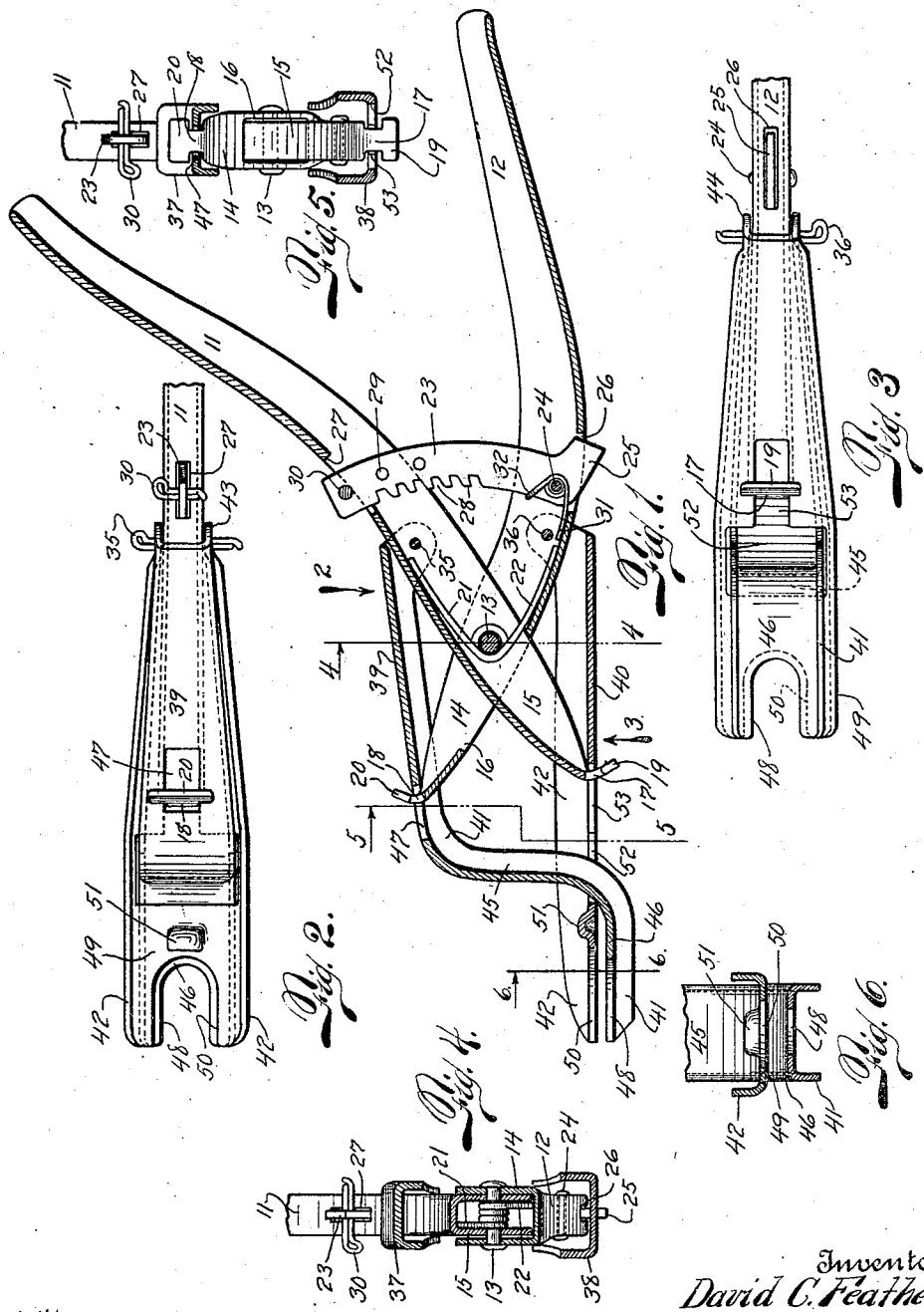
Nov. 16, 1926. 1,607,154

D. C. FEATHER

COIL SPRING COMPRESSING TOOL

Filed Nov. 1, 1924 3 Sheets-Sheet 1



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COIL SPRING COMPRESSING TOOL

