Nov. 13, 1951 J. C. LANG 2,574,875

FASTENER DRIVING DEVICE

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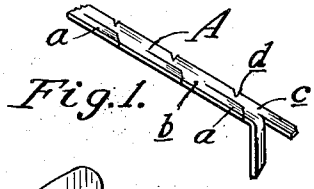

Fig. 1.

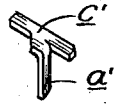

Fig. 2.

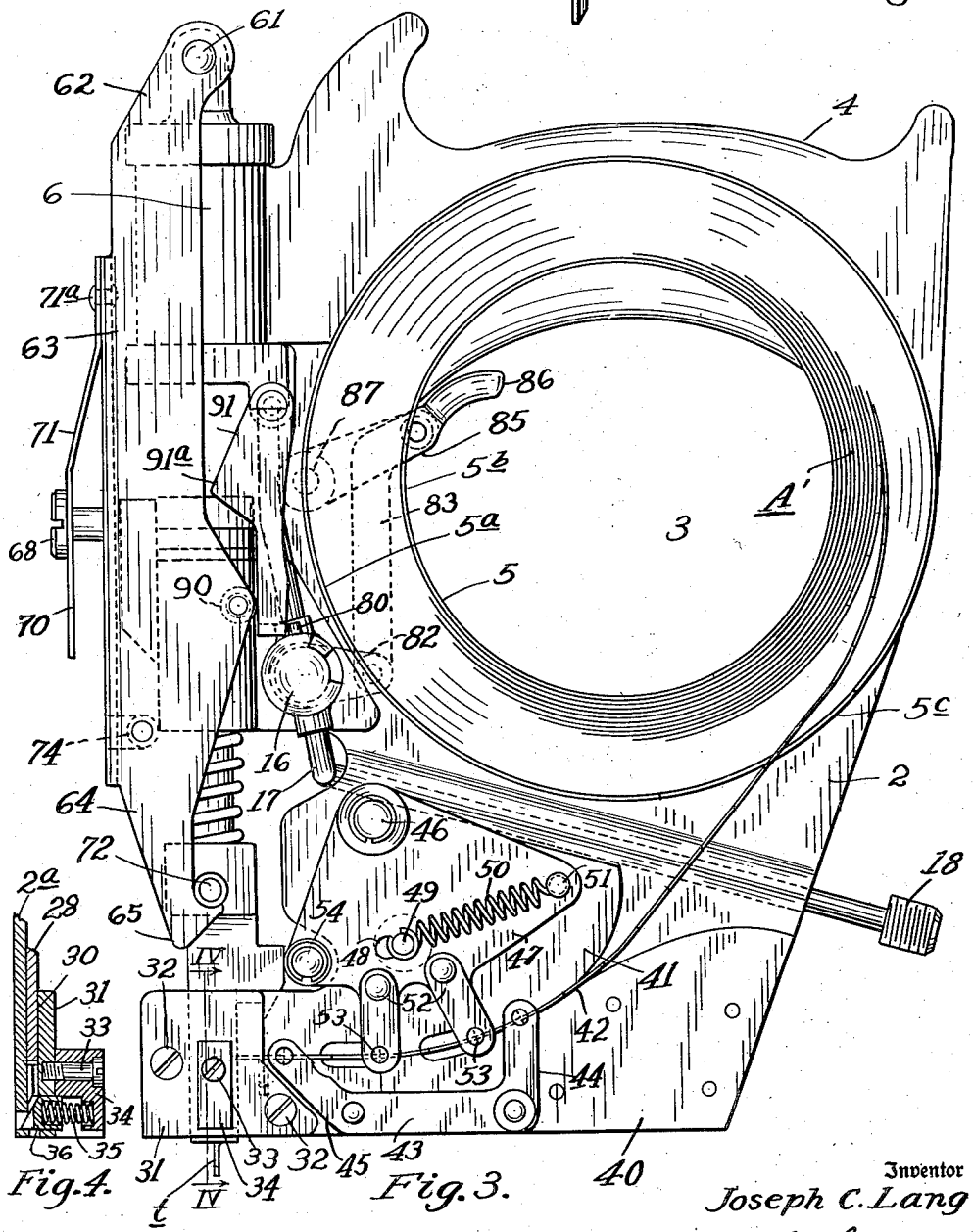

Fig. 4. Fig. 3.

