PATENT SPECIFICATION

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168,331

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Complete Accepted: July 27, 1922.

COMPLETE SPECIFICATION.

Improvements in or relating to Endless Track Vehicles.

I, ADOLPHE KEGRESSE, of 28, Avenue de Tourville, Paris, France, citizen of the Republic of France, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to endless track vehicles and comprises combinations of mechanisms for enabling endless tracks to be used in any vehicle as hereinafter set forth and claimed in the accompanying claims.

In the accompanying drawings—

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 the 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.

Figures 7 and 8 show a construction of a bearing train with four single rollers for narrow endless tracks.

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.

Rollers, the axes of which intersect when extended, are designated herein twin rollers.

In the construction shown in Figures 1 and 2, the weight of the vehicle is transmitted to the bearing system of each of the endless bands 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 in a plane parallel to the axle (Figures 1—3).

In the cylinders 5 hollow plungers 6 (Figures 1 and 3) travel to which are secured rectilinear guiding keys 7 (Figure 3) which are adapted to slide in grooves 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 5 and 6, 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 upwards.

In the interior of the plungers 6 is mounted a spring 13 (Figure 3) surmounted by a guide 14. The latter, under the action of the spring 13, presses against one end of a small balance beam 18, which is adapted to 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 may 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 rigidity to the whole arrangement.

It will be seen that the load received by each roller, is 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

is practically constant owing to the pivoted balance beams 10 and 4, and to the transverse compensator 18.

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 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.

On very rough ground, in order not to expose the endless track 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 position, also strikes the same cover 16 of the cylinders, which forms a stop for it. The lower balance beams 10 also have their large amplitudes limited by the outer part of the bottom of the plungers, against which the balance beams 10 rest. It is obvious that all these stops have to be judiciously calculated so as not to interfere with the movement of all the parts even on very rough ground.

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 another construction of the bearing train for narrow endless tracks, 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 endless track as shown 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.

In all these systems, the rollers 12 may be mounted in the ordinary manner by means of two ball bearings for each 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 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 oscillation is limited by the length of the recess in the part 25 so that the balls cannot come out of 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 nothing. On large 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 23. In this case, part of the load is 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 does not tend to escape and thus ensures proper lubrication of the system.

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 device utilising the reciprocating motion of the plungers 6 in the cylinders 5 (Figure 3).

The following is a 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 communicates 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 a ball 27 rests on a seat which may be replaced by any desired valve.

A tube 28 secured to the cover 16, is adapted to 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) for instance is extended, in the interior of the plunger is produced a slight suction 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, sends the oil in proportional quantities to the upper part of the tube 28, whence it passes through the hole 29 to the spindle 15 of the balance beam which it lubricates, in order to drop down again on the guide 14, the walls of which are lubricated as well as those of the plunger 6. It also passes 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 bases with a stuffing box preventing oil from escaping and also forming a stop of 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 endless track on an ordinary motor car, with the least possible expenditure. The following combination solves the problem in question.

The rear axle of the machine is utilised merely as a driving axle. A third axle with an under-carriage is secured to the vehicle and carries the weight ordinarily carried by the back wheels. These wheels are replaced by suitable driving pulleys which may rest on the ground, with inter-position of the endless track, or be suspended above the ground by means of a bracket 34, Figure 1, flexible or rigid, adjustable or not. In any case, these pulleys, and consequently the axle, are able to rise under the action of differences of level of the ground, without affecting the rest of the vehicle.

The vertical travel of the driving axle may 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) firmly connected together by a spring blade 38 mounted edgewise.

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

The front pulley of the system may be connected to the fixed axle in the same way as the driving pulley, It may also be made to drive, whilst the rear pulley in that case would merely carry the endless track.

The front pulleys 39 are connected to the bearing axle 1 by an arrangement 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 ends of the girders 40 (Figures 9 and 10) carry the tension device for the endless track 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. With that object stops 48 (Figures 1 and 2) are provided on the cylinders 5. These stops may be adjustable, and the lower ones may be so arranged that the front pulley is suspended at a certain height above the ground, whilst still being capable of executing, under the action of unevenness of ground, ascending movements independent of the rest of the whole,

The ascending movements of great amplitude are limited by the upper stop.

The rear pulley may also be mounted in the same way.

The whole of the front pulley is constituted by two half-pulleys 39 (Figures 9 and 10) mounted on a hub which will be hereinafter described.

The body of the hub 49 of each front pulley, Figures 9 and 0, is rigidly connected to the tension device. Each end of the hub body 49 has inside it a ball bearing 50 (Figure 10) on which fits the rotating hub 51. 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 endless track, which depends only on the outer front half-pulley, for on the latter being removed the putting in place of the endless track does 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 pulley is sufficient for disengaging automatically the hub 54 of the half-pulley of the cone which is made with a great angle, from the rotating hub 51.

The system of tension of the endless track 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 4 (Figure 9) engaging with a screw-threaded 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 is adapted to produce the same effect. The latter part slides 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.