Filed Nov. 1, 1924 3 Sheets-Sheet 2

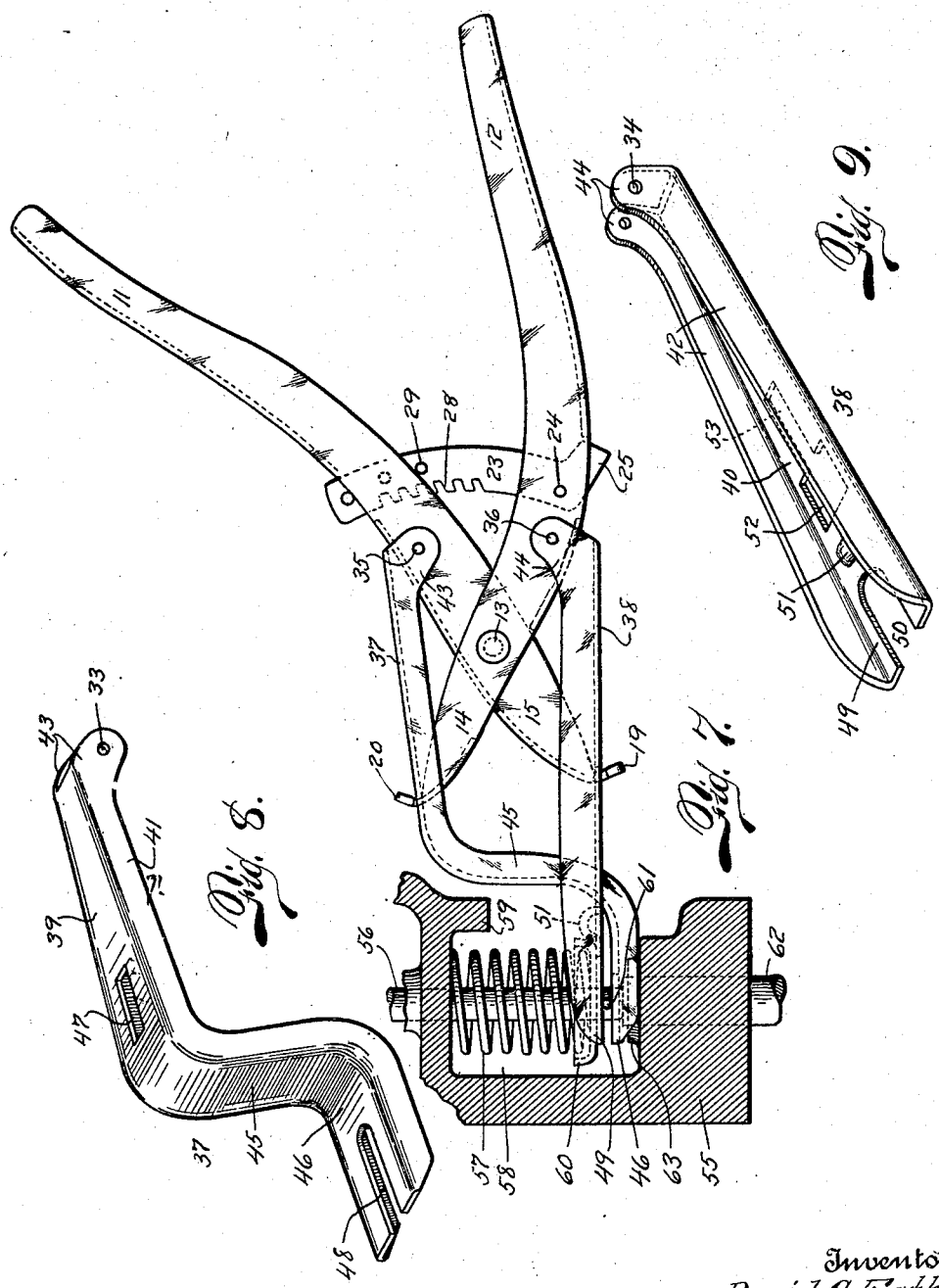


Fig. 9.

