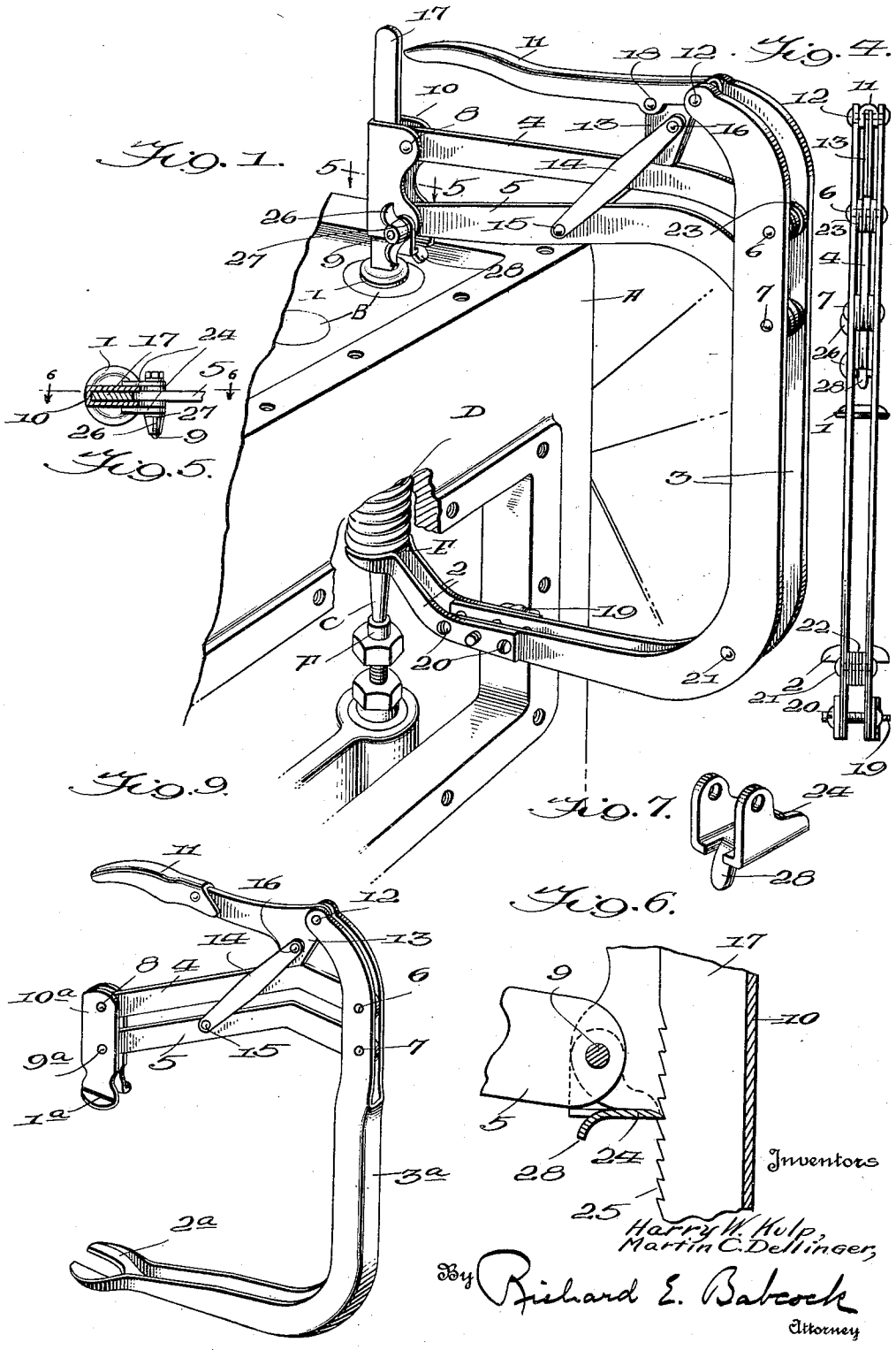
June 14, 1932. H. W. KULP ET AL 1,862,793