It has already been stated that the body of the tension device 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 which increases the rigidity of the whole arrangement considerably.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A combination of mechanisms for enabling flexible endless tracks to be used on any vehicle characterised by a bearing train constituted by a combination of balance beams, and sets of rollers arranged at each side of the inner guide of the endless track, each roller being entirely independent and adapted to move in vertical direction against spring pressure, parallel to the vertical-longitudinal plane of the whole, without affecting its neighbour situated at the other side of the inner guide of the endless track, the axes of two twin rollers not being parallel but intersecting each other and forming an angle, the apex of which is directed upwards, and the twin rollers being mounted at the ends of longitudinal balance beams mounted on spring plungers for bearing trains with four double rollers, or directly on the lower part of the plungers for the purpose of forming a bearing train with two twin rollers, the spring plungers being mounted at the ends of a balance beam pivoted on the main supporting arm.

2. A combination of mechanisms as claimed in Claim 1, characterised by a pivoted compensating system for ensuring a practically constant distribution of the load on the twin rollers, independently of any transverse differences of level of the ground, this system being if desired air tight and arranged at the upper part of the spring boxes, in which when the endless track is narrow simple rollers are provided with axes parallel to the single rolling track, only two of which, for instance the centre ones, each have a guide flange opposite to each other, at each side of the endless track and astride of the adjoining roller which penetrates into the groove of one of the two large pulleys or drums, for the purpose of bringing as close together as possible the point of contact of each roller with the endless track, and reducing the total length of the whole.

3. A combination of mechanisms as claimed in Claims 1 and 2 characterised by the axis of rotation of each roller being always parallel to the endless track, this result being obtained preferably

with a single swivel ball bearing combined with a ring (such as 25) sliding in a suitable direction and to a given extent only, on the rigid axle of the roller.

4. A combination of mechanisms as claimed in the preceding claims characterised by automatic lubrication of all the rubbing parts of the bearing train taking place owing to the action of the movements to which the parts of the mechanisms are exposed owing to the unevenness of the ground, being ensured by a device which is mounted in the interior of the spring plungers.

5. A combination of mechanisms as claimed in the preceding claims, characterised by the movements of all the parts, produced by uneven ground being mechanically limited in order to avoid excessive tension on the endless track.

6. A combination of mechanisms as claimed in the preceding claims characterised by the removal of the wheels from the rear axle of a motor car and their replacement by driving pulleys, the whole load of the corresponding part of the machine being then taken by a third axle secured to the frame of the motor car, the pulleys on the rear axle driving the endless track being suspended or resting on the ground, whilst retaining their vertical movement under the action of differences of level of the ground without in any way affecting the rest of the vehicle.

7. A combination of mechanisms as claimed in the preceding claims in which the movements of excessive amplitude of the rollers due to uneven ground are checked by means of an elastic buffer arranged between the axle and the chassis.

8. A combination of mechanisms as claimed in the preceding claims characterised by semi-flexible torque rods connecting the spindle of the driving pulleys to the bearing axle and pivoted if desired at both their ends.

9. A combination of mechanisms as claimed in the preceding claims characterised by a method of mounting each loose half-pulley on a rotating hub with a cone with a great angle, facilitating quick dismantling and putting into place.

10. A combination of mechanisms as claimed in the preceding claims characterised by a system for quick tension of the endless track, consisting in a countershaft (such as 41) having a circular motion which is transformed into a longitudinal rectilinear movement acting on the spindle of the loose pulley, the control of the said system being arranged outside the whole apparatus and obtained preferably by means of a crank or of a hand wheel, the body of the tension mechanism preferably forming a connection between the hub of the loose pulley and the tension girders pivoted to the fixed axle.

11. A combination of mechanisms as claimed in the preceding claims, characterised by a system for limiting vertical movements of the loose pulley by means of suitable stops, adjustable or not and secured to the central balance beam of the bearing train, the lower stops being arranged, if desired, in such a manner that on smooth ground, the loose pulley rests freely on the said stops 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 suspended if desired at a certain height from the ground, whilst retaining an ascending movement which takes place owing to the action of the inequalities of the ground and is entirely independent of the rest of the apparatus.

Dated this 27th day of August, 1921.

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111 112, Hatton Garden, London, E.C. 1,
Chartered Patent Agents.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1922.

Fig.3.

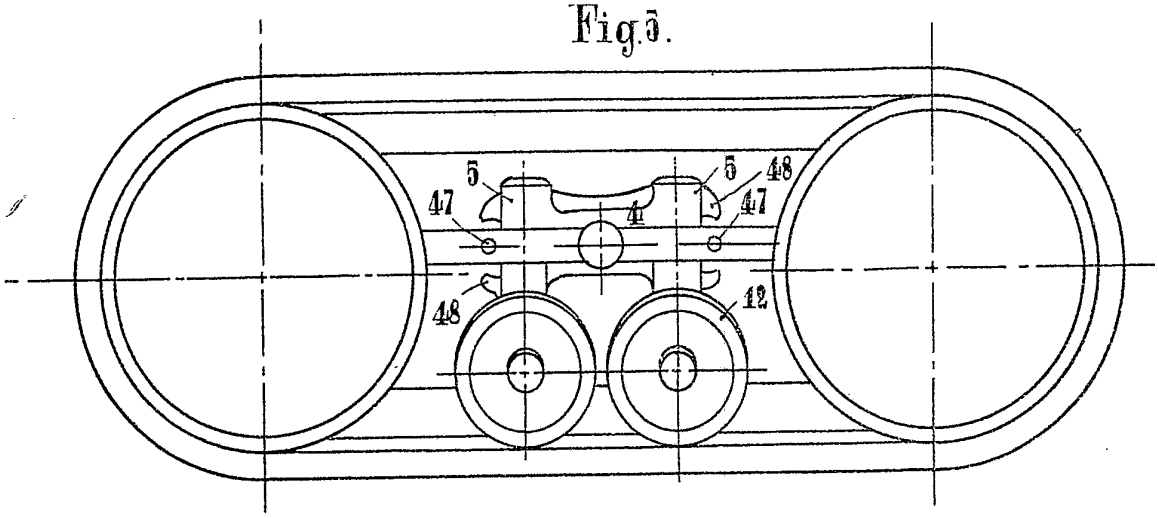


Fig.1.

