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An Agency of Industry Canada / Un organisme d'industrie Canada

(11) CA 221284 (13) A

(40) 25.07.1922

(12)

(21) Application number: 221284D

(22) Date of filing: ..

(51) Int. Cl:

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(54) MECHANISM FOR PRACTICAL UTILIZATION OF FLEXIBLE CATERPILLARS

(54) MECANISME DE CHENILLE DE TRACTEUR

(57) Abstract:

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This invention relates to mechanical combinations intended to render practical the use of flexible caterpillars on any vehicles.

Figure 1 is an elevation of the general arrangement of one of the systems suggested, with four twin rollers;

Figure 2 is a plan of the same;

Figure 3 shows in section a construction of the bearing train; and,

Figure 4 is a section on line A-A of Figure 3;

Figure 5 shows in elevation a modified construction with two twin rollers;

Figure 6 illustrates in end view the bearing train of Figure 5;

Figure 7 is a side view of the bearing train of Figure 5;

Figure 8 shows a modified construction of a bearing train with four single rollers for narrow caterpillars;

Figures 9 and 10 show in elevation and in plan, partly in section, an example of the system of mounting and of tightening of the free pulley.

(By twin rollers are designated here those, the axes of which intersect or are extended).

In the construction shown in Figures1 and 2, the weight of the vehicle is transmitted to the bearing system of each of the caterpillars by an axle 1 rigidly secured to the chassis 2 by any desired bracket 3 and a balance beam 4 pivoted to the axle 1. This balance beam 4 terminates at its two ends in two cylinders 5 connected parallel to the axle (Figures1-3).

In the said cylinders travel hollow plungers 6 (Figures 1 and 3) to which are secured rectilinear guiding keys 7 (Figure 3) which can slide in grooves 8 provided for the purpose in the cylinders 5.

The lower part of the plungers 6 carries either the pin 9 of the balance beams 10 (Figures 1-3) or, in the case of Figures 4 and 5, the spindle 11 of the rollers 12.

As will be seen from the Figures, the axes of the twin rollers are not parallel, but intersect each other and form an angle, the apex of which is directed to the side opposite to the ground.

In the interior of the plungers 6 is mounted a spring 13 (Figure 3) surmounted by a guide pot 14.

The latter, under the action of the spring 13, presses against one of the ends of a small balance beam 18 in one piece, which can oscillate about a pin permanently secured in the walls of the upper part of the cylinders 5 and at right angles to the axis of the axle of the vehicle. The cover 16 could be provided with special lugs through which also passes the pin 15. The screws 17 securing the cover 16 to the cylinders 5, give the necessary consistency to the whole.

It will be seen that the load received by each roller, will be one eighth of the load transmitted by each end of the axle, that is to say one sixteenth of the total load supported by the axle. On an uneven ground, as is almost always the case, the distribution of the load on the rollers will be practically constant owing to the pivoted balance beams 10 and 4, and to the transverse compensator 18.

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Whilst ensuring constant distribution of the load on the various rollers, whatever be the differences of level of the ground in both directions, this combination renders the twin rollers completely independent of each other and enables one to be moved without its neighbour situated at the other side of the inner guide of the caterpillar, being in the least affected. Moreover, the vertical movement of each roller takes place in a straight line, vertical or inclined at a suitable angle, consequently without lateral friction against the guide of the endless band.

The mechanical construction giving this result, is one of the points aimed at by the present invention.

On very rough ground, in order not to expose the caterpillar to extensive tension, stops are provided for limiting the travel of all the parts in accordance with the differences of level of the ground.

To that end, the upper part of the plungers 6 is caused to strike the cover 16 of the cylinders, in the same way as the compensator 18 in its extreme travels, will also strike the same cover 16 of the cylinders, which will form a stop for it.

On the other hand, the lower balance beams 10 will have their great amplitudes limited by the outer part of the bottom of the plungers, against which the balance beams 10 will rest. It is obvious that all these stops will have to be judiciously calculated so as not to interfere with the movements of all the parts even on very rough ground.

These new peculiarities also form part of the invention.

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The bearing train shown in Figures 5 and 6, has only two pairs of twin rollers. In this construction, the pin or spindle of each roller is mounted direct on the lower part of the corresponding plunger 6. There are therefore four bearing surfaces per apparatus, that is to say eight per bearing axle. The main balance beam 4 ensures here, by itself, longitudinal oscillations, whilst the transverse compensating system obtained by means of the balance beams 18 remains the same as in the previous construction.

Figures 7 and 8 show, also by way of example, another construction of the bearing train for narrow caterpillars, this time without any necessity for a transverse compensating system. There are therefore no twin rollers. The figures are sufficiently clear to show that this system is derived from the preceding ones.

In this latter case, in order to bring the rollers as close to each other as possible, and to reduce the total length of the whole the two central rollers for instance have only one cheek each, and are arranged in such a manner that each cheek is at either side of the caterpillar as shown besides in Figures 7 and 8. The other two rollers have no flanges at all, and partly engage with the grooves of the large front and back pulleys or drums.

These arrangements shown by the corresponding figures, form a part of the invention.

In all these systems, the rollers 12 could be mounted in the ordinary manner by means of two ball bearings per roller or on plain bearings, on roller bearings with large bearing surface etc. Here by way of example

is shown a practical construction of a roller mounted on a single swivel bearing.

