July 18, 1933. F. B. PFEIFFER 1,918,557

NUT RUNNING APPARATUS

Filed Dec. 18, 1930 5 Sheets-Sheet 1

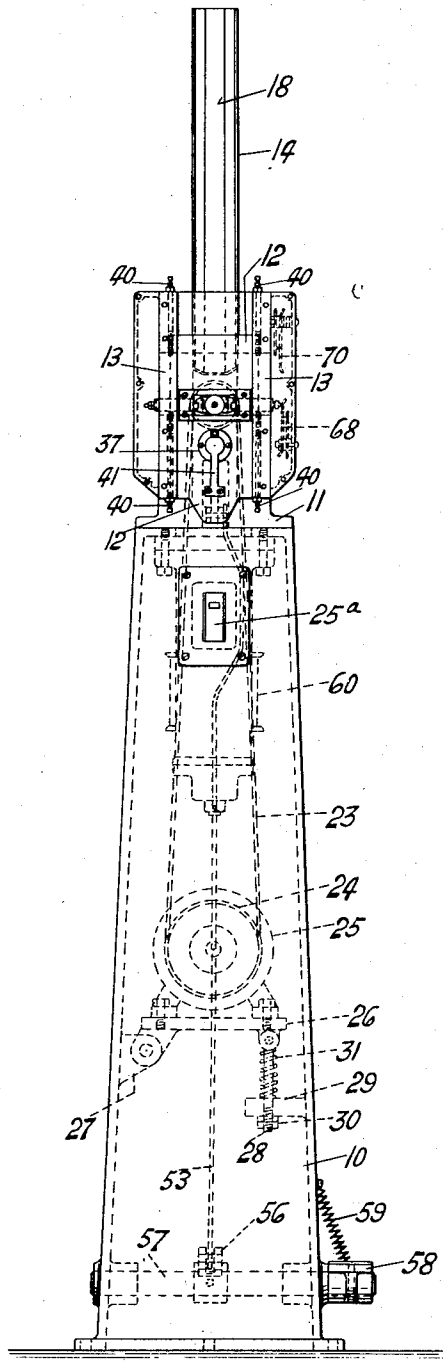

FIG. 1

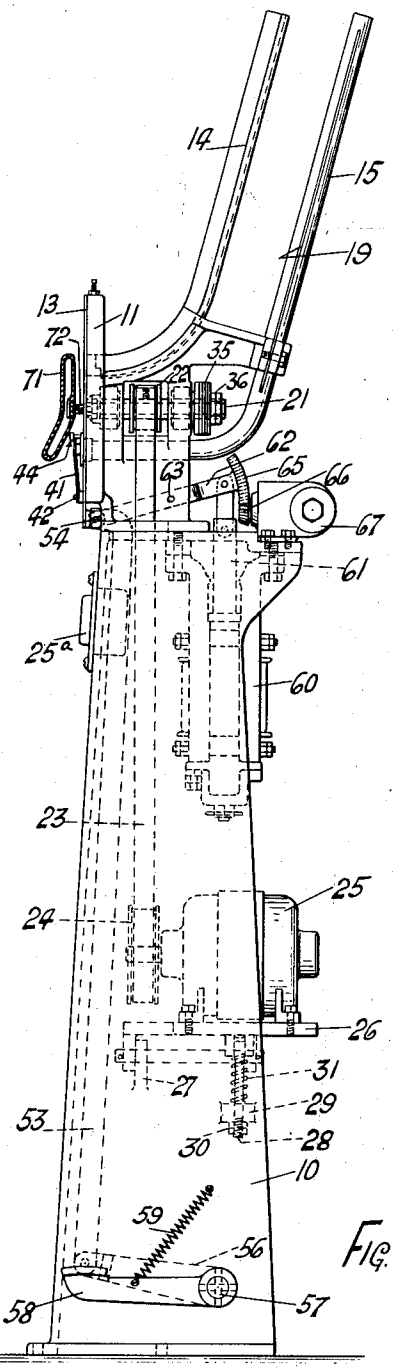

