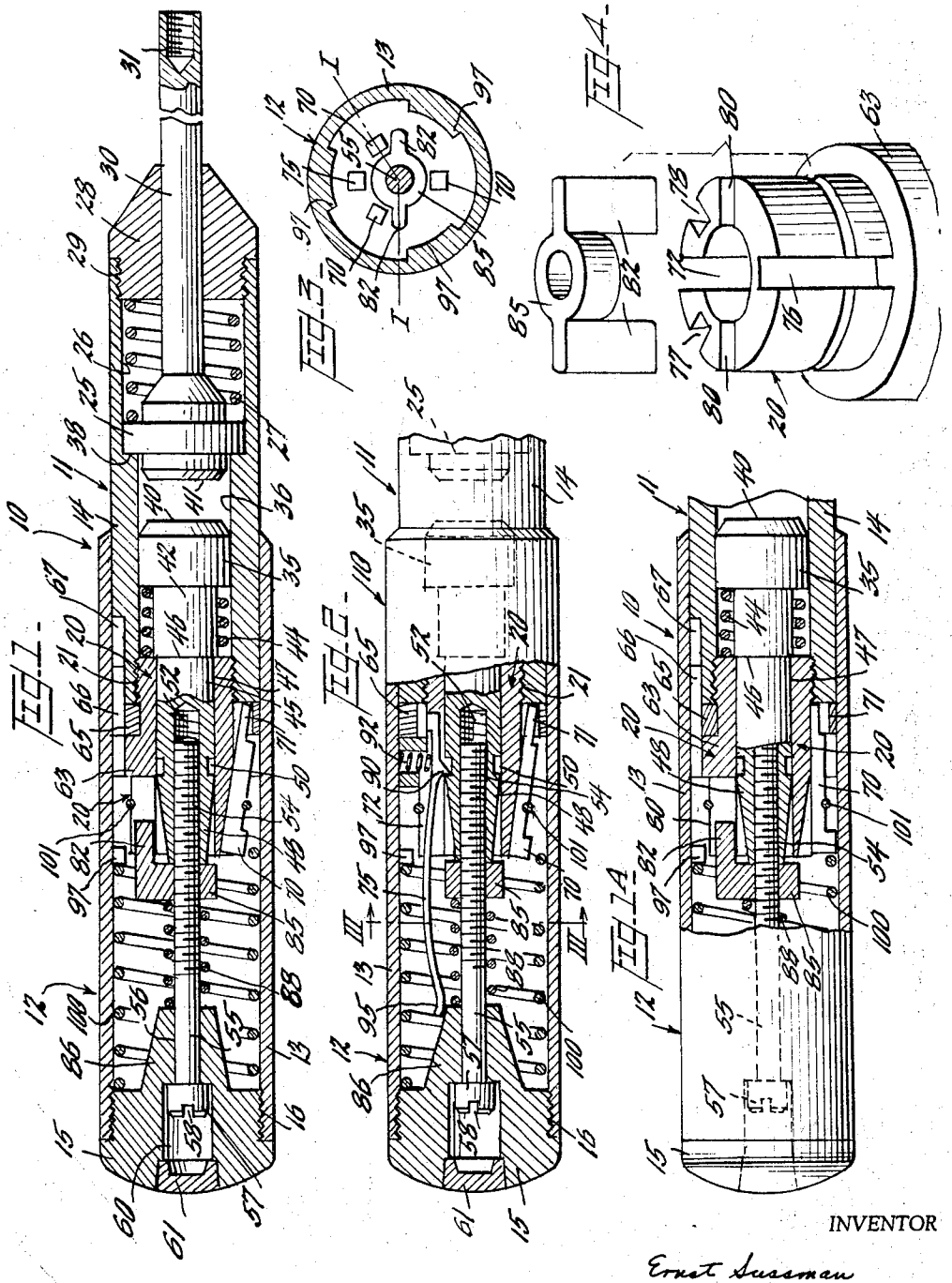
Aug. 23, 1966 E. SUSSMAN 3,268,013

IMPACT TOOLS

Filed Feb. 18, 1964 2 Sheets-Sheet 1



INVENTOR

Ernst Sussman

BY Watson, Cole, Grindle & Watson

ATTORNEYS

Aug. 23, 1966 E. SUSSMAN 3,268,013

IMPACT TOOLS

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FIG. 5

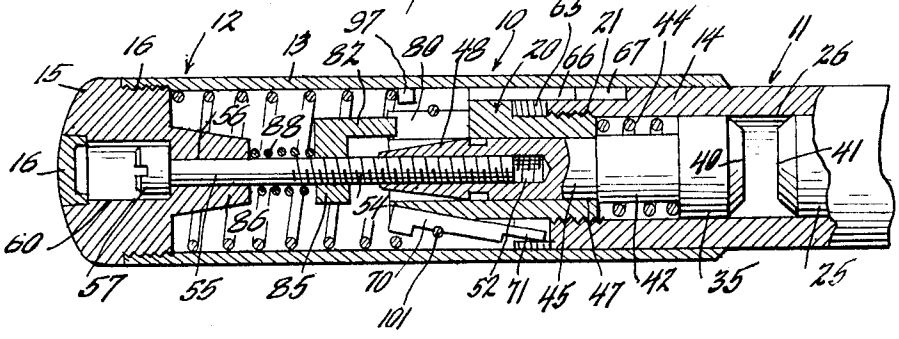


