April 12, 1932. F. L. BORCHERT 1,853,846

TERMINAL PULLER

Original Filed Dec. 19, 1930 2 Sheets-Sheet 1

Fig. 1.

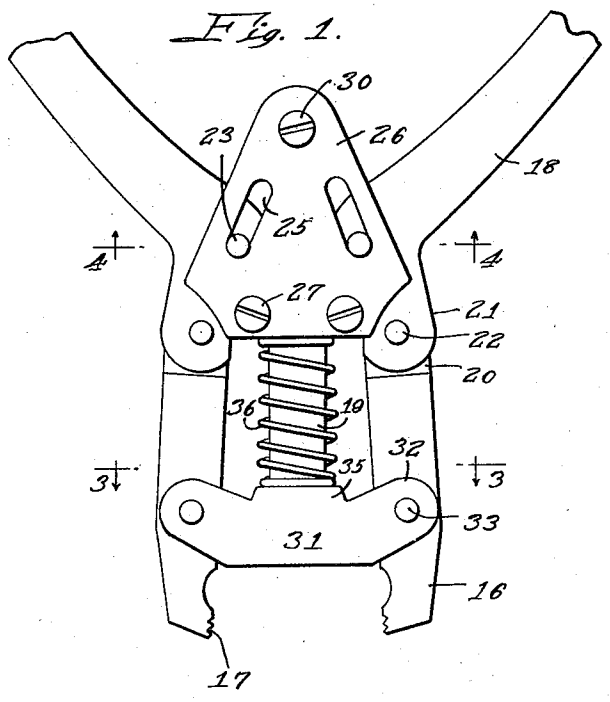


Fig. 2.

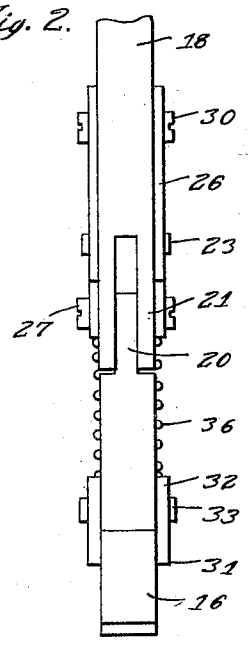


Fig. 3.

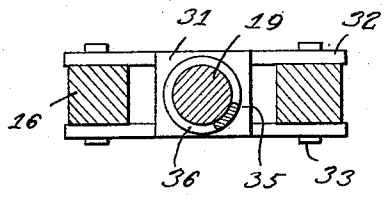
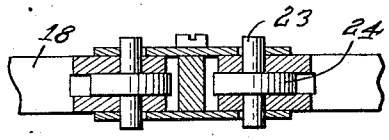


Fig. 4.



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TERMINAL PULLER

Original Filed Dec. 19, 1930 2 Sheets-Sheet 2

Fig. 7.

