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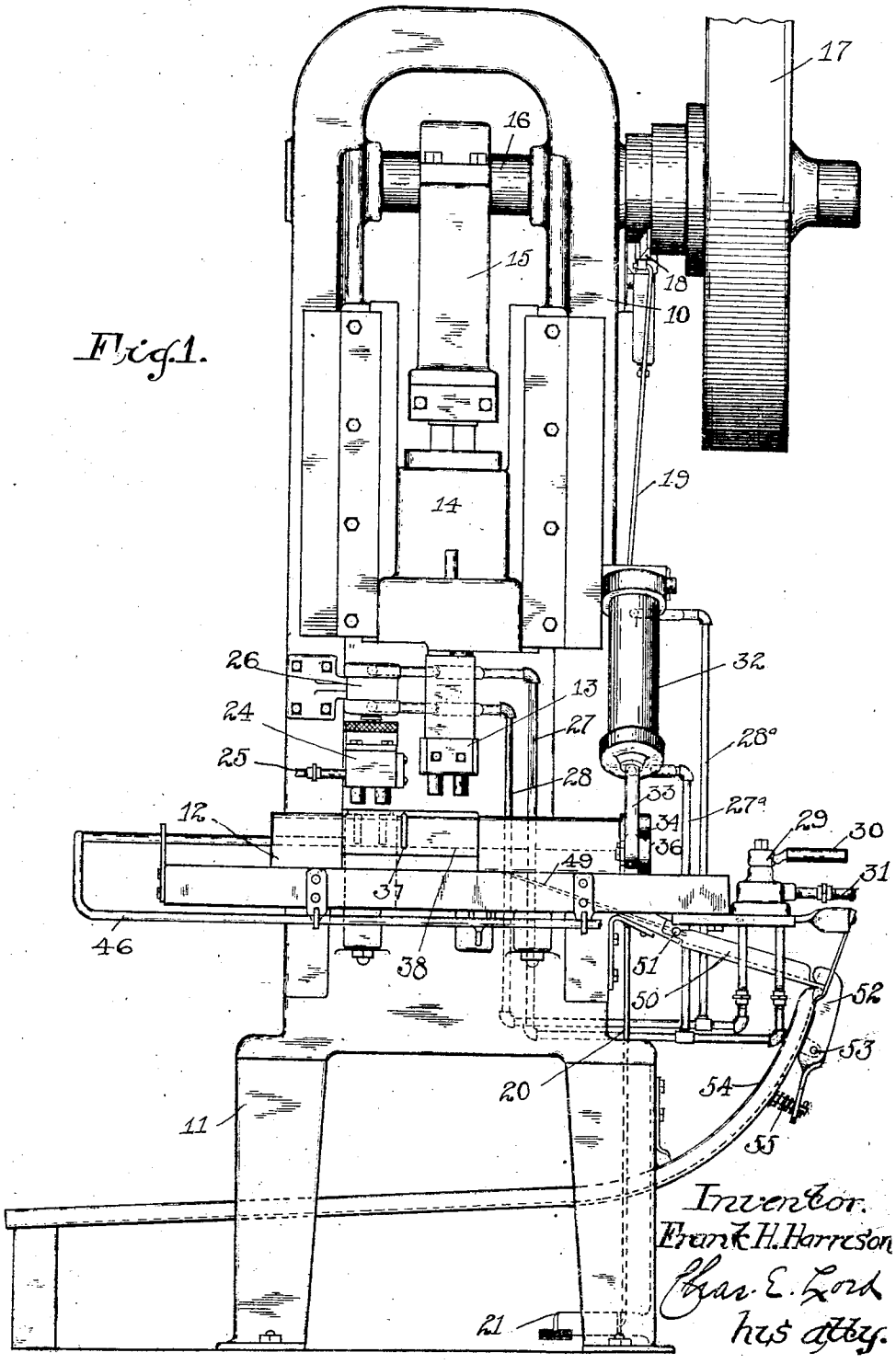
1,527,797

F. H. HARRISON

PROCESS AND MACHINE FOR RIVETING CHAIN LINKS

Filed Aug. 29, 1919 3 Sheets-Sheet 1

Fig. 1.



