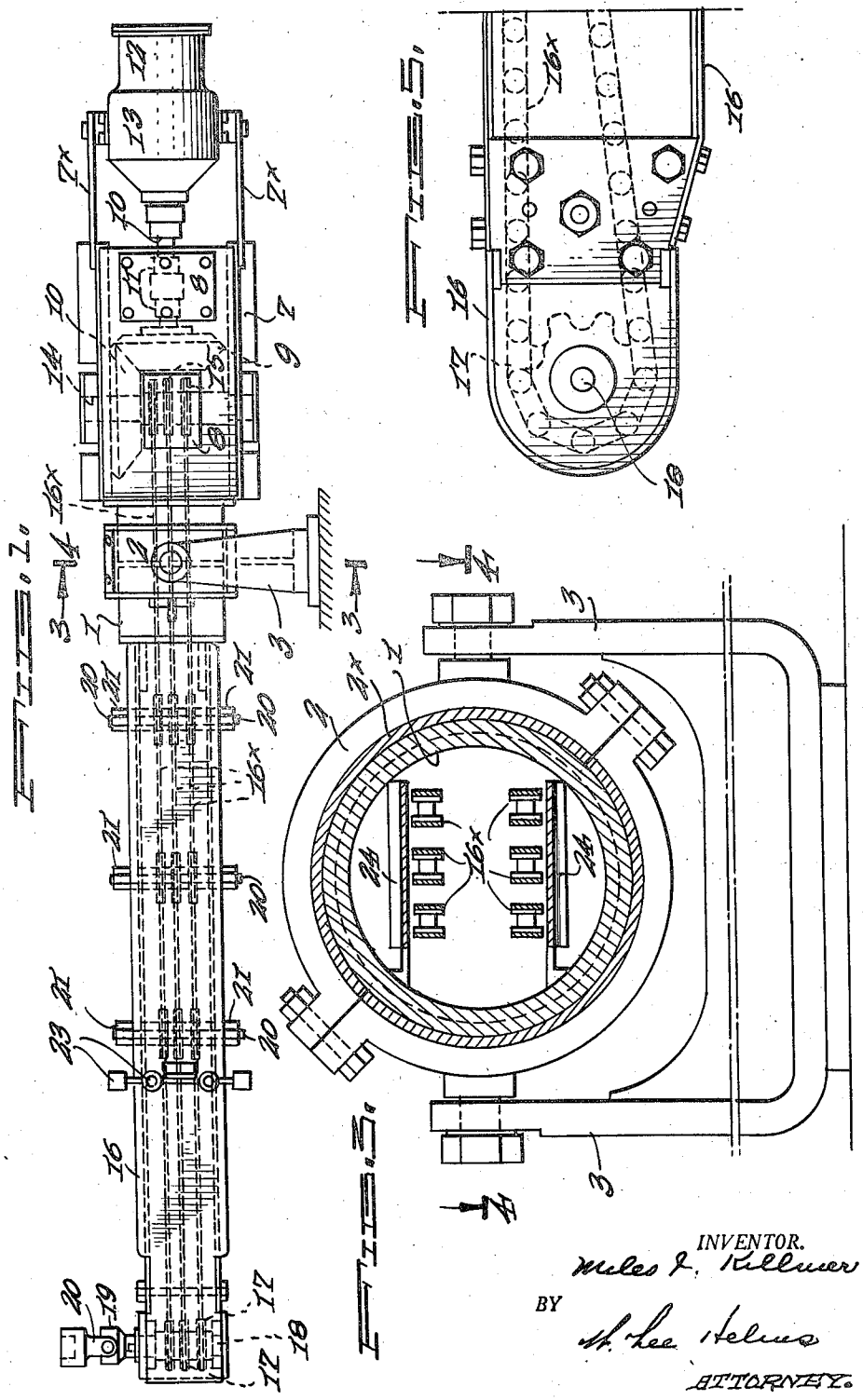
Feb. 24, 1948. M. I. KILLMER 2,436,650

BOLT TIGHTENING APPARATUS