Fig. 7.

Fig. 8.

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Filed Nov. 1, 1924 3 Sheets-Sheet 3

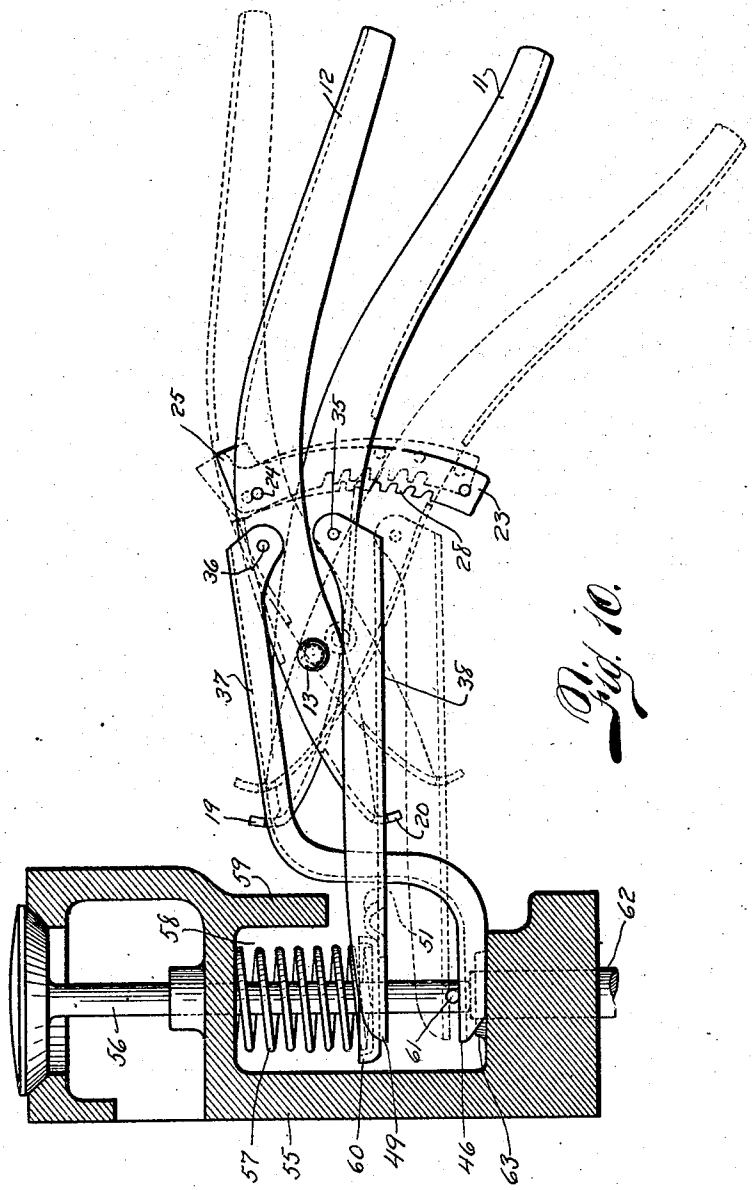


Fig. 10.

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1,607,154

UNITED STATES PATENT OFFICE.

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COIL-SPRING-COMPRESSING TOOL.

Application filed November 1, 1924. Serial No. 747,361.

This invention relates to spring compressing tools, the present improvements embodying certain unique structural elements of themselves and as assembled in combination, and the tool as a whole functioning in an improved manner, to overcome certain obstacles sometimes met with and which other forms of tools do not provide for, as will hereinafter appear.

In a prior filed application, Serial No. 708,710, I have disclosed an analogous type of spring compressor which, however, embodies a combined spring compressor and carrier holding tool. In that application I have rather fully stated various uses and conditions, generically and specifically, under which such tools may be very satisfactorily and economically employed, and accordingly, especially in avoidance of unnecessary repetition herein, reference is made to my aforesaid application, both as to the said varied fields of usefulness, in which the present improvements may likewise generally be employed, and also concerning the general utility of this class of tools in such relations. Like in my aforesaid application, and for the purposes of simplicity and brevity in disclosure, however, in certain views of the accompanying drawings, I have only illustrated the application of the present improved tool with particular reference to the spring controlled poppet valves of the cylinders of automobile engines, or the like, but it is to be emphasized that this is done with the understanding, of course, that such specific disclosure imposes no limitations whatsoever on the general uses of the invention itself.