VALVE SPRING LIFTER

Filed May 29, 1930 2 Sheets-Sheet 1



Inventors
Harry W. Kulp,
Martin C. Dellinger,
By Richard E. Babcock
Attorney

June 14, 1932. H. W. KULP ET AL 1,862,793

VALVE SPRING LIFTER

Filed May 29, 1930 2 Sheets-Sheet 2

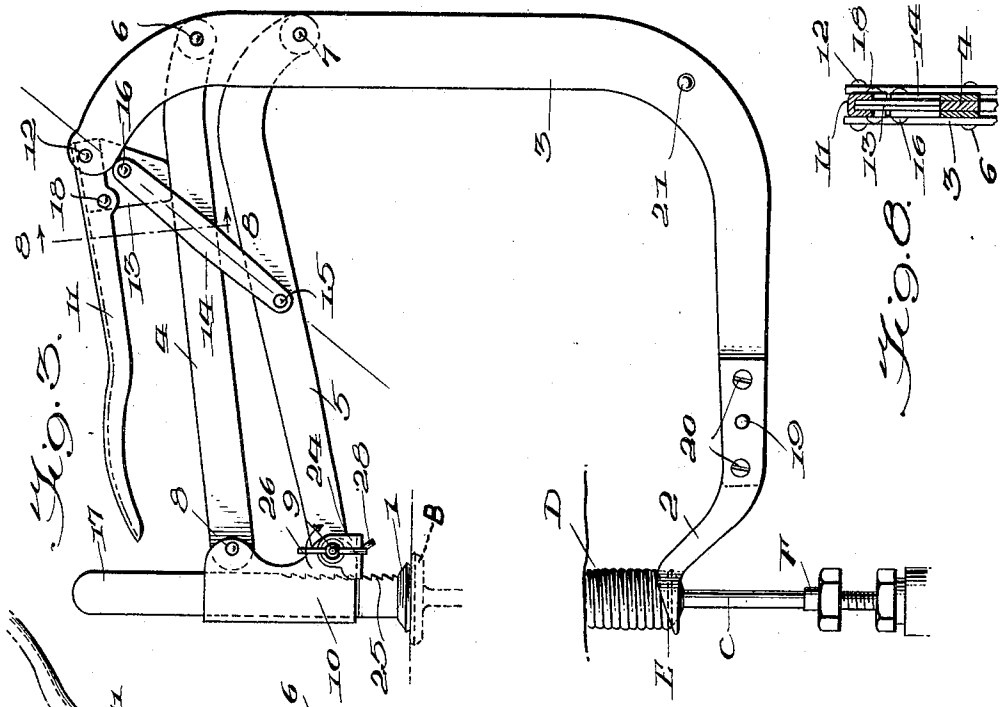


Fig. 2.