Inventor
Joseph C. Lang

By Christy, Parmelee, Stickland

Attorneys

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FASTENER DRIVING DEVICE

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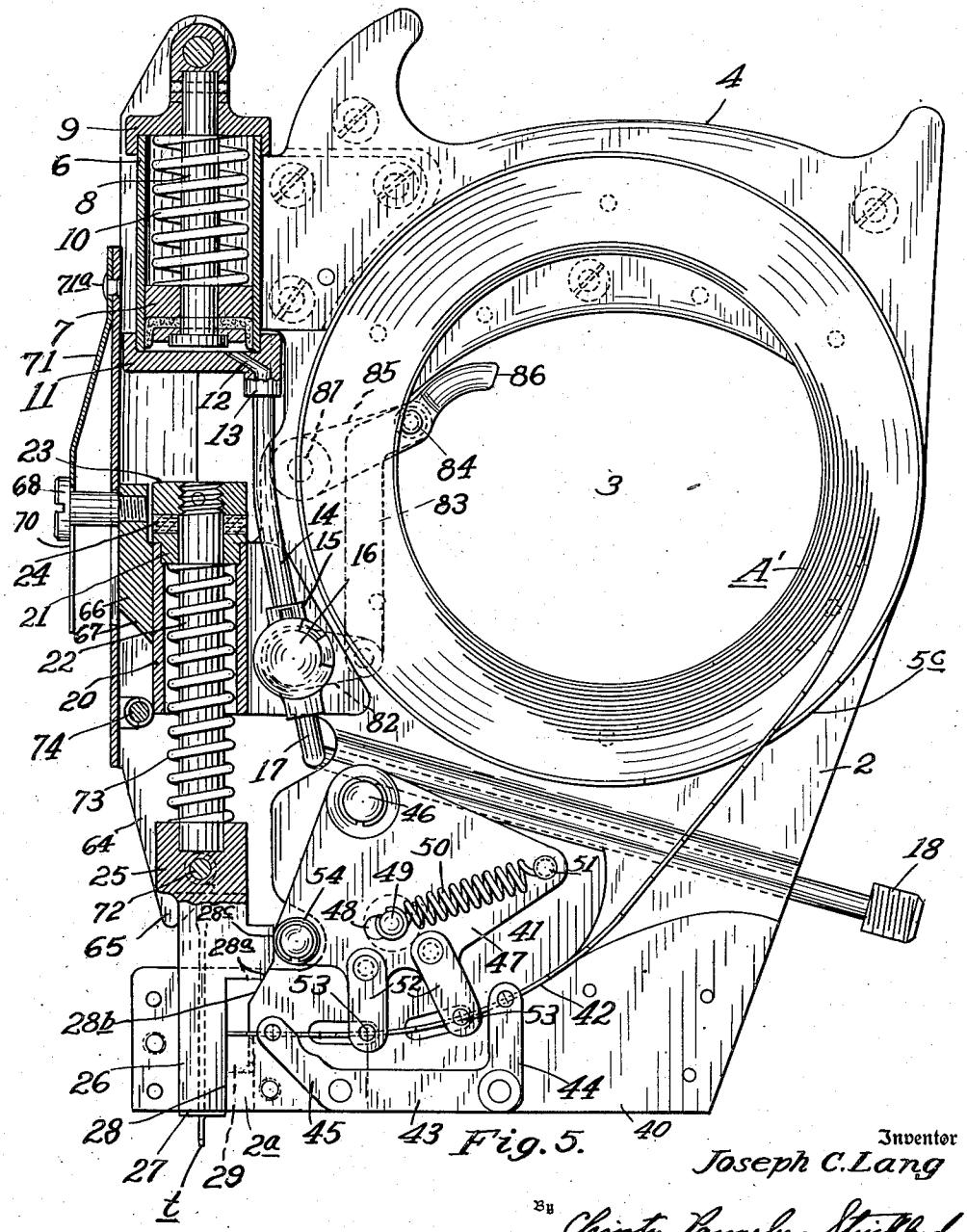

Fig. 5.

Inventor
Joseph C. Lang

By Christy, Parmele, Strickland

Attorneys

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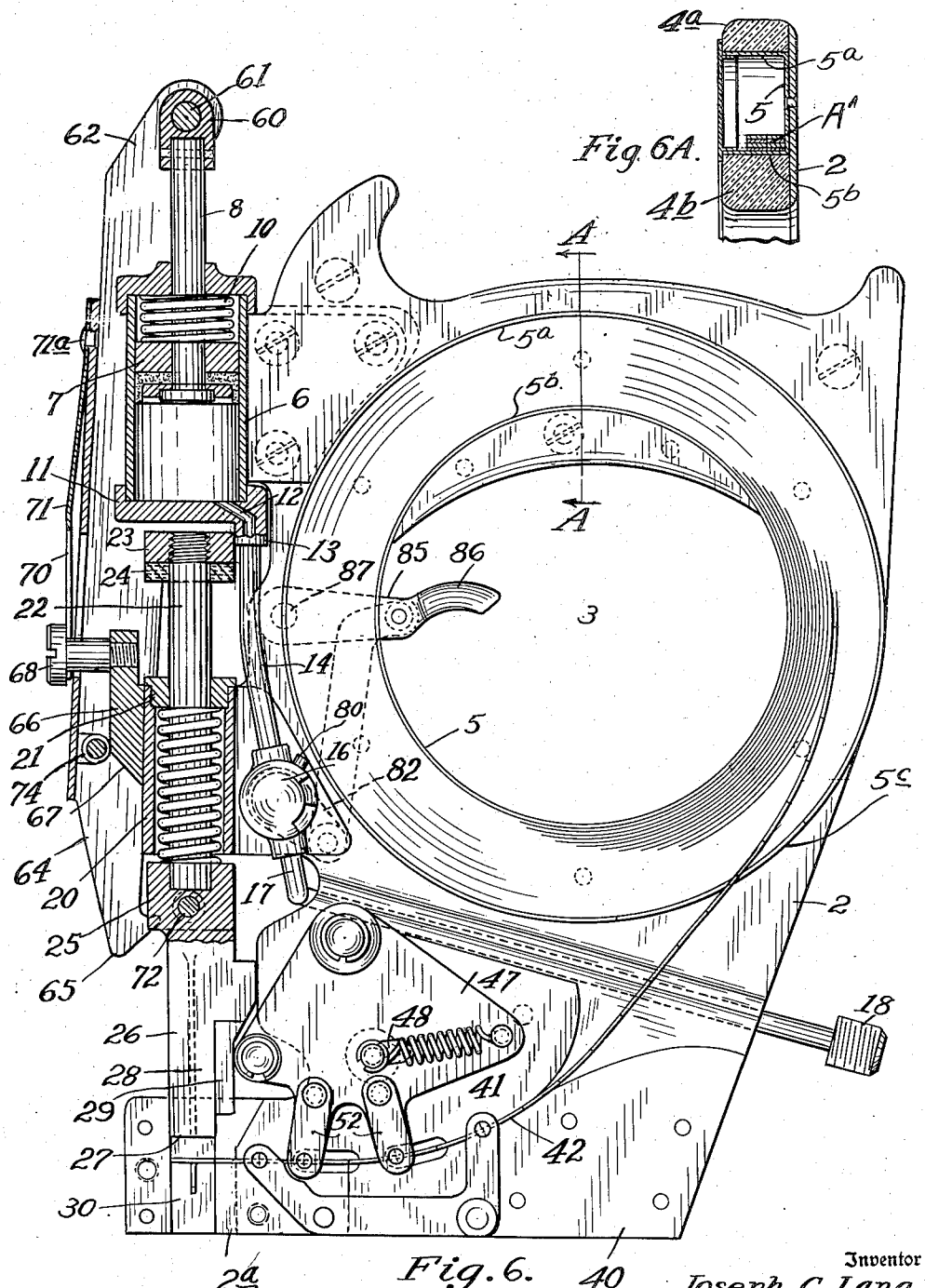

Fig. 6.

Fig. 6A.