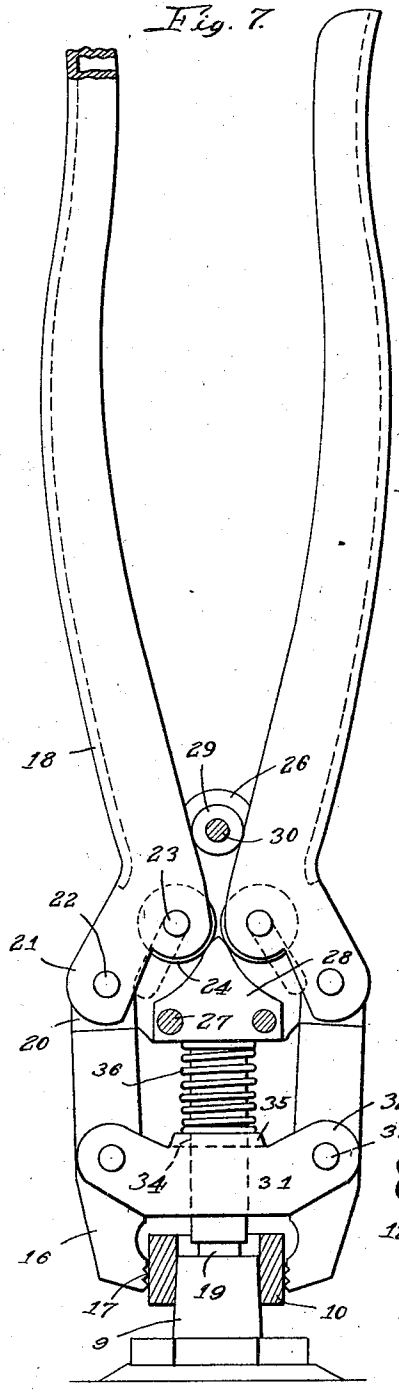


Fig. 5

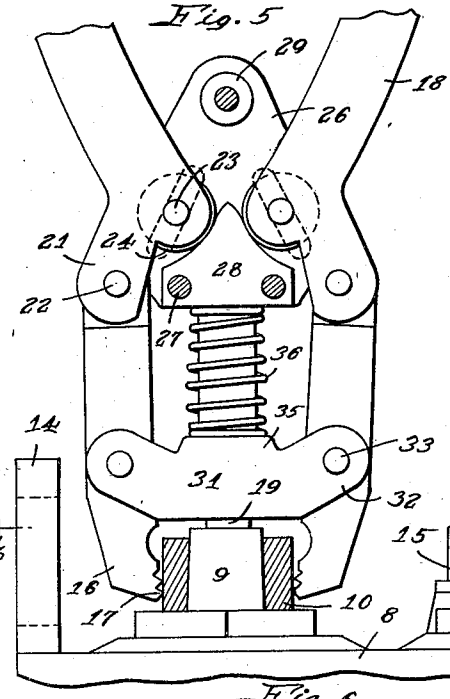
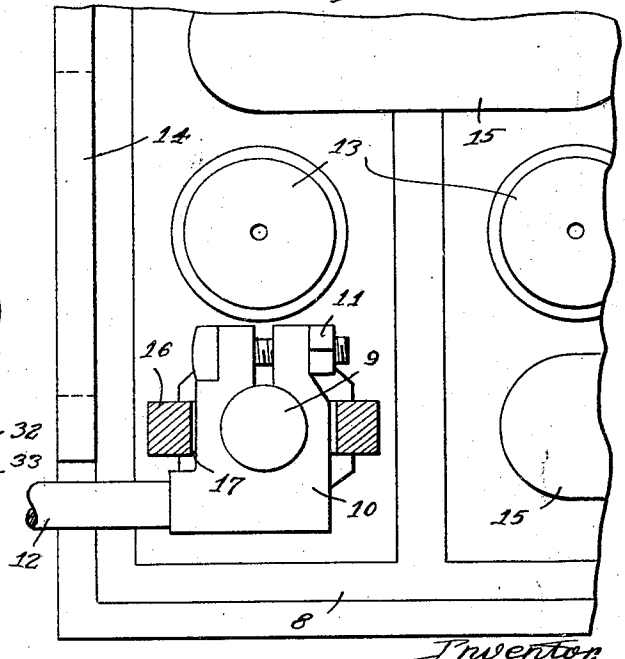


Fig. 6.



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UNITED STATES PATENT OFFICE

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TERMINAL PULLER

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This invention relates generally to hand tools for communicating pushing and/or pulling force, and has particular reference to a terminal puller especially designed and adapted for use in servicing and repairing batteries on automobiles, but, of course, suitable for use otherwise wherever there is similar operation to that of terminal pulling to be performed.

The tools now available for removing terminals from battery posts have been unsatisfactory for various reasons. For one thing, most of them relied upon engaging the jaws thereof below the terminal in order to pull the same off the post. In most cases, the terminal is forced down too far for that and it is, therefore, necessary for the workman to use other tools to work the terminal part way off, in which event there is hardly any need for the terminal puller itself. Then, too, many terminal pullers involved the operation of three handles, two for gripping the terminal and a third for forcing it off, thereby making the tool awkward and cumbersome to handle and impractical to use, especially where the battery is so placed that there is very little space available to use the tool. Actual experience has shown that many of the tools now available can be used only where the battery is situated advantageously. It is, therefore, the principal object of my invention to provide a tool which is free from the objections just noted, being capable of use on any terminal regardless of how it is clamped on the post, and being operable with two handles that can be grasped in one hand to pull off the terminal quickly and easily in one operation, namely, that of pressing the handles together.

Another object of my invention is to provide a thoroughly practical and serviceable tool of this kind of light and yet strong construction and one which can be produced and sold at reasonably low cost.