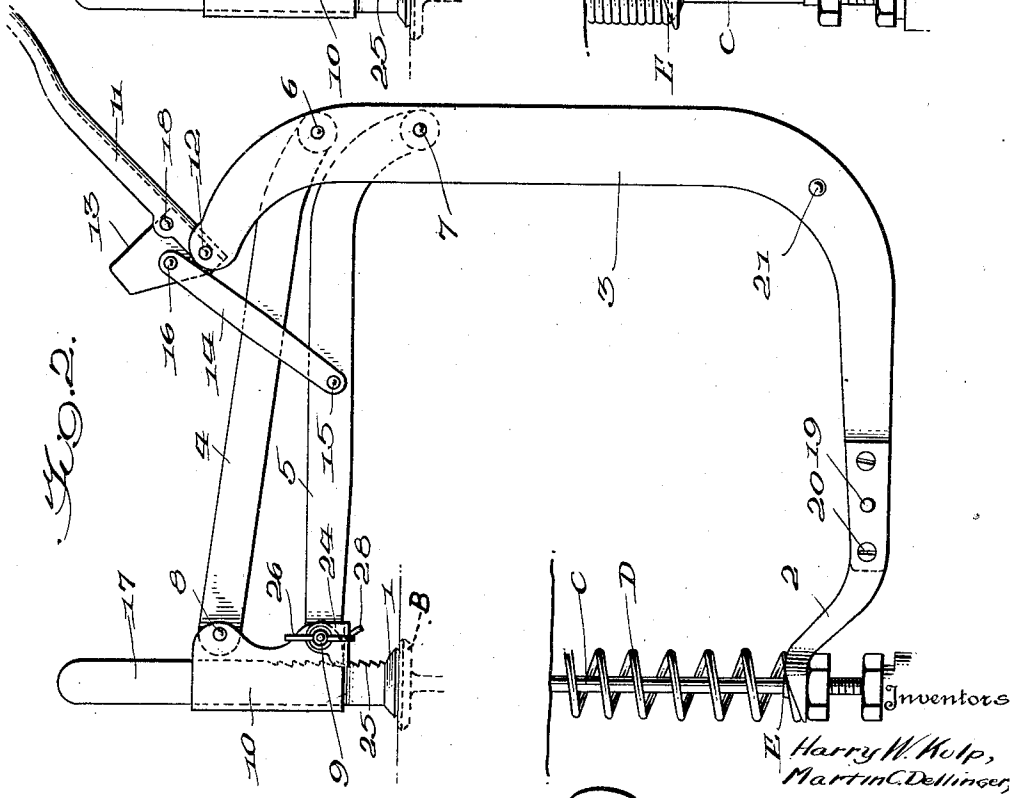


Fig. 3.

Fig. 8.

Inventors
Harry W. Kulp,
Martin C. Dellinger,
By Richard E. Babcock
Attorney

Patented June 14, 1932 1,862,793

UNITED STATES PATENT OFFICE

HARRY W. KULP AND MARTIN C. DELLINGER, OF LANCASTER, PENNSYLVANIA

VALVE-SPRING LIFTER

Application filed May 29, 1930. Serial No. 457,027.

This invention relates to valve-spring lifters or compressers for use in compressing or lifting the lower ends of the valve-springs as arranged about the valve-stems of poppet valve type internal combustion engines to permit the retaining or locking elements or key to be easily removed or inserted in removing or replacing the valves and their stems incident to the grinding of the valves or their removal or replacement or adjustment for any reason.

The primary objects of this invention are to provide a very rugged tool with great leverage and quick action, notwithstanding the great strength of the spring, for lifting or compressing the latter; to provide a special cam stop means in combination with a special lever assembly for stopping the movement of the handle toward the levers and to maintain the handle in such position, while preventing pinching of the mechanic's hand between the handle and adjacent parts and maintaining said handle in definite spaced relation to all other parts so as to be easily accessible and fully gripped by the mechanic with one hand, to provide a special C form frame construction giving great visibility about the foot and jaw of the tool whereby the tool may be easily and quickly operated by a single mechanic to perform the operations necessary incident to the removal or replacement of the valves; to provide a special adjustable pressure post or foot; to provide easy, simple, quick and positive means for adjusting the vertical position of said post or foot, and to otherwise improve and simplify such devices.

In the accompanying drawings:

Figure 1 represents a perspective view of a tool embodying our invention as applied in use to the valve-spring and valve of an internal combustion engine fragmentarily and conventionally shown, said tool being illustrated in closed position;

Figure 2, a side elevation of said tool in open condition as applied to a valve-spring and valve;

Figure 3, a view similar to Fig. 2, the tool being closed or locked to hold the valve-spring in compressed condition or lifted;

Figure 4, a rear elevation of said tool in closed condition;

Figure 5, a sectional view on line 5—5 of Fig. 1, looking in the direction of the arrows, and omitting foot 1;

Figure 6, a sectional view on line 6—6 of Fig. 4, looking in the direction of the arrows and on an enlarged scale;

Figure 7, a detail perspective view of the post-locking catch;

Figure 8, a sectional view on line 8—8 of Fig. 3, looking in the direction of the arrows; and

Figure 9, a perspective view of a modified form employing an integral channel sheet metal frame.

Referring now in detail to the drawings, A indicates a conventional internal combustion engine having poppet valves, such as B, with valve-stems C about which are respectively arranged valve-springs, such as D, having their respective lower ends bearing on a cup or washer E, said cup or washer E being normally prevented from slipping down off the end of the valve-stem C by locking elements or horseshoes, not shown, adapted to engage the upper face of the annular shoulder or enlargement F at the lower end of stem C and normally forced radially inwardly toward each other against the intervening tapering portion of the valve-stem C by the cooperating lower face of the cup or washer E, all in accordance with usual well known practice, or any suitable means functioning as a locking element, such as a cotter-pin or cross-pin long well known in this art for this particular function, may be employed.