To that end, in the hub 19 (Figure 3) of the roller 12 is mounted the outer ring or race of the swivel bearing 20. The inner race is keyed to the spindle 21 secured to the balance beam 10 through the intermediary of a part 22 (Figures 3 and 4) held in place by a nut 23 and key 24. This part 22 has two flat faces with which engages, with a slight amount of friction, a ring 25 provided for the purpose with an opening of suitable shape which prevents the ring 25 from turning, but allows it to slide in the vertical direction. The corresponding end of the hub 19 fits inside with a slight amount of friction on the part 25.

The advantage of this combination is always to arrange automatically the axis of rotation of the roller parallel to the rolling track.

In fact, the part 25 allows the roller to oscillate on its swivel bearing only in the vertical direction, and allows it therefore, under the action of a part of the weight of the vehicle, to follow the variations of the rolling track. The travel itself in the direction of the oscillation is limited by the length of the recess in the part 25 so that the balls cannot come out from their race. In normal running, the whole weight being supported by the ball bearing 20 (Figure 3), the friction between the hub 19 and the part 25 is practically nil. On strong difference of level in the ground, the bottom or rather the top or the bottom of the recess of the ring 25 can alternately come to rest on the corresponding

portion of the central part 22. In this case, part of the load will be taken up by the guide ring 25 and the corresponding part of the hub 19. It will be seen that, owing to the inclination of the axis, the lubricating oil will not tend to escape and thus will ensure proper lubrication of the system.

All this combination is also one of the points aimed at by the present invention.

Lubrication of the whole of the bearing trains is ensured automatically and in proportion to the number and magnitude of the oscillations caused by the road.

To that end is provided a special device utilising the reciprocating motion of the plungers 6 in the cylinders 5 (Figure 3), and which also forms a subject of this patent application. This is the description of its principle:

In the interior of each plunger 6 and held in place for instance by the spring 13, is arranged a tubular body 26 (Figure 3) which can communicate through its base with the inner chamber of the plunger 6 in which, and to a height of a few centimeters, is the oil required for the lubrication.

In the interior of the tubular body 26, at the bottom, rests on a seat a ball 27 which could be replaced by any desired valve.

A tube 28 secured to the cover 16, can plunge into the tubular body 26. The upper portion of the said tube is in communication with the oil conveying conduits or grooves.

The working is as follows: when under the action of differences of level of the road, the spring 13 (Figure 3)

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for instance is compressed, in the interior of the plunger is produced a slight pressure which results in forcing a certain quantity of oil into the tubular body 26. When the contrary effect takes place, the ball drops back on its seat, and the oil introduced in the tubular body cannot descend again from it. During the running, the alternate movement of the plunger 6 taking place without interruption and in proportion to the bad state of the road, will therefore send the oil in proportional quantities to the upper part of the tube 28, whence it passes, on the one hand, through the hole 29 to the spindle 15 of the balance beam which it lubricates, in order to drop down again on the pot 14, the walls of which are lubricated as well as those of the plunger 6; on the other hand, through the conduits 30 (Figure 1) which bring it to the central balance beam which is thus lubricated. Here it is collected in grooves provided for the purpose to which are connected other conduits 31 which return it to the point of departure, that is to say to the cylinders 5. The latter are provided at their base with a stuffing box preventing oil from escaping and also forming a stop for the key 7 (Figure 3) in the event of an excessive expansion of the spring 13.

It may be advantageous to be able to utilise a flexible caterpillar apparatus on an ordinary motor car, with the least possible expenditure. The following combination solves the problem in question. It also forms part of the present invention.

To that end, the rear axle of the machine is utilised merely as a driving axle. It does not carry any

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weight. Its wheels are replaced by suitable driving pulleys which can rest on the ground with interposition of the caterpillar, owing to the action of their own weight and of that of the axle, or be suspended at a suitable height by means of a bracket 34, Figure 1, flexible or rigid, adjustable or not. In any case, these pulleys, and consequently the axle, will be able to rise to a certain height under the action of differences of level of the ground, without affecting the rest of the vehicle.

The vertical travel of the driving axle can be limited by an elastic buffer 35 (Figure 1) secured to the chassis.

The connection of the driving axle to the rest of the machine can be obtained by means of a semi-rigid torque rod pivoted to the bearing axle 1 or round a spindle adjoining it. This thrust rod is constituted by two rigid parts 36 and 37 (Figure 2) strongly connected together by a spring blade 38 mounted edgewise.

It will be seen that in normal running the torque rod 36, 37, 38 will work only in compression. The elastic portion can undergo a certain torsion necessitated by eventual angular movements of the driving axle relatively to the fixed axle, under the action of uneven ground.

The front pulley of the system could be connected to the fixed axle in the same way as the driving pulley. It could also be rendered driving, whilst the rear pulley would then be merely carrying the caterpillar. These different arrangements are of course within the scope of the invention.

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In the drawings accompanying the present patent application, the mounting of the front pulleys, as well as their connection to the rest of the vehicle, again form one of the points of the present patent application.

The whole of the front pulleys 39 is connected to the bearing axle 1 by a system constituted by two symmetrical or non-symmetrical girders 40 (Figures 1, 2, 9 and 10) pivoted to the bearing axle 1 (Figures 1 and 2). The other end of the girders 40 (Figures 9 and 10) carries the tension device for the caterpillar which also ensures a rigid connection between the girders which it connects, by a device hereinafter described, to the hub of the pulley in question.

Transverse rigidity of the girders 40 is further assured by a stay 47 of any desired cross-section (Figures 1, 2, 9 and 10) which is here shown of tubular shape. This stay has further for its object to limit the travel of the front pulley relatively to the bearing train. To that end stops 48 (Figures 1 and 2) have been provided on the cylinders 5. These stops could be adjustable, and the lower ones could be so arranged that the front pulley would be suspended at a certain height above the ground, whilst still being capable of executing, under the action of uneveness of ground, ascending movements independently of the rest of the whole. The ascending movements of great amplitude are limited by the upper stop.