Inventor
Joseph C. Lang

By Christy, Parmelee & Strickland

Attorneys

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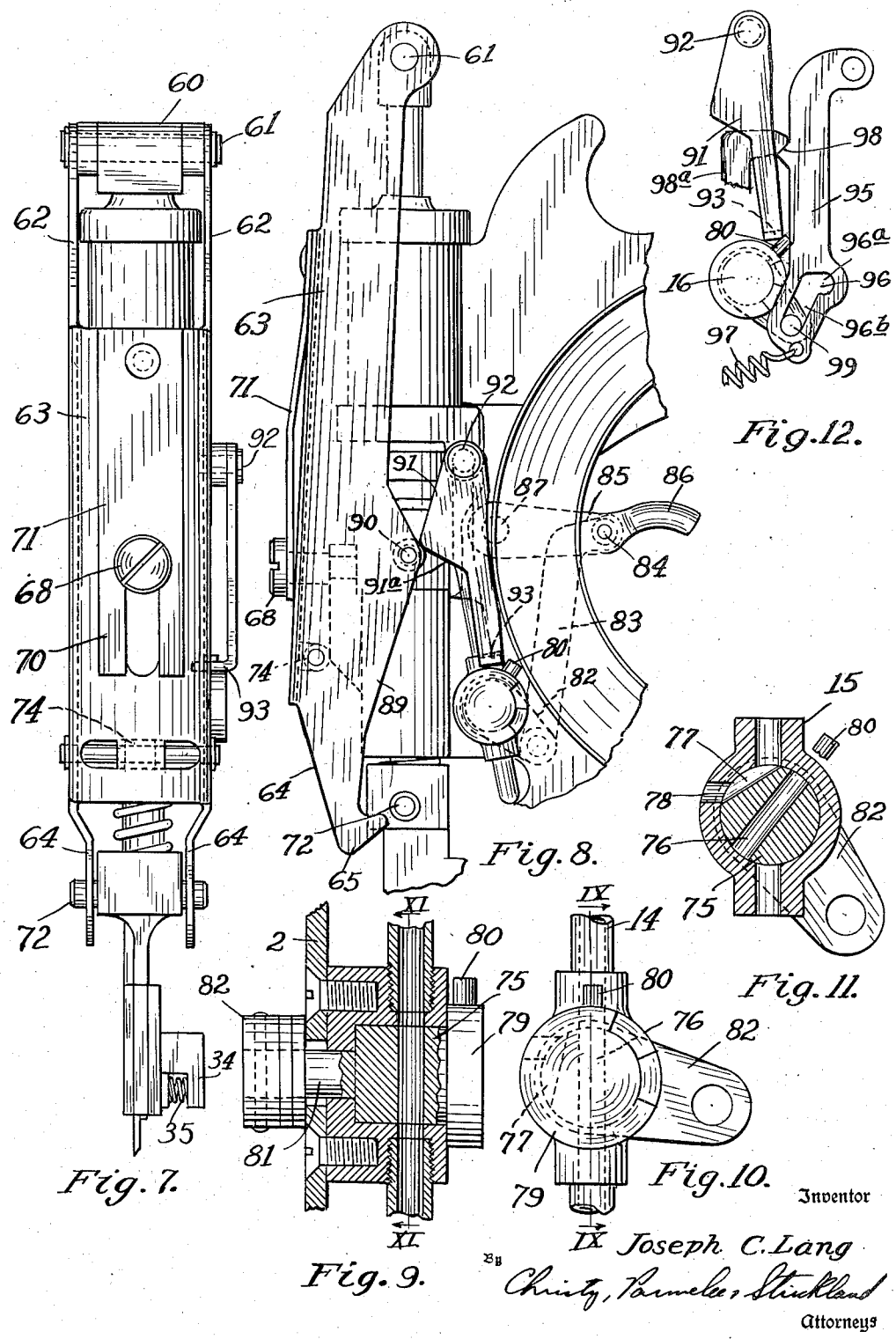

Fig. 7. Fig. 8. Fig. 12.

Fig. 9. Fig. 10. Fig. 11.

Inventor

Joseph C. Lang

By Christy, Parmelee & Strickland

Attorneys

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UNITED STATES PATENT OFFICE

2,574,875

FASTENER DRIVING DEVICE

Joseph Conrad Lang, Pittsburgh, Pa., assignor to Bocjl Corporation, Pittsburgh, Pa., a corporation of Delaware

Application June 5, 1947, Serial No. 752,717

21 Claims. (Cl. 1—51)

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This invention is for a fastener driving device, and relates particularly to a tool for converting a prepared strip of fastener blanks into individual fasteners and for driving the same.

The invention is especially applicable to completing the formation of and driving what I term "T-tacks" and will be hereinafter specifically described in this connection, but it may be adapted for use in driving various other types of fasteners, staples and the like.

The invention is particularly designed for use in the furniture, automobile and other industries where great quantities of tacks are required. In the furniture and automobile industries, for example, large quantities of tacks are individually driven in securing upholstery to wooden frames. At the present time this is done by "tack-spitters"; skilled workmen who hold a quantity of tacks in their mouths and who remove them one-at-a-time and drive them. These persons not only require considerable training to acquire their skill, but their number is limited. Often they disgorge a mouthful of tacks, just to speak a word, and it is estimated that many more tons of tacks are wasted every year than are used. Sanitary laws make the use of waste tacks impractical. Additionally, in the furniture industry, much work is done on furniture that has been otherwise finished, that is assembled, stained, and varnished to a finished condition, and a careless blow by the tack spitter frequently sends furniture back for repair or refinishing.

My invention has for a primary purpose to provide an air-operated driver of light, compact construction, adapting it to easy handling. Its driving "nose" may be exactly positioned on the work and the tack driven. It requires little skill to use or operate; tacks can be accurately positioned; the unsanitary conditions of tack spitting are eliminated, and the speed of operation, besides being more sure, is faster, and a great waste of tacks is avoided.

The invention further provides an impact driver in which the air pressure and pressure responsive mechanisms serve to "cock" a spring-propelled driver, so that the driver is operated with a uniform, quick, sharp blow, while the mechanism itself is compact, light, positive, and relatively inexpensive.