FIG. 2

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NUT RUNNING APPARATUS

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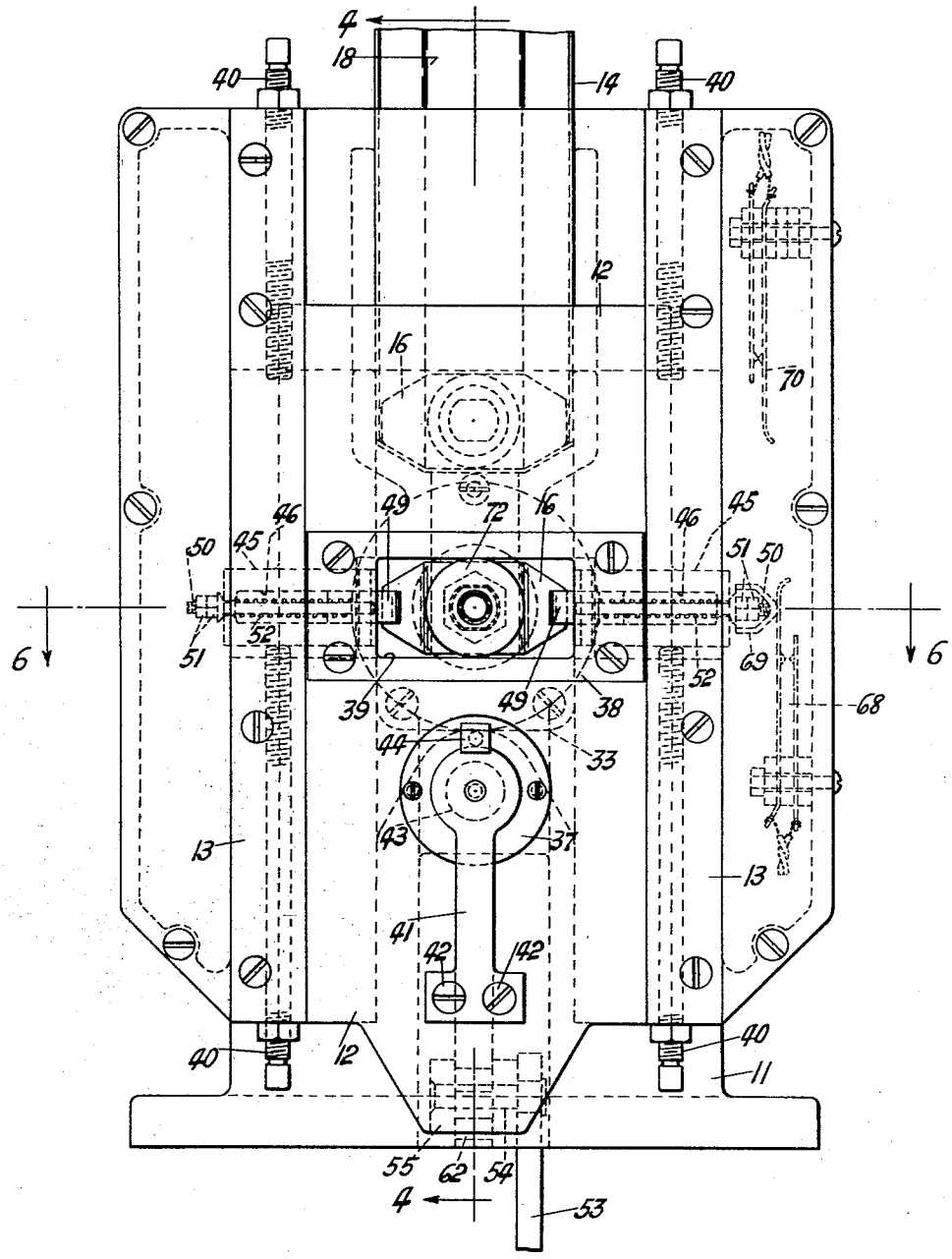