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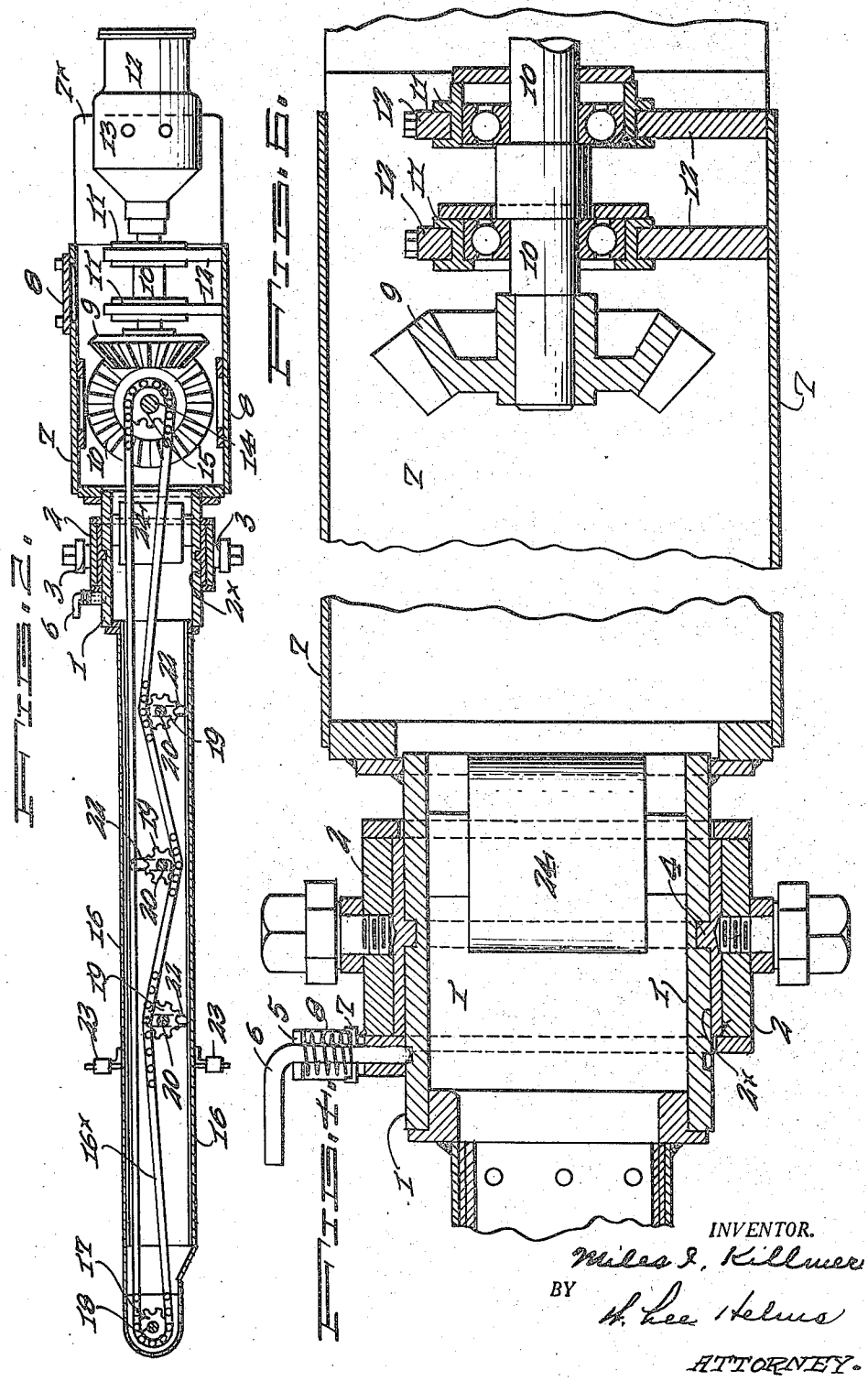


INVENTOR.
Miles I. Killmer
BY
H. Lee Helms
ATTORNEY.