The tool of the present invention comprises a foot 1 adapted to rest on the upper face of a valve B, a pair of adjustable jaws 2 adapted to straddle the valve-stem C and engage the lower face of the cup or washer E, a C-shape type frame preferably comprising two spaced preferably thick sheet metal plates 3, two parallel movement arms 4 and 5 pivotally mounted adjacent each other at one end between the upper portion of the plates 3 on pivot-pins 6 and 7 respectively and having their inner ends pivotally connected between the adjacent side portions of the sleeve 10 by means of the pivot-

pin 8 and adjusting bolt 9 respectively; an operating handle 11 pivotally mounted between the extreme upper end portion of the plates 3 by means of a pivot-pin 12 and formed with or having a cam 13 adapted to engage the upper edge face of arm 4 to limit the pivotal movement of handle 11 toward arm 4, a pair of preferably thick sheet metal thrust links or levers 14 pivotally connected at one end to arm 5 by pivot-pin 15 passing through their said end portions and the intervening portion of arm 5 and pivotally connected at their other ends to the cam 13 or other part of, or part rigidly secured to and carried by, the handle 11 by a pivot-pin 16, and a preferably thick flat sheet metal shank or post 17 vertically slidably adjustable in the sleeve 10 and to the lower end portion of which the foot 1 is preferably rigidly secured.

The distance between the axes of pivot-pins 6 and 7 is substantially the same as the distance between the axes of pivot-pin 8 and bolt 9 to maintain the sleeve 10 and post 17 in alignment with the axis of valve-stem C throughout the range of movement of the parallel movement links 4 and 5.

The cam 13 and the pivot-pin 12 are so related to the thrust link or lever 14 and the pivotal points of connection of the latter to the arm 5 by pivot-pin 15 and to the cam 13 by pivot-pin 16 that when the flat lower face of the cam 13 is in engagement with the upper edge of arm 4 the pivot-pin 16 will be beyond dead center of pivot-pin 12; in other words, so that the thrust link or lever 13 will exert pressure on the cam 13 on a line passing to the rear of pivot 12, as indicated in Fig. 3, so that the compressed spring D will act to hold the parts in closed or locked relation.

The handle 7, cam 13, arms 4 and 5 and thrust link 14, together with their points of pivotal mounting or connection, are so related that the handle 11 cannot be turned about its pivot 12 toward arm 4 beyond the point where the straight lower face of cam 13 is in contact for substantially its full area with the adjacent upper edge portion of the arm 4. This guards against the possibility of the mechanic having his hand or a finger pinched between the adjacent edge faces of the handle 11 and arm 4, either due to his own pressure on the handle 11 or due to the action of the compressed spring D after the longitudinal central line of thrust link 14 moves to the rear of pivot-pin 12.

Of course, it is not essential that the cam 13 should have a straight lower face of unbroken area so long as it is so formed and related to the link 14, handle 11, arms 4 and 5 and their fulcrum points as to definitely lock against the arm 4 to prevent the closer approach thereto of the handle 11.

The cam 13 may be formed of two thicknesses of sheet metal secured between the sides of the rear end portion of the U-shape channel sheet metal handle 11 by means of the pivot 12 and a rivet 18, and secured together against relative movement by said rivet 18 and pivot-pin 12 in cooperation with the overlapping sides of handle 11 and by pivot-pin 16 passing through the upper ends of the thrust links 14 and said cam 13. However, it is not essential that said cam 13 shall be so formed of two thicknesses of sheet metal, or that it shall be sheet metal, or that it shall be formed separately from the handle 11. Operatively considered, it is a part of the handle, as though integral therewith or welded thereto, moving rigidly therewith throughout the range of movement of said handle 11.

The plates 3 will preferably be held substantially parallel to each other except for their lower forward portions carrying the respective jaws 2, which portions may be adjusted toward and from each other by an adjusting screw 19. Said jaws 2 may be removably mounted on the respective plates 3 by means of screws 20.

Pivot-pins 12, 6 and 7 serve to hold the upper portions of the plates 3 together, and a rivet pin 21 serves to hold their lower portions together, while spacing washers or blocks or sleeves 22 disposed about rivet 21 between plates 3 and spacing washers 23 disposed about the pivot-pins 6 and 7 respectively and respectively between each face of the respective arms 4 and 5 and the opposed faces of plates 3 serve to maintain said plates 3 in the desired spaced substantially parallel relation to each other.