The rear pulley could also be mounted in the same way and controlled by a system for instance with transverse Cardan joints.

The whole of the front pulley is in its turn constituted by two half-pulleys 39 (Figures 9 and 10)

mounted in a special manner on the hub which in its turn is of a very special construction.

The body of the hub 49 of each front pulley, Figures 9 and 10, is rigidly connected to the tension system. Each end of the hub body 49 has inside it a ball bearing 50 (Figure 10) on which fits the rotating hub 51 of special shape. In order to avoid any jamming in the two bearings 50 (one for each half-pulley), whilst keeping the two pulleys loose relatively to each other, the two rotating hubs have passing through them, in their centre, a single spindle 52 mounted with a slight amount of friction in the two rotating hubs. It will be seen that this combination allows of independent rotation of the two half-pulleys 39 relatively to each other, whilst at the same time ensuring normal working of the two bearings.

The two half pulleys 39 are mounted on the rotating hub 51 in such a manner as to facilitate the putting on and the dismantling of the caterpillar, which depends only on the outer front half-pulley, for on the latter being removed, the putting in place of the caterpillar will not offer any difficulties. The half-pulleys 39 are held in place by an ordinary locking nut (Figure 10). The latter being removed, the tension exercised by the belt on the pulleys, will be sufficient for disengaging automatically the hub 54 of the half-pulley of the cone with great angle, from the rotating hub 51. The mounting on the cone with a great angle, facilitates also the putting in place of the corresponding pulley.

The system of tension of the caterpillar is here of a very special construction, and forms part of the new mechanisms provided by the invention.

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It is constituted by a worm 41 (Figures 9 and 10) controlled by an outer crank handle 42 permanently secured or detachable. The worm 41 operates a nut or worm wheel 42 (Figure 9) engaging with a screwthreaded cylinder or tension screw 43 which terminates, at the side of the pulley, in a square 44 of great length or in a groove which can produce the same effect. The latter part can slide in a fixed guide 45 permanently locked to the body 46 of the tension system (Figures 9 and 10) in which are hermetically enclosed the parts described. The screwthreaded and grooved cylinder 43-44 is locked on the fixed central hub of the loose pulley.

The tension mechanism constituted by the worm, worm wheel or nut and tension screw, could be replaced by other mechanical parts whilst retaining the same arrangement.

It has been already stated that the body of the tension system formed a connection for the girders 40. Moreover, owing to its extension at the side opposite to the front pulley, it presses against the stay 47, a very rigid while thus being formed.

Having thus fully described the invention, what I claim as new and desire to protect by Letters Patent is: -

1. A bearing train for an endless track for a vehicle comprising, in combination with a frame of a vehicle, a plurality of pairs of spring pressed plungers beneath the load of the vehicle and actuated thereby, a roller associated with the lower ends of each of said plungers and engaging the endless track, the axes of ~~them~~ two twin rollers intersecting each other and forming an angle the apex of which is directed upwards.

2. A bearing train for an endless track of a vehicle comprising, in combination with a frame of a vehicle, a plurality of pairs of spring pressed plungers beneath the load and actuated thereby, a balance beam passing through the lower end of each plunger, a roller mounted on the free end of each beam and engaging the endless track, the axes of two twin rollers intersecting each other and forming an angle, the apex of which is directed upwards.

3. A device according to claim 1 characterized by a compensator pivoted to the frame of the vehicle and engaging the plungers.

4. A device according to claim 1 characterized by the axis of rotation of each roller being always parallel to the endless track, this result being obtained by a swivel ball bearing combined with a ring (25) sliding in a suitable direction and to a given extent on the rigid axle of the roller.

5. A device according to claim 1 characterized by means mounted within the plungers for automatically lubricating all the rubbing parts of the bearing train taking place owing to the action of the movements to which the parts of the mechaniems are exposed on account of uneven ground.

6. A device according to claim 1 characterized by means for limiting the movements of the parts produced by uneven

ground, in order to avoid excessive tension on the endless track.

7. A device according to claim 1, the vehicle consisting of a motor car from the rear axle of which the wheels have been removed and replaced by driving pulleys, the whole load of the corresponding part of the machine being then taken up by a third axle secured to the frame of the motor car, the pulleys on the rear axle driving the endless track resting on the ground, while retaining their vertical movement under the action of differences of level of the ground without affecting the rest of the vehicle.

8. A device according to claim 1 characterized by an elastic buffer arranged between the axle and the chassis for checking the movements of excessive amplitude of the rollers due to uneven ground.

9. A device according to claim 1 characterized by pulleys mounted on spindles for driving the endless track, semi-flexible pivoted torque rods connecting the spindle of the driving pulleys to the bearing axle.

10. A device according to claim 1 characterized by pulleys mounted on the vehicle for driving the endless track, each of said pulleys consisting of a pair of half-pulleys, one of which is loose, each loose half-pulley being mounted on a rotating hub with a cone having a large angle, facilitating quick dismantling and replacement.

11. A device according to claim 1 characterized by pulleys mounted on spindles on the vehicle for driving the endless track, each of said pulleys consisting of a pair of half-pulleys, one of which is loose, a system for quick tension of the endless track, consisting of a countershaft (41) having a circular motion which is transformed into a longitudinal rectilinear movement acting on the spindle of the loose pulley, the control of said system being arranged outside the whole apparatus and obtained by means of a crank

wheel, the body of the tension mechanism forming a tension between the hub of the loose pulley and the tension girders pivoted to the fixed axle.