FIG. 6

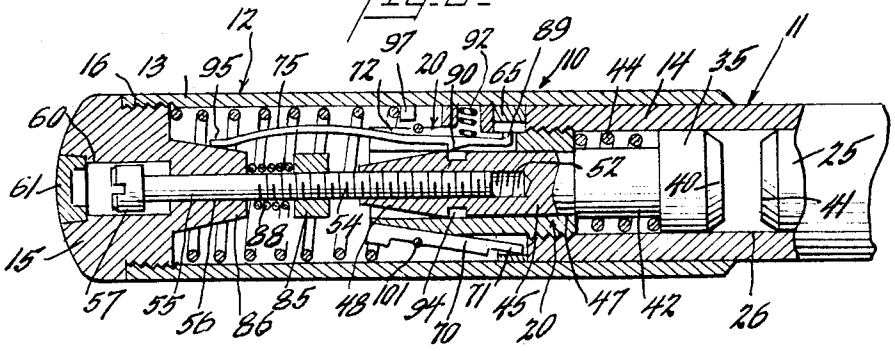


FIG. 7

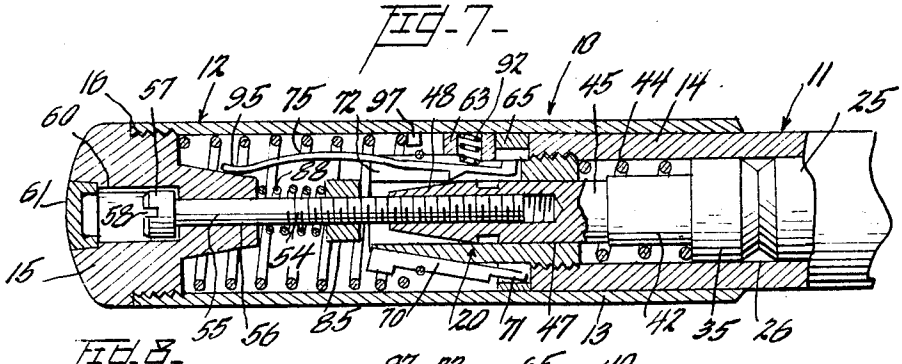
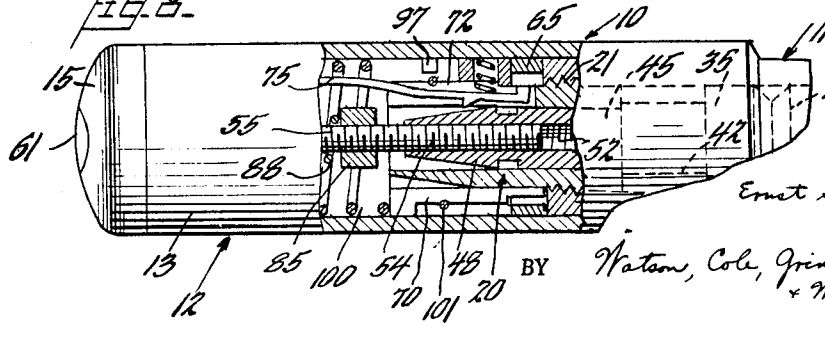


FIG. 8



INVENTOR

Ernst Sussman

BY Watson, Cole, Grindle + Watson

ATTORNEYS

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IMPACT TOOLS

Ernst Sussman, Biery's Bridge Road, Bethlehem, Pa.

