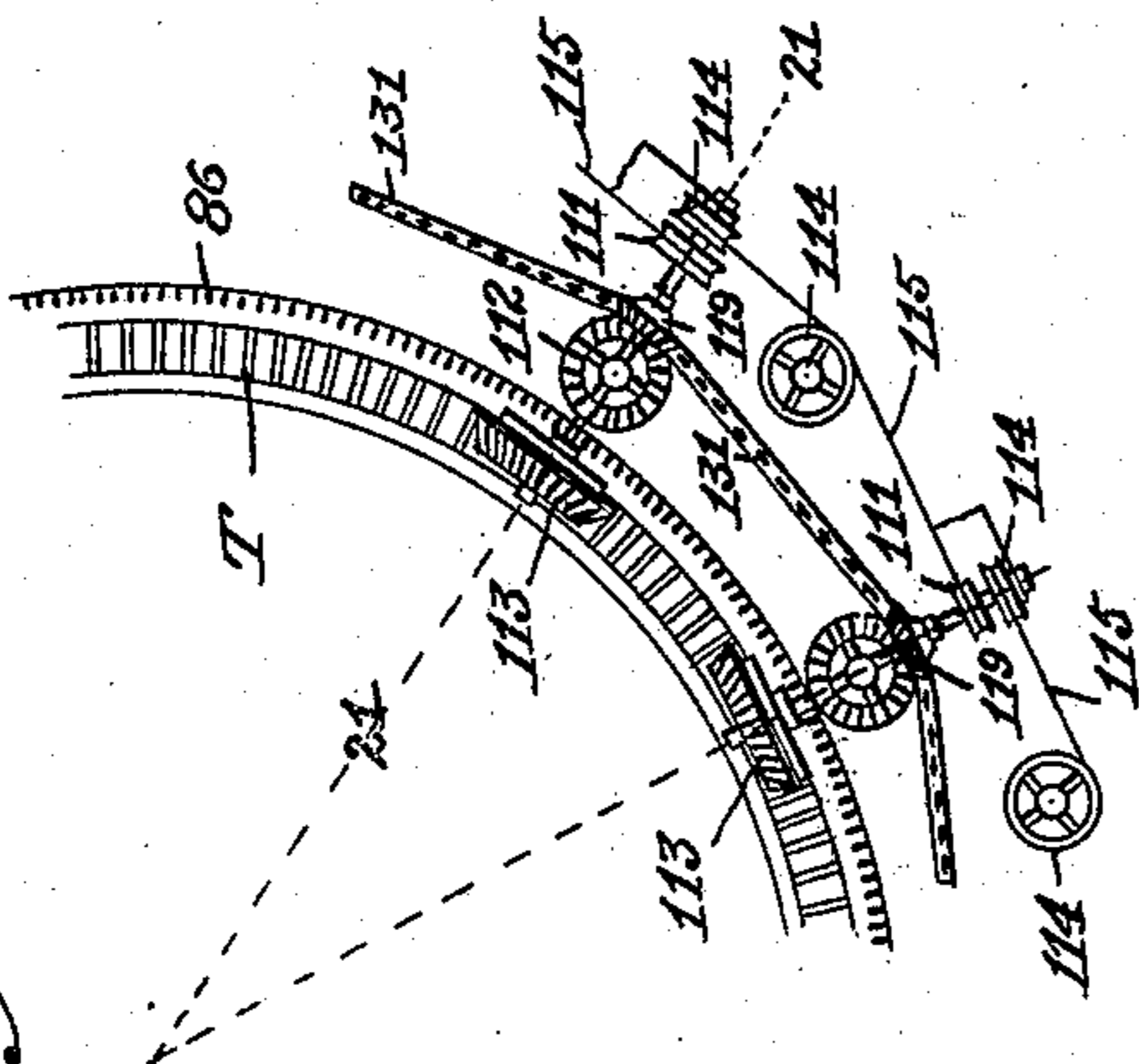


Fig. 21.