12. A device according to claim 1 characterized by pulleys mounted on the vehicle for driving the endless track, each of said pulleys consisting of a pair of half-pulleys, one of which is loose, a system for limiting vertical movements of the loose pulley by means of suitable stops secured to the central balance beam of the bearing train, the lower stops being arranged in such a manner that on smooth ground the loose pulley rests freely on the said stop owing to its own weight and through the intermediary of parts keeping it at a suitable distance from the axle secured to the chassis, this pulley being supported at a distance from the ground, while retaining an ascending movement which takes place owing to the action of the unevenness of the ground and is entirely independent of the rest of the apparatus.

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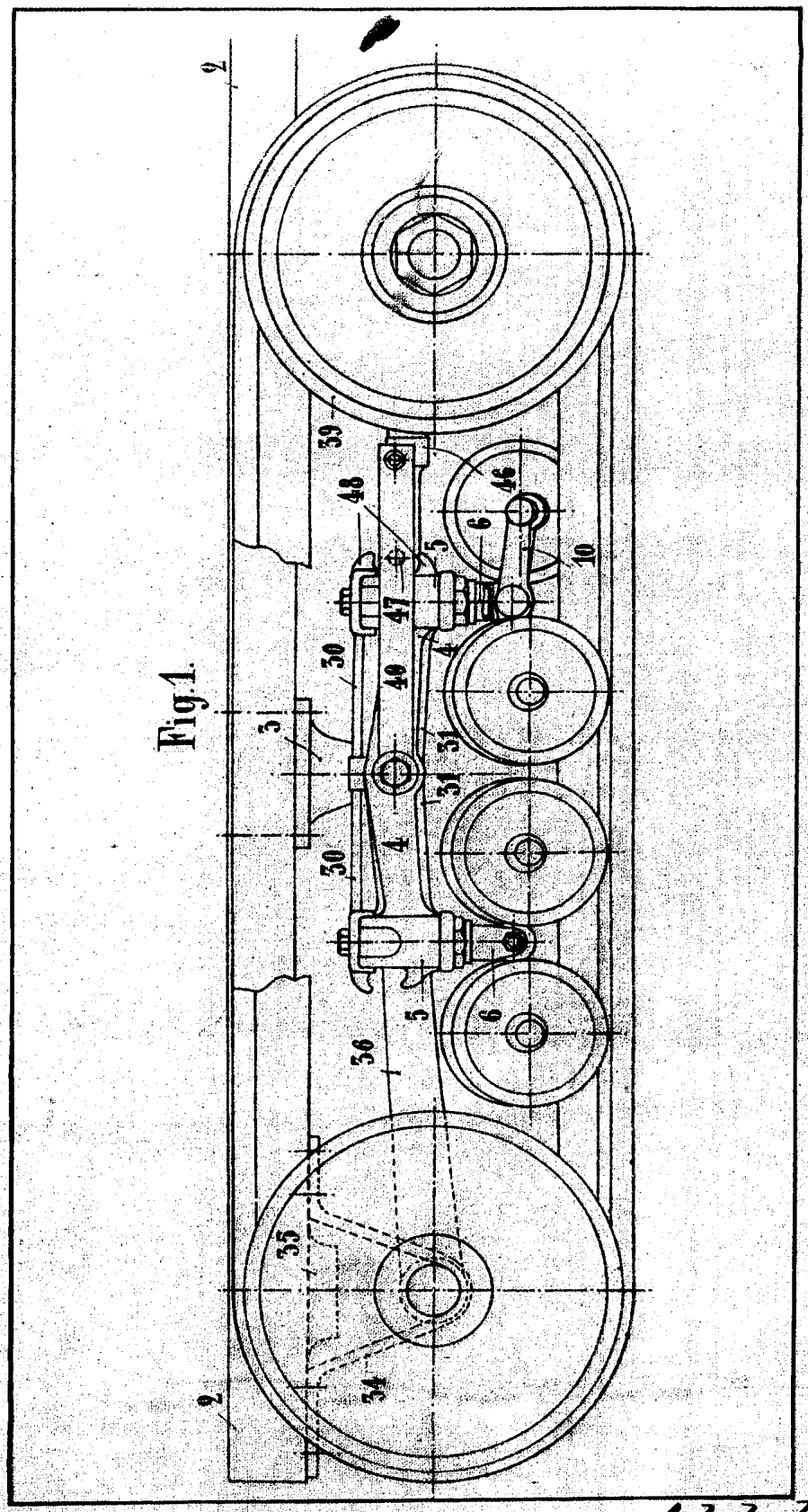

Fig. 1.

In presence of
J. A. Wareham
R. A. Robic

Certified to be the drawing referred to in the specification hereunto annexed.
Montreal, 11 Feb. 1921

