C. PAULI.

CRANE.

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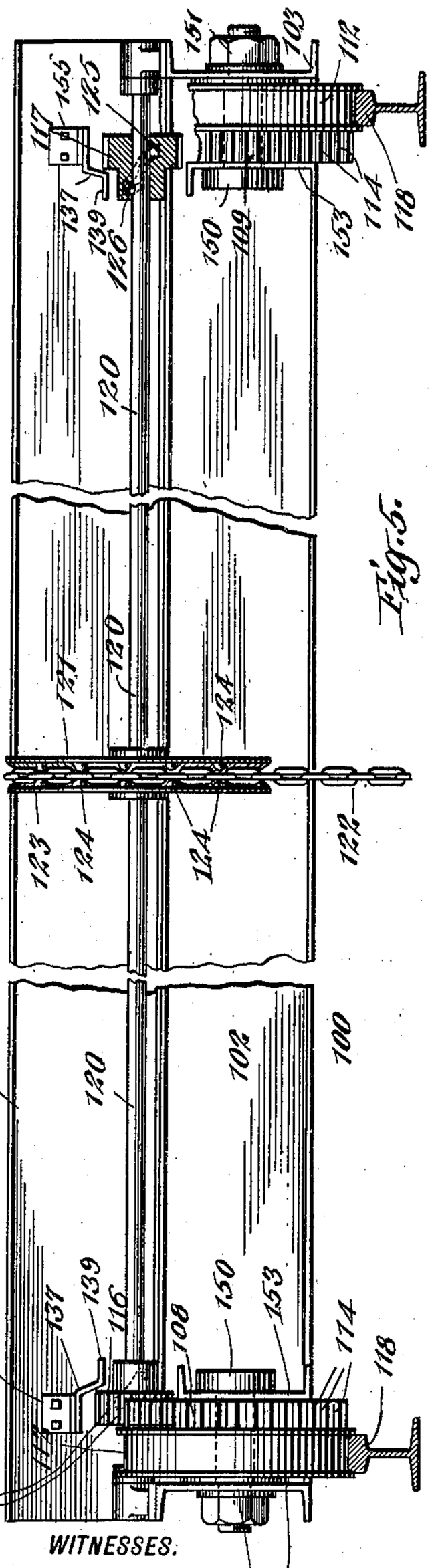

Fig. 1.

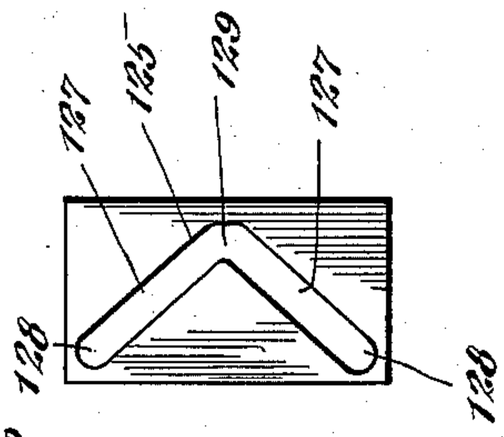

Fig. 4.

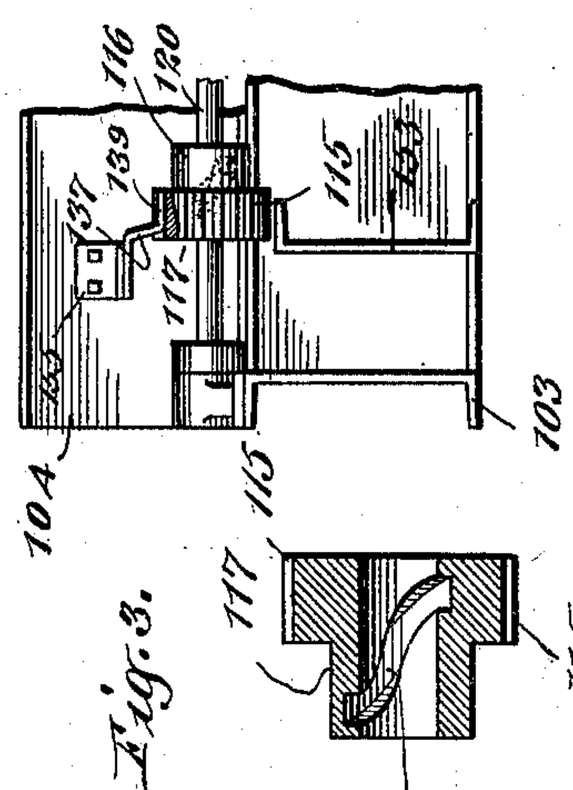

Fig. 5.