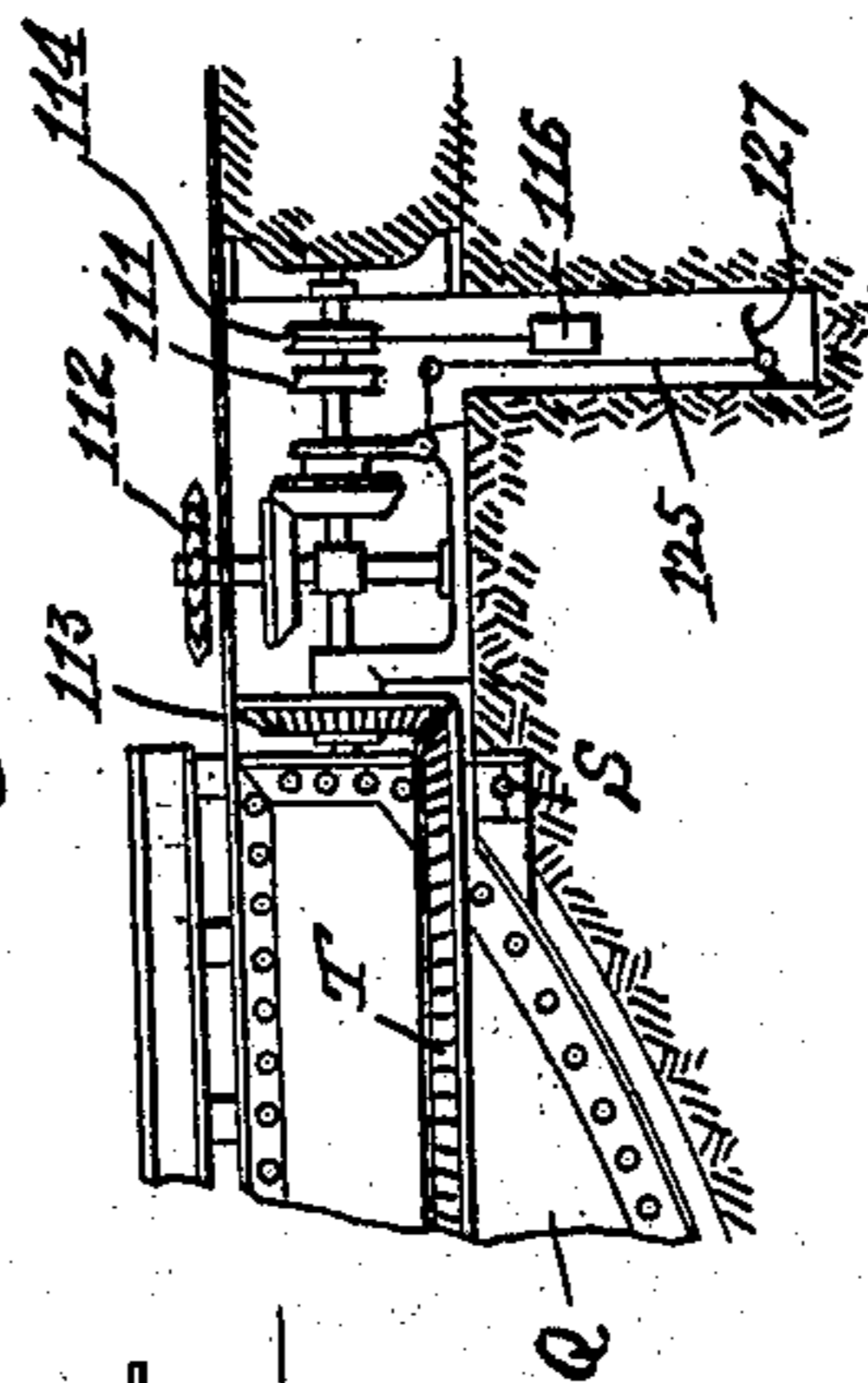


Fig. 17.

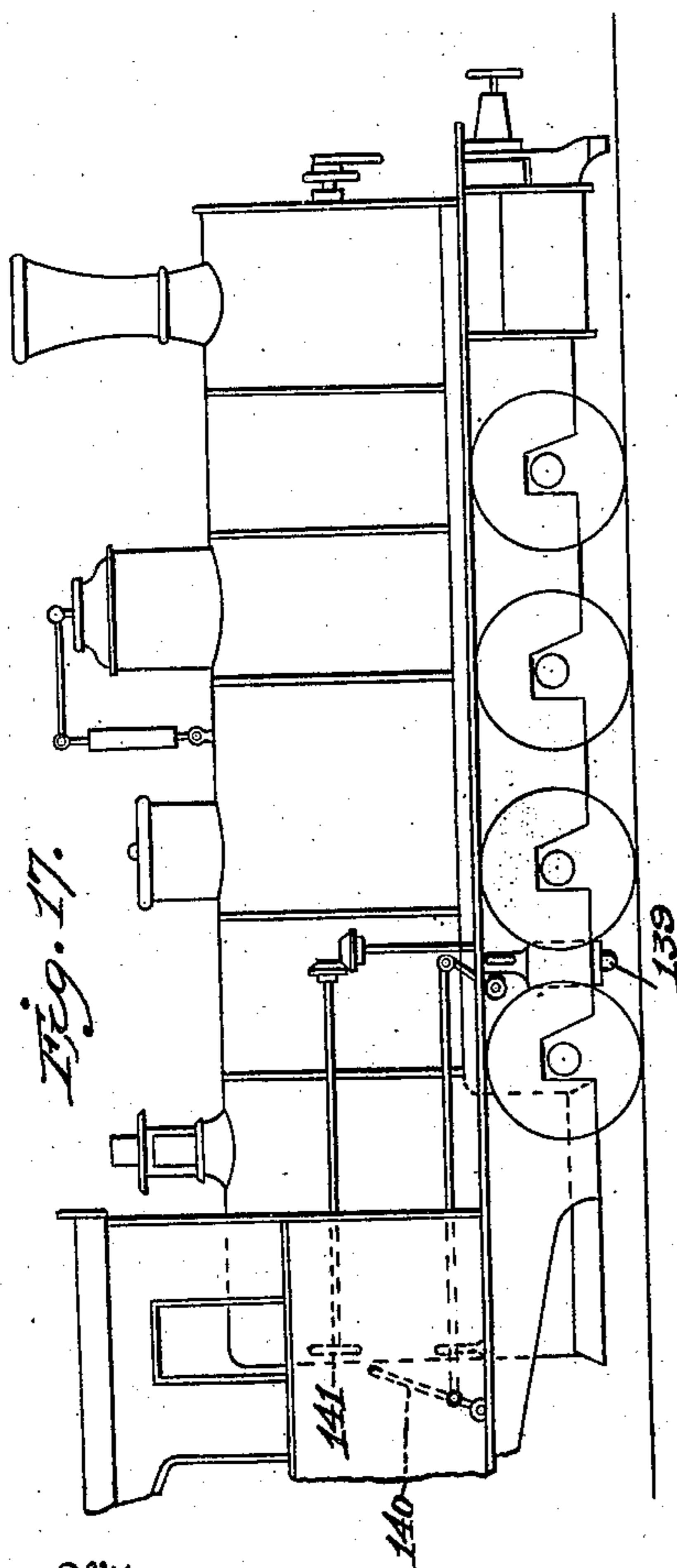


Fig. 18.