Adolphe Kegresse
Inventor
By Marion & Marion
Attorneys

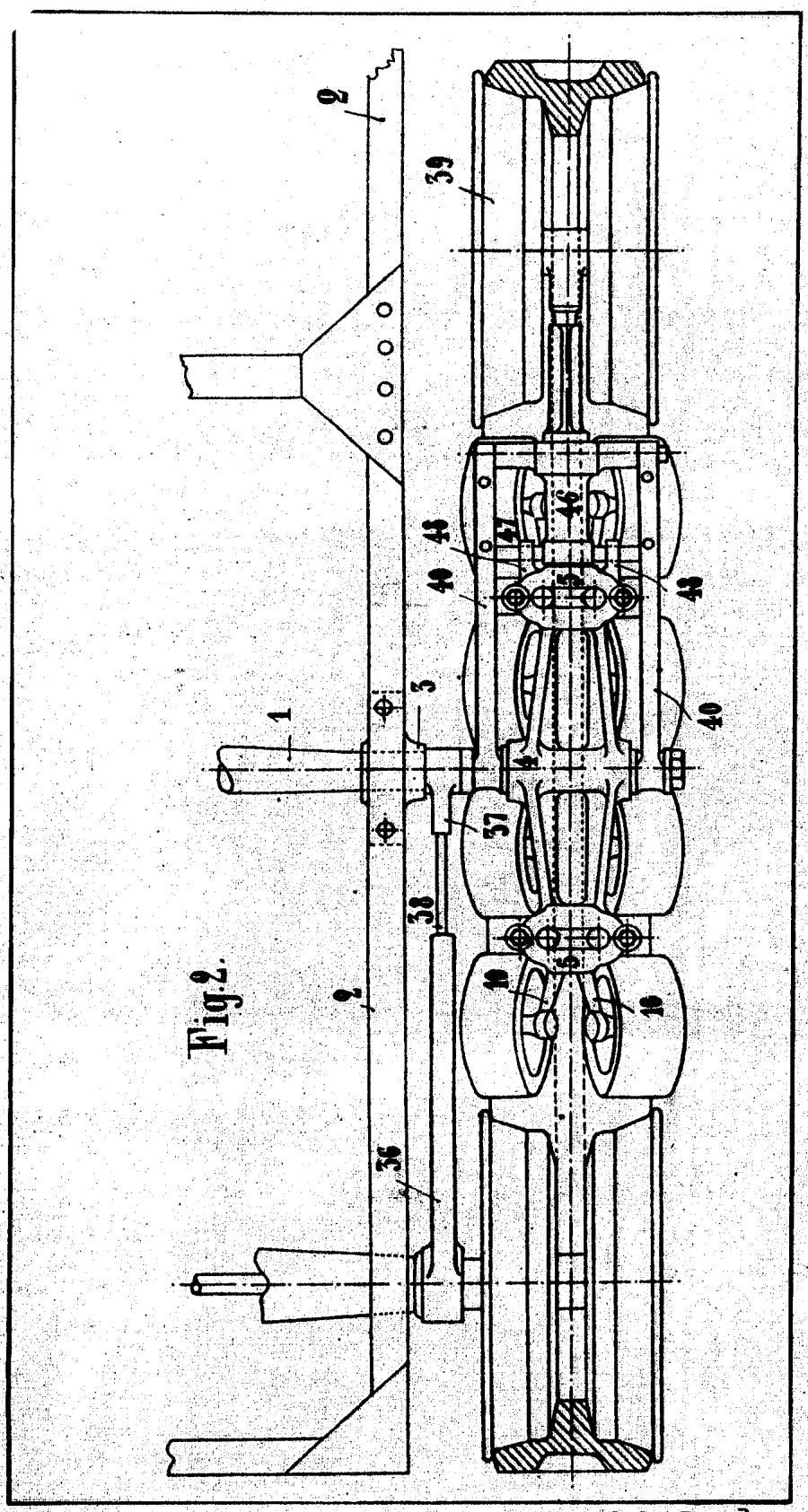

Fig. 2.

In presence of
J. Wareham
R. A. Robic

Adolphe Kegresse
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Certified to be the drawing referred to in the specification hereunto annexed.
Montreal 11 Feb. 1921 Marion

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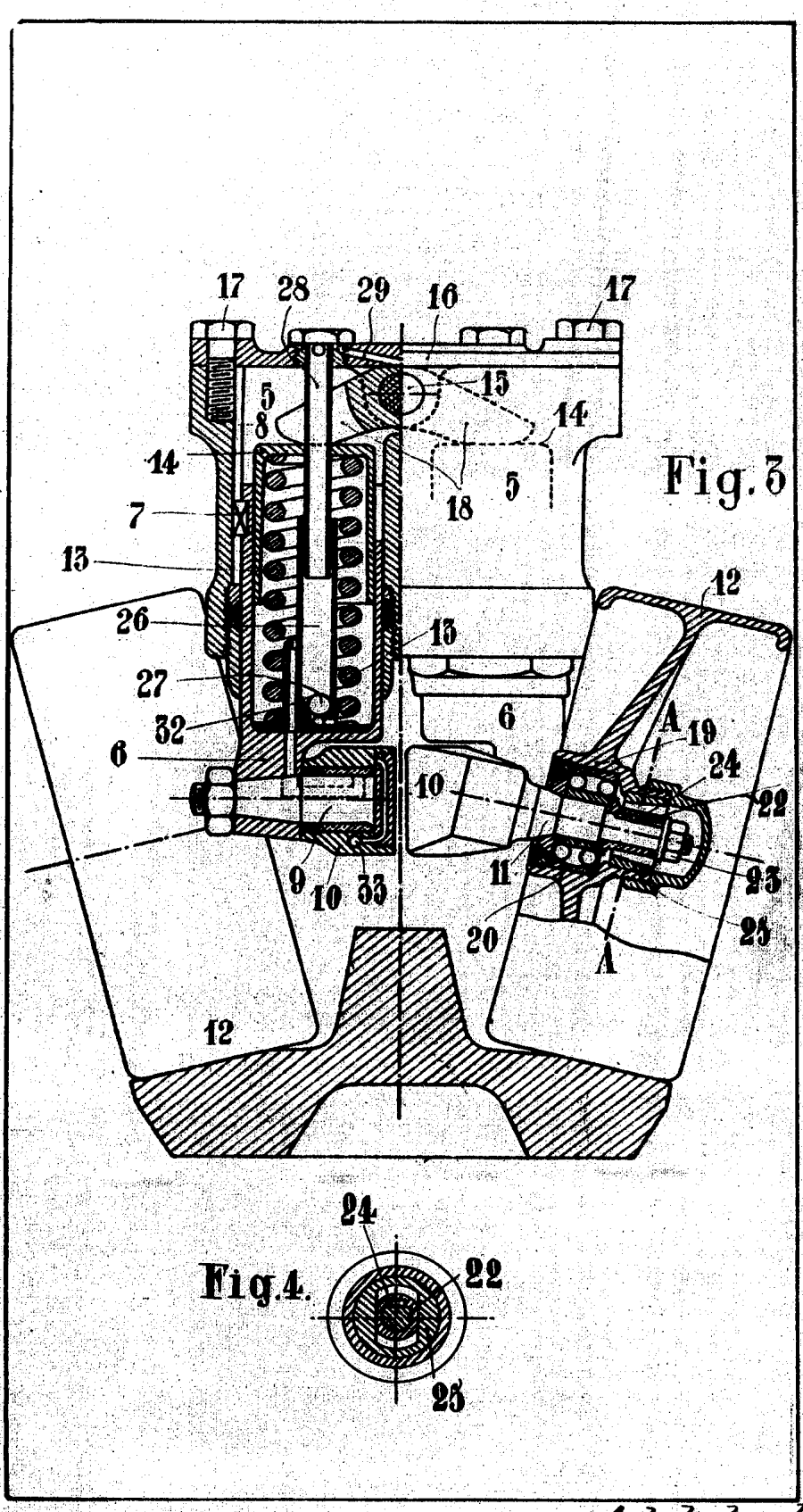

