Oct. 16, 1962 R. TEMPLE ETAL 3,058,295

EXPLOSIVE TOOL FOR REMOVING SPROCKET CHAIN PIVOT PINS

Filed Nov. 30, 1960 2 Sheets-Sheet 1

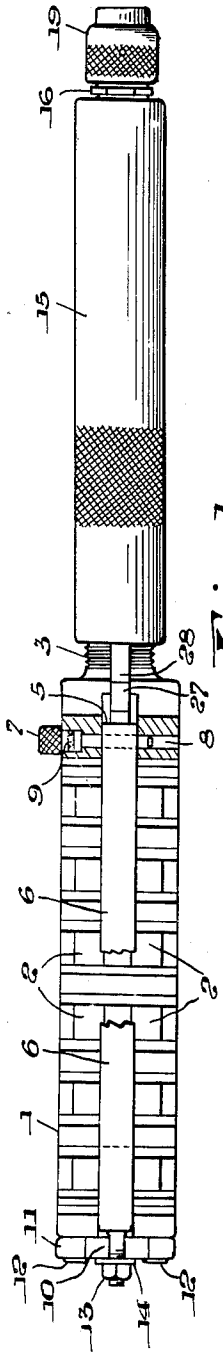


Fig. 1.

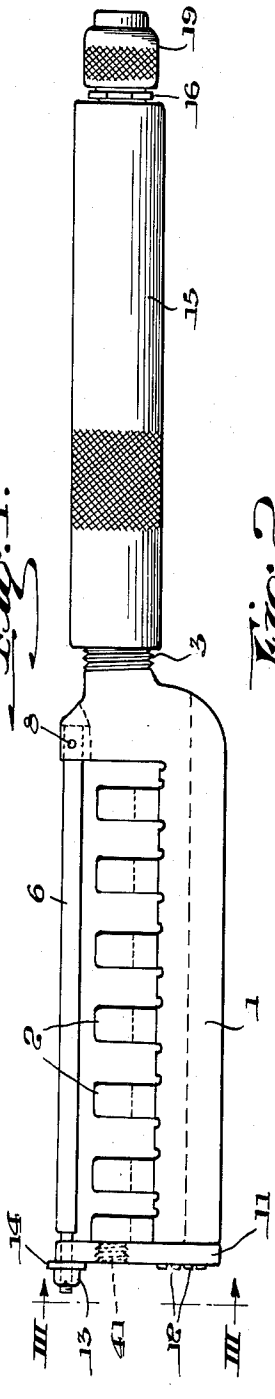


Fig. 2.

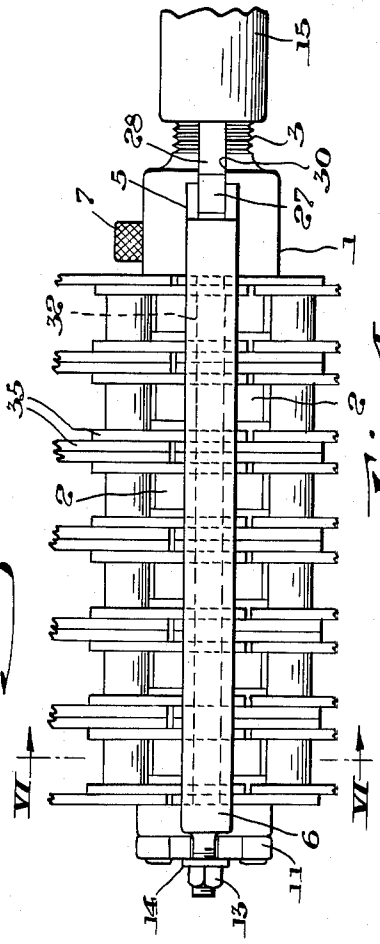


Fig. 4.

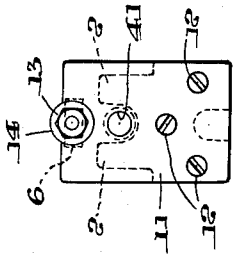


Fig. 3.

INVENTORS.
ROBERT TEMPLE,
ERNEST E. TEMPLE.
BY
Brown, Critchlow, Flick & Peckham
their
ATTORNEYS.