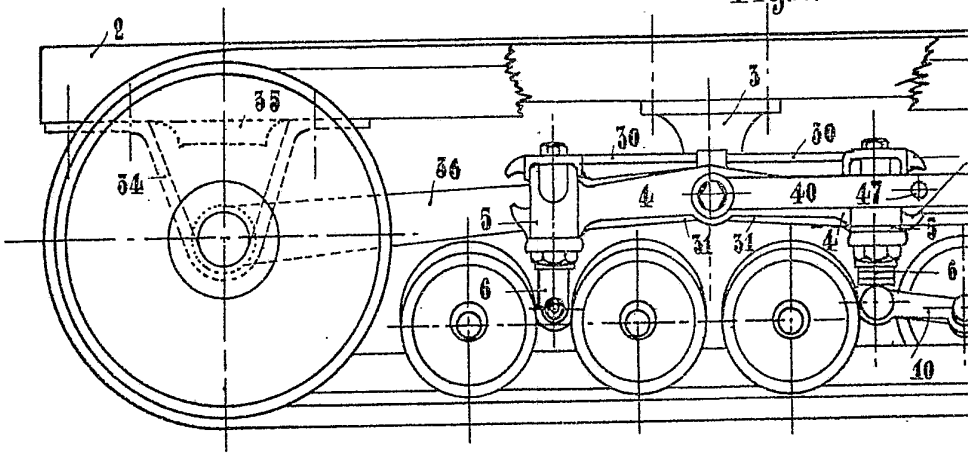
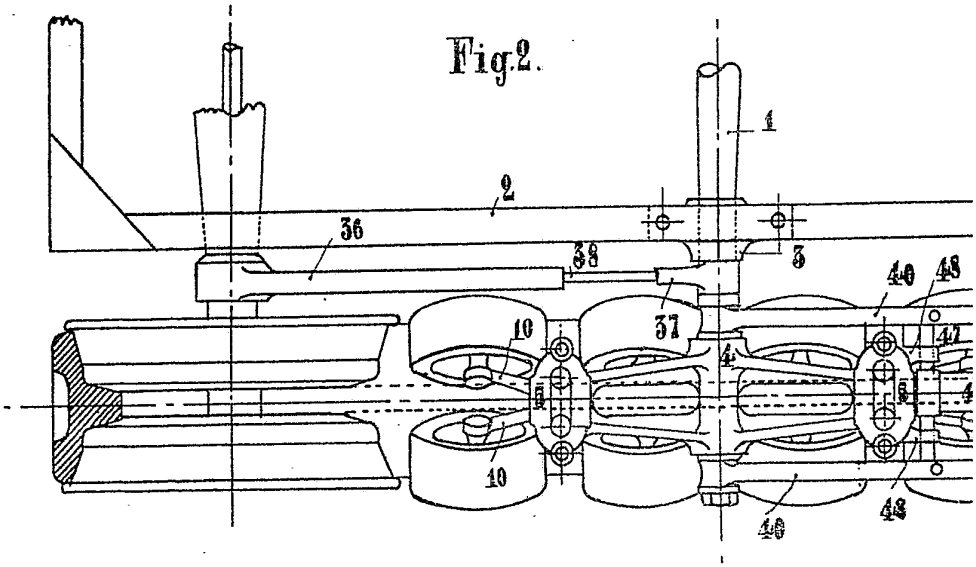


Fig.2.



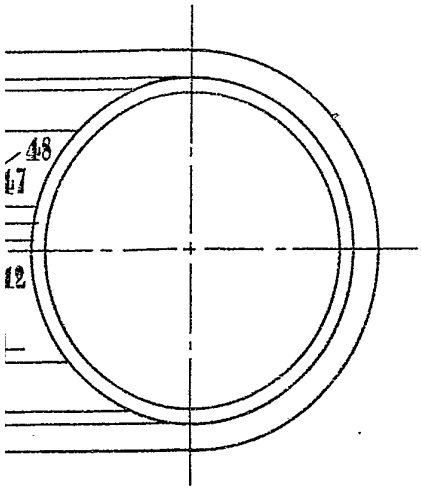


Fig.6.