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INVENTOR.
Miles I. Killmer
BY
H. Lee Helms
ATTORNEY.

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BOLT TIGHTENING APPARATUS

Miles I. Killmer, New York, N. Y., assignor to Mason & Hanger Co., Inc., New York, N. Y., a corporation of West Virginia

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3 Claims. (Cl. 81—57)

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The present invention relates to power driven bolt tightening apparatus particularly adapted for tightening very heavy tunnel-liner bolts, and requiring ease of manipulation and great durability. A characteristic of the invention is the provision between the wrench socket carried by the device and the power means of a flexible connection by which a constant torque may be imposed upon the wrench socket member. Such connection means consists of rotary drive elements and a plurality of chains which in practice will have constant progressive movement until the bolt has been tightened even to the point where the power means is stalled.

The invention will be described with reference to the accompanying drawings, in which—

Fig. 1 is a view in elevation, partly in dotted lines showing an embodiment of the invention;

Fig. 2 is a horizontal section taken generally on the line 2—2, Fig. 1, but showing the power means in full lines;

Fig. 3 is a vertical section taken on the line 3—3, Fig. 1;

Fig. 4 is an enlarged horizontal section taken on the line 4—4, Fig. 3;

Fig. 5 is an enlarged detailed view showing the wrench socket end of the device at the side opposite the socket, certain parts being shown in dotted lines; and

Fig. 6 is an enlarged fragmentary section showing the drive shaft, its bearing supports and the drive gear.

Referring to the drawings, I have shown at 1 the central or key connecting member for the power means and the forward end of the apparatus. Member 1 is a heavy sleeve having its mounting in an annular supporting carrier 2 pivoted at opposed points upon the standards 3. The carrier 2 may be provided with an inner ring or facing 2x formed with an annular rib 4 which enters an encircling channel formed in sleeve 1, so that sleeve 1 may be rotated relatively to the carrier as well as giving pivotal movements therewith on the standards 3.

Secured to the carrier 2 is a bracket 5 having a bent extension apertured to receive a latch pin 6, the latter carrying a collar 7 engaged by a spring 8, the upper end of the latter abutting the bent end of the bracket 5. Thus, the latch pin is pressed downwardly and its lower end is adapted to enter any one of a plurality of recesses formed annularly in the surface of sleeve 1 to hold the latter in position relatively to the carrier when it has been rotationally adjusted.

The power end of the apparatus consists of a

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suitable casing, generally indicated at 7 and held on sleeve 1 in fixed position in any suitable manner. The casing is preferably provided with removable covers 8 for access to a driving gear 9 and a driven gear 10. Driving gear 9 is preferably of beveled type and is mounted on a shaft 10 held in bearing members 11 supported by brackets 12.

My preferred power device consists of an air motor connected to shaft 10 by suitable reduction gearing. The specific form of such power means and reduction gearing is not claimed herein and the elements may be of widely varying types as to specific construction. For this reason, the air motor is only diagrammatically shown at 12 and the reduction gearing is indicated at 13, the drawings showing casings only for the respective elements. In the embodiment illustrated the motor and reduction gearing cases are bolted to heavy rearwardly projecting plate extensions 7x carried by the casing 7.

The driven gear 10 is a bevel gear carried by a shaft 14 which also carries a plurality of sprockets 15.

The forward portion of the apparatus consists of an elongated housing generally indicated at 16 and rigidly carried by connecting sleeve 1. In the present embodiment there are three sprockets 15 on shaft 14, and these sprockets carry three endless chains extending within the housing 16 and led over three sprockets 17 within the forward end of the housing. These sprockets are mounted on a shaft 18 carrying at its end a releasable head 19 (Fig. 1) to which is swivelled a wrench socket 20.

Within the housing 16 are adjustably positioned a plurality of idler sprockets 19 on shafts 20. These shafts are led through slots in the housing. The simplest form of adjustment holding means for the shafts 20 will consist of nuts 20x on the ends of the shafts so that when the shafts are adjusted in slots 22 (Fig. 2) the nuts may be tightened down onto the housing 16 to hold the idler sprockets in adjusted position, and in order that undue slack in the chains 16x may be taken up.