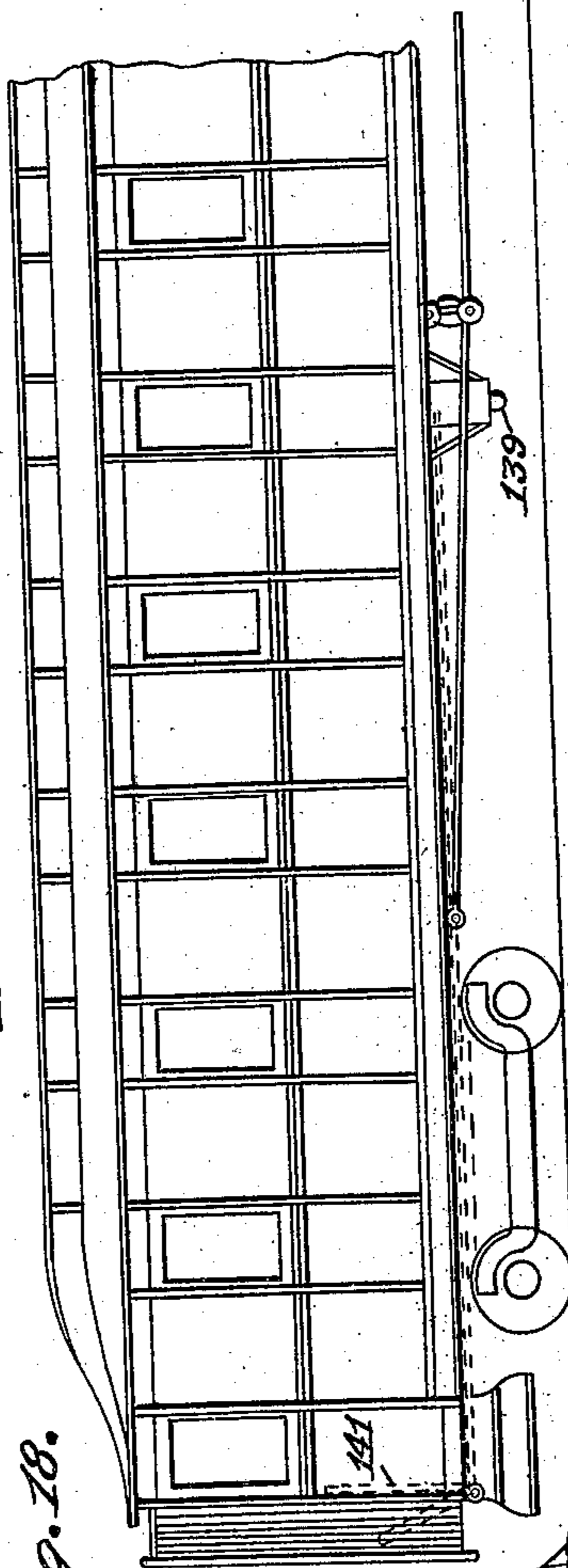
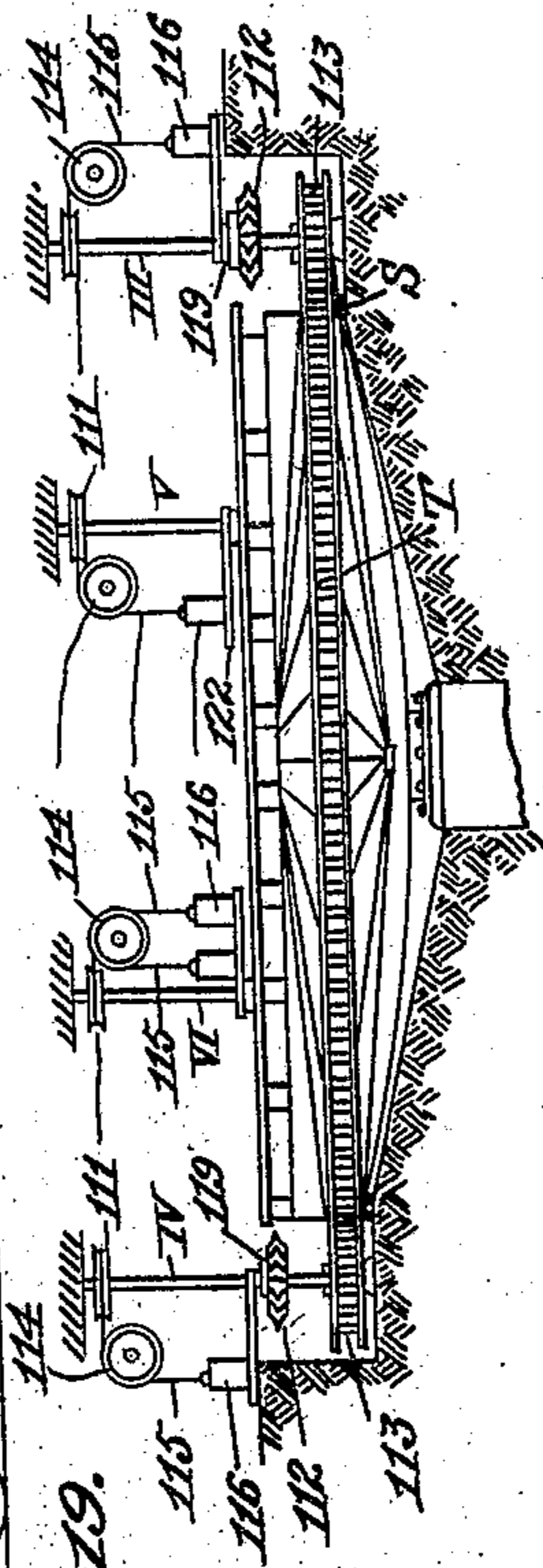


Fig. 19.



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# UNITED STATES PATENT OFFICE.

SERGIUS ENBULAYEFF, OF ST. PETERSBURG, RUSSIA.

## METHOD AND APPARATUS FOR AUTOMATICALLY TURNING ROUND RAILWAY-VEHICLES.

No. 858,802.

Specification of Letters Patent.

Patented July 2, 1907.

Application filed August 9, 1906. Serial No. 329,880.

To all whom it may concern:

Be it known that I, SERGIUS ENBULAYEFF, a subject of the Emperor of Russia, residing at St. Petersburg, Russia, have invented new and useful Improvements in the Methods of and Apparatus for Automatically Turning Round Railway-Vehicles; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings.

10 The present invention relates to the method of and apparatus for automatically turning round railway vehicles (engines, cars or the like) without the aid or application of any external power, but exclusively by the proper motion of displacement or momentum of the vehicle.

To this end, the invention has for its object to provide an automatic turntable by means of which the railway vehicle is not only turned round automatically about the axis of the turntable to the desired angle, when the vehicle has got upon the center of the turntable but also it sets itself automatically upon this center in a position of equilibrium, the starting and stopping of the turntable at the end of its rotation being also performed automatically. Moreover, almost all the working parts of the turntable are lubricated automatically during their operation. Therefore the operation and control of the turntable needs no attendance, whatever, thus reducing practically to naught the costs of the operation of turning round the vehicles.

30 To this end, the invention consists in the peculiar method of working, and also in the new arrangement, combination and operation of the parts of the automatic turntable, as will be more fully set forth in the following specification with reference to the accompanying drawings which form part of this specification.

35 In the drawings: Figure 1 shows the general plan view of the automatic turntable embodying my invention. Fig. 2—a longitudinal vertical section of the same on the line 2—2 of Fig. 1, but showing the turntable bridge in side elevation. Fig. 3—partly a side elevation and partly a vertical central section of the central pivot column of the turntable. Fig. 4—a partial transverse section through the center of the bridge, showing a part of the central column and of its connection with the bridge. Fig. 5—a horizontal section of the central part of the bridge on the line 5—5 of Fig. 4. Fig. 6—a partial horizontal section of one of the end portions of the bridge, showing the segmental rack. Fig. 7—a transverse section of the bridge at an intermediate point. Fig. 8—a side elevation of the centrator. Fig. 9—a similar elevation of the same from the opposite side. Fig. 10—a transverse section of the centrator on line 10—10 of Fig. 8. Fig. 11—a similar section, but showing the parts in another position. Fig. 12—a sec-

tion of the centrator on the line 12—12 of Fig. 10, on an enlarged scale. Fig. 13—a detail vertical section of the automatic lock. Fig. 14—a section of the same on the line 14—14 of Fig. 13. Fig. 15—an elevation of one of the spindles with its clutch levers. Fig. 16—a plan view of one of the levers. Fig. 17—a view in side elevation of an engine, showing the device for automatically controlling the operations of the turntable. Fig. 18—a similar view of a railway car provided with such a device. Fig. 19—a transverse section of a modified form of the invention, with a circular rack, on a reduced scale. Fig. 20—a partial plan view of another modification of the invention, with horizontal spindles. Fig. 21—a partial vertical section of this modification on the line 21—21 of Fig. 20. Fig. 22, a plan view of another modification.