FIG. 3

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NUT RUNNING APPARATUS

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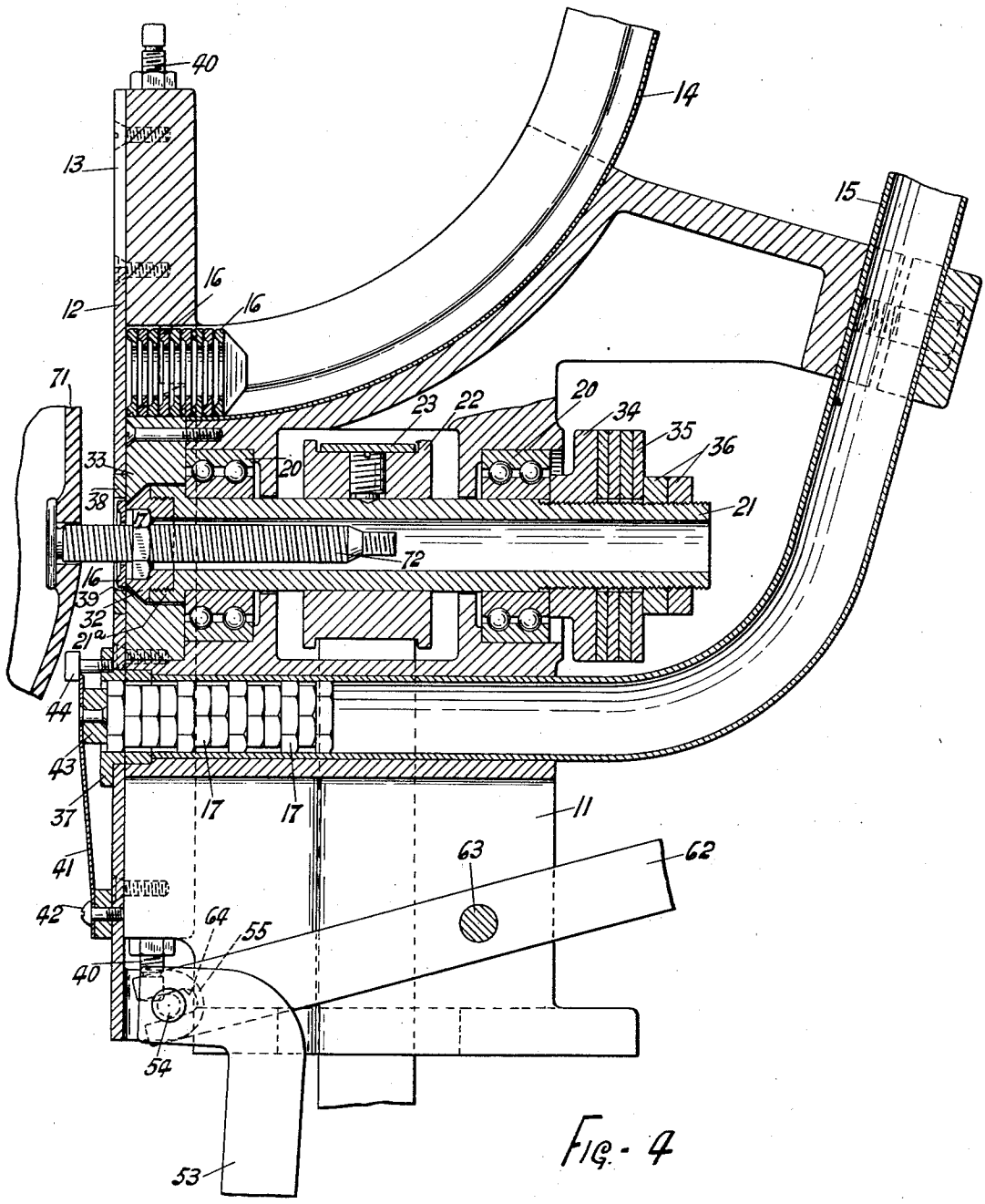