For manual rotation of the apparatus relatively to its carrier 2 a series of handles 23 may be carried thereby. It will also be understood that the carrier 2 and the rib-ring 2x may be split members, as indicated in Fig. 3. It is also preferred that the chains run between guide plates 24 carried within sleeve 1. These plates are shown with bent ends in Figs. 2 and 3 so that the chains may readily ride over them.

The guide plates 24 may be arranged at the top end of the chain leads within the sleeve 1, as shown in Figures 2 and 3 or may be disposed at the side of the outermost chains, or in both positions. In Fig. 4 the guide plates are arranged so as to lie at the sides of the chains, one only being shown inasmuch as this is a cross-sectional view. Guide plates also may be disposed between the chains, if desired.

In the use of the apparatus for the tightening of tunnel liner bolts, it will usually be mounted on a large ring carrier equipped with means for moving the apparatus about the various liner plates, which are usually circumferentially placed. Inasmuch as such carrier means forms no part of the present invention it has not been illustrated.

In the use of the apparatus a wrench socket 20 of the size appropriate to the bolts to be acted upon is connected to shaft 18 at the forward end of the apparatus and the latter is adjusted by swinging and rotation to bring the wrench socket into engagement with the bolt and in register with the bolt aperture of the liner plate. The power means is then thrown into operation and gear 14 will be rotated to impart progressive rotation to the wrench socket through the intermediary of the gears and the chains.

It will be understood that various modifications may be made in the form and arrangement of the elements illustrated in the drawings without departing from the spirit of the invention, what I claim and desire to secure by Letters Patent being as follows:

1. A bolt tightening apparatus consisting of an elongated forwardly projected casing and a rearwardly projecting casing, an intermediate sleeve-like member connecting the casings, a carrier having a loosely embracing surface for the sleeve to permit rotation of the latter, a pivotal support for the carrier, a shaft carried by the end of the forwardly projecting casing, at least one sprocket on said shaft, an aperture being formed in said forwardly projecting casing, said aperture being in registration with an end of the shaft for access thereto, a shaft carried by the rearwardly projecting casing, at least one sprocket carried by said shaft, a chain leading therefrom to the first named sprocket and extending through the forwardly projected casing, and a power drive for said last named shaft.

2. A bolt tightening apparatus consisting of an elongated forwardly projected casing and a rearwardly projecting casing, an intermediate sleeve-like member connecting the casings, a carrier having a loosely embracing surface for the sleeve, a pivotal support for the carrier, a shaft carried by the end of the forwardly projecting casing, at least one sprocket on said shaft, an aperture being formed in said forwardly projecting casing, said aperture being in registration with an end of the shaft for access thereto, a shaft in the rearwardly projected casing, a sprocket on said shaft, a chain connection between the sprockets and running longitudinally of the forwardly projected casing, and power means carried by the rearwardly projected casing for driving the sprocket therein.

3. A bolt tightening apparatus consisting of an elongated forwardly projected casing and a rearwardly projecting casing, an intermediate sleeve-like member connecting the casings, the sleeve being formed with a circular keyway, a split annular carrier having a key in said keyway, a pivotal support for said carrier, latching means supported by the carrier and adapted to latch the sleeve in rotationally adjusted position, a forwardly projected support carried by said sleeve, a rearwardly projected support carried by the sleeve, a sprocket device and a shaft connected thereto at the end of the forwardly projected support, sprocket means carried by the rearwardly projected support, a chain drive carried by said sprocket means, and power means for rotating said sprockets including gearing carried by the rearwardly projected support, the forwardly projected support being formed with an aperture in registration with the end of the shaft through which aperture the shaft projects.

MILES I. KILLMER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
717,528	Bartlett	Jan. 6, 1903
1,978,513	Talboys	Oct. 30, 1934
2,009,409	Parker	July 30, 1935