In all figures similar letters and numbers indicate similar parts.

The curb of the turntable, may be of any suitable or well-known construction (as of concrete, iron plates or the like) and is internally outlined in the vertical longitudinal section by the lines marked by the numbers from 1 to 14 (Fig. 2) and in plan view by the lines marked by the numbers 15 to 42 (Fig. 1). At the center of this curb is mounted on a foundation-block A a pivot-column B; the base plate C of this column is fixed to the block A by means of bolts D (Fig. 2, 4, 5) and on the top of the column is removably mounted a spherical pivot-head E (Fig. 3). On the head E a cap F is placed which supports the central pivot plate G (Fig. 1, 3), a ball bearing H consisting of two conical plates with annular grooves and balls being interposed between the cap F and the pivot plate G.

The whole step-bearing is surrounded by a jacket or casing I (Fig. 3) and the space J between the casing and the bearing is filled with oil; this latter not only lubricates the balls, but centers also through an opening K into the joint between the cap F and the head E. Moreover, oil flows down from the jacket J through a pipe L to the horizontal antifriction rollers M (Fig. 4, 5) which bear against the lateral periphery of the column B and so prevent the lateral oscillations of the turntable. Fresh oil is supplied to the space J by means of pipes N mounted on the pivot plate G (Fig. 3). This plate has several holes O (Fig. 3) for screw ties P (Fig. 1, 4) serving to secure the movable bridge of the turntable to the central pivot plate G.

The movable bridge of the turntable has a form outlined in the side elevation by the lines marked by the numbers from 43 to 54 (see Fig. 2) and a rectangular form in plane, as shown by the numbers 55, 56, 57, 58 on Fig. 1. The bridge consists of two parallel longitudinal girders Q firmly tied together in horizontal and vertical transverse planes by means of suitable braces

R at the center, at the ends and in several intermediate points (Figs. 4—7).

To prevent any lateral oscillations of the bridge in the longitudinal or transversal direction about its central pivot, the ends of the girders are supported by ball-bearings S (Fig. 2) and the central part of the girders is provided with the above mentioned side rollers M which are mounted at the lower flanges of the girders and bear laterally against both sides of the central column B (Figs. 4, 5). Besides this, rollers may be mounted on the column and roll on a suitable path of the framework of the bridge. On the upper surface or platform of the movable bridge track rails 59, 59 are fixed, which are supported by blocks 63 (Figs. 2, 7) and may be brought into coincidence with the abutting stationary track rails 60, 61; the number of these stationary tracks may vary accordingly to the circumstances in each case. The ends of the bridge are enlarged and provided at the lower side with horizontal segmental racks T (Figs. 1, 2, 6), the destination of which will be more fully explained in proper place.

At each end of the bridge, near its track rails 59, are disposed the "centrators" V (Fig. 1) best shown in Fig. 8 to 12 inclusively. Each centrator consists of a stop shoe 65 having mounted at one side a toothed wheel 66 and pivotally connected to it at 74 is a treadle or pedal 67. The shoe 65 is secured by means of a lateral extension 68 to a sleeve 69 having a rectangular central opening 64 (Fig. 12); through this opening is slidably threaded a long guide rod 62 square in cross section. This sleeve is inclosed between the two side walls 70 of a carriage, is journaled in bearings 73 of these walls 70 and is provided with an external longitudinal rib or cam 72. The pedal 67 is normally held in a raised position above the shoe 65 by means of a spring 75 and is provided with a toothed segment 76 in gear with a small pinion 77 on a common shaft with the wheel 66 at the opposite side of the shoe 65; this pinion gears with a movable rack 78 extending and suitably guided along the track rail 59. In the lower part of the carriage, between the said side walls 70, is journaled in bearings 80 a long nut 79 provided externally at both ends with ratchet wheels 81. Through this nut is passed a long screw 82 having a great pitch and journaled in suitable brackets 83; this screw is connected at its outer end by means of an universal joint 84 to a prolongation having fixed on it a gear 85 (see also Figs. 1, 8) engaging an annular rack 86 fixed around the circumference of the curb. The teeth of the ratchet wheels 81 are engaged by pawls 87 connected together, swinging about a common rod 87' between the walls 70 of the carriage and provided on the rear side with a rib 72' adapted to be engaged by the rib 72 of the sleeve 69 (Fig. 12). The squared guide rod 62 is fixed at both ends in brackets 88 and is twisted at a certain angle (for instance of 45° or thereabout) around its axis of symmetry on a certain part of its length, as between the points 89 and 90 (Fig. 8).

To the carriage 70 a chain or rope 91 is fastened (Figs. 1, 8) which extends to the opposite end of the bridge and is wound around a pulley 92 and secured thereto by its opposite end; this pulley is keyed on a common shaft 94 with another smaller pulley 93 which has wound and fixed on it one end of a second rope 95 pass-

ing around a pulley 96 and having its opposite end attached to an eye 97 of a "knife" 98 extending across the track of the bridge and pivoted at 99. The other centrator is of an identical construction. The inner ends of both the racks 78 are connected together by means of an equally-armed lever 100 (Fig. 1) pivoted at 101 on the center plate G, while the outer end of each rack is connected to one end of a rope 102 (Fig. 13, 14) passed around a pulley 103 and attached to the latch 104 of an automatic lock 105. Counterweights 106 tend to always maintain the latches of both locks in a normal horizontal position. Evidently, the rope-transmission may be replaced by a lever system. The lock consists of a heavy metal plate 105 firmly fixed in the wall of the curb and provided with lugs 107, 108 forming between them a recess or socket 109 to receive the end of the latch 104.