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PROCESS AND MACHINE FOR RIVETING CHAIN LINKS

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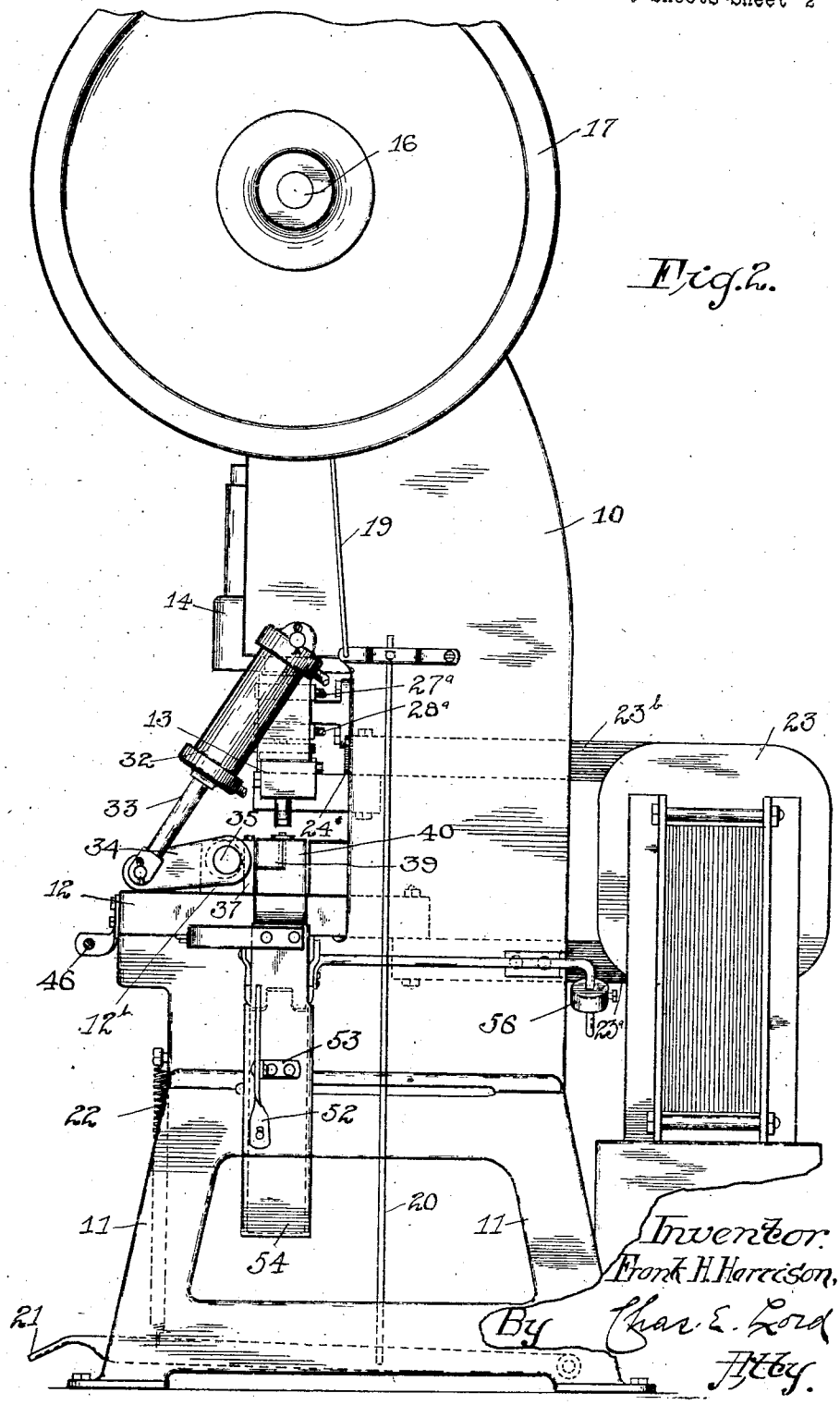


Fig. 2.

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PROCESS AND MACHINE FOR RIVETING CHAIN LINKS

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Fig. 3.