My invention may be more fully understood by reference to the accompanying drawings, in which:

Fig. 1 is a plan view of a typical blank for forming T-tacks such as is used in the machine constituting my invention;

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Fig. 2 is a perspective view of a single tack after it has been separated from the strip;

Fig. 3 is a side elevation of a driver embodying my invention;

Fig. 4 is a fragmentary view, being a transverse vertical section in the plane of line IV—IV of Fig. 3, but with the driver in the upper position shown in Fig. 6;

Fig. 5 is a view partly in elevation and partly in vertical section of the complete tool, showing the driver in its lowermost position;

Fig. 6 is a similar view showing the driver in its elevated position;

Fig. 6A is a transverse section in the plane of line A—A of Fig. 6, and showing a cover on the magazine;

Fig. 7 is a front elevation of the tool;

Fig. 8 is a fragmentary side elevation on a larger scale showing the position of the parts at the instant of the release of the driver;

Fig. 9 is a detail view showing a section through the trigger-operated air valve, the section being in the plane of line IX—IX of Fig. 10;

Fig. 10 is a side elevation of the air valve;

Fig. 11 is a transverse section through the air valve in substantially the plane of line XI—XI of Fig. 9, showing the valve in position to vent the cylinder; and

Fig. 12 is a detail view showing the modified linkage between the trigger and the valve.

Referring first to Figs. 1 and 2, these disclose one form of fastener which the tool of the present invention is especially well fitted to handle. This fastener constitutes the subject-matter of my co-pending application Serial No. 636,467, filed December 21, 1945, in which it is more fully shown and described. In the making of the fastener, a narrow ribbon or strip of metal is slit inwardly from one edge, and then longitudinally at regular intervals, providing a succession of leg-forming elements *a*, the strip itself being designated generally as A. The leg-forming elements are connected to the body of the strip by a portion *b*, while the other margin of the strip, designated *c*, is substantially uncut and continuous, except for ratchet-like notches *d* which are formed at regular intervals in the edge, and which mark the point where the strip is severed to form individual fasteners, and which also serve for indexing or feeding the strip.

The strip of blanks, as shown in Fig. 1, may be formed in rolls or coils containing several hundred or several thousand blanks.

In the operation of the machine about to be described, one blank is cut off from the leading

end of the strip and is driven. The blank so cut off is of T form, having a head-forming portion *c'* constituting a part of the continuous margin *c* of the original strip, while the leg-forming element is bent down on an axis transverse to the axis of the strip, the leg-forming element in the finished fastener being designated *a'*. The fastener thus produced is of generally T shape, with the head set off to one side of the leg, and with the grain of the metal constituting the fastener running lengthwise of both the head and the leg.

In the operation of the machine about to be described, a coil of the prepared strip is placed in the machine and fed to the driver. As indicated above, the endmost blank is sheared off and driven, and at the time of driving, has the form shown in Fig. 2. The machine is so constructed that as the endmost blank is being severed and driven, the leg-forming element of the next succeeding blank is bent down into vertical position so that the fastener is otherwise completed before it is severed and driven. The particular formation of the driver and die for accomplishing this result is disclosed in my copending application Serial No. 634,537 filed December 12, 1945, and the details need not be described in the present application.

The tool constituting the present invention has a foundation plate **2** which may be a relatively thin, flat sheet of metal. It is provided with an opening **3** to provide a hand grip **4**. Riveted onto one face of the flat plate **2** is an angular channel **5** having spaced flanges **5***a* and **5***b*. The circular trough between the two flanges **5***a* and **5***b* constitutes a magazine for holding a coil of fastener blanks designated A'. The outer flange **5***a* of the annular channel is cut away at **5***c* (see Fig. 3) providing an opening through which the leading end of the strip may pass, the end of the strip being carried down through a guide to the driving mechanism. As the strip is consumed, it rolls or unwinds in the trough-shaped magazine **5**. Plastic filler pieces **4***a* and **4***b* (see Fig. 6A) are secured on the plate at each side of the channel to provide a better hand grip, and in Fig. 6A a movable friction cover plate **5***c* is shown over the channel. For clearness of illustration the cover plate is not elsewhere shown.

Secured to the forward edge of the plate **2** is an operating cylinder **6**. As shown in Figs. 5 and 6, this cylinder is provided with a piston **7** which operates a piston rod **8** that slidably passes through an end member **9** at the top of the cylinder. There is a compression spring **10** interposed between the piston and the cylinder head **9**.

At the bottom end of the cylinder there is a second end member or cylinder head **11** having a port **12** therethrough leading into a nipple **13** to which is connected a tube **14**. The tube **14** is connected to a nipple **15** on a control valve designated generally as **16**. From the other side of the control valve **16** there is a pipe **17** which, as shown in Figs. 3, 5 and 6, extends across the plate **2** and terminates in a nipple **18** to which is secured air hose coupling (not shown) and through which air under pressure for operating the tool may be supplied.

Directly below the cylinder **7**, and in axial alignment therewith is a sleeve **20** having a guide bushing **21** in its upper end. Passing through the sleeve **20** and guided in the bushing **21** is a rod **22** having a nut or other abutment **23** on its upper end for limiting the downward travel of the rod. There is a disk of cushioning material such as rubber, leather or the like, attached to the under side of the nut **23**, this disk of cushion material being designated **24**. Its purpose is to cushion the shock of the downward travel of the rod **22** when the rod moves from the elevated position shown in Fig. 6 to the lowered position in Fig. 5, as will be hereinafter more fully described.