Around the edges of the curb are mounted a series of "spindles"; they are eight in number in the present instance (although this number may vary accordingly to the requirements of each case) and are marked I, II, III, IV, V, VI, VII and VIII (Figs. 1, 2). Each spindle consists of a vertical shaft 71 (Fig. 15) journaled at both ends in bearings 110. The lower bearings 110 are disposed in the radial recesses or niches of the curb, marked by numbers 18, 21, 24, 27, 32, 35, 38 and 41 on Fig. 1, while the upper bearings are fixed firmly in any suitable manner, as for instance to the roof, or ceiling, or wall brackets, when the apparatus is disposed within a locomotive round house, or to brackets fixed on suitable posts or connected together by an annular girder in which case this latter must be at a sufficient height above the tracks to allow the locomotives to pass freely thereunder. Each spindle is provided with a grooved pulley 111, a sprocket wheel 112 and a gear 113. Each pulley 111 is fastened on the spindle 71 and has attached to it a rope 115 passing around an idler pulley 114 and carrying a weight 116 at its opposite free end. The gear 113 is mounted on a collar or hub 117 fastened to the spindle and having rollers 118 or any other suitable contrivance (as for instance in the so-called free-wheels of the velocipedes) that prevents the rotation of the gear 113 around its spindle, when the latter is at rest, in a direction opposite to that of the working motion shown by arrows *x* (see Fig. 1). The teeth of the gear 113 are adapted to engage those of the above mentioned segmental racks T at the ends of the movable bridge.

The sprocket wheel 112 (Fig. 15) is mounted to rotate freely on its respective spindle 71 and is adapted to be engaged therewith by means of a frictional clutch, the upper member 119 of which may slide up and down the spindle on a key 120 so as to be compelled to rotate together with the spindle. The clutch member 119 is connected to a clutch lever 122 pivoted at 123 in such a manner, that when the outer end 121 of this lever is urged down, the clutch member rises and is disengaged from the sprocket wheel 112, but when the end 121 of the clutch lever is freed, the clutch member falls down by gravity and becomes frictionally engaged with the sprocket wheel 112. Each clutch lever 122 is actuated by the weight 116 of the foregoing spindle, as considered according to the direction of the working rotative motion of the bridge, marked by the arrows *z* on Fig. 1.

It is however true only for the intermediate spindles III, IV, V, VI, VII, and VIII; the first (in the said direction of the working motion) spindles I and II have another clutch arrangement now to be described.

5 Each of the clutch members 119 for the sprocket wheels 112 of the two diametrically opposite spindles I and II is connected to a clutch lever 124 (Figs. 1, 2, 15, 16) which passes under the end 121 of the clutch lever 122 belonging to the clutch of the following spindle III or 10 IV, respectively so, as to be actuated by the weight 116 belonging to its proper spindle (I or II, as the case may be), together with this lever 122. Since the lever 124 has its pivot 123 common to that of the companion lever 122 it is evident that when the weight 116 say of 15 the spindle I, presses down the outer end 121 of the lever 122 of the spindle III, it presses also down the whole lever 124 and thus disengages the clutch member 119 on the spindle III but causes the clutch member 119 of the spindle I to engage frictionally the sprocket 20 wheel of this latter spindle. The raising of the lever 124, to disengage the clutch of the spindle I (or II), is effected in the following manner. When the weight 116 of this spindle rises, it strikes the end 126 of a rocker 127 swinging about a stationary pivot 128 (Figs. 25 1 and 2); this rocker is connected by a rod 125 to the lever 124 and is provided with a weight 130 sliding freely along a guide rod 129 of the rocker and serving to hold the lever 124 and the clutch of the spindle I (or II) in the one or the other extreme position.

30 The sprocket wheels 112 of all the spindles are connected together by means of a horizontal endless chain 131 (Figs. 1, 2) which moreover, passes at each end of the curb around a double pulley 132 and around a sprocket wheel 134, this latter being connected to its 35 shaft 143 by means of any well-known ratchet and pawl connection 133 which allows the wheel 134 to rotate about the shaft only in one direction, but to rotate therewith in the reverse direction. This shaft 143 is connected by means of a similar ratchet and pawl con- 40 nection to a gearing system W. Both these gearing systems W are disposed respectively at the diametrically opposite sides of the apparatus in recesses or niches of the curb under the abutting stationary tracks 60 and 61; the number of the gears comprised in said system 45 and their ratio depends in each case upon the type of the rolling stock working on the particular railway line and upon the conditions of work at each particular station. The extreme wheels 135 of these gearing systems are each actuated by an endless sprocket chain 136 50 running in a vertical plane and guided by idlers 137 and by a channel or trough 138 disposed at a certain level above the track rails 60 or 61, respectively, and extending parallel along these rails at a predetermined distance from the one or the other rail of each pair, as 55 shown in Figs. 1 and 2.

The above described apparatus works in the following manner. Normally, that is when the turntable is at rest in its initial position, all the weights 116 are lowered and rest each on its respective clutch lever 122 or 122 60 and 124; thus the sprocket wheels 112 of both the spindles I and II are engaged with their corresponding clutches 119, while the sprocket wheels of all the remaining spindles are disengaged or loose; in other words, the spindles I and II are in working or active

condition and the remaining spindles in inactive con- 65 dition. On each locomotive as in Fig. 17, or on each car, as in Fig. 18, is mounted a finger 139, as will be explained thereafter. As the locomotive or car is entering the turntable forwards or backwards, by its proper power or pushed, from the one or the other side (say from 70 the right hand track 60, Fig. 1), its finger 139, which has been previously dropped into its lower position by means of the hand lever 140 and set in the required transverse position by means of the hand wheel 141, (Figs. 17, 18), by passing above the trough 138 the finger 75 139 engages the endless chain 136, draws it and sets thus in motion the gearing system W with which this chain is connected, the opposite system W remaining inactive on account of its ratchet and pawl connection with its respective shaft 143 (Fig. 2). The gearing W, acting by 80 means of the double pulley 132 and of the sprocket wheel 134, sets in motion the endless horizontal chain 131, and consequently all the sprocket wheels 112 of the spindles I to VIII. This causes the clutched spindles I and II to draw up their weights 116; consequently the 85 depressed ends 121 of the corresponding levers 122 rise and let drop their clutch members 119, so that the following pair of diametrically opposite spindles III and IV passes immediately from the inactive into the active condition, while the spindles I and II becomes "wound up" 90 or ready to move the turntable bridge by the gravity of their raised weights 116. As the clutches 119 have now engaged the sprocket wheels 112 on spindles III and IV the continued motion of the horizontal chain 131 causes these spindles to rotate and to wind up their weights 116. 95 This in turn, causes the following pair of spindles V and VI to pass from the inactive into the active condition, and so on, until the finger 139 has passed the whole length of the trough 138 and all the weights have been wound up to their highest position. The weights 116 of 100 the first pair of spindles I and II, in reaching this highest position, strike the ends 126 of the rockers 127 and swing them about their pivots 128; the weights 130 are then shifted from the position shown in full lines on Fig. 2 to the position shown in dotted lines 144 and the rods 105 125 raise the clutch levers 124 and disengage the clutches of the spindles I and II from their sprocket wheels 112. The turntable is now held from rotation only by the automatic locks 105.