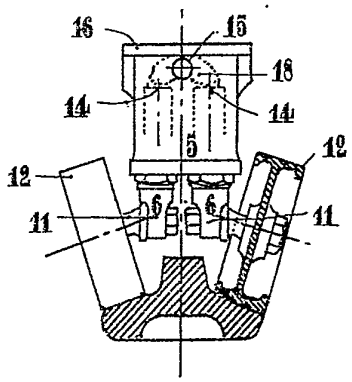
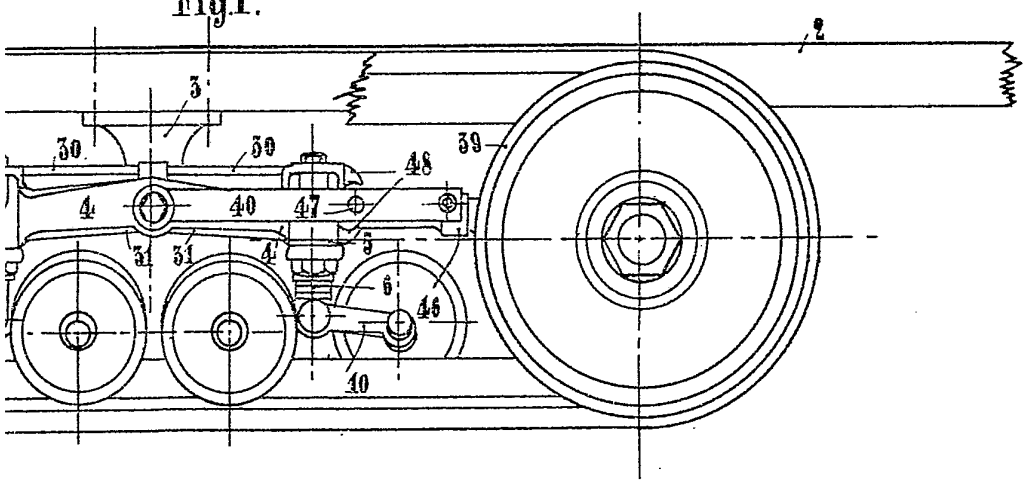


Fig.1.



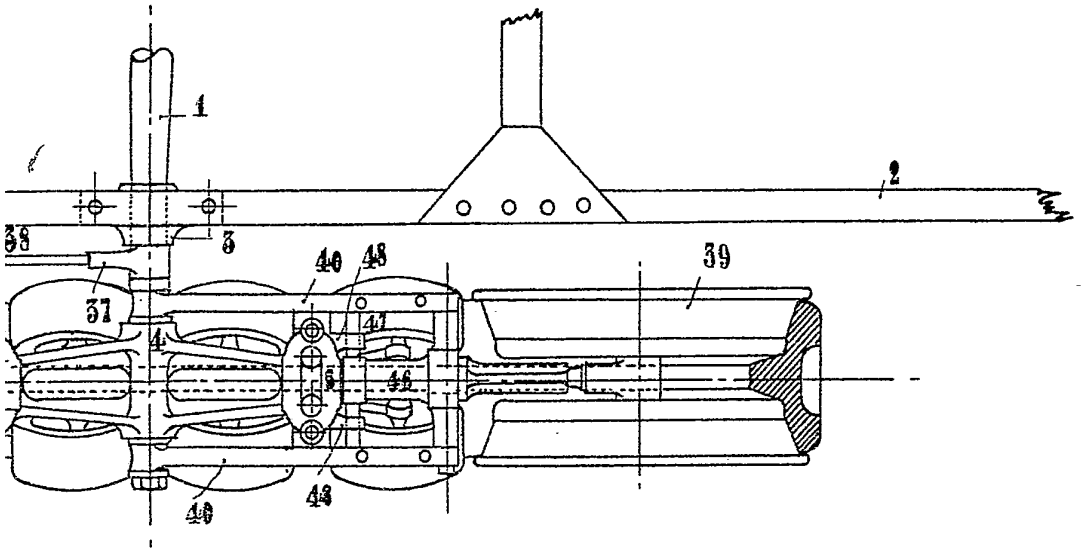


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Fig.3.

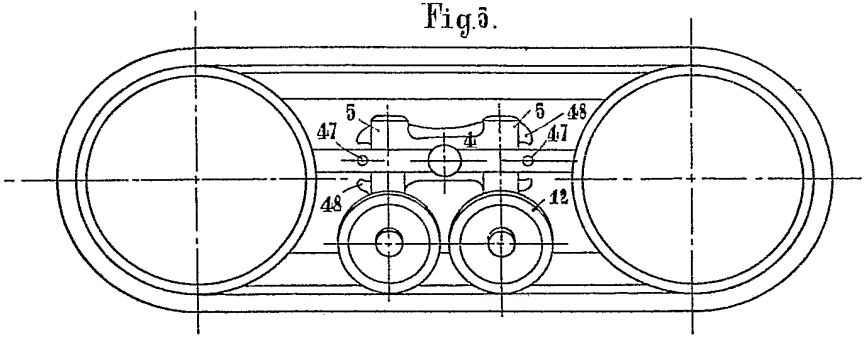

Fig.6.

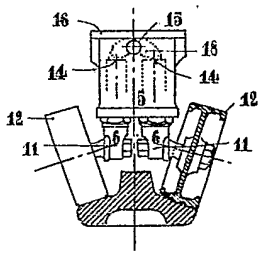

Fig.1.

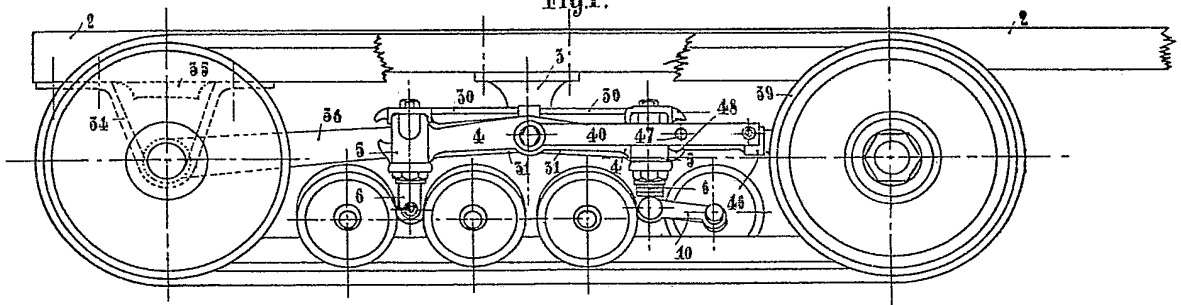

Fig.2.