Fig. 4

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NUT RUNNING APPARATUS

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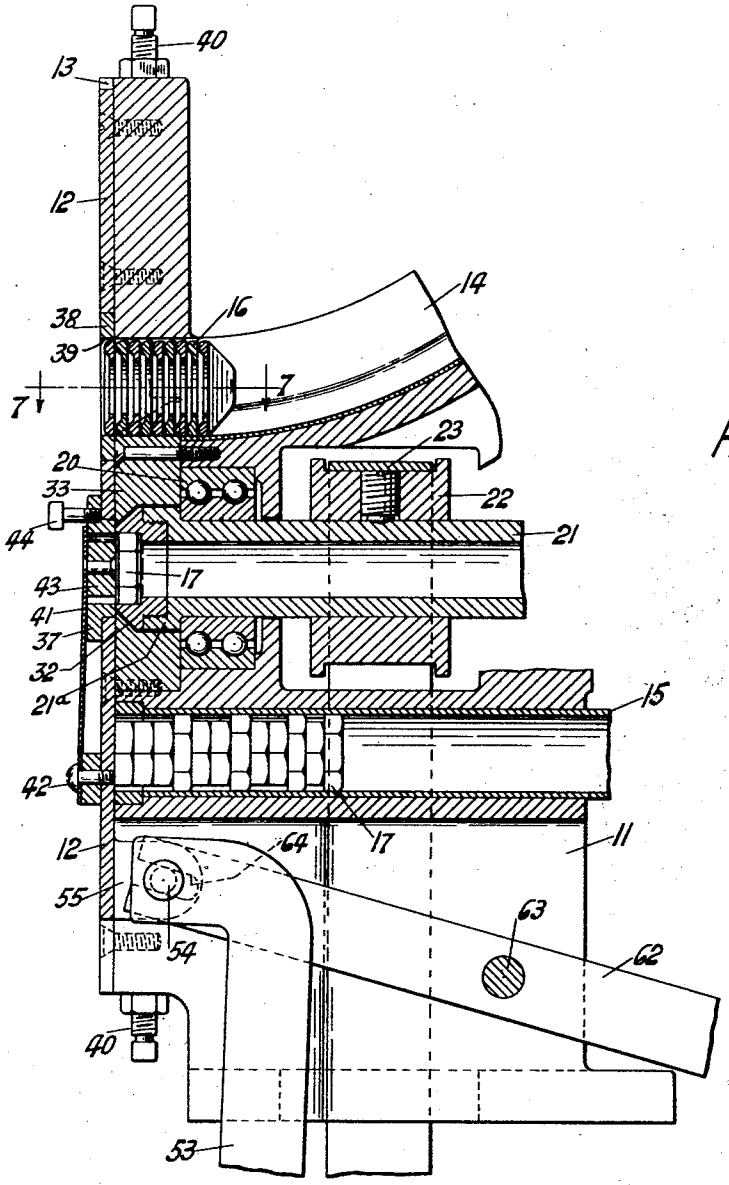

FIG. 5

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NUT RUNNING APPARATUS

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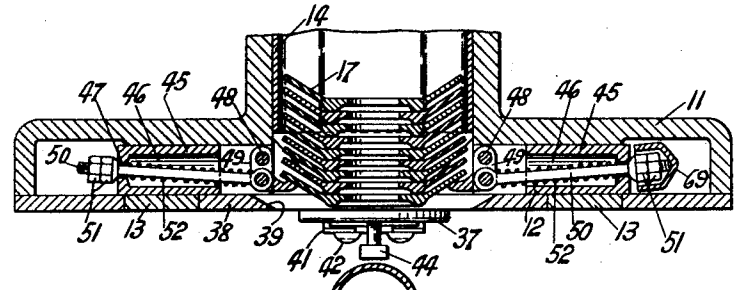