The spontaneous dropping of the weights 116 (except- 110 ing of that of the spindles I and II) is prevented by the pawl and ratchet connection 133 on the shaft 143, which connection prevents the rotation of the gearing system W, and consequently also the motion of the chains 136 and 131, in the direction opposite to that of the working 115 motion. As to the first pair of spindles I and II, although the endless chain 131 does not prevent the dropping of their weights 116, but, as their gears 113 are in engagement with the segmental racks T, these spindles cannot rotate, so long as the automatic locks are closed. 120 After the finger 139 has passed along the whole trough 138 and has thus wound up all the weights 116, this finger (or another) must be now shifted transversely to the frame of the vehicle by means of the handle 140 in such a position, that when the vehicle will enter the 125 bridge, this finger will engage the knife 98 in a predetermined point of the length of this latter and will swing it around its pivot 99 to a predetermined angle. The

outer end of the knife slides in a guide curve 146 and draws, by means of the ropes 95 and 91 and of the pulleys 96, 92, 93 the opposite carriage 70 (viz. the carriage disposed at the end of the bridge opposite to that from which the vehicle enters the bridge) with all its appurtenances, towards the center of the bridge. The nut 79 of this carriage slides along the screw 82 and, as it is free (the double pawl 87 sliding freely on the teeth of the pinions 81), it turns loose in the journals 80 of the carriage (Fig. 12). The shoe 65 with its pedal 67 and pinions 66, 77, which have been held to this time in the raised position (Fig. 11) aside of the track rail 59 by the squared rod 62, now, because of the sleeve 69 sliding with its squared hole along the twisted part 89—90 of the rod 62 is swung towards the track rail and falls thereon (Fig. 10) and the pinion 66 drops into engagement with the rack 78 (Fig. 9).

During the continued movement of the carriage 70, the nut 79 turns freely and slides along the screw 82, the sleeve 69 slides along the rod 62, the pinion 66 runs idle along the rack 78 and the shoe 65 with its pedal 67 slides on the track rail 59 towards the entering vehicle, until it meets the tire 147 of its forward wheel (Fig. 8), thus stopping the vehicle just at the instant as it reaches the true position above the pivot of the bridge. In this manner the vehicle is automatically stopped at the center in the position of equilibrium. This is secured by the fact that the extent of displacement of the carriage, required in each particular case to so stop the vehicle as to cause its center of gravity to coincide with the pivot of the bridge, depends upon the extent or angle of swinging movement of the knife, and this depends in turn upon the transverse position at which the finger 139 has been adjusted; the farther this finger has been shifted from the rail towards the central axis of the track, the more will be swung the knife and the farther will be drawn the carriage of the centrator from the end of the bridge towards its center. The finger 139 may be controlled and adjusted manually by the attendant of the vehicle (*e. g.* by the engineer on the locomotive, the brakeman or guard on the car and the like) before the entrance of the vehicle onto the turntable. In the particular case shown (Figs. 17, 18) it is presumed that the finger is dropped and raised by means of a hand lever 140 and of any suitable mechanical connection and is shifted transversely to the frame of the vehicle by means of a hand wheel 141 and of any well-known or suitable contrivance comprising for instance a worm gear or the like. There may be any suitable indicator for adjusting transversely the finger to a position corresponding to the length and distribution of the charge of the vehicle. In general, the construction and combination of parts of the devices for adjusting and actuating the finger may be varied to a great extent without restricting the scope of this invention. Thus, instead of one finger 139 adapted to draw the chain 136 and to swing the knife 98 two separate fingers may be used, one of which may serve to draw the chain and the other to swing the knife; this latter finger may be provided with a suitable contrivance for the transverse adjustment accordingly to the position of the center of gravity of the vehicle. Moreover, the finger, or fingers may be made removable and each vehicle may be provided with suitable supports to mount

the same before entering the turntable. Returning to the working of the apparatus, it will be seen that the vehicle after being stopped or centered as explained but conserving a certain tendency to be moved forwards by its momentum, presses down by its tire 147 the pedal 67 of the shoe against the spring 75, so that the toothed segment 76 rotates the pinions 77 and 66 and this latter draws the rack 78 towards the center of the bridge. This motion is transmitted by the lever 100 to the second rack 78; the motion of both racks 78 is transmitted by means of the ropes 102 and pulleys 103 (or any other suitable connection) to the latches 104 of both the automatic locks, which are thus opened and the turntable is disengaged from the curve.

The weights 116 of the diametrically opposite spindles I and II, which have been raised but have been prevented to this time from dropping, being now retained by nothing, begin to drop freely and to rotate the spindles with its fastened collars 117, so as to rotate the gears 113 and these latter rotate the segmental racks T and thus the bridge begins to rotate around its pivot, being sustained by its ball bearings and by its lateral rollers. This is the method of automatically starting the mechanism of the turntable. As soon as the bridge has begun to rotate, the gear 85 of the centrator (Fig. 8) rolls on the annular rack 86 and rotates the screw 82; as the nut 79 is now prevented from rotation by the double pawl 87 engaging its pinions 81, the nut slides along the screw. As a result of this motion, the shoe 65 is removed from below the tire 147 of the vehicle wheel and returns towards the end of the bridge, until the sleeve 69 reaches the twisted part 89—90 of the guide rod 62. This causes the sleeve 69 to be turned at a certain angle and to swing aside the shoe 65 with its connected parts, thus leaving the way free for the vehicle to run off the bridge; at the same time the rib 72 bears against the rib 72' of the pawl 87 and causes the same to free the nut 79 of the carriage and to stop the further return motion of the shoe.

The continued rotation of the bridge, although causing the gear 85 and the screw 82 to rotate, causes the centrator to run inactive, because its nut 79 is not retained by the pawl and turns freely. The diametrically opposite centrator, which remained meanwhile swung aside and has not participated in setting the vehicle, runs the whole time inactive. When the mechanism of the turntable thus started will cause the bridge to turn under the action of the weights of the first pair of spindles sufficiently to bring the segmental racks T into engagement with the gears 113 of the second pair of spindles III and IV, the weights of the first pair I and II will reach their lower position and will press down its own clutch levers 124 and the clutch levers 122 of the second pair of spindles. Consequently the spindles of the first pair will be clutched with their sprocket wheels and further dropping of their weights will be stopped, while the spindles of the second pair III, IV will be disengaged from their clutches 119 and their weights 116 will begin to drop, thus continuing the work begun by the weights of the first pair. The action of this second pair of weights 116 will cause the bridge of the turntable to turn further until these weights will reach their lowest position and will press down the clutch levers 122 of the next third pair of

spindles V and VI. Thereafter the weights of these latter spindles will continue to rotate the turntable, and so on until the bridge acted upon by the weights of the last pair of spindles will reach such a position, 5 that the latches 104 of the automatic locks, sliding along the inclined ribs 108 (Figs. 13, 14) of the locks in consequence the momentum of the bridge, will drop into the recesses 109 under the action of their counter-weights 106 and will automatically stop the whole 10 mechanism after having turned round the vehicle to the required angle.