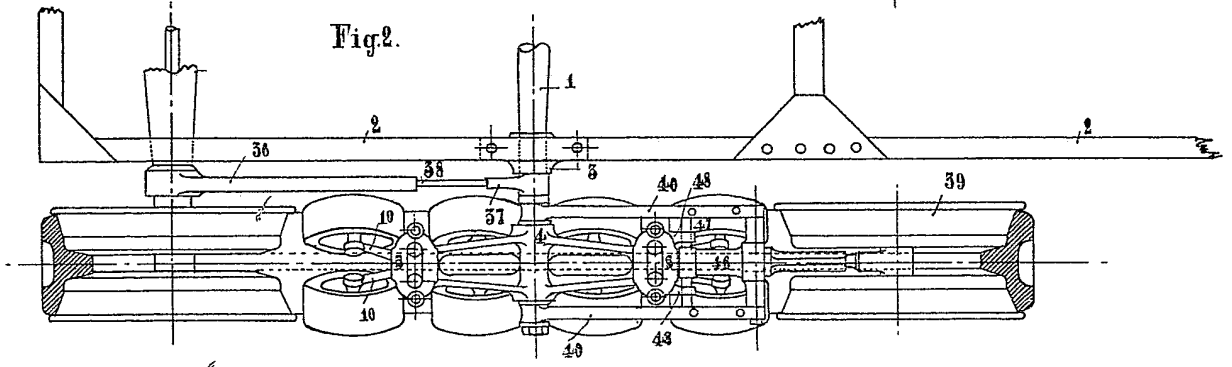

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Fig.7.

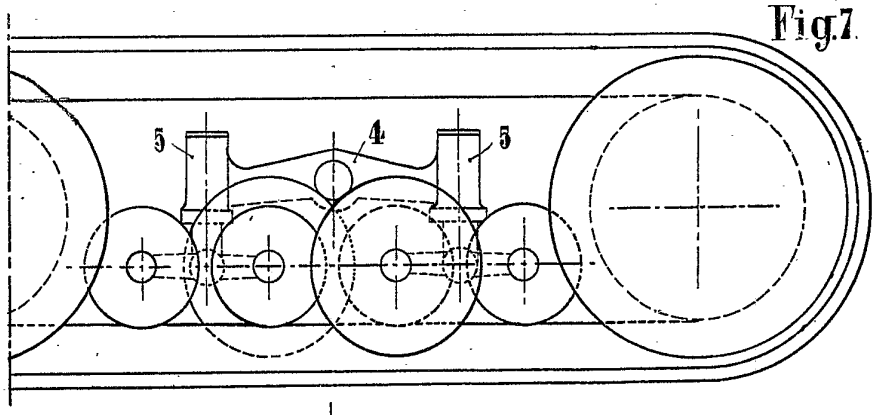

Fig.8.

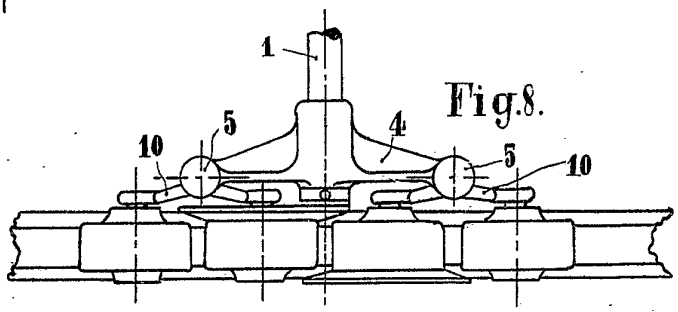

Fig.3.

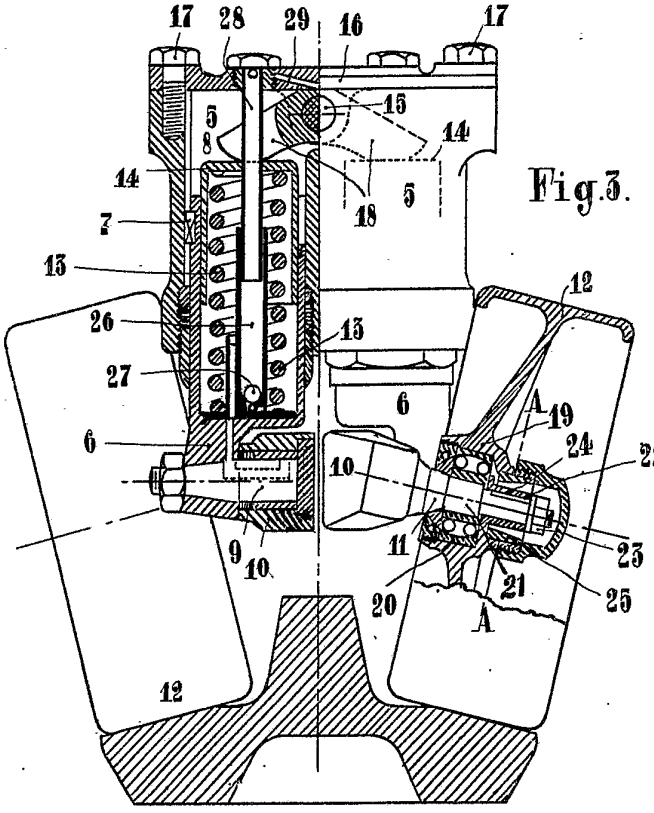

Fig.4.