In my former construction the spring compressing jaws are actuated in substantial parallelism towards each other in compressing a spring, thereby also drawing the ends of the coil spring towards each other, and thus that tool also functions as a carrier holder for the spring contained between the jaws thereof when so compressed. It follows, therefore, that in compressing a spring the said jaws must be applied thereto in substantially opened-out relation. While such a tool is very efficient in general usage, it not infrequently happens, however, with certain forms of structures, that obstacles are sometimes met with, in the nature of walls or other obstructions, which prevent ready access to the springs with the gripping jaws of the tool opened-out, so that it becomes desirable, if not actually necessary, to engage the spring, or equivalently its cupped seating washer, towards one end thereof to cause the compression of the spring in a direction towards its other end, which latter remains seated. As the end engaged is generally located lowermost, although not necessarily so, especially where the spring is associated with an automobile engine valve, these particular types of tools are frequently termed "valve spring lifters" and sometimes, perhaps erroneously, as "valve lifters".

One of the primary objects of my present improvements has been to devise simple, durable and effective means which, as combined with the still retained important feature of actuating the gripping jaw ends in substantial parallelism relatively to each other, will additionally provide for the proper end engagement of a coil spring, when the jaws are closed, for compressing the spring as said jaws are actuated from their relatively closed to opened-out positions.

Another feature of the present improvements is the provision of a trigger-like-actuated latching bar for locking the jaws, when under the tension of an engaged coil spring compressed thereby, at any desired adjusted positions.

The foregoing and other objects, features and advantages of the improvements, however, will be more clearly apparent as incidental to the following disclosure, and with these general outlining remarks, therefore, reference will now be immediately had to the accompanying drawings, illustrating a practical embodiment of the improvements, in which drawings

Figure 1 is a vertical centrally longitudinal sectional view of the improved tool; Figure 2 is a top plan view and Figure 3 a bottom plan view of the tool, with a portion of the operating handles omitted; Figures 4, 5 and 6 are detail transverse sectional views, taken respectively along the lines 4—4, 5—5 and 6—6 of Figure 1, and looking rearwardly in the direction of the indicating arrows; Figure 7 is a side elevational view of the tool, analogous to Figure 1 in that it is shown in the normally closed position, and showing the usual manner of applying the jaws of the tool to an engine

valve-controlling coil spring, a portion of the engine block being illustrated in vertical section; Figure 8 is an external perspective view of one of the jaws, an angular jaw; Figure 9 is an internal perspective view of the other one of the jaws, a straight jaw; and Figure 10 is a view analogous to Figure 7 in dotted lines, but in full lines showing the jaws opened-out and compressing the coil spring of the engine valve, and in this view the curved handles are shown in reversed positions relatively to the positions of Figure 7.

The handle body structure of the present tool is substantially the same as in my aforesaid application, being adapted in both instances as a common unit for the attachment thereto of the spring compressing jaw elements proper, which latter as an assorted set may be of various forms and are of an interchangeable character.

Broadly, therefore, the numerals 11 and 12 designate the handle end portions of complementary operating crossed handle members which may be suitably shaped longitudinally and transversely, the said handle members being pivoted together intermediately, as at 13, to provide forwardly projected continuations or extension arms 14 and 15. In economical and more practical manufacture, however, these operating elements are preferably of channelled formation, for lightness and proper alignment, with the handle portions longitudinally curved, substantially in the manner shown, for better gripping and leverage purposes, the cross-web of one of said forwardly projected arms being slotted as at 16, Figure 1, for the passage of the other said arm therethrough, and the ends of said arms being formed with angularly disposed shanks or necks 17 and 18 that are suitably headed or terminate in cross-lugs 19 and 20, which are adapted for providing sliding connections with the tool jaw elements proper, as will hereinafter appear, although other suitable sliding connections could be provided for. The said handle end portions, and therefore their forwardly projected arms also, are normally maintained divergently opened-out by any suitable resilient means, which in the drawings is shown as comprising an elongated spring that is centrally coiled around the pivot pin 13 and provides the divergent spring arms 21 and 22 engaging the respective cross-webs of the handles 11 and 12.