Filed Feb. 18, 1964, Ser. No. 345,777
12 Claims. (Cl. 173—53)

This invention relates to impact tools for manual application to a piece of work, a tool of this description including a spring-propelled hammer member, a handle grip, and means for cocking the tool for release of the hammer member for impact upon application of pressure to the handle grip.

The present invention is of the same general nature as the one covered in my co-pending application Serial No. 151,970, filed on November 13, 1961, now Patent No. 3,181,626, but has for its principal object the provision of readily manipulatable means for adjusting the force of the spring propulsion of the hammer.

Another object of the invention is the provision of a novel and improved re-cocking spring arrangement with pivoted engaging elements, permitting some advantageous simplification of the construction of the tool.

In its preferred embodiments, the invention contemplates the provision of two springs which together furnish the propulsion power for the hammer; one of the springs being of a fixed spring rate and bodily replaceable by or interchangebale with springs of other predetermined rates, and the other of said springs being subject to variable degrees of initial or effective compression adjustable by a simple rotation of the hammer assembly. However, only one of these springs offers resistance to either manual or automatic re-cocking.

Other objects and features of novelty will be apparent from the following specification when read in connection with the accompanying drawings in which one embodiment of the invention is illustrated by way of example.

In the drawings:

FIGURE 1 is a view in angular axial section as along section line I—I of FIGURE 3, of an impact tool embodying the principles of the invention, the parts being in manually cocked position awaiting the delivery of the hammer blow by the application of pressure to the handle grip portion of the tool;

FIGURE 1A is a similar view of the same tool with the pivoted elements set as for automatic re-cocking for repeat action;

FIGURE 2 is a view in axial section taken at 90° rotation from the view in FIGURE 1;

FIGURE 3 is a view in transverse section taken on line 3—3 of FIGURE 2;

FIGURE 4 is a fragmentary exploded view in perspective illustrating the interfitting relationship of a guide member and an adjusting nut carried by the hammer;

FIGURE 5 is a view similar to FIGURE 1 showing the adjusting nut travelled along the shank of the hammer to increase the initial compression of one of the hammer projecting springs;

FIGURE 6 is a view similar to FIGURE 2 and taken at right angles with respect to FIGURE 5, showing the positions of the parts at the instant of release of the hammer trigger;

FIGURE 7 is a view similar to FIGURE 6 showing the positions of the parts at the moment of impact of the hammer with the anvil member; and

FIGURE 8 is a view similar to FIGURE 7 but with the pivoted elements in position with respect to the re-cocking spring to provide for repeat action.

The novel impact tool illustrated in the drawings is

indicated by the general reference numeral **10** and is seen to comprise a body assembly **11** and a handle grip assembly **12**, the handle grip assembly comprising the sleeve **13** which surrounds and is slidable along the barrel **14** of the body assembly. The handle **12** also includes the base element **15** which comprises a bushing threaded into the sleeve **13** as at **16**.

Another fixed portion of the body assembly is the guide member **20** which is threaded into the rearward portion of the barrel **14** as at **21**.

An anvil **25** is slidingly received within a widened cylindrical portion **26** of the barrel **14** and is urged rearwardly toward a retracted position by means of the spring **27**, the spring seating forwardly against the nose piece **28** threaded as at **29** into the forward end of the barrel **14**. A stem **30** carried by the anvil **25** extends through an axial opening in the nose piece **28** and is provided with a suitable socket **31** or other means for connecting a toolbit thereto.

A hammer **35** is slidably received within the cylindrical portion **36** of the barrel **14**, this portion is of a smaller diameter than the portion **26** providing a shoulder **38** against which the wider portion of the anvil **25** abuts in its retracted position. The hammer **35** has an impact face **40** which is adapted to strike the face **41** of the anvil to impart the driving force to the tool.

The hammer **35** is provided with a shank portion of stepped configuration, a larger cylindrical portion **42** being surrounded by a coil spring **44** which is compressed between the rear shoulder of the hammer proper and the forward end of the guide member **20**. A still further attenuated shank portion of the hammer designated **45** is slidingly received within the bore **47** of the guide **20** and the shoulder **46** between the portions **44** and **45** provides an abutment limiting the rearward movement of the hammer **35**.