Fig. 7

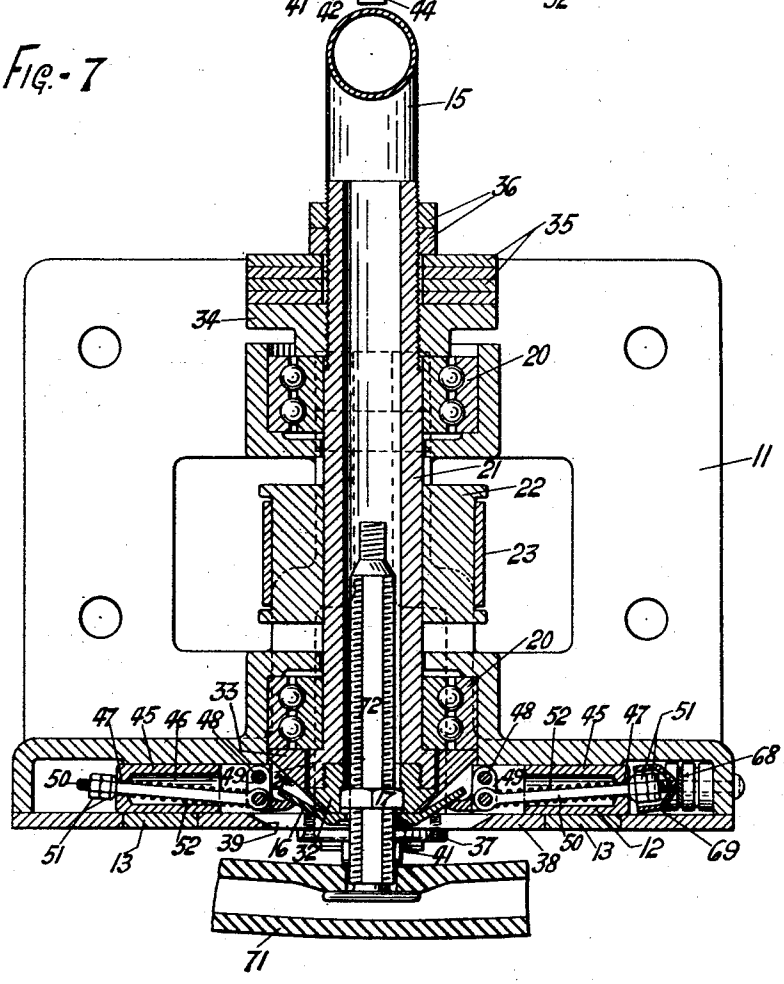

Fig. 6

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UNITED STATES PATENT OFFICE

FRED BROWN PFEIFFER, OF AKRON, OHIO, ASSIGNOR TO CUPPLES COMPANY, MANUFACTURERS, OF ST. LOUIS, MISSOURI, A CORPORATION OF MISSOURI

NUT RUNNING APPARATUS

Application filed December 18, 1930. Serial No. 503,202.

This invention relates to nut running apparatus, and more especially it relates to mechanism for mounting bridge clips and nuts upon the valve stems of inner tubes for pneumatic tires, and for setting up the nuts against the bridge clips at the base of the valve stems.

The chief objects of the invention are to provide apparatus for more quickly and economically mounting bridge clips and nuts on the valve stems of inner tubes; to lighten the manual labor involved; and to provide certain automatic features for expediting the operation of the apparatus.

Of the accompanying drawings:

Figure 1 is a front elevation of apparatus embodying the invention in its preferred form;

Figure 2 is a side elevation thereof and the work therein;

Figure 3 is a front elevation, on a larger scale, of the work-engaging parts of the apparatus in work-receiving position;

Figure 4 is a vertical section on line 4—4 of Figure 3 and the work therein;

Figure 5 is a section similar to Figure 4 with the operative parts shown in loading position, preparatory to receiving the work;

Figure 6 is a section on line 6—6 of Figure 3; and

Figure 7 is a section on line 7—7 of Figure 5.

Referring to the drawings, 10 is a hollow pedestal upon the top of which is mounted a frame member 11 that carries on its front face a vertically reciprocable slide 12 retained thereon by plates 13, 13 overlying its lateral marginal portions. Supported by the frame member 11 are respective magazines or chutes 14, 15 for a supply of bridge clips 16, 16 and a supply of nuts 17, 17, the chutes extending to the front of the frame member and having their delivery orifices behind the slide 12. The chute 14 is positioned somewhat above the chute 15 and is transversely shaped so as substantially to conform to the shape of the bridge clips 16 so that the latter are presented at the delivery orifice in determinate position. The chutes 14, 15 are disposed horizontally at their delivery ends, but otherwise are preferably inclined upwardly as shown so that the weight of the respective columns of bridge clips and washers normally urges the lower ends of said columns toward the delivery orifices of the chutes. Preferably the chute 14 is open on its upper side as shown at 18, Figures 1 and 3, to give access to the column of bridge clips 16 for straightening them if they become cocked or jammed in the chute. The chute 15 is similarly provided with a slot 19, Figure 2, along one side.

Journaled in suitable bearings 20, 20 in the frame member 11, and positioned between the chutes 14, 15 and in the same vertical plane, is a hollow shaft 21 that is provided with a drive pulley 22 mounted thereon between the bearings 20 and connected by a transmission belt 23 with a pulley 24 mounted upon the shaft of a motor 25. The motor 25 is mounted upon a bed plate 26 that is pivotally mounted at one side upon brackets such as the bracket 27 formed interiorly of the pedestal 10 at an intermediate height therein. The other side of the bed plate is provided with a pivotally mounted stem 28 that extends downwardly through an apertured lug 29 projecting from the inner wall of the pedestal 10, there being adjusting nuts 30 threaded on the lower end of the stem 28 below the lug 29, and a compression spring 31 mounted upon the stem between the bed plate and the lug. The arrangement provides conveniently for maintaining proper tension of the belt 23, it being desired to permit slippage of the belt with relation to the pulley 22 when there is determinate resistance to rotation of the shaft 21. An operating switch 25[a] in the circuit supplying electrical current to the motor 25 is mounted upon the front of the pedestal.