As a most convenient means for facilely locking or latching the crossed handle members in desired adjustable positions, while likewise providing for their ready release, I preferably employ a forwardly curved trigger-like-actuated ratchet bar 23. This bar is pivotally mounted towards one end, as at 24, within the channeled handle 12, the said pivoted end terminating in an angularly disposed finger element or trigger 25 that operates through a narrow slot 26, in the cross-web of the handle 12, with the other end of said bar longitudinally operating through a narrow slot 27 in the cross-web of the opposed handle 11, and the curved forward edge portion of said bar having a series of notches or ratchet teeth 28 for coaction with the forward edge face of said slot 27. For adjustably limiting the opening-out movements of the handle members, I may provide a series of apertures 29 through the ratchet bar 23 to receive a cotter pin 30. The teeth 28 of the ratchet bar are normally held out of engagement with the forward edge face of the slot 27, the ratchet bar being under a resilient tension for the rearward retractile swing of its upper end, the upper end being swung forwardly, against said resilient tension, by the actuation of the trigger 25 with an upward swing under the pressure of a finger of the user. This tensioning means is conveniently illustrated by an elongated spring that is coiled centrally around the axis pin 24 and which provides for the spring arm 31, forwardly engaging the cross-web of the handle 12, and a divergent spring arm 32 bent to engage the lower forward edge face of the ratchet bar, as seen from Figure 1. As a matter of fact, other tensioning means could be employed or the spring arm 31 could be a continuation of the handle tensioning spring arm 22, although, in the latter event, it would doubtless be desirable to reduce the diameter of that end, as the trigger spring 31—32 would naturally be a lighter or weaker spring than the handle tensioning spring 21—22.

At a short distance rearwardly of their pivotal axis 13, the side webs of the handles 11 and 12 are provided with paired apertures adapted for registration with paired apertures 33 and 34, respectively, disposed at the inner ends of the spring compressing jaw elements proper, which latter will now be fully described, for the detachable pivotal connection of the inner ends of said jaw elements to a complementary one of the said opposed operating handles, as by means of cotter pins 35 and 36 or their equivalent.

One of these jaw elements 37 may be conveniently referred to as an angular jaw element, and the other one 38 as a straight jaw element, being respectively shown in detail and detached at Figures 8 and 9. Both are preferably of channelled construction, being respectively formed with the cross-webs 39 and 40 and the narrow side-webs or marginally inturned longitudinal flanges 41 and 42, the latter terminating at their inner ends with attaching ears or lugs 43 and 44 that are provided with the paired apertures 33 and 34 before referred to.

The angular jaw element 37 is bent to provide an angularly disposed offsetting arm 45 between its rear straight section and a forwarly projected offset foot-like jaw end 46 that is substantially parallel with the said rear straight section, the cross-web of said rear straight section, adjacently of the offsetting arm 45 being provided with a longitudinal slot 47, and the said foot-like projected jaw end 46 having its cross-web provided with a longitudinal slot 48 that opens out through its forward edge face. In the applied use of the tool, the angular jaw element 37 may be said to be a stationary member, as its foot-like jaw end 46 is adapted to be immovably seated upon a fixed part of the engine body, or its equivalent, normally supporting that end of a coil spring's seating washer which is to be engaged, for the elevatory compression of the spring, by the then movable straight jaw element's jaw end.

The cross-web of the jaw end 49 of the straight jaw element 38 is provided with a longitudinal slot 50 that opens out through its forward edge face, and this slot 50 is adapted for alignment with the slot 48 of the angular jaw, although the slot 50 is shown larger than the slot 48.