Fig. 3

Fig. 4.

In presence of
J. Ware Lunn
R. A. Robic

Certified to be the drawing referred to in the specification hereunto annexed.
Montreal, 11 Feb. 1921

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Fig. 6.

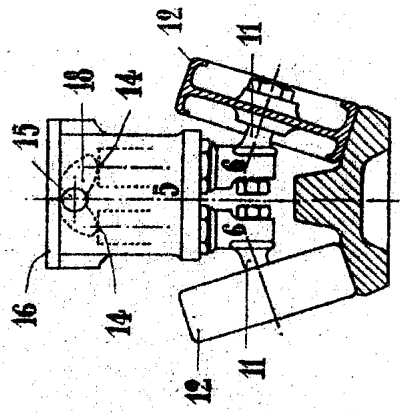
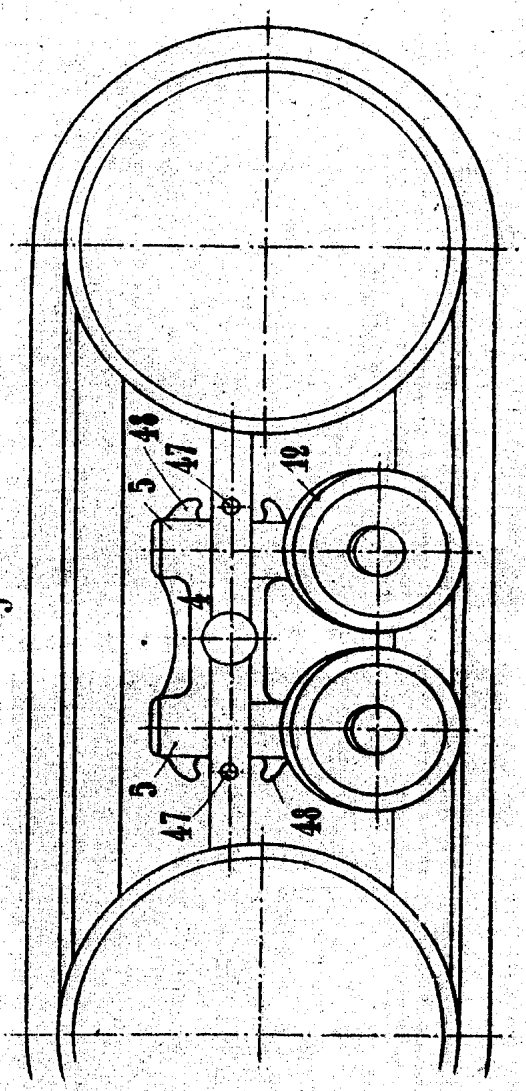


Fig. 5.



In presence of
J. Wareham
W. A. Robic

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Certified to be the drawing referred to in the specification hereunto annexed.
Montreal, 11 Feb 1921