The front end of the shaft 21 is formed with an enlarged head 21[a] which at its rear bears against the adjacent bearing 20 and has its front face recessed to receive a socket wrench 32 which is threaded thereinto, the wrench 32 being formed with an axial aperture of the same diameter as the internal recess in the hollow shaft 21. The front of the socket wrench 32 is forwardly tapered as shown, and the shaft flange 21[a] and socket

wrench operate within a complementally shaped aperture formed in a guide plate 33 that is seated within a recess formed in the front face of the frame member 11, the front faces of the members 11, 33 being flush so that the slide 12 moves smoothly thereover.

The rear end of the shaft 21 is threaded to receive a flanged collar 34 that is set up against the rear bearing 20, and a plurality of metal washers 35, 35 are loosely mounted upon the shaft and secured against the flange of the collar 34 by lock nuts 36, 36. The flanged collar 34 and washers 35 constitute a flywheel for the shaft 21, the mass of which may be varied as desired by adding or removing washers 35.

The slide 12 is formed with a through aperture in which is secured an apertured bushing 37, and somewhat above the latter a carrier plate 38 is inset in the front face of the slide, said carrier plate being formed with a rectangular aperture 39. The arrangement is such that when the slide 12 is in its lowermost position, the apertured bushing 37 is aligned with the delivery end of the chute 15 and the aperture 39 in the carrier plate 38 is in front of the socket wrench 32 giving access thereto. When the slide 12 is in its uppermost position, the bushing 37 is in front of the socket wrench 32 and the aperture 39 in the carrier plate 38 is aligned with the delivery end of the chute 14. Set screws 40, 40 are threaded through the frame member 11 from the top and bottom thereof and extend into the slideway of the slide 12 for accurately fixing the upper and lower limits of the slide's movement.

Mounted upon the front face of the slide 12 is a leaf spring 41 that is secured to the slide at its lower end by screws 42 or the like, and has its upper end portion positioned in front of the apertured bushing 37. A spacer stud 43 of the same thickness as the bushing 37 and of somewhat smaller diameter than the aperture in the latter is mounted upon the inner face of the spring 41 in front of the bushing 37, being adapted, upon occasion, to enter said aperture under the force of the spring 41. A cap screw 44 is threaded into the bushing 37, the head of the screw overlying the edge of the spring 41 and serving as a stop to limit the movement of the free end of the spring outwardly from the slide to the thickness of one nut 17.

Formed on the rear face of the slide 12, behind the carrier plate 38 and at each side of the aperture 39 therein, are respective horizontally disposed ribs or thickened regions 45, 45 that are formed with respective recesses 46, 46 opening onto their adjacent ends, the opposite end of each rib 45 being formed with a through aperture 47 of smaller diameter than the recess 46 and constituting a continuation thereof. Pivotally mounted at 48, 48 on the slide 12, behind the carrier plate 38 and at opposite sides of the aperture 39 therein, are respective L-shaped dogs or detents 49, 49, and rods 50, 50 are pivotally connected to the respective elbows of the detents 49 and extend through the recesses 46 and apertures 47 of the respective ribs 45 on the slide. Nuts 51, 51 are mounted upon the free ends of the rods 50 outside the ribs 45, and respective compression springs 52 are mounted upon the rods 50 between the elbows of the detents 49 and the end walls of the ribs 45, the arrangement being such that one arm of each detent 49 is normally yieldingly urged to a position where it will engage a side of the lowermost bridge clip 17 in the chute 14 when the slide 12 is in raised position, as is most clearly shown in Figure 7.

For raising and lowering the slide 12 both manually operated and power operated means are provided, either of which means may be operated independently of the other. The manually operated slide actuating means consists of a link 53 which is pivotally connected at its upper end to a pin 54 that is mounted in a bracket 55 formed on the rear of the slide 12 at the lower margin thereof, the lower end of the link 53 being connected to a rocker arm 56 mounted upon a rock shaft 57 that is journaled in the pedestal 10 near the base thereof. A foot lever 58 is mounted upon the rock shaft 57 and a tension spring 59 is so connected to said foot lever and pedestal as normally to hold the foot lever, and interconnected parts including the slide 12, in raised position, the arrangement being such that the operator is required to hold the foot lever in depressed condition during the operation of running a nut on a valve stem. The spring 59 is disconnected when the power operated slide actuating mechanism is used.