The lower end of the rod **22** is attached to the upper part **25** of the driver and forms a part of the driver assembly, the driver itself having a depending driving element **26** terminating in a square end **27**. As indicated by dotted lines in Figs. 5 and 6, the driver may have a narrow lip **28** down one face thereof. The driver also has a portion **29** positioned along one side of the portion **28**, and which terminates in a plate above the end surfaces **27** of the driver. The function of the portion **29** is more fully described in the latter of my aforesaid applications, and is the part of the die which operates to bend the leg of the blank from the horiozntal to the vertical position. The part **28** of course is the part which shears off the endmost blank on the strip and drives it, and for accomplishing this purpose the driver **26** operates in a guideway **30** which is formed partly by a forwardly-projecting portion **2***a* of the plate **2**, and partly by a keeper member **31** which is secured to the extension **2***a* by machine screws **32** (see Fig. 3). The keeper member has a block **34** secured thereto by a screw **33** (see Figs. 3 and 4). There is a compression spring **35** that operates to force a yieldable guide **36** to the left as viewed in Fig. 4. Transversely yieldable guide member **36** normally projects across the guideway **30** below the driver and as shown, it has an inclined face which will cause it to be cammed toward the right as viewed in Fig. 4 as the driver pushes a fastener downwardly along the guideway. The slidable block **36** is offset at one edge so as to form a guideway for the leg of the tack and keep it from bending during the initial part of the driving stroke, but as indicated above, the guide block **36** is cammed out of the way as the driver continues its downward movement. This guide arrangement is more or less incidental to the present invention. The fastener is projected from the bottom or end of the guideway **30**, and this portion of the driving tool I term the "driving nose."

As shown in Fig. 5, when the driver is in its lowermost position, the end **27** is substantially flush with the end of the guide **30**, while the fastener or tack itself is designated *t*.

There is a contoured plate **40** secured to the bottom edge portion of the plate **2**, as viewed in Figs. 3, 5 and 6, the bottom edge of this plate being flush with the edge of the plate **2**, but the contour of the top plate is generally curved to define the curvature which the strip of fasteners follows in passing from the magazine to the driver. This plate **40** may be secured to the plate **2** by screws or rivets. Above the plate **40** is another plate **41**, whose lower edge is contoured to conform to the top edge of the plate **40** and is spaced above the plate **40** a distance corresponding to just slightly more than the thickness of the fastener strip, so that there is provided a guiding channel **42** between the lower edge of the plate **41** and the top edge of the plate **40**. The strip is so delivered through the channel that the notches *d* in the edge, as described in connection with Fig. 1, are outermost. There is a member **43** secured to the plate **40** which has two upwardly-extending arms **44** and **45**. Each of these arms is resilient, and each carries a resilient pawl or tooth (not shown in detail) these ratchet teeth being so spaced as

to engage the notches *d* in the edge of the strip in the guideway and prevent reverse movement of the strip. The construction and arrangement of these arms and ratchet teeth is substantially the same as described in my said copending application Serial No. 634,537.

There is a pivot pin secured to the plate 2 at 46, and an oscillating plate 47 is pivotally carried on this pin and arranged to slide over the plate 41. This plate is provided with a slot 48 through which an anchor pin 49 projects, the anchor pin being fixed on the plate 2 and passing through the slot 48. It provides an anchorage for one end of a tension spring 50. The other end of the tension spring 50 is connected to a pin 51 on the oscillating plate 47. The arrangement is such that the plate 47 may move back and forth in an arc a predetermined distance. When it is moved to the right, as viewed in Fig. 5, the tension spring 50 is extended and urges it back toward the left when such movement is permitted. The plate 47 carries two fingers 52, each of which carry a pawl for engaging notches *d* in the edge of the strip, the fingers 53 being spring fingers. The teeth are so arranged that when they move toward the left as viewed in Figs. 3 and 5, their pawls will engage the notches in the strip and push the strip forward or to the left. They are so shaped that when they move to the right from the position shown in Fig. 6, they merely spring out of the notches and slide over the edge of the strip, all as more fully described in my application last above mentioned.

The guide channel for the strip 42 terminates at the guide 30 for the driver, and as shown in Fig. 6, the fastener blank enters the driving guide below the uppermost limit of travel of the lower end 27 of the driver, and well above the bottom of the driving guide. As previously indicated, when the driver 28 moves down, it functions to shear off the blank which is then in the driving guide, and expel it from the end of the driving guide, while the portion 29 of the driver, also on the down stroke of the driver, catches the leg-forming element of the next succeeding blank and bends it down to a vertical position.

The driver is provided with a cam element 28*a* having a riser 28*b* and a dwell 28*c* (see Fig. 5). The oscillating plate 47 has a roller 54 which cooperates with this cam. When the driver is in the elevated position shown in Fig. 6, the roller is in its position furthest to the left, and is at the base of the riser 28*b*. As the driver moves down, the riser 28*b* rocks the plate 47 toward the right from the position shown in Fig. 6 to the position shown in Fig. 5, and thereafter the plate 47 is held over toward the right by the roller being engaged with the dwell 28*c* of the cam. When the driver returns to its elevated position, the spring 50 tends to rock the driver back to the position shown in Fig. 6, and in this position the strip of fastener blanks is advanced.

An important and novel part of the present invention resides in the mechanism through which the air cylinder is utilized to operate the driver. The upper end of the piston rod 8 is secured to a connector 60, through which passes a transverse pin 61. To the opposite ends of the pin 61 are connected the two arms 62 of a yoke member 63 that is somewhat curved to conform to the curvature of the cylinder 6. The lower end of the yoke is bifurcated to provide two arms 64, each of which is formed with a hook 65. A block 66 having a sloping cam surface 67 is secured to the sleeve 20, and it is provided with a machine screw 68, which screw passes through the bifurcated end 70 of a leaf spring 71, whose upper end is attached at 71*a* to the yoke. The head of the screw 68 thus provides an abutment against which the leaf spring 71 acts for urging the yoke toward the right as viewed in Figs. 3, 5 and 6. When the driver is in its lowermost position, and when the piston 7 is in its lowermost position, the hooks 65 of the yoke are pushed under the ends of a transverse pin 72 in the top of the driver block. When air is admitted to the cylinder 6 to drive the piston upwardly, the upward motion of the piston will be transmitted through the yoke, and through these hooks to the driver, so that the driver will be raised against the compression of a powerful spring 73. This spring is confined between the upper part 25 of the driver and the bushing 21 at the top of the sleeve 20. As the piston 7 continues its upward movement, the spring 73 will be compressed to an increasing extent. At a predetermined point in the travel of the piston and driver, a roller 74 on the yoke will engage the rise 67 of the cam 66 to force the yoke to the left, as viewed in Fig. 5, to the position shown in Fig. 6. This will cause the hooks 65 to become disengaged from the ends of the pin 72, whereupon the spring 73 will act to push the driver down with great force. This may happen notwithstanding the fact that the piston 7 may continue to thereafter move up to a very slight distance for the purpose hereinafter to be described.