Fig. 3.

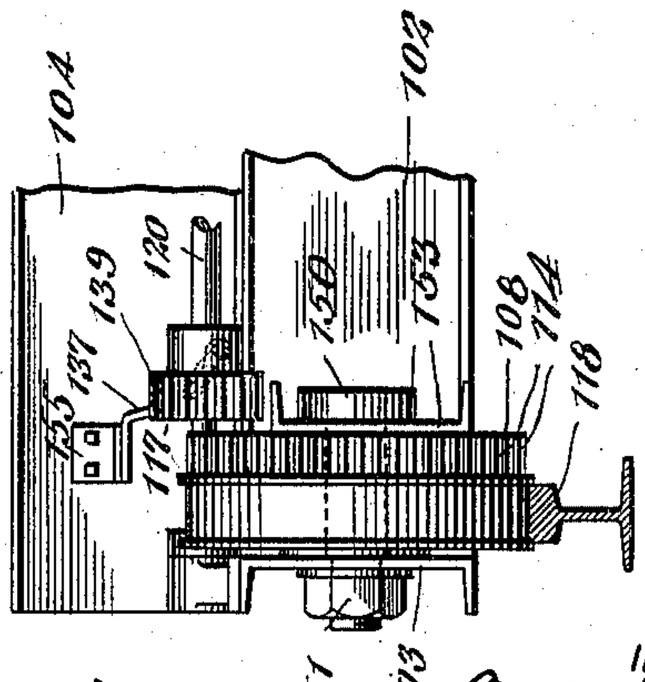

Fig. 2.

WITNESSES.

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CRANE.

963,388. Specification of Letters Patent. **Patented July 5, 1910.**

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To all whom it may concern:

Be it known that I, CARL PAULI, a citizen of no country, having renounced my allegiance to the Emperor of Germany, and not yet having taken out my naturalization papers in this country, and a resident of Roselle Park, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Cranes, of which the following is a specification, taken in connection with the accompanying drawing, which forms a part of the same.

My invention relates to cranes and more particularly to cranes which can be converted or changed from a non-geared crane to a geared crane, or the reverse, as desired to transport light or heavy loads by means of its aid.

While I have shown in the drawing my invention applied to a hand operated crane, it is to be understood that it is equally adapted to a crane operated by any suitable power.

In the accompanying drawing I have shown, simply for purposes of illustration, one illustrative embodiment of my invention applied to the body of a conventional crane, the same reference numerals referring to similar parts in the several figures.

Figure 1 is a side elevation of a crane equipped with my invention, parts of the same being shown in vertical section for the purposes of illustration; Fig. 2 is a fragmentary side elevation of a portion of the crane, the pinion being shown in its inoperative position, parts of the figure being in vertical section; Fig. 3 is a detail vertical section of one of the pinions; Fig. 4 is a plan view of the development of the cam with which the interior of the pinions are provided; Fig. 5 is a detail fragmentary view in side elevation, a portion of the figure being broken away for purposes of illustration.

In the illustrative embodiment of this invention shown in the drawing 100 is a crane of any suitable construction which is shown for purposes of illustration consisting of end channels 102 and side channels 103, 103 and a stiffening channel 104 mounted upon the side channels 103, 103. While I have shown this type of crane it is to be understood, of course, that other forms may be used without departing from my invention.

Mounted on the frame, in any suitable manner, are traction wheels 112, 112 which as shown have connected to them, in any suitable manner, gear wheels 108 and 109. By way of example I have shown these traction wheels 112 and gear wheels 108 and 109 mounted upon the crane by bolts 150, 150 and nuts 151, 151, the bolts taking through the side channels 103, 103 and the supplemental channels 153, 153 mounted upon the channels 102. The traction wheels 112, 112 are mounted on the two parallel rails 118, 118 which are usually mounted at an elevation to permit the crane to readily transport light or heavy loads as the case may be.