It is evident that, as the construction of the apparatus is symmetrical, it will work similarly, from whatever side the vehicle may be pushed or enter onto the bridge. 15 It will be easily seen that for the said automatic turning round of the vehicles by means of the turntable above set forth and controlled by the falling weights the number of the abutting tracks is immaterial, as well as the number of spindles the number of automatic locks, 20 the angle of partial rotation of the turntable and the like, such details being shown on Figs. 1 and 2 only for the sake of clearness and merely as an exemplification.

It will be easily understood by those skilled in the 25 art that many changes may be made in the number, combination and mode of operation of the parts, without digressing from the scope of the present invention. Thus for instance, the number of abutting tracks and of tracks on the turntable may be greater or less than 30 two, as shown *e. g.* on Fig. 22, where four abutting tracks and two crossing tracks on the turntable are provided. The angle to which the turntable may be rotated may be greater or less than  $180^\circ$ , as it is evident, that the turntable may be stopped at each point 35 where an automatic lock is provided and the number and disposition of such points may be as great as desired. The bridge may be provided with usual handspikes 150 (Fig. 1) for manually turning the bridge if the automatic mechanism gets out of order. The 40 number of spindles may be greater or less than eight; as in Fig. 22 wherein four spindles are shown. The number of pairs of centrators may preferably correspond to the number of tracks on the turntable. The spindles, instead of being vertical, may be disposed 45 horizontally, as shown for instance on Figs. 20, 21 and 22. The segmental racks T may be disposed only at the ends of the turntable tracks, or it may be replaced by a continuous annular rack T, as shown on Figs. 19, 20 and 22. Evidently, the weights 116 may be re- 50 placed by suitable springs, and the toothed engagement of the parts 85, 86 by a frictional engagement.

The supporting ball bearing S may consist of a continuous (although made of segments) bottom ring and of several upper bearing plates or of one segmental 55 plate with balls under each end of the bridge track or tracks, or of a continuous upper bearing ring with a groove throughout filled with balls; this latter construction will be preferable particularly when a continuous angular rack T is used, as in Figs. 19, 20 and 22. 60 The number of lateral antifricition rollers M may also vary, as instead of two such rollers shown on Fig. 5 a series of rollers may be mounted around the whole circumference of the central column B. The drawing chain 131 may work in a horizontal, instead of a vertical

plane. The curb of the turntable may be covered by 65 a platform rotating together with the bridge, particularly when this latter has several tracks or a continuous annular rack T or roller path S.

As in all the modifications of Figs. 19, 20, 21 and 22 the same letters and numbers of reference indicate simi- 70 lar or equivalent parts as on the main Figs. 1 to 16 inclusively, it would be superfluous to describe them more fully. It will thus be seen, that the construction and combination of parts of the automatic turntable may vary to a considerable extent accordingly to the 75 requirements and to the conditions of working of each station and of construction of the rolling stock. Thus for instance for the locomotive round houses, where the turntable is ordinarily disposed within the building in the center thereof, the provision of an automatic turn- 80 table with several tracks and vertical spindles will be probably found preferable, while the horizontal spindles would be preferable for one-track turntables disposed in the open air. As to the centrator, its use should be considered as absolutely advantageous particularly 85 in all cases where not only a fully automatical working is desirable, but also an efficient, regular and rapid operation securing an absolute safety of working.

The dispensing with the centrator simplifies to a certain degree the mechanism of the automatic turntable 90 and is admissible in the cases where the apparatus is used not too frequently and when it would be found desirable to limit it only to an automatic turning round the vehicles, while in setting them at the center, the starting and stopping of the mechanism may be per- 95 formed manually in the ordinary manner which, besides does not exclude the possibility of certain accidents occurring, as heretofore, from the irregular positioning of the bridge or of the vehicles.

Without the centrator the operations of the apparatus 100 are extremely simple and require no special attendant, as the starting and stopping of the mechanism may be always performed by one of the ordinary attendants of the vehicle by merely opening and closing of the locks. The centrator, however, is a most important feature in 105 the round and segmental locomotive houses, when it is desirable not only to provide an automatic turntable with variable angles of rotation, but also to absolutely prevent any possibility of derailing on the turntable.

I claim as my invention:— 110

1. In combination with a turntable, a power accumulator, means operated by the movement of a vehicle towards the table to store power in the accumulator, and means operated by the movement of the vehicle after it is on the table to apply the accumulated power to the table. 115

2. The combination with a turntable, of mechanism for operating the same, said mechanism controlled by the movement of a vehicle as it approaches the table and as the vehicle moves on the table.

3. The combination with a turntable, of means to lock 120 the same, weights connected with the table, mechanism to lift the weights operated by the movement of a vehicle towards the table mechanism on the table engaged by the moving vehicle to release the table and permit the weights to act independently of their raising mechanism and rotate the table. 125

4. The combination with a turntable, of mechanism for locking the same, weights, mechanism connecting the weights and table, mechanism for raising the weights operated by the movement of a vehicle towards the table, mechanism operated by the movement of the vehicle to stop its movement on the table, and mechanism operated 130