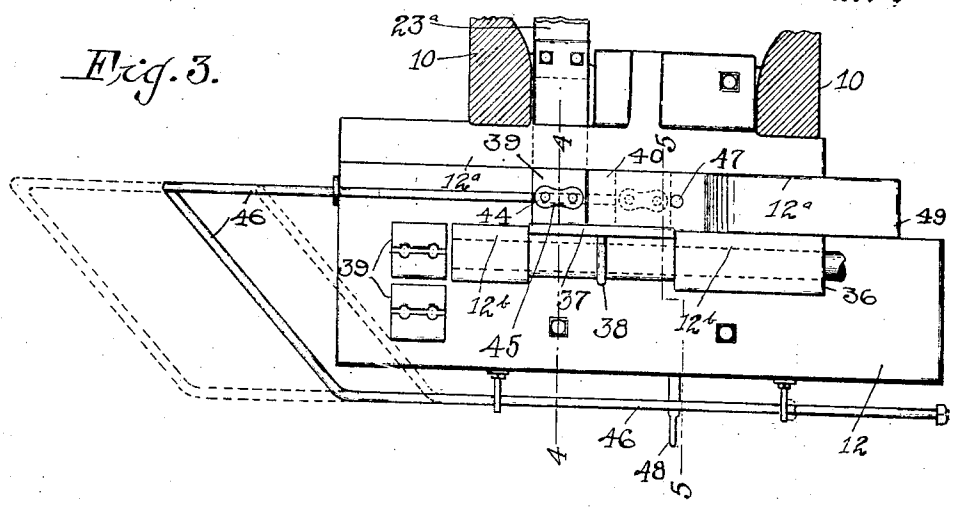


Fig. 4.

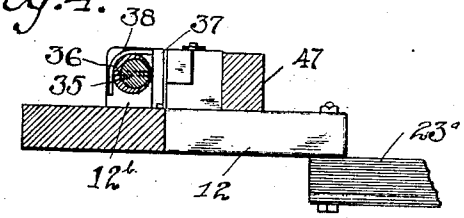


Fig. 8.

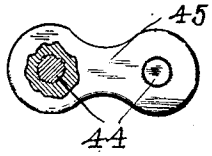


Fig 5.

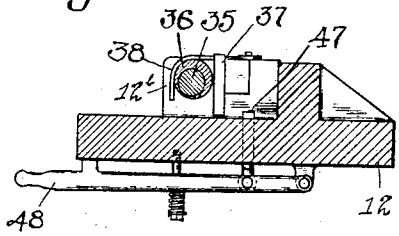


Fig. 11.

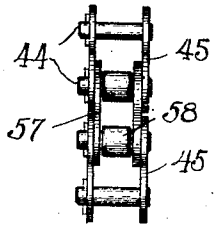


Fig. 9.

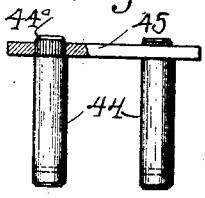


Fig. 6.

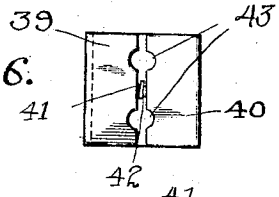


Fig. 10.

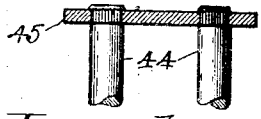
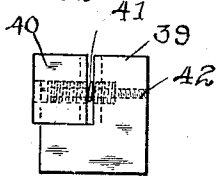


Fig. 7.



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Patented Feb. 24, 1925. 1,527,797

UNITED STATES PATENT OFFICE.

FRANK H. HARRISON, OF CHICAGO, ILLINOIS, ASSIGNOR TO INTERNATIONAL HARVESTER COMPANY, A CORPORATION OF NEW JERSEY.

PROCESS AND MACHINE FOR RIVETING CHAIN LINKS.

Application filed August 29, 1919. Serial No. 320,718.

To all whom it may concern:

Be it known that I, FRANK H. HARRISON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Processes and Machines for Riveting Chain Links, of which the following is a full, clear, and exact specification.

This invention relates to a method of and means for riveting pins in the side bars of chain links and like articles. These pins are usually hardened to insure a longer life for the chain, and heretofore it has been customary in making these chains, to soften the end of the pin to be riveted, either before the pin is assembled in the side bar or afterward. With the end of the pin softened it has been customary to rivet with a pneumatic hammer or in a rivet press. As a result the riveted end of the pin is soft and in time the pin will work loose from the side bar, giving rise to a very poor chain.