I have heretofore referred to the valve 16 for controlling the admission of air to the cylinder 6. This valve includes a body 16 having a rotary valve element 75 therein. As shown in Fig. 11, this valve element has a through passageway 76 which in one position may permit the flow of air from the air supply pipe 17 to the air supply pipe 14. It has a second passageway 77 in its periphery which, in the position shown in Fig. 11, allows air to flow from the tube 14 through a vent 78 to the atmosphere. When the port 78 is in position to permit the escape of air from the pipe 14, the passage 76 of course is inoperative, and when the valve plug is rotated to bring the port 76 into its operative position, the passageway 77 is rendered inoperative. The valve plug 75 has a disk 79 thereon at one end thereof outside the valve casing, and it is provided with a radial pin 80 (see particularly Figs. 8, 9, 10 and 11). The other end of the valve plug 75 has a stem 81 that passes through the plate 2, and which is provided with an operating crank or lever 82. An operating link 83 is pivotally connected at one end to the crank 82, and has its other end connected at 84 to a trigger lever 85, which has a finger-engaging portion 86, and which is pivotally hung to the plate 2 at 87, the trigger being on the opposite side of the plate 2 from the magazine wihch holds the spool of fasteners.

The trigger mechanism being coupled in the manner indicated, serves to move the valve in one direction, i. e., from the position shown in Fig. 11 to the position shown in Figs. 9 and 10. The yoke 63 has an edge portion 89 (see Fig. 8) which carries a cam roller 90. Pivotally secured to the lower piston head element 11 is a lever 91, the pivot for the lever being designated 92. The lower end of this lever is turned inwardly as best shown in Fig. 7 to provide a valve-operating finger 93. This finger is in position to engage the pin 80 on the disk 79 at one end of the rotatable valve body. When the trigger is operated in one direction, i. e., to the position shown in Fig. 5,

the pin contacts the finger 93 and pushes the lever 91 toward the left from the position shown in Fig. 8.

After the hooks 65 have been released from the driver in the manner hereinbefore indicated, and the piston continues its upward movement, the roller 90 engages cam surface 91*a* on the lever 91 and forces the lever toward the right to the position shown in Fig. 8. The finger 93 engaging the pin 80 on the valve disk 79, rotates the valve to the vent position shown in Fig. 11. Thus just as the piston reaches the upper limit of its travel, the valve 16 is kicked into the off position, i. e., to the position shown in Fig. 11. The supply of compressed air to the cylinder 6 is cut off, and the air which is in the cylinder is vented through the port 78. By this time the driving of the tack will have been completed and the spring 10 will act to push the piston back to its lowermost position. As the piston 7 comes down, the hooks 65 on the operating yoke are again lowered to a position where the leaf spring 71 will be effective for engaging the pin 72 and connect the yoke with the driver in preparation for the next operating cycle.

The complete operation may now be readily followed. Assume first that the machine is coupled to a source of high pressure air. Pressure of the order of 50 to 75 pounds will be sufficient, but this may be changed if spring 73 is made stronger or weaker. The operator positions the driving nose of the tool in the position where the tack is to be driven. The parts at this time are in the position shown in Figs. 3 and 5, but the trigger is shown in the position which it assumes immediately after it has been pressed. The operation of the trigger rotates the valve to bring the passage 76 into operative position, whereupon air enters the bottom of the cylinder and lifts the piston. The upward motion of the piston transmits motion through the yoke and hooks 65 to the driver which is raised against the compression of spring 73, and as the upward motion continues, the roller 74, striking the incline on cam block 67, moves the yoke to the left, disengaging the hooks 65 from the driver, thus disconnecting the driver from the piston, and the spring 73 immediately expands, forcing the driver down with a quick, sharp blow.

It might be pointed out that as the driver moves up, it clears the end of the strip of blanks, at which time the feed plate 47 which is then in the position shown in Fig. 5, snaps to the left, forcing the endmost blank on the strip into position under the driver as shown in Fig. 6, so that when the driver comes down in the manner above described, it shears the fastener and drives it with great force. After the release of the hooks 65 the yoke will continue to lift a slight distance until the roller 90 rocks the lever 91 to the position shown in Fig. 8, at which time the finger 93 on the lever 91 hits the radial pin 80 and turns the valve to the off position. In so doing it resets the trigger. As soon as the trigger is reset and the valve is in off position, the air is vented from the cylinder, the piston 7 drops down, the hooks 65 are lowered, and the spring 71 restores the connecting yoke to its operating position where the hooks 65 are again engaged with the pin 72 on the driver.

For the purposes of simplicity of operation, I have shown a simple connection between the valve and the trigger. The particular mechanism shown has the disadvantage that the trigger might be rocked forward, notwithstanding the fact that the operator had not had time to release the pressure from the trigger. In order to overcome this difficulty, lost motion linkage may be employed such for example, as that shown in Fig. 12.

In Fig. 12 the valve 16 is the same as heretofore described, and it has the radial pin 80. The link 91 is the same as previously described, and it has the inwardly-turned finger 93 as previously described.

In lieu of the link 83 as previously described, however, there is used in the modification shown in Fig. 12 a link 95 having a bayonet type of slot 96 at one end, this slot having a notch portion 96*a* and an elongated portion 96*b*. In Fig. 12 the plate 2 is not shown, but it may be borne in mind that actually 91 and 95 are on opposite sides of the plate. A tension spring 97 is connected to the end of the link 95, and tends to urge it to the left, and downwardly as viewed in Fig. 12. The link 95 has a raised abutment or lug 98 thereon intermediate its ends, which abutment is in a position to be engaged by the fixed lug 98*a*. Fig. 12 shows the position of the parts after the trigger has been pulled and the valve has been reset to the "off" position at the completion of the driving stroke. At this time the pin 99 on the valve-operating crank is at the end of the slot 96*b* most remote from the notch 96*a*. In other words, pressure is still being put on the trigger. When the trigger pressure is released, link 95 will be pulled down (as viewed in Fig. 12) under action of spring 97, after which it is caused by the same spring to move to the left so as to cause the pin 99 to seat in the notch 96*a*. When the trigger is next pulled, the link 95 will move up, as viewed in Fig. 12. The pin 99 will be seated in the notch 96*a* so as to transmit motion to turn the valve. When the lug 98 strikes the fixed lug 98*a* a lever 95 is forced to the right to move the pin 99 out of the notch, so that the pin 99 is free to move lengthwise along the slot 96*b* without imparting a corresponding movement to the trigger-operated link when the valve is operated to the "off" or "vent" position.