Finally, the shank portion **45** terminates in a frustoconical end portion **48**, an annular groove **50** being formed in the surface of the shank adjacent the junction of the portion **45** and the tapered portion **48**.

The shank of the hammer is provided with a threaded bore **52** for the reception of the forward threaded end **54** of the adjustment screw **55**. This adjustment screw **55**, which also acts as a tractive means for the hammer as will be explained, is guided through an opening **56** in the forward portion of the handle bushing **15** and terminates in a head **57** provided with a slot **58** for the application of a suitable tool for rotating the adjustment screw **55**. The head portion **57** is received within a cylindrical recess **60** of the bushing **15** which recess is closed by a removable plug **61**.

The guide member **20** will now be described in considerable detail and in this connection it might be well to compare this member with its counterpart designated by the numeral **12** in the co-pending application Serial No. 151,970. The portion of the member **20** which is of the greatest diameter is indicated at **63** and this presents a shoulder between which and the rearward end of the barrel an annular cam element **65** is rotatably positioned. This element corresponds exactly to its counterpart **14** shown most clearly in FIGURE 4 of the application above referred to and performs the same function, being actuated by means of the sliding member **66** which works in the groove **67** formed in the outer surface of the rearward portion of the barrel **14**.

Just as in the case of the embodiment disclosed in the co-pending application, this cam element **65**, by means of the rotation of the handle **12** with respect to the body portion **11**, controls the rocking of the pivoted elements **70** by acting upon the forward ends **71** of these elements to shift them from the position shown in FIGURE 1 to the position shown in FIGURE 1A, the effect of which

is to convert the operation of the tool from single impact to repeat action. The details of this operation will be described later.

As previously described, the forward end of the guide member **20** provides a rear spring seat for the spring **44** and also an abutment for the shoulder **46** of the shank of the hammer. Rearwardly, as best shown in FIGURE 4 of the drawings, the member **20** is provided with an elongated slot **72** to accommodate the swinging of the latch or trigger member **75**.

Diametrically opposite the slot **72** is a tapered groove **76** which, together with the other two tapered grooves **77** and **78**, accommodates the pivoting of the pivoted elements **70**, these grooves being preferably disposed 120° apart. Two other slots **80** are formed in the rearward portion of the guide member **20** to accommodate the wings **82** of the spring compression adjusting nut **85** threaded on the shank **54** of the screw **55**.

Between the rear surface of the nut **85** and the forward end of the frusto-conical portion **86** of the base member **15** of the handle is compressed a second hammer-projecting spring **88** which when the hammer is released cooperates with the spring **44** to drive the hammer **35** forwardly to strike the anvil **25**.

The latch or trigger member **75** has a forward fulcrumed end portion **89** and an intermediate tooth **90**, and a small coil spring **92** serves to urge the member **75** radially inwardly to engage the tooth **90** within the annular groove **94** formed in the shank of the hammer adjacent the junction of the tapered portion **48** and the intermediate shank portion **45**. The extreme end **95** of the latch member bears against the tapered wall of the frusto-conical base portion **86** and it will be seen that upon forward movement of the handle **12** upon the body **11** the wedging action of the tapered portion **86** will swing the latch **75** outwardly until it reaches the position shown in FIGURE 6 of the drawings, whereupon the tooth **90** will disengage from the groove **94** and the springs **44** and **88** will propel the hammer forwardly to strike the anvil **25** and deliver the predetermined blow to the work.

Internally of an intermediate portion of the handle sleeve **13** are a series of arcuate inwardly projecting lugs **97**, and between these lugs and the forward face of the larger portion of the base member **15** of the handle is compressd a coil spring **100**. For single or one-shot action, the rotated position of the handle with respect to the body of the tool is set according to the disclosure in the co-pending application Serial No. 151,970, now Patent No. 3,181,626 and the annular cam member **65** permits the pivoted elements **70** to occupy the positions shown in FIGURES 1, 2, 5, 6 and 7 where the garter spring **101** retains the latches in their radially inwardly retracted positions. However, upon proper rotation of the handle with respect to the body of the tool, again in accordance with the procedure described in the co-pending application, the cam member **65** acting upon the forward smaller ends **71** of the elements **70** pivots them around the fulcrum provided by the inclined portion of the slots **76**, **77** and **78** and brings the heads of the elements **70** outwardly against the inner wall of the sleeve **13** of the handle into the positions shown in FIGURES 1A and 8 of the drawings. This brings them into alignment with the re-cocking spring **100** which is utilized under these conditions to automatically re-cock the hammer for repeat action as will be described.