Power means for reciprocating the slide 12 comprises a vertically positioned electric solenoid 60 mounted upon the pedestal 10 below the frame member 11, the core 61 of the solenoid being connected to one end of a lever 62 that is pivoted near its middle at 63 on the frame member 11 and has its other end portion formed with an end slot 64 that embraces the pin 54 of the slide 12. The end portion of the lever 62 nearest the solenoid 60 is formed with a gear sector 65 that is meshed with a pinion 66 mounted on the shaft of a governor 67 of known design, the arrangement being such that the movements of the solenoid core 61 are retarded and the up and down movements of the slide 12 are relatively slow instead of quick and violent.

Cyclic operation of the slide 12 by the solenoid 60 is effected automatically upon the removal of the work from the apparatus. For accomplishing this result, a normally open switch 68 is mounted on the frame member 11 beside the slide 12, said switch controlling a relay (not shown) in the elec-

trical circuit supplying current to the solenoid. One member of the switch 68 is engaged by a button 69 of insulating material mounted upon the end of the adjacent rod 50 over the nuts 51 thereon, the arrangement being such that when a bridge clip is withdrawn through the aperture 39 in the carrier plate 38, as upon the removal of finished work from the apparatus, the resulting angular movement of the detents 49 pushes the rods 50 outwardly against the pressure of the springs 52, and closes the normally open switch 68 whereby the solenoid 60 is energized to raise the slide 12. A normally closed switch 70 in the solenoid circuit is mounted on the frame member 11 above the switch 68 in position to be engaged by the button 69 when the slide is in raised position, to open the switch and de-energize the solenoid whereby the slide 12 is permitted to return to its lowered position.

In the operation of the apparatus, the socket wrench 32 is constantly rotated by the motor 25 driving through the belt 23, pulley 22, and shaft 21. Assuming the other parts of the apparatus to be in the positions shown in Figures 3, 4 and 6, that is, with the slide 12 in lowered position, a nut 17 mounted in the rotating socket wrench 32, and a bridge clip 16 supported by the carrier plate 38 in front of the socket wrench, the operator takes an inner tube 71 having a valve stem 72 projecting therefrom, inserts the end of the valve stem through the aperture in the bridge clip 16 and into engagement with the rotating nut 17 in the socket wrench, the nut thereby being threaded onto the valve stem as the latter is fed inwardly into the hollow interior of the shaft 21. When the bridge clip finally abuts the tube structure at the base of the valve stem, and the nut 17 is set up tightly thereagainst by the momentum of the shaft 21 and its flywheel, the shaft ceases to rotate and the belt 23 slides idly thereover. The torque imparted to the valve stem 72 by the socket wrench when the nut 17 is set up against the bridge clip at the base of the valve stem is imparted to said bridge clip and absorbed by the carrier plate 38 which so engages the bridge clip as to prevent angular movement thereof. Thus the operator is relieved of the heavy torsional jolt incidental to the stopping of the shaft 21.

The operator then removes the work from the apparatus, and in doing so pulls the bridge clip, now mounted on the valve stem, past the detents 49, rocking the same and causing such movement of the rods 50 connected thereto as momentarily to close the normally open switch 68 whereby the solenoid 60 is energized to raise the slide 12 to its upper position shown in Figure 5. It will be observed, referring to Figure 4, that when the slide 12 is in its lowered position the weight of the nuts 17 in the chute 14 is sufficient to flex the leaf spring 41 to the limit defined by the stop 44, whereby the lowermost nut in the chute is moved into the aperture in the bushing 37 in the slide. Thus when the slide rises to its upper position, the said nut is moved into axial alignment with the socket wrench and the spring 41, now relieved of the pressure of the column of nuts, ejects the nut from the bushing aperture and positions it in the socket of the socket wrench, the latter having resumed rotation as soon as the finished work was withdrawn from the apparatus.