The sleeve 10 will preferably be of sheet metal and U-shape in cross-section to slidably receive the post or shank 1 and will have rearwardly extending portions to accommodate between them respective adjacent end portions of arms 4 and 5 and to receive the transverse pivot-pin 8 and bolt 9 respectively extending through said sleeve portions and the intervening end portions of the respective arms 4 and 5.

The lower rear corners of the sides of said sleeve 10 are rounded off to permit the rocking movement or partial rotation of the post or shank-locking catch, plate or element 24 about the bolt 9 to engage with, or to be disgengaged from, the serrations or teeth 25 formed in or on the adjacent rear vertical edge of post or shank 17, said teeth preferably having upwardly presented flat or horizontal faces, and said locking catch preferably having a flat or horizontal lower face immediately adjacent its rear or operative edge or face, and preferably having its upper face at said point downwardly and forwardly inclined or beveled toward the lower face thereof and said post or shank 17.

Said locking catch 24 is preferably formed with a pair of perforated vertically disposed lugs having their perforations in registry in a transverse plane, said lugs receiving be-

tween them the lower rear portion of said sleeve 10 and respectively engaging with their inner faces the respective opposed outer faces of said sleeve 10 and receiving in their registering perforations the bolt 9 which extends through the said lugs, the adjacent intervening portion of arm 5, and the interposed side portions of sleeve 10, to adjustably and pivotally connect said parts.

The bolt 9 is formed with a head to clamp one of said lugs between it and the opposed face of sleeve 10 and receives on its screw-threaded end a nut 26, which will preferably be a wing-nut, and a friction or lock washer 27 is preferably interposed about said bolt 9 between the opposed faces of said nut 26 and the adjacent opposed face of the other lug of catch 24, so that by turning the nut 26 up on the bolt 9 the catch 24 may be firmly held in locking engagement with, or relation to, the teeth 25 of post or shank 17, and by turning the nut 26 in the reverse direction said catch 24 may be released from such frictional grip to be easily moved to inoperative position about the axis of bolt 9 by pressure on the preferably integral depending lug or finger 28.

It will be seen that as arranged the lock catch 24 will not positively resist and prevent movement of the post or shank 17 through the sleeve 10 toward jaws 2, and even if frictionally gripped in operative locking position such frictional grip can yield to permit said catch 24 to swing about the axis of bolt 9 to move out of the path of the teeth 25, whereas pressure in the reverse direction will force the horizontal upwardly presented face of the adjacent tooth 25 into firm engagement with the opposed lower face of catch 24 and will force the upper face thereof against the horizontal lower edge portion of the sleeve 10 which it spans, and also will tend to force the end edge face of said catch 24 forwardly and upwardly about the axis of bolt 9 into engagement with post or shank 17, so positively preventing endwise movement of the post or shank 17 away from the jaws 10 when catch 24 is in operative position.

Also, it is to be noted that the rotary movement of the nut 26 in being screwed on to the bolt 9 and the frictional contact between frictional or lock-washer 27 and the opposed faces of the nut 26 and the adjacent lug of catch 24 will result in moving the catch or lock 24 to operative position if it be in inoperative position, and that the reverse rotation of the nut 26 will, for the same reason, result in moving the catch or lock 24 to inoperative position, the bolt 9 being formed with a right-hand thread as usual, not shown, the arrow on Fig. 3 adjacent nut 26 indicating the direction of rotation of said nut 26 when being screwed on the bolt 9 to clamp the lock or catch 24 in operative position.

In the modification illustrated in Fig. 9 the construction and operation are the same as in the preferred form, except that the frame is formed of a single U-shape channel sheet metal stamping 3^a having its upper portion slotted and mashed toward each other to receive between them the ends of arms 4 and 5 pivotally mounted therebetween on pivot-pins 6 and 7 respectively, the bifurcated jaw portion 2^a being integral with the frame, the rivet 21 and the spacing washers 22 and 23 being omitted, and the foot 1^a being integral with the U-shape channel sheet metal clip or bracket 10^a between the sides of which extend the forward end portions of arms 4 and 5 respectively pivotally connected thereto by pivot-pins 8 and 9^a, and the post or shank 17 being omitted.

This modified form is intended for use with the smaller types of internal combustion engines which do not employ the more powerful valve-springs and consequently may be made most economically of lighter weight sheet metal stampings while maintaining the highest degree of efficiency in their more limited field of use.

As to both forms the tool is designed for production from sheet metal by usual sheet metal stamping, riveting and assembling operations.

