April 6, 1943. T. G. GEROW 2,315,781

RACK AND PINION FOR EXCAVATING SHOVEL HANDLES

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Fig. 1.

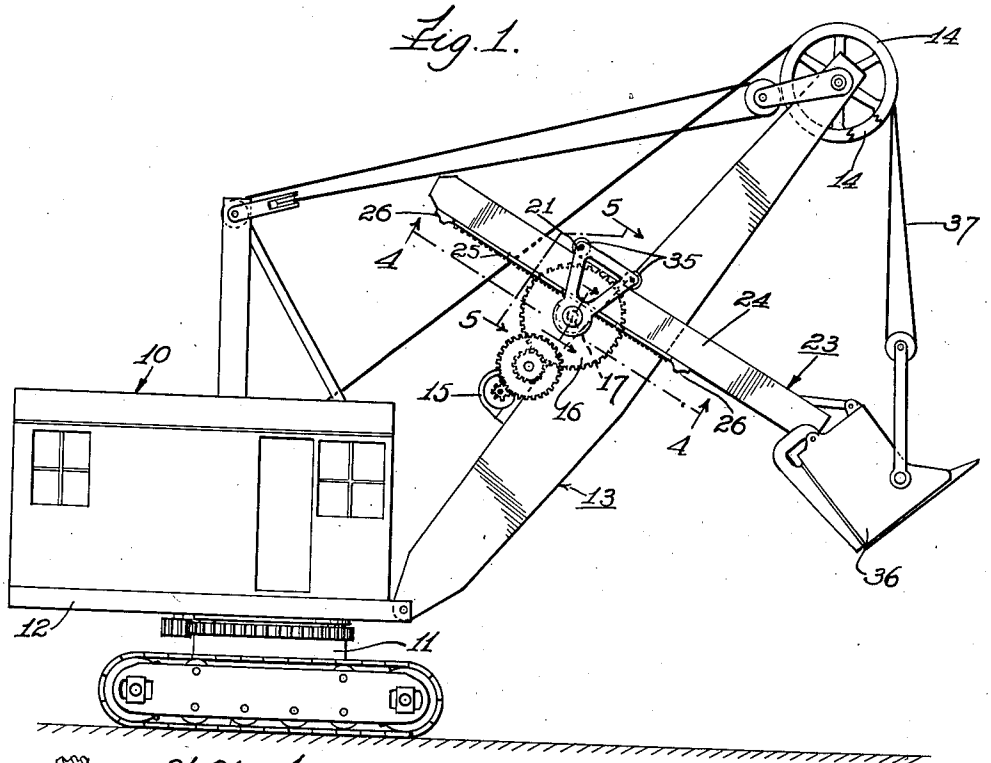


Fig. 2.

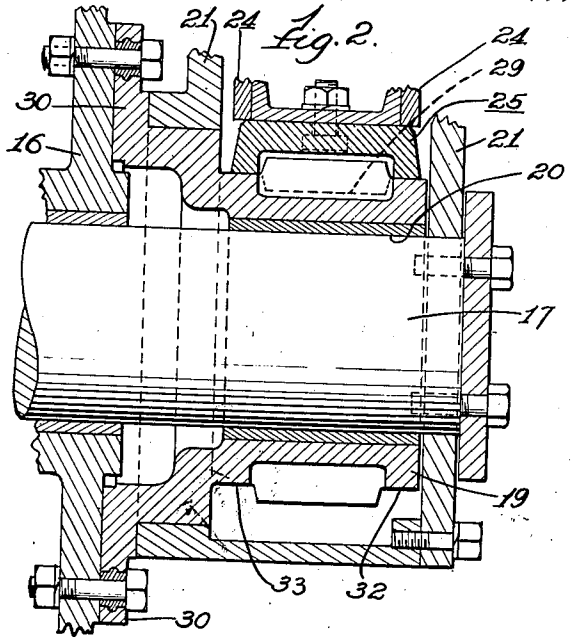
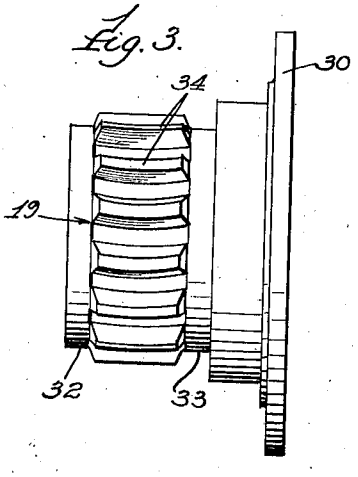


Fig. 3.