The invention embraces these and other objects as will appear in the course of the following specification in which reference is made to the accompanying drawings, wherein—

Figure 1 is a front view of the tool showing the parts in unconstrained condition, and with the handles broken away to conserve space in the drawing;

Fig. 2 is a side view of Fig. 1;

Figs. 3 and 4 are sections taken on the lines 3—3 and 4—4 of Fig. 1, looking in the directions indicated by the arrows;

Fig. 5 is a view similar to Fig. 1 but partly in section and showing the tool with the jaws gripping a terminal on a battery post and about to pull the terminal off;

Fig. 6 is a plan view of Fig. 5 showing the jaws in section on the line 6—6, and

Fig. 7 is a view similar to Fig. 5 but showing the plunger of the tool advanced by reason of the closing of the handles so as to pull off the terminal, this view showing the handles full length.

The same reference numerals are applied to corresponding parts throughout the views.

The present tool, while capable of use wherever it is desired to remove a part, such as a collar or sleeve or the like, from another part, such as a post or shaft, is herein illustrated as a terminal puller. For that reason, attention is called to Figs. 5–7 in which the numeral 8 designates a battery such as is used on automobiles, having posts 9 on the opposite end cells thereof onto which the terminals 10 are clamped, as indicated at 11, for connection of the usual cables 12. Considering that the filler caps 13, handles 14 and connectors 15 all constitute projections in the vicinity of the terminals, and the fact that these terminals are frequently pretty badly corroded, it is usually not a simple matter to get at and work on the terminal to remove it. In many cases, there is the added difficulty that the battery is placed so that it is more or less inaccessible. There has, therefore, grown to be a real demand for a tool that is properly designed to surmount these difficulties and one which, as was pointed out above, does not rely on being favored to the extent of having the terminal placed so that the jaws of the tool can engage below it. The tool of my invention is so designed that so long as it is just possible to approach the terminal from above to engage the jaws thereon there is no difficulty

whatever in removing the terminal, and since it has but two handles to be operated, arranged simply to be pressed together with one hand it follows that the tool can be used to very good advantage under conditions where tools having three handles and other types would be decidedly unhandy, if not out of the question entirely. Briefly stated, the tool of my invention has a pair of jaws 16 suitably serrated, as at 17, to grip the terminal from opposite sides and arranged to be closed and tightened on the terminal by the bringing together of a pair of handles 18. Once the terminal is gripped by the jaws and the handles 18 are then pressed closer together, as by closing the hand thereon, a plunger 19 is moved outwardly between the jaws and brought to bear on the top of the post. When the movement of the plunger is stopped by engagement with the post the result is that the further pressure on the handles causes the jaws to pull the terminal up off the post. That is to say, the plunger 19 as it is advanced more and more with reference to the jaws causes the jaws to pull off the terminal. This operation will be more clearly understood as the description of the construction and operation of the tool is more fully described. It should also be evident from the description that the tool may also be used for pushing purposes, if the part on which the jaws engage is stationary and the plunger engages the part to be moved.

The jaws 16 have their upper ends 20 reduced to fit in the bifurcated lower ends 21 of the handles 18 for pivotal connection therewith, as at 22. The handles are actually channel-shaped the full length thereof, as indicated in Fig. 7, and it is simply by cutting away of the connecting web between the two side flanges that the lower ends of the handles are bifurcated, as is thought will be clear. This channel-shaped construction makes the tool that much lighter and easier to handle and it will soon appear how the channel-shaped cross-section is further taken advantage of. The handles are in the form of bell-crank levers, the lower ends 21 extending outwardly at an angle with respect thereto. Pins 23 are passed through the side flanges of the handle spaced inwardly and upwardly from the pins 22, as permitted by the bell-crank form, and these pins provide mountings for rollers 24. The latter are disposed between the side flanges of the handles and their function will soon appear. The pins project from opposite sides of the handles through upwardly converging slots 25 provided in frame plates 26 fastened, as by means of screws 27, onto opposite sides of a substantially triangular shaped cam 28, the said screws being entered into the base portion of the triangle with the apex portion of said triangle reaching upwardly between the rollers 24. A spacer 29 is disposed between the plates 26 at the opposite end thereof from the cam and screws 30 serve to fasten the same in place and hold the plates firmly in the predetermined desired spaced relation. The slots 25, previously mentioned, are disposed at such angles that the pins 23 are free to move therein as the rollers 24 ride up on the opposite sides of the cam 28. In other words, the rollers 24 constitute the fulcrums for the levers 18 with reference to the opposite sides of the cam 28 and the slots 25 permit these rollers to remain in contact with the cam when the same is forced out from between the rollers from the position shown in Fig. 5 to that shown in Fig. 7. A yoke 31 interconnects the jaws 16, the same having its opopsite ends forked, as indicated at 32, for reception of the jaws therein, and the jaws being pivoted thereto, as indicated at 33. The pivots 33 are intermediate the ends of the jaws 16 so that the jaws are arranged to be brought together by a toggle action in the closing of the handles 18. It is, of course, evident upon inspection of Fig. 7 that there is considerable leverage exerted by reason of the length of the handles 18 as against the close spacing of the pivots 22 and 23 and further by reason of the distance between the pivots 22 and 23 as against the shorter distance between the pivots 33 and the serrated ends 17 of the jaws 16. It is, therefore, possible with comparatively light hand pressure in the grasping of the handles to take a good hold on the terminal 10 with the jaws 16 for the removal of the terminal from the post 9.