Oct. 16, 1962 R. TEMPLE ETAL 3,058,295

EXPLOSIVE TOOL FOR REMOVING SPROCKET CHAIN PIVOT PINS

Filed Nov. 30, 1960

2 Sheets-Sheet 2

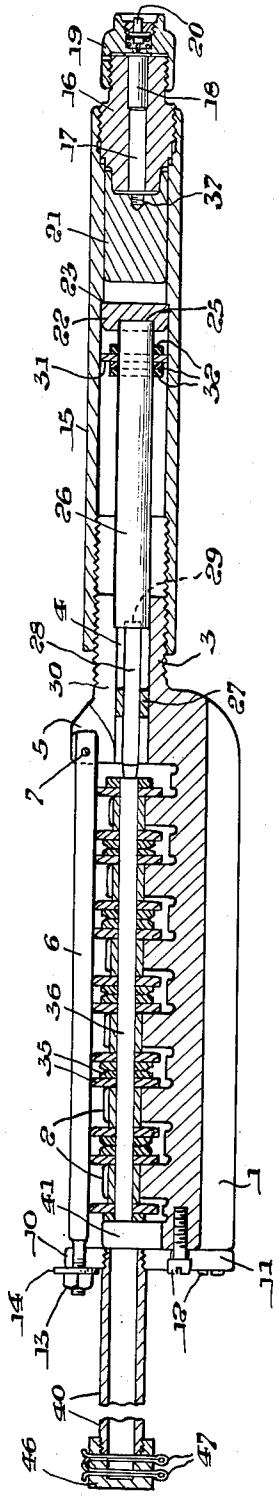


Fig. 5.

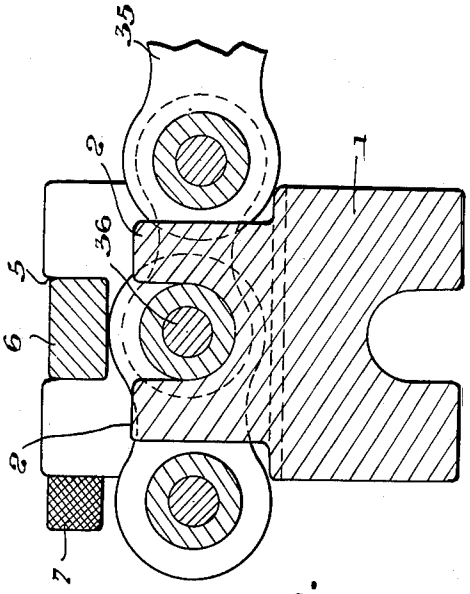


Fig. 6.

INVENTORS.
ROBERT TEMPLE,
ERNEST E. TEMPLE.
BY
Brown, Critchlow, Flick & Peckham
their
ATTORNEYS.

United States Patent Office

3,058,295

Patented Oct. 16, 1962

3,058,295

EXPLOSIVE TOOL FOR REMOVING SPROCKET CHAIN PIVOT PINS

Robert Temple, Swissvale, and Ernest E. Temple, Murraysville, Pa., assignors to Mine Safety Appliances Company, a corporation of Pennsylvania

Filed Nov. 30, 1960, Ser. No. 72,597
4 Claims. (Cl. 59—7)

This invention relates to explosive-actuated tools, and more particularly to one for removing pivot pins from sprocket chains.

Wide belt-like sprocket chains are used with machinery for transmitting power. They are composed of a great many links connected together by long, parallel pivot pins that extend from one side of the chain to the other. Occasionally a chain has to be repaired and that requires one or more of the pins to be removed, which is a difficult task because the pins fit very tightly in some of the links. It is also difficult to replace the pins after the repairs have been made.

It is among the objects of this invention to provide a tool, which will force pivot pins out of sprocket chains or replace them, which is small and compact, which is very portable, which is extremely simple to operate, which is actuated by explosive charges, which can operate on chains of various widths, and which is simple and durable in construction.

In accordance with this invention, an elongated frame, which is designed to be placed across a sprocket chain, is provided with two spaced rows of teeth adapted to project between some of the chain links when their connecting pivot pin is disposed between the rows of teeth. Connected to the frame at one end of the rows of teeth is a barrel that extends lengthwise of those rows away from the frame. A rod in the barrel extends longitudinally of it in line with the space between the rows of teeth. Explosive-actuated means connected with the outer end of the barrel will drive the rod lengthwise between the rows. When that happens, the teeth hold the chain links so that the rod can drive out the pivot pin.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which:

FIG. 1 is a plan view of the tool;

FIG. 2 is a side view thereof;

FIG. 3 is an end view;

FIG. 4 is an enlarged fragmentary plan view showing the tool attached to a chain;

FIG. 5 is a central longitudinal section of the complete tool on the chain; and

FIG. 6 is an enlarged transverse section taken on the line VI—VI of FIG. 4.