We claim:

1. A valve-spring lifting tool comprising a frame, a pair of jaws mounted on said frame, a sleeve, a post slidably mounted in said sleeve for movement therein toward and from said jaws, a pair of parallel movement arms pivotally connected at their respective end portions to said frame and to said sleeve respectively, said post having a vertically extending portion formed with a plurality of teeth having abrupt flat horizontal faces, a catch mounted for partial rotation about the axis of the pivotal connection of one of said arms to said sleeve and straddling said sleeve and operatively engaging the lower face of said sleeve and the opposed upper face of one of said teeth to lock said post against movement in said sleeve away from said jaws, and means for holding said catch in operative position, in combination with a handle pivotally mounted in the upper portion of said frame adjacent to one of said arms, said handle being provided with a cam having a long straight lower edge face substantially parallel with the opposed edge face of said adjacent arm when in engagement therewith, a pair of thrust links extending parallel to, and in registry with, each other and respectively disposed on opposite sides of said cam and arms, and pivot pins respectively passing through the registering respective end portions of said links and the intervening portions respectively of said cam and the distant arm, said lower face of said cam engaging the opposed upper face of the ad-

jacent arm in the closed position of the tool, and in such position the line of thrust of said thrust links extends below and to the rear of the pivotal point of mounting of said handle in said frame, whereby the spring being compressed will hold the tool closed and whereby said cam will hold the gripping portion of said handle in spaced relation to said adjacent arm to be easily gripped by hand.

2. A valve-spring lifting tool comprising a frame, a pair of jaws mounted on said frame, a sleeve, a post slidably mounted in said sleeve for movement therein toward and from said jaws, and a pair of parallel movement arms pivotally connected at their respective end portions to said frame and to said sleeve respectively, in combination with a handle pivotally mounted in the upper portion of said frame adjacent to one of said arms, said handle being provided with a cam having a long straight lower edge face substantially parallel with the opposed edge face of said adjacent arm when in engagement therewith, a pair of thrust links extending parallel to, and in registry with, each other and respectively disposed on opposite sides of said cam and arms, and pivot-pins respectively passing through the registering respective end portions of said links and the intervening portions respectively of said cam and the distant arm, said lower face of said cam engaging the opposed upper face of the adjacent arm in the closed position of the tool, and in such position the line of thrust of said thrust links extending below and to the rear of the pivotal point of mounting of said handle in said frame, whereby the spring being compressed will hold the tool closed and whereby said cam will hold the gripping portion of said handle in spaced relation to said adjacent arm to be easily gripped by hand.

3. A valve-spring lifting tool comprising a frame, a pair of jaws mounted on said frame, an element carrying a pressure foot, and a pair of parallel movement arms pivotally connected at their respective end portions to said frame and to said element respectively, in combination with a handle pivotally mounted in the upper portion of said frame adjacent to one of said arms, said handle being formed with a cam having a long straight lower edge face, a thrust link, and pivot-pins respectively connecting the end portions of said link to said cam and the distant arm respectively, said lower face of said cam engaging the opposed upper face of the adjacent arm in the closed position of the tool, and in such position the line of thrust of said thrust link extending below and to the rear of the pivotal point of mounting of said handle in said frame, whereby the spring being compressed will hold the tool closed and whereby said cam will hold the gripping portion of said handle in spaced relation to said adjacent arm to be easily gripped by hand.

4. A valve-spring lifting tool comprising a frame, a pair of jaws mounted on said frame, a pair of parallel movement arms pivotally connected at their respective rear end portions to said frame, means pivotally connecting the front end portions of said arms in spaced relation, in combination with a handle pivotally mounted in said frame adjacent to one of said arms, said handle being formed with a cam opposed to the edge face of said adjacent arm, a thrust link, and pivot-pins respectively connecting the end portions of said links to said handle and the distant arm, said cam engaging the opposed upper face of the adjacent arm in the closed position of the tool, and in such position the line of thrust of said thrust links extending below and to the rear of the pivotal point of mounting of said handle in said frame, whereby the spring being compressed will hold the tool closed and whereby said cam will hold the gripping portion of said handle in spaced relation to said adjacent arm to be easily gripped by hand.