This tool is not intended to be used simply to exert a direct pull by hand on the terminal, as should be evident from some of the foregoing statements, but is so designed that the plunger 19, previously referred to, is arranged to bring pressure to bear on the post 9 in the pressing together of the handles 18 as the workman closes his grasp thereon, whereby to exert a pull on the terminal coincident with the gripping thereof by the jaws 16. The plunger 19 is simply a pin formed suitably integral with or secured to the cam 28 and extending through a hole 34 provided in a horizontal web portion 35 of the yoke 31, the said plunger extending downwardly from the cam between the jaws 16 and being arranged in the closing of the handles to be forced outwardly by reason of the cam 28, as is thought to be evident from a comparison of Figs. 5 and 7. A coiled compression spring 36 fits about the plunger 19 between the cam 28 and the web 35 and serves normally to urge the cam 28 upwardly as far as it will go between the rollers 24, the upward movement being, of course, limited by the pins 23 coming to the lower ends of the slots 25, see Fig. 1. The plunger 19 is, of course, retracted at the

same time by this spring action since it moves with the cam.

It is believed the operation of the tool is pretty clear from the foregoing description, at least to the extent that it will suffice to state merely that the workman in using the tool first closes the jaws 16 on the terminal 10, as indicated in Fig. 5. Then, the free ends of the handles 18 are usually close enough together to permit the workman to hold them in one hand, so that the handles can be brought together by simply closing his grasp thereon. This is, of course, quite an advantage over the way in which other tools provided for a similar purpose had to be operated. As the handles are pressed together the rollers 24 bearing on the opposite sides of the cam 28 with a pressure proportionate to the pressure exerted on the handles force the cam out from between the rollers and accordingly move the plunger 19, so that the terminal is pulled up, as indicated in Fig. 7. In many cases, the terminal will come off easily once it is pulled as far as shown, but if it happens to be so tight on the post that it is still hard to remove it otherwise, the handles can be spread apart to permit the jaws to take a new hold farther down on the terminal, thus permitting the operation just described to be repeated to raise the terminal still farther, and off the post. The principle of operation of this tool is such that up to the time that the terminal commences to loosen and give way the entire pressure exerted on the handles is used to force the jaws together to grip the terminal more and more tightly. That is to say, if the terminal is so tight it will not budge when the jaws 16 have a light hold thereon, the further closing of the handles results in the jaws biting into the soft metal of the terminal and taking a firmer hold until eventually the pressure of the plunger 19, which is translated into a pull of the jaws 16, is enough to move the terminal. Once the terminal commences to give and move, the jaws 16 will not close any farther on it, owing to the fact that the cam 28 moves enough to compensate for the bringing together of the handles. For that reason, it is obvious that there is absolutely no danger of crushing the terminal.

The invention has been described as embodied in one specific construction but it should be understood that various changes might be made without seriously departing from the spirit and scope of the invention. For example, very little change in the construction and design of this tool adapts it to the work of removing shackle bolts on automobiles. And, of course, other kinds of work to which this type of tool would be adapted will at once suggest themselves to mechanics in various lines of work. For that reason the appended claims have been drawn in terms to cover legitimate modifications and adaptations.

I claim:

1. A tool of the class described comprising, in combination, a frame member, a pair of handles slidably pivotally mounted on the frame member for swinging movement of the free ends thereof toward and away from each other, said levers having angular portions at their pivoted ends reaching outwardly from the frame member, a pair of work gripping jaws pivotally connected at the ends thereof remote from their gripping ends to the ends of the angular portions of said handles, a member extending crosswise between the jaws intermediate the ends of the latter and pivotally connected at its opposite ends with said jaws, whereby to permit closing of the gripping ends of the jaws on a piece of work by toggle action when the free ends of the handles are moved toward each other, a plunger rigid with the frame member and extending outwardly between the jaws, the frame member being movable outwardly toward the gripping ends of the jaws whereby to advance the outer end of the plunger between the gripping ends of the jaws, and means operated by the handles for moving said frame member outwardly by cam action in the movement of the free ends of the handles toward each other.