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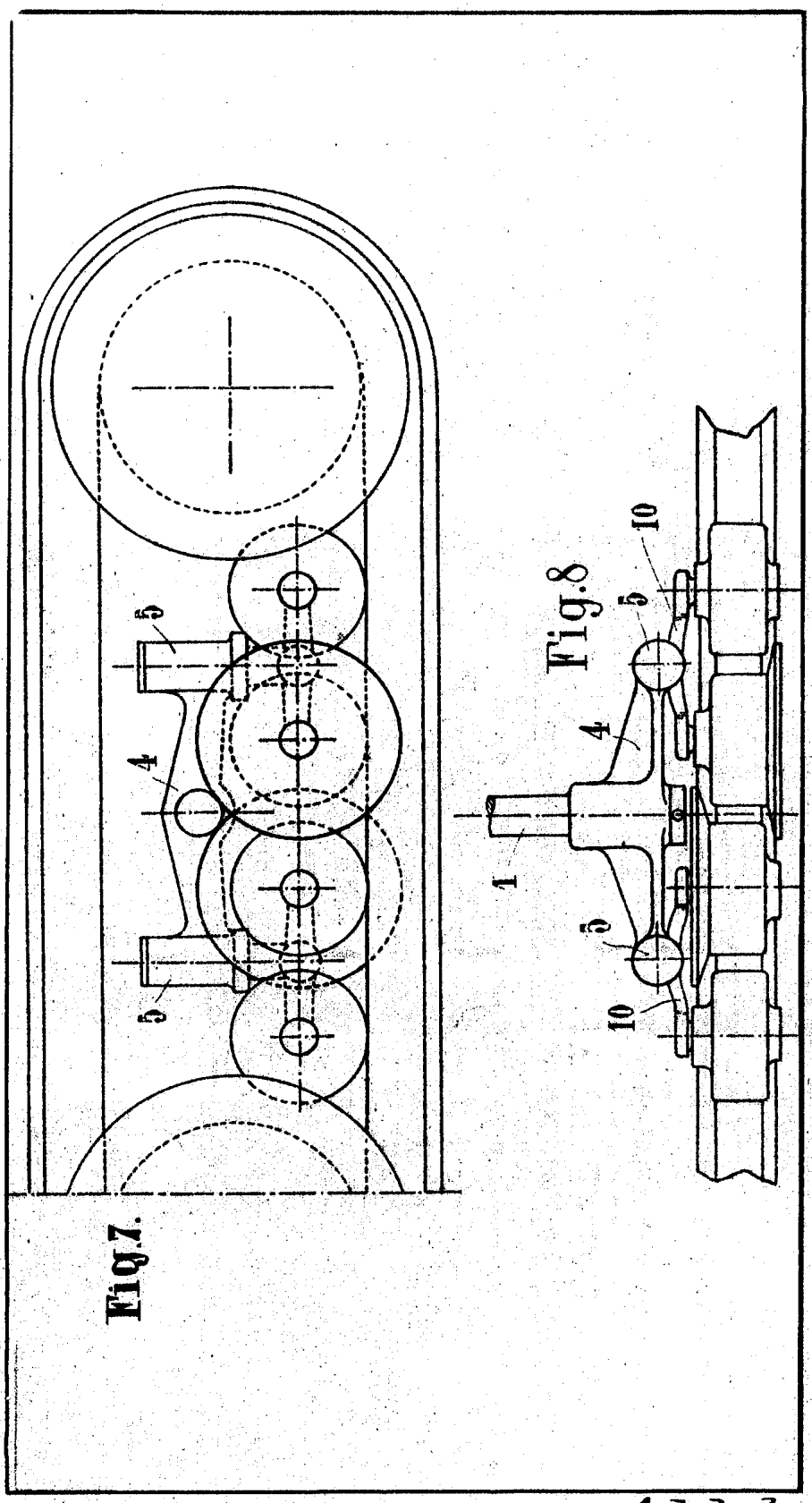

Fig.7.

Fig.8

In presence of
J. W. Arelam
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Certified to be the drawing referred to in the specification hereunto annexed.
Montreal, 11 Feb 1921

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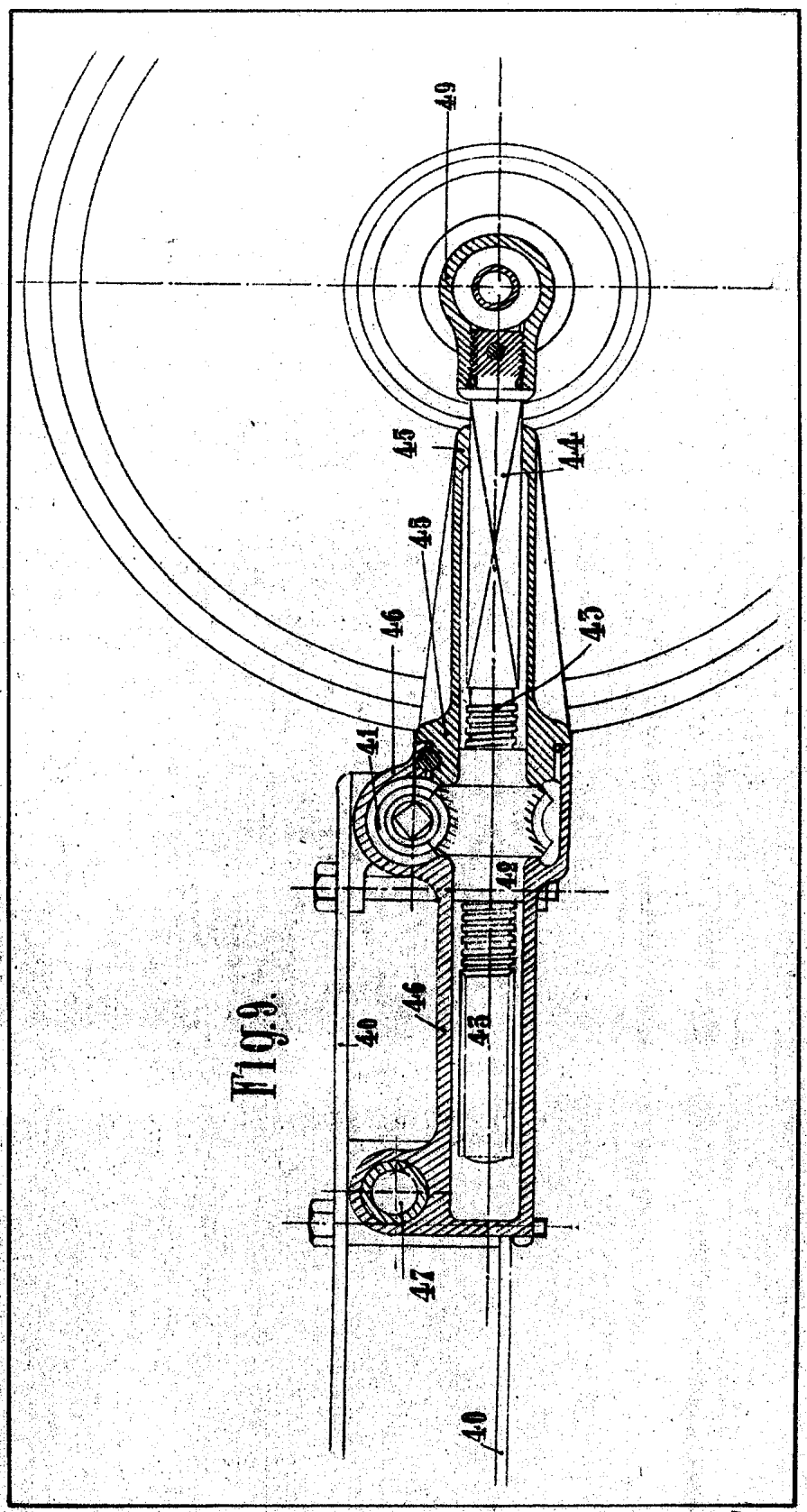