It is an object of my invention to produce a pin which has means for getting a better gripping action between the end of the pin and the side bar, so as to obtain a more rigid connection between the pin and side bar, and in order to do this I have found it necessary to assemble the pin and side bar with the pin remaining in a hardened state throughout its entire length, and this in turn gives rise to another object of my invention, which is the provision of a method of assembling a hardened steel pin and a side bar of a chain link and riveting over the protruding end without permanently withdrawing the hardness of the pin, this being accomplished by localizing the heat generated in the end of the pin through rapid heating of the end while cooling the body.

Another object of my invention is to provide means for assembling chain links which will produce a chain of great uniformity and which will accomplish the riveting by the novel method stated and in a very speedy and economical manner.

These and other objects, as will be apparent from the specification, are accomplished by my invention, which in one aspect consists of the process of making chain links of the character described, consisting of pressing a hardened steel pin into a side bar of the link, softening the end only of the pin protruding beyond the side bar, riveting the end while softened, and rehardening the softened end of the pin.

In other aspects my invention comprises a machine for riveting hardened steel pins, having means for applying a high degree of heat to the end of the pin to be riveted, means for localizing said heat and means for riveting said pin while heated.

In still another aspect my invention consists of a chain link having a side bar, a steel pin case hardened throughout and made with a reduced, fluted end which is forced through a hole in the side bar, the protruding end of the pin being riveted over.

Referring now to the drawings in which like numerals represent like parts throughout,—

Fig. 1 is a front elevation of a riveting machine embodying my invention;

Fig. 2 is a side elevation of the same;

Fig. 3 is a plan view of a detail of the riveting machine showing the riveting blocks in place and the mechanism for operating the same

Fig. 4 is a vertical sectional view on the line 4—4 of Fig. 3 showing the eccentric turned back before the block is clamped;

Fig. 5 is a vertical sectional view on the line 5—5 of Fig. 3, showing the eccentric thrown over into clamping position of the riveting block;

Fig. 6 is a plan view of the clamping block;

Fig. 7 is an end view of the same;

Fig. 8 is a plan view of my chain link partially in section;

Fig. 9 is a side view of the same partially in section before the pins are riveted;

Fig. 10 is the same but showing the pins riveted; and

Fig. 11 is a view showing a short section of a completed chain.

I have illustrated my riveting mechanism in connection with a riveting machine having a frame 10 mounted upon supports 11. A table 12 is provided to hold the work while being riveted, and above this operates the ordinary riveting dies 13 which are attached to the cross head slide 14 which in turn is reciprocated by means of a connecting rod 15 from the eccentric shaft 16. This shaft may be thrown into operative connection with the drive pulley 17 by means of any well-known clutch mechanism 18. This

mechanism is controlled by the rods 19 and 20 and the foot lever 21. The clutch mechanism, however, is normally held out of engagement by means of the spring 22 acting on the foot lever 21.

The means for heating the end of the pin to be riveted consists of a transformer 23, the secondary terminals 23^a and 23^b which are respectively connected to the table 12 and the heating terminals 24, the latter being cooled by passing water through the pipes 25.

I have preferably provided the terminal 24 with a slight up and down motion by connecting it with the piston of an air cylinder 26, the air pressure for operating this piston being brought in at the two heads of the cylinder through the pipes 27 and 28, and the air pressure for this cylinder being under control of the valve 29 which I have preferably shown to be hand-operated by the lever 30. The air from the supply tank is brought to this valve through the pipe 31. This valve is so arranged that when it is turned in one direction the pressure will be supplied through the pipe 27 to the top of the piston, and the piston together with the terminal 24 will be forced down. At another point in the swing of the lever 30, however, air will be directed through the pipe 28 to the bottom of the piston and the terminal 24 will be raised and will be normally held in this position, as shown in Figs. 1 and 2. Connection is also made with the pipes 27 and 28 through the pipes 27^a and 28^a to the bottom and top, respectively, of the cylinder 32. This cylinder carries a piston (not shown) and a piston rod 33 which is pivotally connected to an arm 34 on the shaft 35. This shaft has fixed thereto a long eccentric 36, which is shown in section in Figs. 4 and 5. This eccentric operates against the follower plate 37, which is held against the face of the eccentric at all times by means of the strap 38.