The operation of the tool for both single and repeat action is as follows.

After a single action operation of the tool the parts will be in the positions shown in FIGURE 7 of the drawings and if the anvil shank **30** is secured as at **31** to a bit having a pull-back connection with the work, the handle **13** is merely pulled rearwardly, which through the connection with the hammer **35** by means of the head **57** of the tractive screw element **55** will draw the hammer rearwardly, compressing the forward propelling spring **44** until the latch **75** sliding down the frusto-conical surface of the handle part **86** permits the tooth **90** to re-engage the annular groove **50** in the hammer shank. The parts will now be in substantially the positions shown in FIGURES 1, 2 and 5 of the drawings.

Under these conditions the rearward pull of the handle against the tension of the spring **44** will test the connection upon which the tool has acted, in the same manner as described in the co-pending application.

If the tool has no pull connection with the work then the handle will have to be retracted manually by an outward pull upon both the body portion **11** and the handle **12** until the tool is in cocked position as in FIGURES 1 and 2 or 5.

Before continuing with the description of the projection of the hammer, it will be well to describe one of the principal novel features of the present invention, namely, the means for adjusting the effective strength of the rearward propelling spring **88**. In FIGURES 1 and 2 of the drawings the nut **85** is practically in its extreme forwardly adjusted position either abutting or about to abut the rear end of the tapered portion **48** of the hammer shank and under these conditions the spring **88** is at its maximum elongation.

Now in order to increase the initial compression of the spring **88** and thus the ultimate force of the hammer blow, the plug **61** is removed from the handle base element **15** and a screwdriver or other tool applied to the slot **58** in the head **57** of the adjusting screw **55**. Then upon rotating the screw **55** clockwise the screw will thread its way through the nut **85** and into the threaded bore **52** of the shank portion **45** of the hammer until the shoulder **46** of the shank portion **42** is pulled tightly against the forward end of the member **20**. Further turning of the adjusting screw **55** will now force the nut **85** back against the spring **88** thereby increasing the spring force of that propelling spring. The hammer **35** and its shank portions will then turn with the screw **55** while the nut **85** can only move in the axial direction out of the grooves **80** of the guide member **20**.

This adjustment is carried to the desired point to regulate the force of the spring **88** and one such adjusted position is shown in FIGURE 5 of the drawings where it will be seen that the nut has receded from the end of the member **20** and has compressed the spring **88**.

Now, whatever the point of adjustment of the rearward propelling spring **88**, whether as shown in FIGURES 1 and 2 or as further compressed in FIGURE 5, the point of the tool is applied to the work and the handle **12** is manually moved forwardly, the finger **95** of the latch **75** riding up on the release taper of the portion **86** until the tooth **90** is released from the groove **94**, this instantaneous position being shown in FIGURE 6 of the drawings. This triggers the hammer and under the influence of both the forward spring **44** and the rearward spring **88** the hammer **35** is projected forwardly to strike the anvil **25** as shown in FIGURE 7 of the drawings.

From the position shown in FIGURE 7 the tool is returned to operative position for single action as previously described.

Now for repeat action, the handle **12** is turned so that the cam **65** swings the pivoted elements **70** from the positions shown in FIGURES 1, 2, 5, 6 and 7 to the positions shown in FIGURES 1A and 8 where the heads of the elements **70** are aligned with the spring **100** just beyond the stop projections **97**. In delivering the impact the handle is pressed forwardly as in the case of single action operation, the latch or trigger **75** is released as before, and the blow is delivered as indicated in FIGURE 8 of the drawings. During the forward movement of the handle not only is the spring **88** compressed but the re-cocking spring **100** is also compressed against the heads of the pivoted elements **70**. Now when the blow is delivered as in FIGURE 8, the force of the spring **100** overcomes the opposing force of the forward pro-

pelling spring **44** when the pressure on the handle is relieved, thereby returning the handle to cocked position and re-compressing the spring **44**. Of course, the spring **88** is merely used in applying a regulated impact force, which is the result of the relatively fixed force of the spring **44** plus the variable force of the spring **88**. Thus, the tension of spring **88** does not enter into the force pattern for returning the handle.

It will be understood that a coarse adjustment of the impact force may be attained by the substitution of interchangeable springs **44** of different rates, and a finer adjustment of this impact force can be attained by the rotation of the screw **55** applying a variable compression force to the rearward propelling spring **88**.