- by the stopping mechanism to release the locking mechanism.
5. The combination with a turntable, of mechanism for locking the same, mechanism for releasing the locking mechanism, weights, mechanism connecting the weights with the table, mechanism for raising the weights operated by the movement of a vehicle towards the table, mechanism for holding the weights raised, mechanism on the table operated by the vehicle to arrest the movement thereof and simultaneously operate the releasing mechanism.
6. In a turntable, the combination of a pivoted bridge, means to lock the bridge against rotation, a rack on the bridge, a gear normally in engagement with the rack, a spindle carrying the gear, means to rotate the spindle independent of the gear, a weight connected to the spindle raised by the rotation thereof, and means to release the locking means.
7. In a turntable, the combination of a pivoted bridge, means to lock the bridge against rotation, a rack on the bridge, a gear normally in engagement with the rack, a spindle carrying the gear adapted to be rotated independently of the gear, a sprocket on the spindle, a clutch to normally lock the sprocket to the spindle, means to rotate the sprocket, a weight connected to the spindle adapted to be raised by the spindle, means to disengage the clutch and spindle, and means to release the locking means.
8. In a turntable, the combination of a pivoted bridge, means to lock the bridge against rotation, a rack on the bridge, a gear normally in engagement with the rack, auxiliary gears mounted in the path of the rack, spindles carrying the gears adapted to be rotated independently of the gears, a weight connected to each spindle, means connecting the spindles, means operated by the movement of a carriage towards the bridge to move the connecting means, means operated by the movement of the connecting means to successively rotate the spindles and raise the weights, and means to hold the weights, connected to the spindles of the auxiliary gears, in the raised position.
9. In a turntable, the combination of a pivoted bridge, means to lock the bridge, a segmental rack on the bridge, a gear normally in engagement with the rack, a spindle carrying the gear adapted to rotate independently thereof, a sprocket on the spindle adapted to rotate independently of the spindle, a clutch to normally lock the sprocket to the spindle, a plurality of auxiliary spindles, gears mounted thereon in the path of the rack, sprockets loose on the auxiliary spindles, clutches to lock the sprockets to the spindles, an endless chain connecting the sprockets, mechanism to operate the chain controlled by a carriage moving over said mechanism, a weight, connected to the spindle carrying the normally engaged gear, raised by the movement of the chain, weights connected to the auxiliary spindle, and means operated by the raising of the first mentioned weight to successively raise the weights of auxiliary spindles.
10. In a turntable, the combination of a pivoted bridge, means to lock the bridge, a segmental rack on the bridge, a gear normally in engagement with the rack, a spindle carrying the gear adapted to rotate independently thereof, a sprocket on the spindle adapted to rotate independently of the spindle, a clutch to normally lock the sprocket to the spindle, a plurality of auxiliary spindles, gears mounted thereon in the path of the rack, sprockets loose on the auxiliary spindles, clutches to lock the sprockets to the spindles, an endless chain connecting the sprockets, mechanism to operate the chain controlled by a carriage moving over said mechanism, a weight, connected to the spindle carrying the normally engaged gear, raised by the movement of the chain, weights connected to the auxiliary spindles, means operated by the raising of the first mentioned weight to successively raise the weights of the auxiliary spindles and means to maintain the last named weights in the raised position.
11. In a turntable, the combination of a pivoted bridge, means to lock the bridge, a segmental rack on the bridge, a gear normally in engagement with the rack, a spindle carrying the gear adapted to rotate independently thereof, a sprocket on the spindle adapted to rotate independently of the spindle, a clutch to normally lock the sprocket to the spindle, a plurality of auxiliary spindles, gears mounted thereon in the path of the rack, sprockets loose on the auxiliary spindles, clutches to lock the sprockets to the spindles, an endless chain connecting the sprockets, mechanism to operate the chain controlled by a carriage moving over said mechanism, a weight, connected to the spindle carrying the normally engaged gear, raised by the movement of the chain, weights connected to the auxiliary spindles, means operated by the raising of the first mentioned weight to successively raise the weights of the auxiliary spindles, means to temporarily maintain the last named weights in the raised position and means on the table operated by the movement of the carriage to stop the same and to simultaneously operate the locking means.
12. The combination with a turntable, and a curb surrounding the same, weights connected with the table and mechanism to lift the weights operated by the movement of a vehicle towards the table, of a pivoted member on the table in the path of the moving vehicle, a locking member on the table normally engaging the curb, and means connecting the pivoted member and locking member.
13. The combination with a turntable, weights connected with the table, mechanism to lift the weights operated by the movement of a vehicle towards the table, and means to hold the weights in their raised position, of a pivoted member on the table in the path of the moving vehicle, and a blocking member, connected to and operable by the pivoted member.
14. The combination with a turntable, a curb surrounding the table, weights connected with the table and mechanism to lift the weights operated by the movement of a vehicle towards the table, of a pivoted member on the table in the path of the moving vehicle, a blocking member, means connecting the pivoted member and blocking member, a locking member on the table normally engaging the curb, and mechanism on the blocking member adapted to operate the locking member.
15. The combination with a turntable, a track thereon, a curb surrounding the table, of a locking member on the table normally engaging the curb, a blocking device pivoted near the track, a lever pivoted on the table adapted to be engaged by a vehicle moving thereon, means, connecting the blocking device with the free end of the lever, adapted to advance said device towards the vehicle, a slide for the blocking device adapted to throw the latter onto the track, a pedal carried by the blocking device adapted to be depressed by the moving vehicle, a rack on the pedal, a pinion on the blocking device rotatable by the rack and a rack connected to the locking member in mesh with the pinion.
16. In combination with a turntable, a curb surrounding the table, mechanism for automatically rotating the table, and means for automatically releasing the locking mechanism comprising a lever pivoted on the table in the path of a moving vehicle, a blocking device, means connecting the lever and blocking device, a slide for the latter, a pedal on the blocking device, a rack on the pedal, a pinion on the blocking device in mesh with the rack, a rack connected to the locking means in mesh with the pinion, a screw, a gear thereon, a rack on the curb engaging the last named gear, a nut on the screw carried by the blocking device and pawls on the latter adapted to engage the nut.
17. In a turntable, a central fixed supporting column, a spherical pivot-head removably mounted thereon, a cap having an aperture therein mounted on said head, a pivot-plate, ball carrying members, interposed between the cap and plate and an oil containing casing surrounding the head and ball carrying members.
18. In a turntable, the combination with a central supporting column, and a pivot-plate carried thereby, of a movable bridge carried by the pivot-plate, anti-friction bearings interposed between the bridge and column to prevent longitudinal movement of the bridge, and means to automatically lubricate said bearings.
19. In a turntable, the combination with a supporting column, of a bridge carried thereby, anti-friction guide

rollers mounted on the bridge frame adapted to engage the column to prevent transverse oscillations of the bridge, and means to automatically lubricate the rollers.

5 20. In a turntable, the combination with a central supporting column, of a spherical pivot-head removably mounted thereon, a cap mounted on the head, a pivot-plate, ball carrying members interposed between the cap and pivot plate, an oil containing casing surrounding the head, a bridge frame mounted on the pivot-plate extending  
10 below the same, anti-friction bearings interposed between the frame and column to prevent transverse oscillations of the frame, and pipes adapted to convey oil from the casing to the bearings.

21. In a turntable, the combination with a supporting column, of a bridge-frame pivoted thereon, means for preventing lateral and longitudinal oscillation of the frame, a rack on the latter, a plurality of gears adapted to engage said rack, and means to successively rotate the gears for the purpose specified. 15

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses. 20

SERGIUS ENBULAYEFF.

Witnesses:

H. A. LOVIAGUINE,

EDWD. WANSCHIEDT.