Simply for purposes of illustration I have shown my crane provided with a squaring or driving shaft 120 which is operated by a groove wheel 121 having preferably lugs 124 to coöperate with the links of the driving chain 122. Preferably, though not necessarily, this wheel 121 is mounted approximately midway between the traction wheels. It is to be understood that the squaring or driving shaft 120 may be operated by power or any other suitable means. Upon one or both ends of the squaring shaft, preferably, but not necessarily, upon both, I mount pinions 116 and 117, one at either end, the shaft being provided with pins 126, 126 to coöperate with the cam slots 125, 125 formed in the interior of the pinions. This arrangement, however, may be reversed, the cam slot being in the axle or shaft 120 and the pins be carried by the pinions. This cam slot 125 in the different pinions 116 and 117 is of peculiar construction, Figs. 3 and 4, in that it is provided with two connecting arms 127, 127 at an angle to each other, their meeting point 129 being so arranged that when the pin 126 is at this point the pinion 116 or 117, as the case may be, will be out of engagement with its respective gear wheel 108 or 109, thereby permitting the crane to be operated as an ungeared crane. When the pins 126, 126 are at either end 128, 128 of the arms 127 127 the pinion is in engagement with its respective gear wheel.

If it is desired to move the crane over to a light load, it is not necessary to take the time and effort of working it over by means of pulling on the chain 122 until the pinions 116 and 117 have moved the crane over to the object to be transported. On the con-

trary by giving a partial revolution to the axle or squaring shaft 120 by means of the chain 122 the pinions 116 and 117 are caused to move toward each other and out of engagement with the gear teeth 114, 114 of the wheels 108 and 109. The entire crane can then be quickly moved along the tracks 118, 118 by merely pulling or dragging simultaneously upon the two ends of the chain 122, the crane then acting simply as a plain or non-geared crane. If the object to be transported is relatively light and does not create sufficient friction upon the tracks 118, 118 to resist easy movement of the crane, the ends of the chain 122 are retained in the same position as last described which will hold the pinions 116 and 117 out of mesh with the gear teeth 114, 114 so that the crane can be further moved, or pulled, now with the addition of the light load, to the position where said load is to be deposited. This operation of the crane as an ungeared crane may continue until such time as an object to be transported is relatively heavy in which case the pinions are still retained out of gear with the geared teeth 114, 114, until the crane is located over or adjacent to the object to be lifted or carried. With such a heavy object and one which creates considerable friction upon the tracks 118, 118, the ends of the chains 122 are moved with relation to each other sufficiently to give a partial rotation to the chain wheel 121 which being transmitted to the axle or squaring shaft 120 will cause a relative rotation between the pins 126, 126 and the cam grooves 125, 125 in which they are located, so as to throw the pinions 116 and 117 outward and into mesh with their respective gear wheels 108 and 109. The crane has now been converted into a geared crane and the traction wheels 112, 112 are operated by pulling upon the chain 122 so as to rotate the axle or squaring shaft 120 and pinions 116 and 117 through the teeth 114 and 115. While operating as a geared crane, it is ready at any moment, upon the depositing of the relatively heavy load, to be again changed to a non-geared crane, permitting a quick trip to the next load and, if the load be a light one, the crane will be continued as a non-geared crane to permit the light load to be quickly transported. If the next load proves to be a heavy one the crane is moved along the tracks 118, 118 by means of the gears.

In some cases, though not necessarily, I have found it expedient to apply friction to one or both of the pinions 116 and 117 when they are out of engagement with their respective gear wheels 108 and 109 so as to prevent an accidental reëngagement of the pinion with its gear wheel. Various forms of friction devices may be used. One form which I have found to be satisfactory in practice, but to which my invention is not to be limited, is illustrated in Fig. 5. In this form of friction device I secure a piece of material, preferably spring metal, 137 by means of a plate 155 to the channel 102 bringing the arm 139 of the friction device 137 into position where it will engage between the teeth 115, 115 on the pinions 116 or 117 when one or both have been thrown over into their inoperative position such as shown in Figs. 2 and 5. It is to be understood, of course, that the same retarding device can be applied with equal facility to both pinions 116 and 117 if desired, or may be omitted entirely. The retarding device holds the pinion, or if two such retarding devices 137, 137 are used, both pinions are held from relative movement on the squaring shaft or axle 120 until such time as it is desired to give a positive relative movement between the pinion and the squaring shaft or axle 120 which will cause the pinion, with its teeth to engage with the teeth 114 of the gear wheel and at the same time become disengaged from the arm 139 of the retarding device 137.