Various changes and modifications may be made in the embodiment illustrated and described herein without departing from the scope of the invention as defined by the following claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. An impact tool comprising a hollow tubular body member, an anvil slidably disposed within said body member and having a stem projecting forwardly from the body member to carry a tool-bit, a hammer slidably disposed within said body member rearwardly of said anvil, a hammer-projecting spring disposed for compression between said hammer and a portion of said body member and urging said hammer toward said anvil, a handle member carried by said body member and movable longitudinally with respect thereto, a lost motion connection between said hammer and said handle member whereby retractive movement of said handle member will pull said hammer rearwardly and compress said projecting spring whilst the handle member may be moved in the forward direction independently of said hammer, a compression spring disposed between said handle member and said hammer urging the hammer and handle member apart to take up the slack of the lost motion connection, and means for cocking the hammer and tripping it to project it toward said anvil.

2. An impact tool comprising a hollow tubular body member, an anvil slidably disposed within said body member and having a stem projecting forwardly from the body member to carry a tool-bit, a hammer slidably disposed within said body member rearwardly of said anvil, a hammer-projecting spring disposed for compression between a rearwardly facing portion of said hammer and a forwardly facing portion of said body member and urging said hammer toward said anvil, a handle member carried by said body member extending rearwardly thereof and movable longitudinally with respect thereto, a lost motion connection between said hammer and said handle member, a second spring disposed for compression between a rearwardly facing portion of said hammer and a forwardly facing portion of said handle member, and means for cocking the hammer and tripping it to project it toward said anvil.

3. The impact tool as set forth in claim **2** in which the rearwardly facing portion of the hammer against which said second named spring bears is adjustable longitudinally of the tool with respect to the handle member to apply a predetermined initial compression to the spring.

4. An impact tool comprising a hollow tubular body member, an anvil slidably disposed within said body member and having a stem projecting forwardly from the body member to carry a tool-bit, a hammer slidably disposed within said body member rearwardly of said anvil, a hammer-projecting spring disposed for compression between said hammer and a portion of said body member and urging said hammer toward said anvil, a handle member carried by said body member and movable longitudinally with respect thereto, a lost motion connection between said hammer and said handle member whereby retractive movement of said handle member will pull said hammer rearwardly and compress said projecting spring whilst the handle member may be moved in the forward direction independently of said hammer, a compression spring disposed between said handle member and said hammer urging the hammer and handle member apart to take up the slack of the lost motion connection, and latch means for retaining said hammer in cocked position upon retraction of the handle to a certain point of compression of said first named spring, and trip means for releasing said latch means actuated by forward movement of the handle beyond a certain point of compression of said second named spring, whereby the propulsive force of said second named spring is added to that of said first named spring in projecting the hammer against the anvil and tool-bit.

5. The impact tool as set forth in claim **4** in which means are provided for varying the initial compression of the second spring to apply variable propulsive forces to said hammer in addition to the force supplied by said first spring in projecting the hammer toward the anvil.

6. An impact tool comprising a hollow tubular body member, an anvil slidably disposed within said body member and having a stem projecting forwardly from the body member to carry a tool-bit, a hammer slidably disposed within said body member rearwardly of said anvil, a hammer-projecting spring disposed for compression between a rearwardly facing portion of said hammer and a forwardly facing portion of said body member and urging said hammer toward said anvil, a handle member carried by said body member extending rearwardly thereof and movable longitudinally with respect thereto, a lost motion connection between said hammer and said handle member whereby retractive movement of said handle member will pull said hammer rearwardly and compress said projecting spring whilst the handle member may be moved in the forward direction independently of said hammer, a second compression spring disposed between said handle member and said hammer urging the hammer and handle member apart to take up the slack of the lost motion connection, and a third spring disposed for compression between a rearwardly facing portion of said body member and a forwardly facing portion of said handle member, and means for effecting or interrupting the contact of said third spring with said body member at will, and means for cocking the hammer and tripping it to project it toward said anvil, said third spring assisting in effecting the relative retractive cocking movement between the handle member and the hammer on the one hand and the body member on the other.