As this straight jaw end 49 is adapted to seat the seating cupped washer for the end of the coil spring to be elevatedly compressed (see Figs. 7 and 10) the cross-web thereof may be provided with a lug or stop 51, immediately behind the slot 50, for engaging the periphery of the washer at the rear and with the side-webs or flanges 42 engaging the same at the sides. However, the lug 51 could be dispensed with and the said flanges 42 be so shaped as to provide for the proper reception of said washer.

Immediately at the rear of said lug 51, or rearwardly of the slot 50, the cross-web of the straight jaw element is provided with an enlarged aperture or rectangular slot 52, adapted for the free passage therethrough of the offsetting arm 45 of the angular jaw element, and which enlarged aperture 52 merges into a longitudinal slot 53 that is adapted for complementary association with the slot 47 of the cross-web of the rear section of the angular jaw element.

Before finally describing the tool in assembly, and its manner of operation, I will first briefly indicate the additional elements shown at Figures 7 and 10, illustrating the use of the tool in association with engine valve springs. In these views, 55 designates a portion of a cylinder block mounting a poppet valve, the stem 56 of which is surrounded by the valve controlling coil spring 57, housed in a chamber 58 that frequently has a depending wall projection 59, or other analogous obstruction, which prevents access to the spring with the average valve spring compressing tools heretofore employed. One end of the spring 57 is seated by a cupped washer 60, loosely encompassing the valve stem, and this washer in turn seats upon a retaining cross-pin 61 extending through the free end of the valve stem, the said free end of the valve stem being engaged by a cam-actuated push-rod 62 that generally operates through a boss 63 formed on the bottom of the housing chamber 58, and all of which is fully understood.

In the assembly of the jaw elements with the handle unit structure of the tool, the offsetting arm 45 of the angular jaw element 37, which I commercially designate as an S-jaw or a Z-jaw, operates through the enlarged aperture 52 of the straight jaw element 38, the cross-web of the foot-like jaw end 46 being proximately opposed to the cross-web of the jaw end 49, in normally closed relation under the controlling resilient tension of the spring 21—22 and associated parts, and the side-webs or flanges 42 and 41 thereof, respectively, are projected in opposite directions. With the arrangement of the operating handles 11 and 12, as shown at Figures 1 and 7, the neck 18 rides in the slot 47 and the neck 17 rides in the slot 53, the cross-lugs or heads 19 and 20 wiping over the outer surfaces of the cross-webs of their complementary jaw elements, thus providing for sliding connections between the extremities of the arms 14 and 15 and their complementary jaw elements forwardly of the pivotal axis 13. Rearwardly of the pivotal axis 13, in these views, the rear end of the angular jaw is pivotally connected to the handle 11 of the arm 15, as by means of the ears 43 and the cotter pin 35, and likewise the rear end of the straight jaw element is pivotally connected to the handle 12 of the arm 14, as by means of the ears 44 and the cotter pin 36. In Figure 10, however, it will be noted that the jaw elements are positioned the same as heretofore described but that the handle unit structure is reversed, being necessary sometimes to avoid obstructions outside of the actual zone of the coil spring being compressed, so that in this reversed position, the neck and cross-lug sliding connection 17—19, of the arm 15, is made with the angular jaw element 37, and the neck and cross-lug sliding connection 18—20 is made with the straight jaw element 38, through the respective slots 47 and 53, or in a manner just the reverse of that described with reference to Figures 1 and 7. In all of the foregoing, I have described the various elements and the assembly thereof as they are actually shown on the drawings, but in some respects equivalent constructions and connections might be employed, without departing from the gist of the invention.

Excepting for the reversal of the handle

unit in Figure 10, the construction, assembly and manner of operating the tool is substantially the same in all of the illustrations, and in now describing the operations, reference will be had conjointly to Figures 7 and 10, the former showing the tool as initially applied for compressing a coil spring, and the latter showing the same, in full lines, with said spring compressed and with the parts locked or latched against the tension of said spring.