In the raised position of the slide 12, the aperture 39 in the carrier plate 38 is positioned in front of the delivery end of the chute 14, and the weight of the column of bridge clips therein moves the column so that the lowermost bridge clip is moved forward into said aperture until stopped by engagement with the detents 49 at each side thereof as is most clearly shown in Figure 7. The positioning of the bridge clip as described is concurrent with the opening of the normally closed solenoid switch 70, whereby the solenoid is de-energized and the slide 12 permitted to move, by gravity, to its lowermost position, carrying with it the bridge clip in the aperture 39 of the carrier plate 38. The slide comes to rest with the bridge clip therein positioned in front of the socket wrench 32, whereupon the operations described may be repeated.

The apparatus sets up the nuts to uniform tightness, and its automatic features make for speed and economy in the operation thereof. The labor involved in operating the apparatus is sufficiently light to permit the employment of female operatives.

The invention may be modified within the scope of the appended claims which are not limited wholly to the specific construction shown and described.

What is claimed is:

1. In apparatus of the character described, the combination of a magazine containing nuts, a magazine containing bridge clips, a socket wrench, and a reciprocable slide adapted first to remove a nut from its magazine and to position it in determinate relation to the socket wrench, and then to perform a similar operation with a bridge clip.

2. A combination as defined in claim 1 including means actuated by removal of work from the apparatus for effecting cyclic operation of the slide.

3. In apparatus of the character described, the combination of a magazine containing nuts, a socket wrench, a reciprocable slide formed with an aperture and movable to register said aperture in alternation with the delivery end of he magazine and with the socket wrench, and yielding means on said slide over the aperture therein adapted to

be moved a determinate distance by the weight of the nuts in the magazine to permit the lowermost nut in the magazine to enter the slide aperture, said yielding means ejecting the nut from the aperture when the latter registers with the socket wrench.

4. Apparatus as defined in claim 3 in which the yielding means is a leaf spring, including a stop for limiting the flexure of the spring.

5. In apparatus of the character described, the combination of a gravity-feed magazine containing bridge clips, a socket wrench, a reciprocable slide formed with an aperture and movable to register said aperture in alternation with the delivery end of said magazine and with the socket wrench and to receive a bridge clip from said magazine, the aperture being so shaped as to prevent angular movement of the bridge clip therein, and yielding means in the slide aperture for holding a bridge clip therein against the weight of those in the magazine.

6. Apparatus as defined in claim 5 in which the yielding means on the slide consists of a pair of spring-pressed detents so positioned as to engage opposite marginal portions of the bridge clip.

7. In aparatus of the character described, the combination of a chute containing nuts, a chute containing bridge clips, a socket wrench positioned between said chutes, and a reciprocable slide adapted in the first phase of its movement to remove a nut from the nut magazine and mount it in the socket wrench, and in the second phase of movement to remove a bridge clip from the bridge clip chute and position it in front of the socket wrench.

8. A combination as defined in claim 7 including means for effecting cyclic operation of the slide.

9. In apparatus of the character described, the combination of respective magazines containing bridge clips and nuts, a socket wrench, a reciprocable slide adapted to position a bridge clip and a nut from said magazines in determinate relation to said socket wrench, and means actuated automatically by the removal of work from the apparatus for effecting cyclic operation of the slide.

10. In apparatus of the character described, the combination of respective magazines containing bridge clips and nuts, a socket wrench, a reciprocable slide adapted to position a bridge clip and a nut from said magazines in determinate relation to said socket wrench, said slide comprising yielding means engaged by said bridge clip, and electrical switches so positioned as to be operated by said yielding means when work is withdrawn from the apparatus for effecting cyclic operation of the slide.

11. In a means for applying nuts and bridge washers to threaded valve stems, a holding device provided with a support for the supply of nuts and a support for the supply of bridge washers, another holding device provided with a rotary wrench having a socket to receive one of the nuts and a seat for one of the bridge washers, said seat and socket being alined with each other to aline the nut and bridge washer, means whereby one of said holding devices is reciprocated to transfer the nuts and bridge washers from said supports to said wrench and seat, and means whereby a rotary motion is imparted to said wrench.

12. In apparatus of the character described, the combination of a magazine containing a supply of nuts, a magazine containing a supply of bridge clips, a socket wrench, and a member for receiving a nut and a bridge clip in succession from their respective magazines and positioning them in determinate relation to each other and to the socket wrench, and means carried by said member for moving the nut therefrom into the socket wrench.

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