5. A valve-spring lifting tool comprising a frame, a pair of jaws mounted on said frame, a pair of parallel movement arms pivotally connected at their respective rear end portions to said frame, means pivotally connecting the front end portions of said arms, in combination with a handle pivotally mounted in the upper portion of said frame adjacent to one of said arms, said handle being provided with a cam opposed to the edge face of said adjacent arm, and rigid thrusting means pivotally connecting said handle and one of said arms, said cam engaging the opposed face of the adjacent arm in the closed position of the tool.

6. A valve-spring lifting tool comprising a frame having a jaw portion, a pair of parallel movement arms having their respective rear end portions pivotally connected to said frame and having their front end portions pivotally connected in spaced relation and a pressure foot carried by said front end portions of said arms and moved thereby toward and from said jaw portions, in combination with a handle pivotally mounted in said frame and formed with a face portion extending in spaced relation to the rest of said handle, and a thrust link pivotally connected to said handle and to one of said levers, said points of pivotal connection of said thrust link assuming such relation to the pivotal point of connection of said handle to said frame that the line of thrust will lie below and to the rear of the latter in the closed condition of the tool, wherein said face portion of said handle engages the opposed face of one of said arms in front of said thrust link.

7. A valve-spring lifting tool comprising a

frame having a jaw portion, parallel movement means connected to said frame and having their front end portions connected, in combination with a handle pivotally mounted in said frame and formed with a face portion extending in spaced relation to the rest of said handle, and a thrust link pivotally connected to said handle and to said parallel movement means, said points of pivotal connection of said thrust link assuming such relation to the pivotal point of connection of said handle to said frame that the line of thrust will lie below and to the rear of the latter in the closed condition of the tool, wherein said face portion of said handle engages an opposed face of said parallel movement means in front of said thrust link.

8. A valve-spring lifting tool comprising a frame having a jaw portion, a sleeve, a post slidably mounted for adjustment in said sleeve toward and from said jaw portion, and a pressure foot carried by the lower portion of said post, said post having a vertical edge face serrated to form a series of teeth having abrupt horizontal upwardly presented faces, in combination with a catch straddling the lower rear portion of said sleeve, a bolt passing through the transversely registering portions of said catch and the intervening portions of said sleeve to connect said catch to said sleeve for partial rotary movement about the axis of said bolt, said catch having a flat lower inner end face portion adapted to engage the upper face of the adjacent tooth of said post and being adapted to engage with its upper face the lower end face of said sleeve and to engage with increasing pressure against the said post adjacent the top of said tooth as the foot is pressed against, a nut adapted to be turned on said bolt, and frictional means disposed about said bolt and between said catch and nut for yieldingly holding said catch in operative position, said nut and frictional means serving to move said catch to operative position when the nut is turned clockwise and to move said catch to inoperative position when the nut is turned in the reverse direction.

9. A valve-spring lifting tool comprising a frame having a jaw portion, a sleeve, and a post slidably mounted for adjustment in said sleeve toward and from said jaw portion, said post having a vertical face serrated to form a series of teeth having abrupt horizontal upwardly presented faces, in combination with a catch, a bolt passing through the transversely registering portions of said catch and sleeve to connect said catch to said sleeve for partial rotary movement about the axis of said bolt, said catch having a flat lower inner end face portion adapted to engage the upper face of the adjacent tooth of said post and being adapted to engage with its upper face the lower end face of said sleeve and to engage with increasing pressure against the said post adjacent the top of said tooth as the foot is pressed against, a nut adapted to be turned on said bolt, and frictional means disposed about said bolt for yieldingly holding said catch in operative position, said nut and frictional means serving to move said catch to operative position when the nut is turned clockwise and to move said catch to inoperative position when the nut is turned in the reverse direction.

10. A valve-spring lifting tool comprising a frame having a jaw portion, a sleeve, and a post slidably mounted for adjustment in said sleeve toward and from said jaw portion, said post having a series of teeth having abrupt horizontal upwardly presented faces, in combination with a catch means pivotally connecting said catch to said sleeve for partial rotary movement, said catch having a flat lower inner end face portion adapted to engage the upper face of the adjacent tooth of said post and being adapted to engage with its upper face the lower end face of said sleeve and to engage with increasing pressure against the said post adjacent the top of said tooth as the foot is pressed against.

In testimony whereof, we have signed our names to this specification at Lancaster, Pennsylvania, this 24th day of May 1930.

HARRY W. KULP.
MARTIN C. DELLINGER.