As seen from Figure 7, or the sectional view at Figure 1, the jaw end 46 normally extends in slightly spaced juxtaposition along the far side or off side face of the jaw end 49, the handles 11—12 and their forward crossed arms being then opened-out and it will be particularly noted that both said jaw ends are disposed on the same side of a transverse longitudinal plane extending approximately through the central zone or axis pin 13 of the tool, the jaw ends being underhung or undershot, as it were, with relation to the rear section of the angular jaw element 37, thereby providing for substantial space over the jaw ends, relatively to the rear section of the angular jaw element, to afford proper clearance space around any obstructions, such as indicated at 59.

In such position, the forked or slotted jaw ends are inserted into association with the coil spring 57, to be compressed, the spaced or forking-like branches of the jaw ends, formed as by the slots 48—50, straddling the valve stem 56, with the webs of the jaw end 46 encompassing the boss 63 and with the webs of the jaw end 49 encompassing and snugly seating the cupped washer 60, supporting that end of the coil spring, in which positions the cross-web of the relatively straight jaw end is disposed on one side of the retaining pin 61 and the cross-web of the angular jaw end is disposed on the other side thereof.

It follows, therefore, upon exerting a gripping pressure upon the handles 11—12 to move the same towards each other, that the pivotal connections at 35—36 and the sliding interlock connections at 19—20, respectively, and functioning as swinging fulcrums, will likewise be moved towards each other complementally, actuating the rear portions of the jaw elements towards each other, in maintained substantial parallelism, while actuating the jaw ends 46—49 away from each other, also in substantial parallelism, whereby the coil spring 57 is compressed and the cupped washer 60 moved away from the retaining pin 61, permitting of the ready withdrawal of said retaining pin and hence the facile removal of the valve.

During the closing in movements of the handles 11—12, and when the spring 57 has been sufficiently compressed or while it is being compressed, pressure is exerted on the trigger projection 25 by means of a finger of the user, or the thumb if the handles are disposed in reversed position as at Fig. 10, to swing the other end of the ratchet bar 23 towards the forward edge face of the slot 27, see Fig. 1 for clearer illustration, whereupon an appropriate notch 28 engages over the said forward edge face of the slot 27, and the jaws and other parts are held locked or latched, against the tension of the spring 57 compressed thereby, until the ratchet bar is retracted. The upper end of the ratchet bar 23 being normally held away from the forward edge face of the slot 27, under tension of the spring end 32, it will be obvious that the release of the ratchet bar will be immediately accomplished upon a further slight squeezing together of the handles 11—12, which is done after the retaining pin 61 has been withdrawn from the valve stem 56, when the jaw ends are permitted to move towards each other, for relieving the compression of the spring 57 and the removal of the tool.

In assembling the valve and the retaining pin 61, the same operations are performed by the tool, and the tool jaw ends are always normally held in approximately closed position, for ready insertion into association with a coil spring to be compressed, by virtue of the handle tensioning spring arms 21—22, as hereinbefore referred to.

Although I have thus fully set forth the improvements from various angles, the objects, advantages and functioning of which will be clearly apparent it is believed, it will nevertheless be understood that I do not wish to unnecessarily restrict the invention to all of the details exactly as disclosed, excepting as they may come within the terms of the ensuing claims, or equivalent elements or combinations thereof, or as fairly interpreted in the light of the specification if requisite.

What I do claim, as new and patentable, is:—

1. A coil spring compressing tool, embodying a pair of handles operating towards and away from each other, a relatively straight jaw element, movable in applied use, terminating forwardly in a jaw end adapted for elevatedly compressing association with the lower end of said coil spring, an angular jaw element, held stationary in applied use, embodying an offsetting arm, extending towards and beyond said other jaw element, for normally projecting its jaw end immediately along the offside face of the other jaw end, in proximately closed relation forwardly of said handles, resilient means for automatically holding said jaw ends normally in said proximately closed relation, and means so

connecting said jaw elements to said handles as to cause said jaw ends to open and close concurrently with the respective closing and opening movements of said handles.