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Fig. 4.

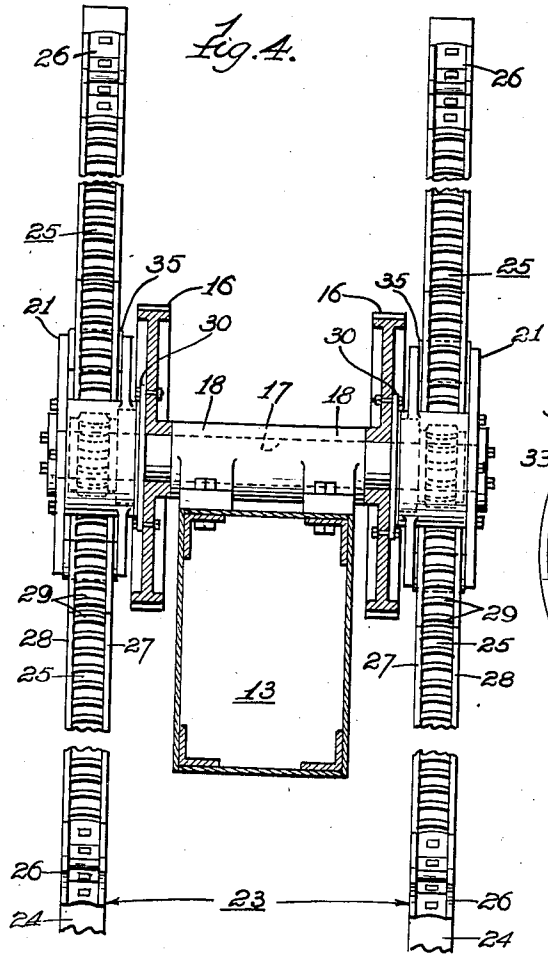


Fig. 5.

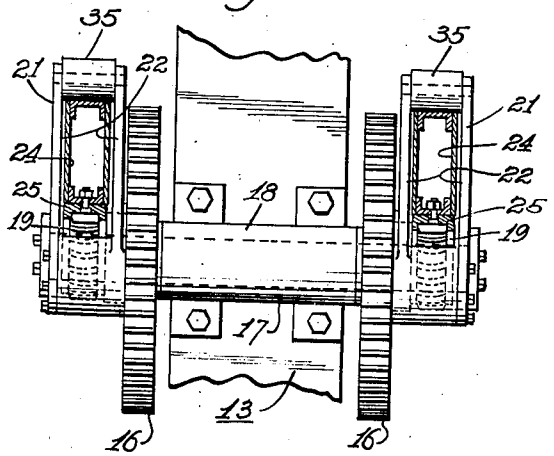
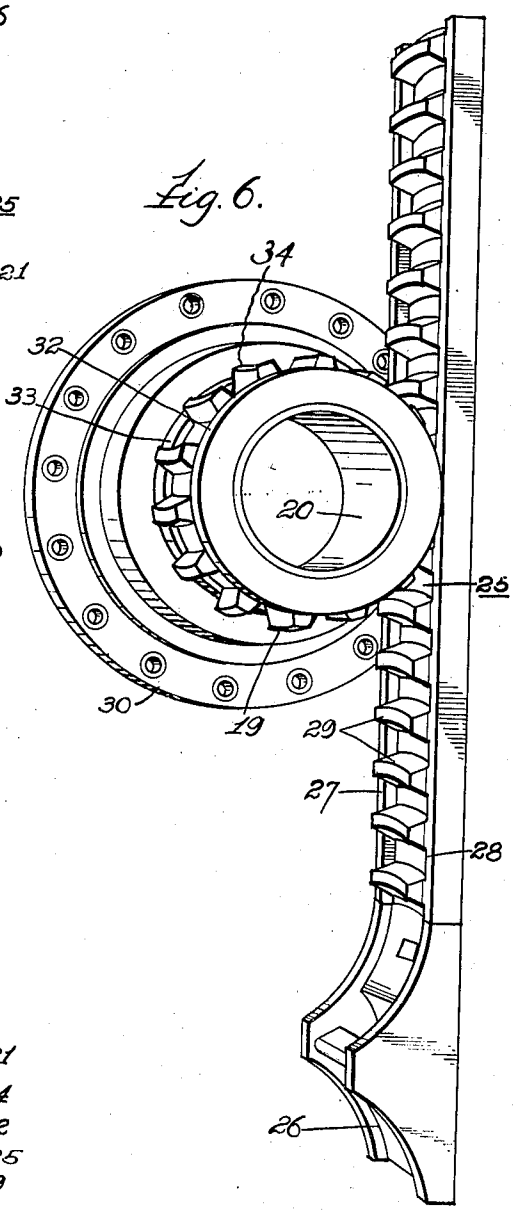