It will be noted from the foregoing description that when the valve 29 is turned so as to force the contact 24 down, that air will be admitted at the same time to the bottom of the cylinder 32, and that the lever 34 will be raised, and that the eccentric will be turned from the position shown in Fig. 4 to the position shown in Fig. 5. The purpose of this, as will hereinafter be explained, is to clamp the rivet block containing the link to be riveted at the same time that the electric contacts are forced down on top of the pins of the link.

Referring now to Figs. 6 and 7, the riveting block consists of two clamping elements 39 and 40 which are normally held in separated position as shown in these figures, by means of a spring 41, but are prevented from being separated entirely by means of a screw 42. They preferably include water jackets to assist in cooling the pins. These blocks are accurately recessed at 43 to receive the pins 44 which have previously been assembled with the side bar 45, as shown in Fig. 9. These assembled chain links are placed in the riveting blocks, and the blocks, together with the links, placed on the table 12, as shown at the left-hand side of Fig. 3. This figure shows one of these blocks together with the chain link which is about to be riveted in full lines, under the electric contact and gripped by the follower 37. Just to the right of this, in dotted position, is shown the same block with the link therein after it has been heated, and pushed over to the riveting position by means of the shifter 46, which I have preferably shown to be operated by hand. It is very necessary that the block stops very accurately under the riveting press, and for this reason I have provided a stop 47. After the operation of riveting, the block, together with the link is forced along in the same channel which is formed by the back 12^a of the table 12 and the guides 12^b by means of the hand shifter 46 after the stop 47 has been retracted by means of the hand operated lever 48. This is accomplished by moving the hand shifter 46. The riveting block will then be forced upon the chute 49 which has a trap door 50 hingedly mounted thereon at 51. The outer edge of the trap door is held by means of a latch 52 pivotally mounted at 53 to a curved chute 54, and normally held in the latching position by means of a spring 55. A counterweight 56 is attached to the trap door 50 in such a way as to hold the trap door normally in the closed position as shown in Fig. 1.

In Figs. 8 to 11, I have shown my chain link in some detail. I have preferably made the pins 44 with a fluted and slightly tapered end 44^a, which is also preferably slightly smaller in diameter than the body of the pin. The result of fluting and tapering the pin as well as making it very hard even at the fluted end, is that this pin can be driven into a side bar which is made of steel of considerable hardness. The flutings will not be crushed to any appreciable degree, but by carefully dimensioning the size of the hole to the fluted end of the pin, I am able to force a pin of this kind into the side bar in such a way as to cause the material around the edge of the hole of the side bar to practically completely fill the spaces between the flutings of the pin, as shown in Fig. 8.

It will accordingly be seen why the remainder of the invention is necessary, namely, the provision of means for riveting such a hardened steel pin into a steel side bar. In operation, as previously explained, the assembled link as shown in Fig. 9 is placed in one of the riveting blocks, and

this is brought into heating position on the table 12 as shown in full lines in Fig. 3. The air valve 29 is then turned so as to force air through the pipe 27, when the piston in cylinder 32 will be drawn back, clamping the riveting block firmly between the follower 37 and the back of the table 12ª. At the same time the piston in the cylinder 26 will force down the contact 24 on the two protruding ends 44ª of the link to be riveted. An alternating current of very high amperage is then forced through the two pins, contact being made directly through the riveting block. Owing, however, to the good contact which it is possible to get between the two clamping elements 39 and 40 of the riveting block with the lower portions of the pins 44, these sections will not be greatly heated, but a very poor contact is made between the tops of these pins and the contacts 24, and consequently a great amount of heat will be generated at the very top of the pins where it is most needed. The current is allowed to flow until the end only of the pin is sufficiently heated to become soft when the valve 29 is operated so as to raise the contact 24 and cause the eccentric 36 to be turned and the riveting block released. The shifter 46 is then pulled to the right, forcing the riveting block to the dotted position shown in Fig. 3 against the stop 47. The valve 29 is again quickly operated, clamping the riveting block and at the same time the operator places his foot on the foot lever 21 when the flywheel 17 acting through the shaft 16 will force the die down over the top of the chain link, riveting the two ends of the pins 44 as shown in Fig. 10.