Fig. 9.

In presence of
R. A. Wolfe

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Certified to be the drawing referred to in the specification hereunto annexed.
Montreal, 11 Feb. 1920 Marion & Marion

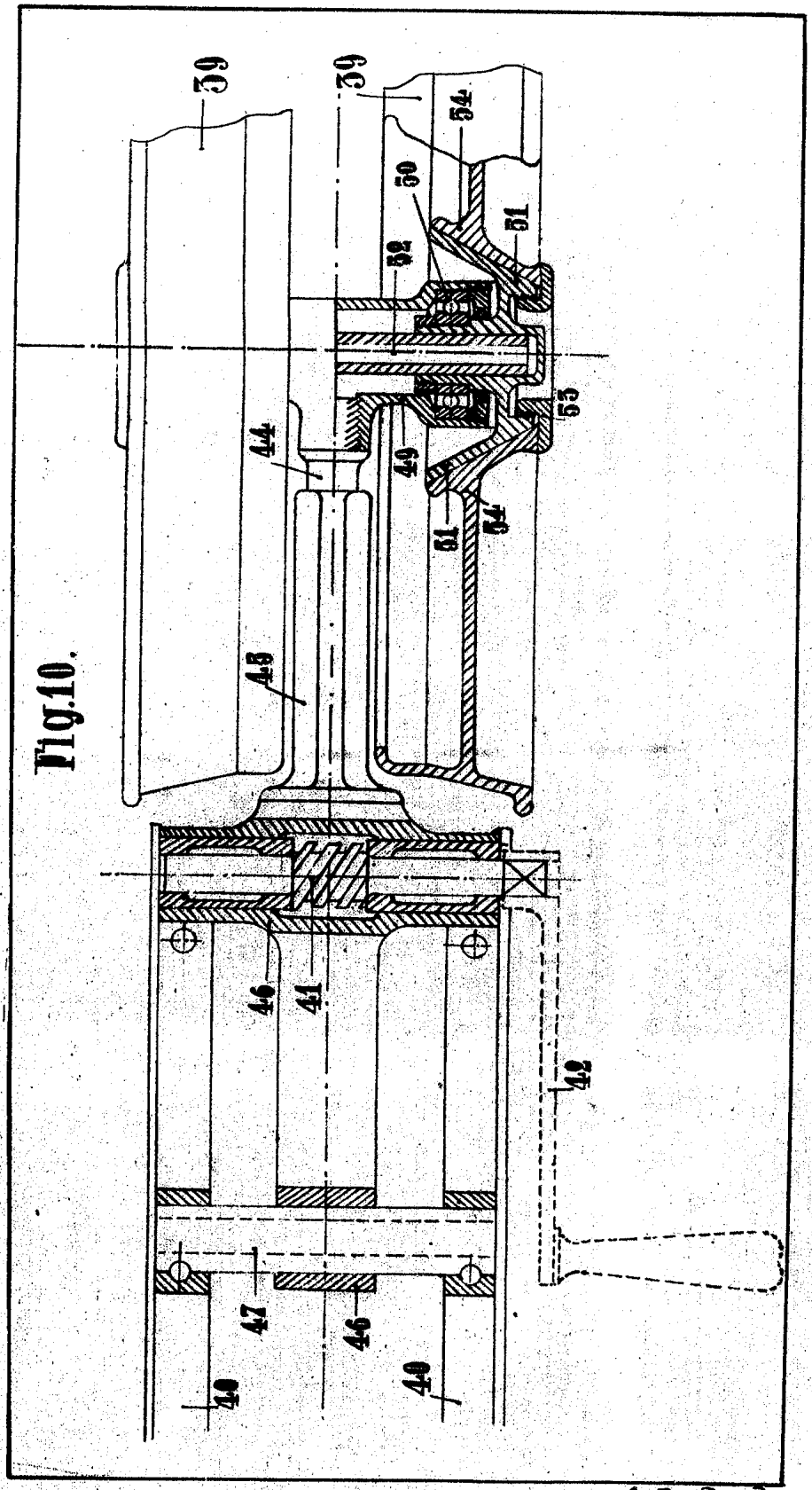

Fig.10.

In presence of

Ware Lamb

N. A. Robic

Adolphe Regresse
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