The advantage of this lost motion connection is, as above indicated, that even though pressure continues to be applied to the trigger, the parts will all rest themselves without disturbing the relation of the trigger, and then when the pressure is released from the trigger, the link 95 will automatically be restored to an operating position.

While air impact tools of many types have been developed, the present invention is unique in that the air cylinder is used only to raise the driver and compress the spring 73, while the force of the actual blow is delivered by the compressed spring itself. Each impact blow is of the same force as the other, that is, the blows are of uniform force. The air operated piston can make only one stroke with one operation of the trigger, and hence the trigger must be pressed each time that a tack is to be driven. This is a definite advantage because it would be extremely undesirable and dangerous to have an automatically-operated air hammer such as is commonly used in air-operated impact tools moving the driver in rapid succession.

The construction of the tool itself is also novel by reason of the use of a single plate or web 2 as the support for the magazine, and all of the operating parts. It makes a tool of extremely compact construction, and one which is very light, so that it can be handled very easily, and

of very small dimension so that tacks can be driven close into crevices and corners. The positioning of the tacks and the driving can be accomplished quickly and accurately and very little skill is required on the part of the operator to successfully use the machine. A single row of tacks may contain several hundred or several thousand blanks, so that the capacity of the machine is relatively large, and little time is lost in recharging the machine. At the same time the feed mechanism and the magazine are exposed for ready access for threading a new strip into the machine, or for removing any imperfect blanks that might possibly clog the driver.

While I have shown one form of strip feeder, it will be understood that other mechanisms may be substituted, and that by substituting other known or preferred feed mechanisms and proper design of the driver and guide, various types and shapes of fasteners, tacks or staples may be driven in like manner. Also, while I have shown a single driver, two or more may be grouped in gangs, and the thin compact construction enables them to be put close together when desired, and a cluster of several will be quite light to suspend and maneuver about.

While I have illustrated and described one specific embodiment of my machine, it will be understood that this is by way of illustration, and that various changes and modifications in the construction and arrangement of parts may be made within the contemplation of my invention.

I claim:

1. An impact tool of the class described comprising a reciprocable driver which moves in one direction to deliver an impact and in the opposite direction to a retracted position, a spring for moving the driver on its impact stroke, a fluid pressure piston and cylinder for moving the driver to compress the spring, and rigid means releasably connecting the piston and driver during such spring compressing stroke, and means for releasing said last named means when the spring is compressed.

2. An impact tool of the class described comprising a reciprocable driver which moves in one direction to deliver an impact and in the opposite direction to a retracted position, a spring for moving the driver on its impact stroke, a fluid pressure piston and cylinder for moving the driver to compress the spring, and mechanical means releasably connecting the piston and driver during such spring compressing stroke, and means for releasing said last named means when the spring is compressed, said last named means including a cam engaged by said connecting means during its travel.

3. An impact tool comprising a cylinder and a piston movable therein, means for controllably supplying fluid under pressure to the cylinder to move the piston in one direction, means for returning the piston after it has been so moved, a reciprocable driver, a spring for operating the driver on its opposite or impact stroke, and a rigid linkage operable to connect the piston and driver to move the driver in a direction to compress the spring, means for disconnecting the linkage from the driver when the driver has been moved against the compression of the spring to a predetermined position, and means for moving the linkage into engagement with the driver after the driver has been moved under the operation of the spring to the opposite limit of its travel and when the piston has been returned to the opposite limit of its travel.

4. An impact tool comprising a cylinder and a piston movable therein, means for controllably supplying fluid under pressure to the cylinder to move the piston in one direction, means for returning the piston after it has been so moved, a reciprocable driver, a spring for operating the driver on its opposite or impact stroke, rigid means for automatically connecting the piston and driver to move the driver to compress the spring and release the driver when the spring has been compressed, said last means including a yoke pivotally connected with the piston and having a hook element for releasably engaging the driver, a spring for urging the yoke into a position for the hook to engage the driver, and a cam engaged in the travel of the yoke for moving the yoke on its pivot to release the driver.

5. An impact tool comprising a reciprocable driver movable in one direction to strike a blow, a spring for operating the driver on said stroke, a fluid pressure motor means for moving the driver in the opposite direction to compress the spring, a mechanical connection between the motor and driver operable to transmit motion from the motor to the driver only in a direction to compress the spring, and a control for the motor.

6. An impact tool comprising a reciprocable driver movable in one direction to strike a blow, a spring for operating the driver on said stroke, a fluid pressure motor means for moving the driver in the opposite direction to compress the spring, a connection between the motor and driver operable to transmit motion from the motor to the driver only in a direction to compress the spring, a control for the motor, said control including a valve movable from an off position to a motor-operating position, a manually operable trigger for moving the valve to motor-operating position, and means actuated through movement of the driver under the power of said motor for moving the valve to its off position when the spring has been compressed.

7. An impact tool comprising a reciprocable driver movable in one direction to strike a blow, a spring for so moving the driver, a fluid pressure motor means for moving the driver in the opposite direction to compress the spring, a connection between the motor and driver operable to transmit motion from the motor to the driver only in a direction to compress the spring, a control for the motor, said control including a valve movable from an "off" position to a motor-operating position, a trigger movable manually for turning the valve to a motor-operating position, motor-driven means for turning the valve to an "off" position, means for operating said connection between the motor and driver to release it when the driver has moved to the limit of its travel in a direction to compress the spring, and means for urging said connection into engagement with the driver to re-establish said connection after the driver has been actuated by the spring.

8. An impact tool having a driver movable from a raised position to a down position, a spring for propelling the driver from the first to the second position, a piston and cylinder in which the piston is moved in one direction by fluid pressure, a spring for moving the piston in the opposite direction, means for connecting the piston to the driver when the piston is being operated by fluid pressure for retracting the driver and compressing the spring which propels it, means

for releasing said connection when the spring is compressed, and trigger means for controlling the flow of fluid into and out of the cylinder.