By forcing a very heavy electric current for a very short time through the chain pin, it is possible to heat it to a very high degree, but to localize the heat in such a way that the hardness of only a small part of the pins will be withdrawn. Then the operation of riveting so quickly follows the operation of heating, that the cold rivet die rehardens the softened end of the pin. The riveting action also has the effect of spreading the flutings of the upper end of the pin and forcing them into the side bar, thereby greatly increasing the strength of the joint. After riveting, the valve 29 is again operated, releasing the riveting block, when it is forced down the chute 49 by means of the shifter 46 after retracting the stop 47 by means of the lever 48. Once started down the chute it slides by its own weight until it strikes the upper end of the latch 52, forcing back the latch and releasing the trap door 50; the riveting block together with the link then drops down the curved chute 54 under the bottom of the riveting machine.

By employing a number of riveting blocks I am able to keep a supply of cool blocks constantly on hand. In order to cool them more quickly, however, the chute 54 may pass through a tank of water.

In Fig. 11 I have shown a section of a chain made up of finished chain links 45 having pins 44. These may be assembled in any of the well-known ways by means of connecting links 57 preferably having rollers 58 mounted thereon.

While I have in the above specification shown and described but a single embodiment of my invention, it is to be understood that it is capable of modifications. Changes, therefore, in the construction and arrangement of parts may be made which do not depart from the spirit and scope of the invention as expressed in the following claims:

1. In a machine for riveting hardened steel pins, means for softening one end only of the pin, means for preserving the hardness in the remainder of the pin, and means for riveting the end while it is in a softened condition the same means restoring the hardness of the softened end as it is riveted.

2. The process of making chain links of the character described, consisting of pressing a hardened steel pin into a side bar of the link, softening the end of the pin projecting beyond the side bar by heating it, maintaining the remainder of the pin relatively cool, riveting the projecting end while softened and then restoring the riveted end to its original hardness.

3. The process of making chain links of the character described, consisting of pressing a hardened steel pin into a side bar of the link, softening the end only of the pin projecting beyond the side bar and riveting the end while softened, and rehardening the softened end of the pin.

4. The process of making chain links consisting of driving a hardened pin into a side bar, placing said pin in a block having gripping jaws, applying pressure to said gripping jaws, completing an electric circuit through the bottom of said block and the top of said pin, whereby a local riveting heat will be generated at the top of the pin while the remainder of the pin is kept relatively cool, and riveting the softened end of the pin while hot.

5. The process of making chain links consisting of driving a hardened pin into a side bar, placing said pin in a movable block having gripping jaws, applying pressure to said gripping jaws, completing an electric circuit through the bottom of said block and the top of said pin, whereby a local riveting heat will be generated at the top of the pin while the remainder of the pin is kept relatively cool, and riveting the softened end of the pin while hot.

6. The process of making chain links consisting of driving a hardened pin into a side

bar, placing said pin in a movable block having gripping jaws, applying pressure to said gripping jaws, completing an electric circuit through the bottom of said block and the top of said pin, whereby a local riveting heat will be generated at the top of the pin while the remainder of the pin is kept relatively cool, moving said block and link under a riveter, and riveting the softened end of the pin while hot.

7. The process of making chain links consisting of driving a hardened pin into a side bar, placing said pin in a block having gripping jaws, applying pressure to said gripping jaws, completing an electric circuit through the bottom of said block and the top of said pin, whereby a local riveting heat will be generated at the top of the pin while the remainder of the pin is kept relatively cool, riveting the softened end of the pin while hot, and rehardening the riveted end of the pin.

8. The process of making chain links consisting of driving a hardened pin into a side bar, placing said pin in a movable block having gripping jaws, applying pressure to said gripping jaws, completing an electric circuit through the bottom of said block and the top of said pin, whereby a local riveting heat will be generated at the top of the pin while the remainder of the pin is kept relatively cool, moving said block and link under a riveter, riveting the softened end of the pin while hot, and rehardening the riveted end of the pin.

In testimony whereof I affix my signature.

FRANK H. HARRISON.