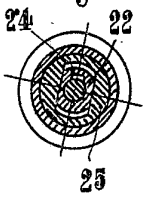

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Fig.9.

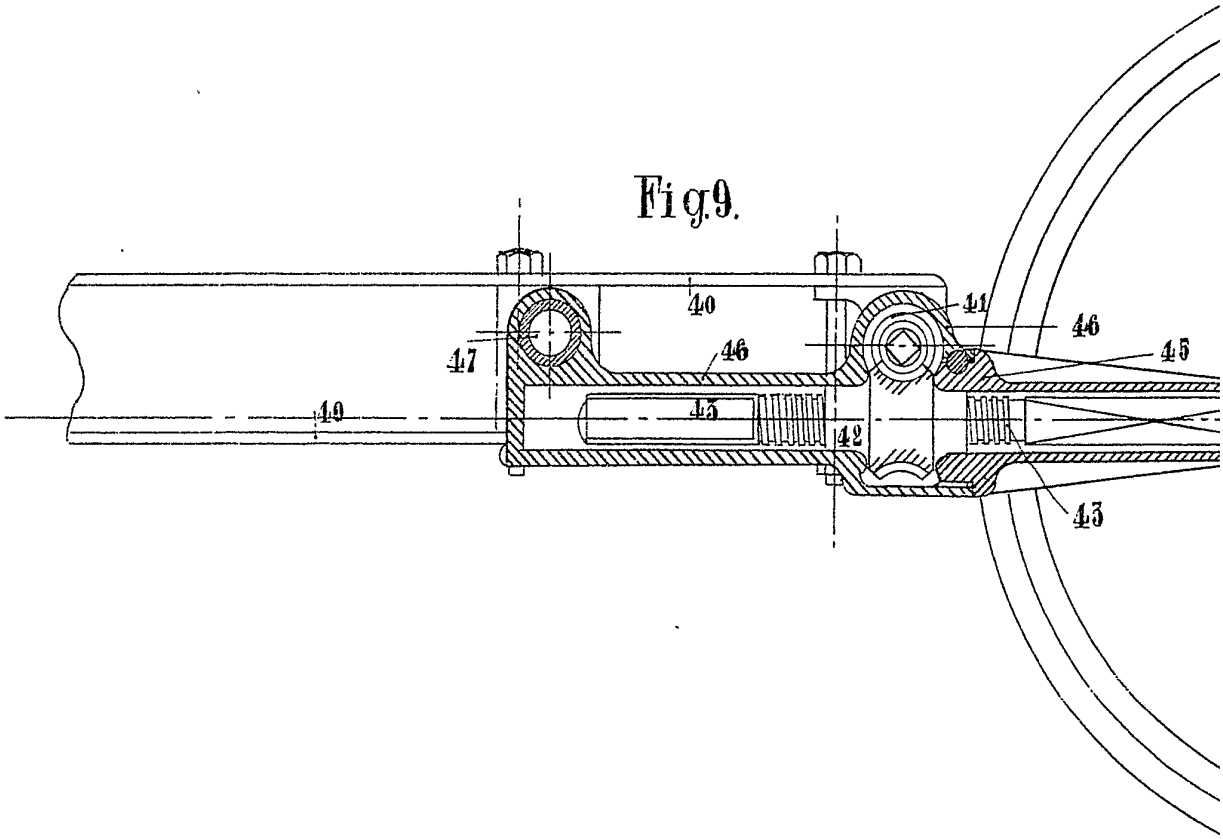
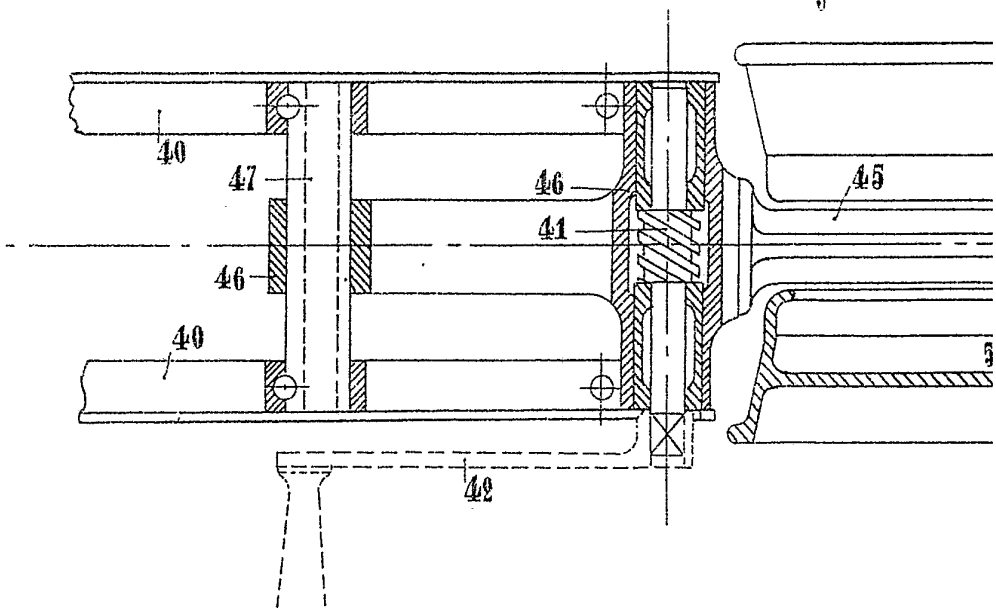


Fig.10.