Fig. 6.



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UNITED STATES PATENT OFFICE

2,315,781

RACK AND PINION FOR EXCAVATING SHOVEL HANDLES

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Application November 2, 1942, Serial No. 464,256

2 Claims. (Cl. 214—135)

My invention relates to large excavating shovel constructions in which the engaging teeth of the driving pinions and the dipper handle racks have full surface contact regardless of side sway of the dipper handle and bucket.

In prior excavating shovel constructions, the driving pinion had straight teeth which meshed with the straight teeth of the dipper handle rack. This construction would have been satisfactory had the path of the bucket followed a straight line in the digging operation. But the bucket ordinarily followed an irregular line due to varying obstructions and conditions encountered. This twisting and weaving side sway of the bucket and dipper handle moved the straight teeth of the pinion and rack out of full surface contact and set up a condition of point contact. This caused excessive wear and breakage on the outermost corners of the teeth and excessive noise.

It is among the objects of this invention to overcome these difficulties and provide a construction for the driving pinion and dipper handle rack that will have full surface contact at all times, regardless of the side sway or out of line movement of the bucket and dipper handle. My invention also contemplates such further objects, advantages and capabilities as will later more fully appear and which are inherently possessed by my invention.

While I have shown in the accompanying drawings a preferred form of my invention, yet I wish it understood that the same is susceptible of modification and change without departing from the spirit of my invention.

Referring to the drawings, Fig. 1 is a side elevational view of an excavating shovel embodying my invention; Fig. 2 is an enlarged detailed sectional view of one of my driving pinions and racks in operation; Fig. 3 is a detailed side elevational view of one of the driving pinions; Fig. 4 is a detailed sectional view on line 4—4 of Fig. 1; Fig. 5 is a detailed sectional view on line 5—5 of Fig. 1 and Fig. 6 is a perspective view of one of my racks and driving pinions in engagement.

The embodiment selected to illustrate my invention comprises an excavating shovel construction 10 having a base 11 and rotatably mounted thereon a housing 12, within which the operator controls the operation of the construction. A boom 13 is pivotally attached at its lower end to the housing 12, and has rotatably attached to its upper end sheaves 14.

A motor 15 is mounted on boom 13 and by suitable means drives gears 16 which are mounted on shaft 17. Shaft 17 is rotatably mounted on bearing or pillow block 18 which is attached to boom 13.

Attached to the outer surface of each of said gears 16 is a driving pinion 19. Each of said driving pinions 19 has a bore 20 to receive shaft 17 on which said pinions are mounted and with which they rotate.

A pair of spaced saddle blocks 21 are provided. Each saddle block 21 has its ends pivotally mounted to the end portions of the shaft 17 and has a loop portion 22.

Extending across boom 13 is a dipper handle 23, bifurcated to form spaced parallel portions 24 straddling boom 13. Said parallel portions 24 extend through loops 22 of saddle blocks 21.

To each of the under sides of said parallel portions 24 is attached a rack 25. Each of said racks is preferably formed of connected sections, and at each end of said racks is a raised terminal or greenhorn 26. Each of said racks 25 has an inner shroud 27 and an outer shroud 28. Between each of said shrouds 27 and 28 are a plurality of spaced curved involute teeth 29.

Each of said pinions 19 has an attaching flange 30 having a plurality of spaced openings through which suitable bolts or the like are driven to extend into the outer surface of the gears 16. for attachment of the driving pinions to the gears 16.