9. An impact tool having a driver movable from a raised position to a down position, a spring for propelling the driver from the first to the second position, a piston and cylinder in which the piston is moved in one direction by fluid pressure, a spring for moving the piston in the opposite direction, means for connecting the piston to the driver when the piston is being operated by fluid pressure for retracting the driver and compressing the spring which propels it, means for releasing said connection when the spring is compressed, trigger means for controlling the flow of fluid into and out of the cylinder, said means including a valve movable from an "on" position to a "vent" position, a trigger for moving the valve to the one position, and means operated by the piston for moving it to the vent position.

10. An impact tool of the class described comprising a metal plate having a hand hole therethrough, a cylinder secured along one edge of the plate and parallel therewith, a piston in said cylinder, a guide on the same edge of the plate in line with the cylinder, a driver in said guide, a spring for moving the driver in one direction, a link on the piston detachably engaging the driver, means for operating the link to transmit motion from the piston to the driver to compress the spring, and means for disconnecting the link from the driver when the spring has been compressed, and means for controlling the operation of the piston.

11. An impact tool having a reciprocable driver with a spring for moving it one direction and a fluid pressure operated piston for moving it the other direction characterized by the provision of link for releasably and directly connecting the piston and driver, means operable through movement of the piston for releasing the link when the spring has been compressed, and means for connecting the link when the driver has been operated.

12. An impact tool as defined in claim 11, wherein a fixed cam co-acting with means on the link effects movement of the link to release the driver and a spring acts to reconnect the link.

13. An impact tool as defined in claim 12, wherein the link is a yoke-like member pivotally connected with the piston for movement transversely of the axis of the piston and has hooks at its other end for releasably engaging the driver.

14. An impact tool of the class described including a cylinder, a piston in the cylinder, a fluid pressure connection and control valve for effecting operation of the piston in one direction, a spring for operating the piston in the return direction, a driver and a spring for moving it one direction, a yoke secured to the piston and releasably connected to the driver to provide a non-yielding linkage for transmitting motion from the piston to the driver for moving the driver in the other direction to compress the spring, means for releasing the yoke connection between the piston and driver when the spring for operating the driver has been compressed, and means for automatically operating said valve to vent the cylinder and relieve pressure therein after the driver has been released, whereby the spring for returning the piston may then be effective.

15. The driver defined in claim 14 wherein the said cylinder is secured along the edge of a metal plate and there is a guide sleeve for the driver secured to the same edge under the cylinder, said metal plate having an opening therethrough to provide a hand grip.

16. The driver defined in claim 15 wherein said plate has a U-shaped annulus secured to one face thereof to provide a magazine for a coiled strip of fastener blanks, the plate also having a pair of smaller plates thereon providing a guideway for the strip of fastener blanks, said guideway being located to deliver the end of the strip under the driver, and means for feeding the strip.

17. An impact tool for driving fasteners and the like comprising a driver, a spring for moving the driver in one direction, an air operated piston for moving the driver to compress the spring, a releasable connection through which the piston is made effective for moving the driver and means for operating the releasable connection for disconnecting the piston and the driver when the spring has been compressed, said releasable connection providing a non-yielding linkage between the piston and the driver when it is operating the transmit motion between the two.

18. An impact tool comprising a movable driver, a spring for propelling the driver on its working stroke, a fluid pressure operated piston for moving the driver to compress the spring, and a self-operating connection for coupling the piston and driver to move the driver to compress the spring and for releasing the piston when the spring has been compressed, said connection being movable into coupling position when the driver is at the end of its working stroke and means for moving it to a released position adjacent the limit of the spring compressing stroke, said releasable connection providing a non-yielding linkage between the piston and driver when it is operative to transmit motion between the two.

19. A tool of the class described comprising a reciprocable driver movable in one direction to deliver an impact and movable in the other direction to a retracted position, a spring for moving the driver on the impact stroke, a fluid pressure operated cylinder member and piston member, one of which is movable relative to the other, a latch mechanism on the movable member operable to engage the driver at the limit of its impact stroke and retract it against the pressure of the spring and operable to release the driver when it reaches its retracted position and providing a rigid linkage between the movable member and the driver when it is transmitting motion between them, means for operating the latch to release the driver at the end of the retracting stroke, means for operating the latch to effect its re-engagement with the driver at the end of the impact stroke of the driver, and a control valve for operating the cylinder and piston.

20. An impact tool comprising a reciprocable driver, a spring for moving the driver in one direction, a fluid pressure cylinder and piston assembly for operating the driver in the other direction and for stressing the spring, said cylinder and piston assembly having one part movable relatively to the other, means rigidly connecting the driver to the movable part of the fluid pressure cylinder and piston assembly adjacent one limit of the cycle of movement of the driver to effect such movement of the driver and

stress the spring, and means effective at a predetermined position in such movement for releasing the connection between the driver and the cylinder and piston assembly whereby the driver is then operated in the reverse direction by the spring.

21. An impact tool comprising a reciprocable driver, a spring for propelling the driver in one direction to strike a blow, a cylinder and movable piston assembly for moving the driver in the opposite direction for compressing the driver spring and for compressing a cylinder spring to return the piston, a link for connecting the piston and the driver which is movable with the piston, the connection between the driver and the link being releasable, a spring connected with the link for effecting the connection of the link with the driver when the driver is at the limit of its travel of operation under the driver spring, a fixed cam mounted adjacent the link to operate the link to disconnect the piston and driver when the driver is at its opposite limit

of travel and the driver spring is compressed, and a valve for controlling the admission of fluid under pressure to the cylinder to operate the piston to compress the cylinder spring and for releasing pressure fluid from the cylinder for the return movement of the piston by the spring.

JOSEPH CONRAD LANG.

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Certificate of Correction

Patent No. 2,574,875 November 18, 1951

JOSEPH CONRAD LANG

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 8, line 49, for "rest" read *reset*; column 12, line 27, for "the transmit" read *to transmit*;

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 5th day of February, A. D. 1952.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.