2. A coil spring compressing tool, embodying a pair of handles operating towards and away from each other, a relatively straight jaw element, movable in applied use, terminating forwardly in a jaw end adapted for elevatory compression association with the lower end of said coil spring, an angular jaw element, held stationary in applied use, embodying an offsetting arm, extending through an aperture of said relatively straight movable jaw element, for normally projecting its jaw end immediately along the offside face of the other jaw end, in proximately closed relation forwardly of said handles, resilient means for automatically holding said jaw ends normally in said proximately closed relation, and means so connecting said jaw elements to said handles as to cause said jaw ends to open and close concurrently with the respective closing and opening movements of said handles.

3. A coil spring compressing tool, embodying a pair of pivotally connected crossed handle elements, a pair of jaw elements terminating in suitably formed complementary jaw ends, one of said jaw elements having an offsetting arm, extending towards and beyond said other jaw element, for normally projecting its jaw end immediately along the offside face of the other jaw end, in proximately closed relation forwardly of said handle elements, resilient means for automatically holding said jaw ends normally in said proximately closed relation, and paired complemental means connecting said jaw elements to said handle elements forwardly and rearwardly of their pivotal connection, one of said paired complemental means providing for sliding connections and the other said paired complemental means providing for pivotal connections.

4. A coil spring compressing tool, embodying a pair of pivotally connected crossed handles, a pair of jaw elements terminating in suitably formed complementary jaw ends, one of said jaw elements having an offsetting arm, extending through an aperture of the other jaw element, for normally projecting its jaw end immediately along the offside face of the other jaw end, in proximately closed relation forwardly of said handles, resilient means for automatically holding said jaw ends normally in said proximately closed relation, and paired complemental means connecting said jaw elements to said handles forwardly and rearwardly of their pivotal connection, one of said paired complemental means providing sliding connections and the other said paired complemental means providing for pivotal connections.

5. A coil spring compressing tool, embodying a pair of pivotally mounted handles, a pair of jaw elements operatively connected thereto and terminating at their forward ends in suitably formed and disposed complementary jaw ends, a latching bar pivotally connected at one end to one of said handles and at its other end projected into association with the second handle, the said latching bar having a forward edge ratchet face, adapted to adjustably engage co-acting means provided forwardly thereof by said second handle, and resilient means for automatically maintaining said ratchet face, during both closing and opening movements of said handles, normally out of latching engagement with said co-acting means provided for by said second handle.

6. A coil spring compressing tool, embodying a pair of pivotally mounted handles of channel-bar formation, a pair of jaw elements operatively connected thereto and terminating at their forward ends in suitably formed and disposed complementary jaw ends, the cross-webs of said channel-bar handles being formed with an opposed pair of narrow longitudinal slots, a latching bar pivotally connected towards one end to one of said handles and provided at that end with a trigger-finger operating through the adjacent one of said slots, the swinging end of said latching bar being projected for longitudinal operation through the opposed slot of the second handle, and the said latching bar having a forward edge ratchet face adapted to adjustably engage the forward edge face portion of the slot of said second handle, and resilient means, in engagement with said latching bar, tensioned to automatically maintain the swinging end of said latching bar rearwardly in its slot, during both closing and opening movements of said handles, with said ratchet face thus normally held disengaged from said forward edge face portion thereof.

7. A coil spring compressing tool, embodying a pair of pivotally connected crossed handles of channeled formation, the cross-web of one of said handles having a longitudinal slot, a latching bar in pivotal connection at one end with the other of said handles and the swinging end thereof being projected for longitudinal operation through said slot, the said bar having a forward ratchet face adapted to adjustably engage the forward edge portion of said slot, resilient means in engagement with said bar and tensioned to automatically maintain the swinging end thereof rearwardly in said

slot, during both closing and opening movements of said handles, with said ratchet face normally disengaged from the forward edge portion of said slot, a pair of jaw elements terminating in suitably formed complementary jaw ends, one of said jaw elements having an offsetting arm, extending through an aperture of the other jaw element, for normally projecting its jaw end immediately along the offside face of the other jaw end in proximately closed relation, resilient means for automatically holding said jaw ends normally in said proximately closed relation, and suitable paired means connecting said jaw elements to said handles forwardly and rearwardly of the pivotal connection between the latter.

In testimony whereof, I affix my signature.

DAVID C. FEATHER.