7. An impact tool comprising a hollow tubular body member; an anvil slidably disposed within said body member and having a stem projecting forwardly from the body member to carry a tool-bit; a hammer slidably disposed within said body member rearwardly of said anvil; a hammer-projecting spring disposed for compression between a rearwardly facing portion of said hammer and a forwardly facing portion of said body member and urging said hammer toward said anvil; means for releasably latching said hammer to said body member upon retraction of the hammer a predetermined distance against the expansive tendency of said spring; a handle member carried by said body member, extending rearwardly thereof, and movable longitudinally with respect thereto; a lost motion connection between said hammer and said handle member whereby retractive movement of said handle member will pull said hammer rearwardly and compress said projecting spring whilst the handle member may be moved in the forward direction independently of said hammer; a second compression spring disposed between said handle member and said hammer urging the hammer and handle member apart to take up the slack of the lost motion connection and resisting forward movement of said handle; means on said handle member for releasing said latching means upon forward movement of the handle member; an abutment, adjustable along said hammer, against which said second spring

seats; and means for adjusting the position of said abutment to vary the initial compression of said second spring and thus the propulsive force exerted on said hammer by said second spring upon such forward movement of the handle member.

8. An impact tool comprising a hollow tubular body member; an anvil slidably disposed within said body member and having a stem projecting forwardly from the body member to carry a tool-bit; a hammer slidably disposed within said body member rearwardly of said anvil, and having a threaded stem portion extending rearwardly through and beyond said body portion; a hammer-projecting spring disposed for compression between a rearwardly facing portion of said hammer and a forwardly facing portion of said body member, and urging said hammer toward said anvil; means for releasably latching said hammer to said body member upon retraction of the hammer a predetermined distance against the expansive tendency of said spring; a handle member carried by said body member, extending rearwardly thereof, and movable longitudinally with respect thereto; a lost motion connection between said stem portion on said hammer and said handle member, whereby retractive movement of said handle member will pull said hammer rearwardly and compress said projecting spring whilst the handle member may be moved in the forward direction independently of said hammer; a second compression spring disposed between said handle member and said hammer urging the hammer and handle member apart to take up the slack of the lost motion connection, and resisting forward movement of said handle; means on said handle member for releasing said latching means upon forward movement of the handle member; an abutment element threaded on said stem portion, for adjustment therealong, against which said second spring seats; and means for rotating said hammer to adjust the position of said abutment element to vary the initial compression of the second spring and thus the propulsive force exerted on said hammer by said second spring upon such forward movement of the handle member.

9. An impact tool comprising a hollow tubular body member; an anvil slidably disposed within said body member and having a stem projecting forwardly from the body member to carry a tool-bit; a hammer slidably disposed within said body member rearwardly of said anvil, having a threaded stem member screwed into the main portion of the hammer and extending rearwardly beyond said body portion; a hammer-projecting spring disposed for compression between a rearwardly facing portion of said hammer and a forwardly facing portion of said body member, and urging said hammer toward said anvil; means carried by said body member for releasably latching said hammer thereto upon retraction of the hammer a predetermined distance against the expansive tendency of said spring; a tubular handle member telescoping upon said body member, extending rearwardly thereof, and movable longitudinally with respect thereto; a lost motion connection between said stem member and said handle member, whereby retractive movement of said handle member will pull said hammer rearwardly and compress said projecting spring whilst the handle member may be moved in the forward direction independently of said hammer; an abutment element threaded on said stem portion for adjustment therealong; a second compression spring disposed between said handle member and said abutment element urging the hammer and handle member apart to take up the slack of the lost motion connection, and resisting forward movement of said handle; means on said handle member for releasing said latching means upon forward movement of the handle member; and means for rotating said stem member to adjust the position of said abutment element therealong to vary the initial compression of the second spring and thus the propulsive force exerted on said hammer by said second spring upon such forward movement of the handle member.

10. The impact tool as set forth in claim 9 in which said tubular handle member terminates outwardly of said body member in an end wall, and in which there is provided an opening in said end wall through which said threaded stem member extends, and a head on the end of said stem member outwardly of said opening.

11. The impact tool as set forth in claim 10 in which a recess is provided in said end wall outwardly of said opening of sufficient depth to afford adequate movement of said head to correspond to the relative movement of said hammer and said handle during operation.

12. The impact tool as set forth in claim 11 in which there is provided a removable plug for the closure of said recess and means on the head of said stem member for the application of a tool to rotate said stem member.

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MILTON KAUFMAN, *Primary Examiner.*

L. P. KESSLER, *Assistant Examiner.*