Each of said pinions 19 has an outer shroud 32 and an inner shroud 33, and a plurality of circumferentially spaced curved involute teeth 34 therebetween.

The teeth 34 of the pinions 19 are formed so that their upper portions extend above shroud diameters, and their lower portions extend below the pitch diameter of the shrouds.

The teeth 29 of the racks 25 are likewise formed so that their upper portions extend above the top level of the shrouds and their lower portions extend below the level of the shrouds.

The spaced pinions 19 are positioned so that their teeth 34 engage the teeth 29 of the spaced racks 25, the inner shrouds 32 of the pinions ride on the inner shrouds 27 of the racks, and the outer shrouds 33 of the pinions ride on the outer shrouds 28 of the racks.

Each saddle block 21 has a pair of rollers 35 which roll on the top side of the parallel portions 24 of the dipper handle 23, so as to retain the teeth 29 of the racks 25 in mesh with the teeth 34 of the pinions 19.

At the forward end of the dipper handle 23 is pivotably attached a bucket 36. Suitable con-

trol cables 37 extend from the bucket 36 to sheaves 14 and thence to housing 12.

It is to be noted that since all the teeth 29 of the racks 25 curve in the same direction, that one of the pinions 19 is left handed and the other right handed so as to provide teeth 34 of the proper curvature to mesh with the teeth 29 of the racks 25.

Having thus described my invention, I claim:

1. In an excavating shovel construction a pivotally movable boom, a pillow block attached to said boom, a shaft rotatably mounted on said pillow block, a pair of spaced gears mounted on said shaft, a pair of spaced driving pinions, said driving pinions attached to the outer surfaces of said gears and rotatable therewith, a pair of spaced saddle blocks pivotally attached to opposite ends of said shafts, each of said saddle blocks having a loop portion, a bifurcated dipper handle straddling said boom and having spaced portions, said spaced portions of said dipper handle extending through said loop portions of said spaced saddle blocks, a bucket pivotally attached to the lower end of said dipper handle, said spaced driving pinions each having outer and inner shrouds and a plurality of circumferentially spaced curved involute teeth therebetween, said teeth formed with their upper portions extending above and their lower portions extending below the pitch diameter of the shrouds, a rack attached to the under side of each of said spaced portions of said dipper handle, each of said racks having an inner and an outer shroud and a plurality of spaced curved involute teeth therebetween, said teeth formed with their upper portions extending above, and their lower portions extending below the top level of said shrouds, said shrouds of said pinions positioned to ride on said shrouds of said racks, and said curved involute teeth of said pinions positioned to mesh with said curved involute teeth of said racks and adapted by their curved, involute form extending above and below said shrouds to provide full surface contact between said pinions and said racks regardless of side sway of said bucket and said dipper handle, and rollers rotatably attached to the tops of said loop portions of said saddle blocks, said rollers adapted to roll on the top surfaces of said spaced portions of said dipper handle for retaining the teeth of the racks in mesh with the teeth of the pinions.

2. In an excavating shovel construction a pivotally movable boom, a pillow block attached to said boom, a shaft rotatably mounted on said pillow block, a gear mounted on said shaft, a driving pinion attached to said gear and rotatable therewith, a saddle block pivotally attached to said shaft, and having a loop portion, a dipper handle extending through said loop portion, a driving pinion rotatably positioned adjacent said boom, a bucket pivotally attached to the lower end of said dipper handle, said driving pinion having outer and inner shrouds and a plurality of circumferentially spaced curved involute teeth therebetween, said teeth formed with their upper portions extending above and their lower portions extending below the pitch diameter of the shrouds, a rack attached to the inner surface of said dipper handle, said rack having an inner and an outer shroud and a plurality of spaced curved involute teeth therebetween, said teeth formed with their upper portions extending above, and their lower portions extending below the top level of said shrouds, said shrouds of said pinion positioned to ride on said shrouds of said rack, and said curved involute teeth of said pinion positioned to mesh with said curved involute teeth of said rack and adapted by their curved involute form extending above and below said shrouds to provide full surface contact between said pinion and said rack regardless of side sway of said bucket and said dipper handle, and a roller rotatably attached to the top of the loop portion of said saddle block, said roller adapted to roll on the top surface of said dipper handle for holding the teeth of said pinion and said rack in constant engagement.

THERON G. GEROW.