Referring to FIGS. 1, 2 and 3 of the drawings, an elongated frame is formed principally from a heavy metal bar 1 that is provided with two laterally spaced parallel rows of teeth 2 projecting upwardly. The rear end of the bar extends up beside the teeth and has a longitudinally projecting cylindrical threaded extension 3 provided with an axial passage 4 aligned with the space between the two rows of teeth. The same end of the frame is provided with a vertical notch 5 above the area between the rows of teeth, in which one end of a locking bar 6 is pivotally mounted on a removable pin 7 held in a transverse passage 8 through the frame by an O-ring 9 encircling the outer portion of the pin and frictionally engaging the surrounding wall of that passage. The opposite end of the locking bar is threaded and extends through a central notch 10 in the top of a rectangular end plate 11 that is attached to the front end of the frame bar by screws 12. A nut 13 and a washer 14 on the threaded end of the locking bar serve to hold it in the notch.

Screwed on extension 3 is the front end of a barrel 15,

in the opposite end of which a cartridge receiver 16 is screwed. As shown in FIG. 5, the receiver has a passage 17 through it, in the outer end of which an explosive cartridge 18 is disposed. The cartridge is held in place by a breechblock 19 screwed onto the receiver and containing a firing pin 20 that can be struck by a hammer to detonate the cartridge. The front end portion of the cartridge receiver is smaller than the barrel and is slightly tapered to permit the rear end of a piston 21 to be wedged on it. The piston is slidably mounted in the barrel behind a shorter guide piston 22, also slidably disposed in the barrel. A shoulder 23 in the barrel spaces the guide piston from the drive piston, so that when the cartridge is fired the drive piston will be able to acquire velocity before it strikes the guide piston and drives it forward.

The front end of guide piston 22 has a shallow central socket 25 that receives the rear end of a drive rod 26. The rod extends forward through the barrel and into the rear end of passage 4, in which a short bushing 27 also is slidably mounted. Slidably supported in the bushing is a push rod 28, the rear end of which is held in a central socket 29 in the front end of the drive rod. The push rod has a slightly smaller diameter than the chain pin that is to be removed. The portion of the frame above passage 4 is provided with a longitudinal slot 30 that is slightly wider than push rod 28, but narrower than bushing 27 so that the bushing cannot escape through it. A metal washer 31 is held on the rear end of rod 26 by means of smaller rubber washers 32, which serve as bumpers. The metal washer centers the rod in the barrel before the rear end of the rod is inserted in guide piston 22.

To use this tool, locking bar 6 is raised and swung back and the frame 1 is placed beneath a section of the chain, from which a pivot pin is to be removed. Then the frame is raised to insert teeth 2 between the links 35 of the chain in such a position that the two rows of teeth will straddle the pin 36, as shown in FIGS. 4, 5 and 6. Following this, bar 6 is swung down over the chain and locked in end plate 11 by means of nut 13 to hold the tool on the chain. After rod 28 has been inserted in bushing 27, and the front end of drive rod 26 has been inserted in passage 4, the barrel is screwed onto extension 3 far enough to cause guide piston 22 to receive the drive rod and push the front end of the push rod against the adjoining chain pin 36. This takes up all slack. Rod 26 should be of such a length that the barrel can be secured onto the frame far enough to make a secure connection, but not so far that it will be stopped before piston 22 has pressed the front rod against the pivot pin. Piston 21 may be wedged onto the front end of cartridge receiver 16 before the latter is screwed into the rear end of the barrel, or the piston can be pulled back onto the receiver by a tool inserted in a threaded hole 37 in the back of the piston. A cartridge 18 is inserted in the receiver before breechblock 19 is screwed onto it.

Firing pin 20 now is struck by a hammer or the like in order to detonate the cartridge. The expanding gases will build up pressure in chamber 17 until it is great enough to drive piston 21 forward at high velocity against guide piston 22 and thereby drive the two rods, acting as a single rod means, and the pivot pin forward. The pivot pin fits in the links so tightly that it ordinarily will not be driven out of the chain with only one firing. Therefore, the barrel is removed from the frame and reloaded and the push rod 28 and bushing are withdrawn. A longer push rod then is inserted in passage 4 and in the portion of the chain from which the pivot pin has been driven, but the bushing is not used. After drive rod 26 has been replaced and the barrel has been applied to the frame, the second cartridge is discharged to drive the rods forward and thereby drive the pin farther or the rest of the way out of the chain.

Since the pivot pin may leave the chain with consider-

ble velocity, it may be desirable to first screw a pipe **40** FIG. 5) into a threaded opening **41** in end plate **11** to :ceive and stop the pin. The outer end of the pipe is osed by a plug **46**, across which cotter pins **47** extend) act as shear pins that will cushion the shock of the ivot pin striking the plug.

In case a rod **28** becomes stuck in the chain, barrel **15** unscrewed from the frame and then the bushing **27**, hich does not fit the rod tightly, is pushed back out of ame extension **3** by means of a screwdriver or the like the bushing is in use. Then, after releasing locking ar **6**, the chain can be lifted from the tool because the ortion of the rod remaining in extension **3** can be lifted ut of slot **30**. Suitable means may then be employed) pull the rod out of the chain.