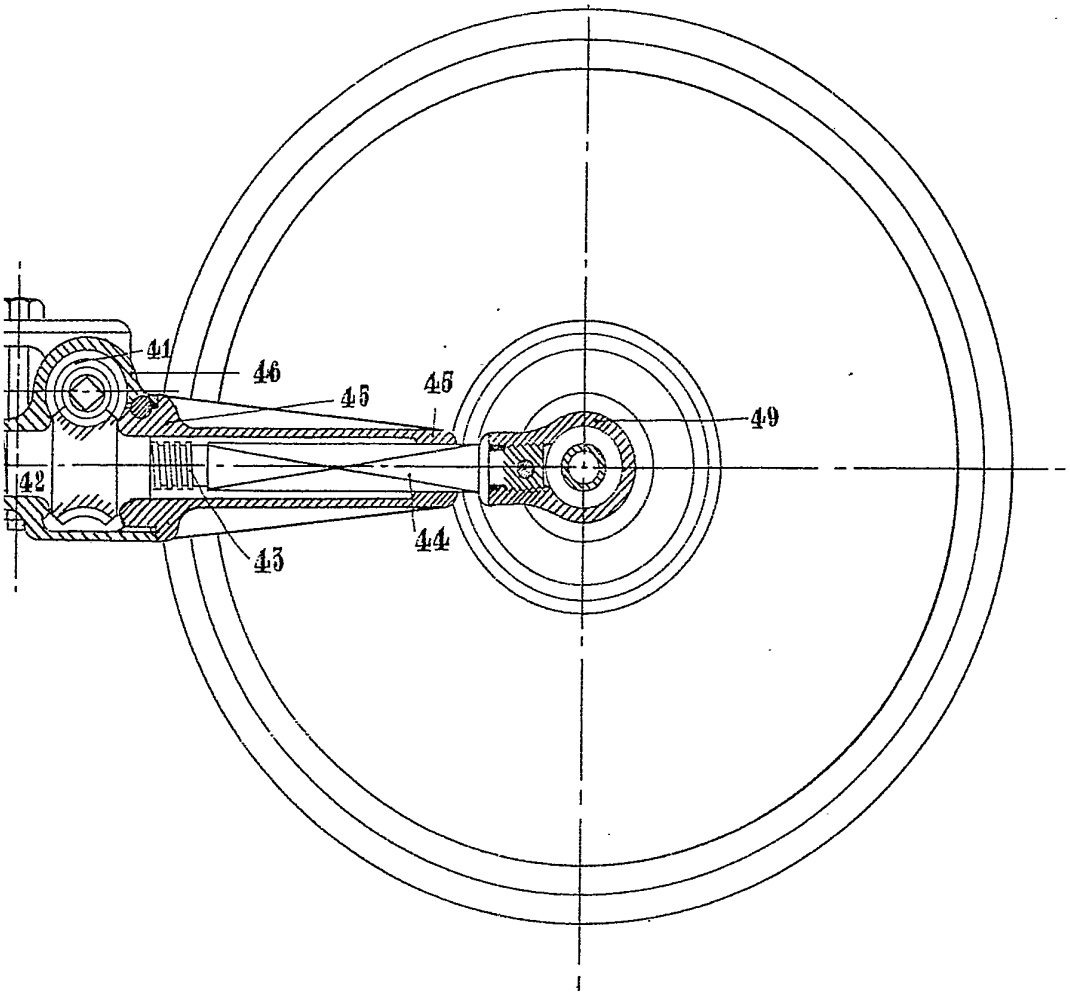
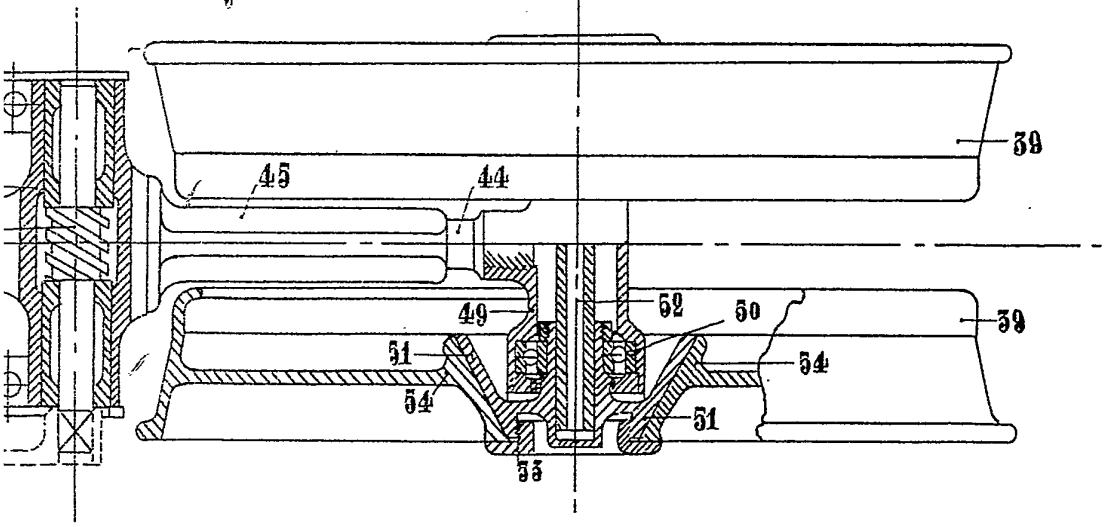


Fig.10.