In some cases where the rails 118, 118 are curved so that the crane 100 has to move in the arc of a circle, the outside wheel 112 has to travel faster than the inside wheel 112, which in the form of cranes now in use is very objectionable as the outer wheel has at times to slide upon its track and consequently considerable friction is developed. This objection in cranes and the consequent intermittent friction on the tracks is prevented in my device for the wheel traveling on the outside of the curve will rotate its pinion at a slightly higher rate of speed than the axle or squaring shaft 120 is traveling. This will cause that pinion with its cam groove 125 to slide on its pin 126, until the teeth 115 of that pinion have momentarily become disengaged from the teeth 114 which will permit one or more teeth on the gear wheel to slip to compensate for the additional travel of the outside wheel. When the two wheels 108 and 109 are again traveling at the same speed the pinion which has been momentarily disengaged will be automatically thrown back into its engagement with its respective gear wheel. This act of the pinion may be confined either to one of them or the pinions may be successively thrown in or out of engagement depending upon the form of curved tracks over which the crane is traveling.

It will therefore be seen that my improved crane is adapted to be used either as a plain or geared crane and is readily and automatically converted from one form to the other by the driving mechanism, depending upon the weight of the load and the use to which the crane is temporarily put.

Having thus described this invention in

connection with an illustrative embodiment thereof to the details of which I do not desire to be limited, what is claimed as new and what it is desired to secure by Letters Patent is set forth in the appended claims:

1. The combination in a crane of traction wheels carried by the crane, means to drive the crane, and automatic means to connect or disconnect said driving means to or from the wheel or wheels of the crane permitting it to operate as a plain or geared crane.

2. In a crane the combination of traction wheels, a driving or squaring axle, and automatic means to directly connect or disconnect said wheel or wheels with or from said driving or squaring axle to permit the crane to operate either as a power or a non-power driven crane.

3. In a crane the combination of two spaced traction wheels, a driving or squaring shaft, means to drive the driving or squaring shaft, and means to automatically connect or disconnect said driving or squaring shaft with said traction wheels to permit the crane to operate either as a power or a non-power driven crane.

4. In a crane the combination of a plurality of spaced traction wheels, a squaring or driving axle to positively drive said wheel or wheels, and automatic means mounted on the squaring shaft to connect or disconnect said squaring shaft to or from the wheels to permit the crane to operate either as a power or non-power driven crane.

5. In a crane the combination of a plurality of traction wheels adapted to travel upon spaced rails, a squaring or driving shaft, laterally movable means carried by the squaring shaft to automatically connect and disconnect said squaring shaft with the traction wheels, and means to operate the squaring shaft.

6. In a crane the combination of spaced traction wheels, gear wheels connected to the traction wheels, a squaring or driving shaft mounted upon the crane, means to drive the squaring shaft, one or more pinions mounted upon the squaring shaft, means between the driving shaft and pinions to automatically throw the pinions into or out of engagement with the teeth carried by the traction wheels.

7. In a crane the combination of spaced traction wheels adapted to operate upon spaced rails, a squaring or driving shaft mounted on the crane, means to operate the squaring shaft, gear wheels carried by oppositely disposed traction wheels, a loose pinion carried at each end of the squaring shaft and a pin and cam groove between the pinion and the squaring shaft.

8. In a crane the combination of spaced traction wheels adapted to operate upon spaced rails, a squaring or driving shaft mounted on the crane, means to operate the squaring shaft, gear wheels carried by oppositely disposed traction wheels, a loose pinion carried at each end of the squaring shaft and a pin and double cam groove between the pinion and the squaring shaft.

9. The combination in a crane of traction wheels carried by the crane, means to drive the crane, and automatic means to connect or disconnect said driving means to or from the wheel or wheels of the crane permitting it to operate as a plain or geared crane, and a retarding device adapted to coöperate with a portion of the driving means when the latter is in its inoperative position.

10. In a crane the combination of spaced traction wheels, gear wheels connected to the traction wheels, a squaring or driving shaft mounted upon the crane, means to drive the squaring shaft, one or more pinions mounted upon the squaring shaft, means between the driving shaft and pinions to automatically throw the pinions into or out of engagement with the teeth carried by the traction wheels, and one or more retarding devices adapted to coöperate with one or both of the pinions while in their inoperative position.

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Witnesses:
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