If it is desired to replace a pivot pin in the chain, a ummy pin that is slightly smaller in diameter than pin **6** is first passed through the links to hold them in align- ıent between the two rows of teeth **2**. The pivot pin is ıen substituted for push rod **28** and is driven part way ıto the chain by a short drive rod. After each firing, longer drive rod is used until the pivot pin extends ırough the entire chain. A light charge is used for the nal firing so that it will not overdrive the pivot pin and ause it to project too far from the opposite side of the hain. If desired, a removable back stop (not shown) ıay be inserted between end plate **11** and the adjacent nks of the chain to help stop the pin.

A chain may be assembled in the first place in the ıanner described in the preceding paragraph. Or, if esired, a row of links that are to be added to links that ave already been assembled can be aligned by a dummy in extending through them at one end. Then a bolt is ıserted in the opposite end of the links, with spacers etween the links, and the bolt is tightened to hold the nks aligned. The dummy pin then is removed and the ligned links are placed in the tool frame with their open nds in alignment with the holes in the last row of links reviously added to the chain. After that, a pivot pin ; driven through all of the holes, and the bolt and spacers ıen can be removed.

It will be seen that this tool is simple and compact and ery easy to operate. Being small and light weight, it an be readily be carried around and used in the field /henever desired. It has a great deal of power, so it an remove pivot pins that fit very tightly in chains. It lso is well suited for driving pivot pins into chains to eplace broken pins or to assemble the chain links in the rst place.

According to the provisions of the patent statutes, we ave explained the principle of our invention and have lustrated and described what we now consider to rep- esent its best embodiment. However, we desire to have : understood that, within the scope of the appended laims, the invention may be practiced otherwise than as pecifically illustrated and described.

We claim:

1. A sprocket chain pivot pin removing tool, compris- ıg a frame adapted to extend across a sprocket chain nd provided with two spaced rows of teeth adapted to ıroject between some of the chain links when their con-

necting pivot pin is disposed between said rows, a barrel connected to the frame at one end of said rows of teeth and extending lengthwise of the rows away from the frame, rod means in the barrel extending longitudinally thereof in line with the space between said rows of teeth, a straight pipe having an inner end connected to the frame at the opposite end of said rows of teeth and extending lengthwise of the rows away from the frame, means closing the outer end of said pipe, the pipe being axially aligned with the space between the row of teeth, at least one rigidly mounted cotter pin extending across the outer end of the pipe and spaced from said closing means, and explosive-actuated means connected with the outer end of the barrel for driving the rod means lengthwise between said rows, said teeth forming backstops for the chain links while their pivot pin is being driven out of them by said rod means, said pipe being adapted to receive a pivot pin as it is driven out of the chain links, said cotter pin being in the path of a pivot pin driven into the pipe and serving as a shock absorber.

2. A sprocket chain pivot pin removing tool, comprising a frame adapted to extend across a sprocket chain and provided with two spaced rows of teeth adapted to project between some of the chain links when their connecting pivot pin is disposed between said rows, a barrel connected to an end portion of the frame at one end of said rows of teeth and extending lengthwise of the rows away from the frame, said end portion of the frame adjoining the barrel having a passage communicating with said barrel and the space between said rows of teeth, a bushing fitted in said passage in alignment with the barrel and the space between said rows of teeth, the bushing being slidable out of the frame into the barrel, rod means fitted in the bushing and slidable therethrough and extending into the barrel, and explosive-actuated means connected with the outer end of the barrel for driving the rod means forward in the bushing, said teeth forming backstops for the chain links while their pivot pin is being driven out of them by said rod means.

3. A tool according to claim 2, in which said end portion of the frame is provided with a slot beside said bushing, the slot being narrower than the bushing and wider than the rod means in the bushing.

4. A tool according to claim 3, including a removable pin extending across said slot, a bar pivotally mounted at one end on said removable pin and extending lengthwise of said rows of teeth in a position to hold the tool on a chain, and means for detachably clamping the opposite end of the bar to said frame.

References Cited in the file of this patent

UNITED STATES PATENTS

2,020,162	Rodgers	Nov. 5, 1935
2,622,389	Sjostrom et al.	Dec. 23, 1952
2,853,133	Norman et al.	Sept. 23, 1958
2,904,955	Kreiter	Sept. 22, 1959
2,924,147	Bohl et al.	Feb. 9, 1960
3,003,306	Quisenberry	Oct. 10, 1961

FOREIGN PATENTS

744,822	Great Britain	Feb. 15, 1956