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[This Drawing is a reproduction of the Original on a reduced scale.]

Fig.9.

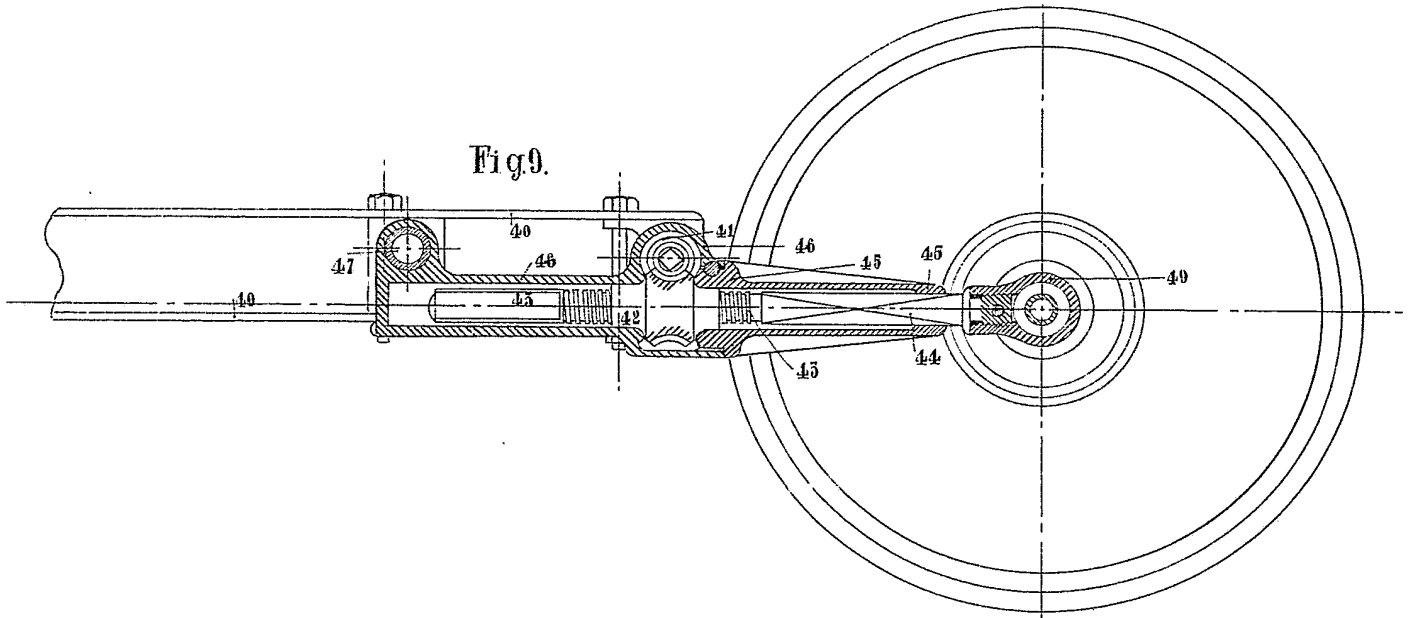
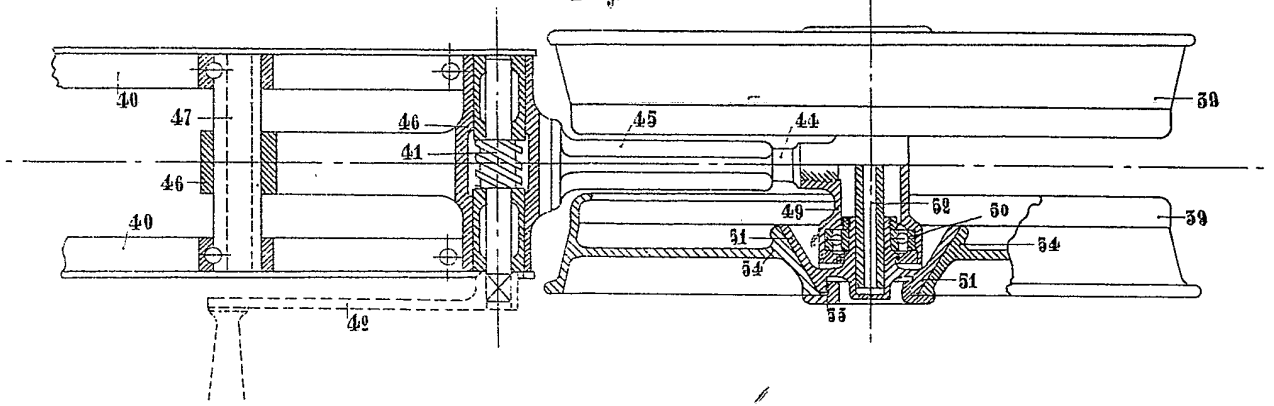


Fig.10.



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