2. A tool of the class described comprising a frame member, a pair of handles slidably pivoted near their one end on opposite sides of said frame member to permit swinging movement of the free ends toward and away from each other, a pair of work gripping jaws having the ends thereof remote from the gripping ends pivoted to the handles in spaced relation to their pivots on the frame member, a yoke member extending crosswise between the jaws and pivoted to the latter intermediate their ends whereby the jaws are actuated by the handles by toggle action, a plunger reaching outwardly from the frame member through and reciprocable in a hole provided in the yoke member, the yoke serving thereby to guide the plunger in its movement and maintain the jaws in a predetermined operative relation to the handles and frame member, a cam on the frame member, and means on at least one of said handles at its pivotal connection with the frame member providing a fulcrum for said handle on said cam whereby to cause movement of the cam under the pressure exerted on the handle to move the plunger outwardly between the gripping ends of the jaws.

3. A tool of the class described comprising a frame member, a pair of handles pivoted near their one end on opposite sides of said frame member to permit swinging movement of the free ends toward and away from each other, a pair of work gripping jaws having the ends thereof remote from the gripping

ends pivoted to the handles in spaced relation to their pivots on the frame member, a yoke member extending crosswise between the jaws and pivoted to the latter intermediate their ends whereby the jaws are actuated by the handles by toggle action, a plunger reaching outwardly from the frame member through and reciprocable in a hole provided in the yoke member, the said frame member having rearwardly converging slots provided therein to provide for movement of the pivots for said handles, a cam on said frame member having rearwardly converging side faces, and means on the handles at their pivotal connections with the frame member having bearing contact with the cam faces whereby outward movement is arranged to be communicated to the plunger in the closing of the handles, the said plunger being thereby adapted to exert a pressure proportionate to the pressure exerted on the handles.

4. A tool as set forth in claim 3 wherein the last mentioned means comprises rollers mounted on said handles, there being cross-pins on said handles providing mountings for said rollers, the ends of said pins being entered in the slots in the frame member for pivotal connection of the handles with the frame member.

5. A tool as set forth in claim 3 including a coiled compression spring fitting about the plunger between the frame member and yoke member and serving normally to hold the yoke member in a predetermined spaced relation to the frame member with the plunger disposed in retracted position relative to the jaws.

6. A tool of the class described comprising a frame, a pair of handles slidably pivotally mounted thereon and arranged to be opened and closed, a pair of gripping jaws pivoted relative to one another and arranged to be closed by closing the handles, a plunger movable outwardly in a median plane between the jaws, a cam for moving said plunger, the same having converging opposite side faces, the said handles being disposed on the frame so as to fulcrum near their ends on said cam faces whereby to exert a pinching action on the cam for moving said plunger outwardly relative to the jaws with a force proportionate to the hand pressure exerted on the handles, and toggle operating connections between the ends of said handles and said jaws.

7. A tool of the class described comprising a pair of handles arranged to be opened and closed, a pair of gripping jaws arranged to be closed by closing the handles, a plunger movable outwardly in a median plane between the jaws, a frame member carrying said plunger, said handles having sliding pivotal connections near their ends with said member to permit movement of said plunger, toggle connections between said jaws and the ends of said handles, and cam means for moving said frame member and the plunger with it relative to the handles and jaws in the closing of said handles.

8. A tool of the class described comprising in combination a pair of gripping jaws, a pair of handles for operating the same, a plunger disposed for outward movement between the jaws, a frame member whereon said handles are slidably pivotally mounted, a cam on said frame member for moving said plunger, said cam being disposed between the handles so that they fulcrum with respect to opposite sides thereof and transmit pressure thereto in proportion to the pressure applied to the handles and thence to the jaws, the sides of said cam being formed rearwardly converging so that a forward thrust is communicated thereto and to the plunger when the handles apply pressure to the opposite sides of the cam as stated, and said frame member having a pair of guides provided thereon for the sliding movement of the pivots for said handles in predetermined directions, said guides also converging rearwardly similarly as the sides of the cam.

9. A tool of the class described comprising in combination a pair of gripping jaws, a pair of handles for operating the same, a plunger disposed for outward movement between the jaws, a frame member whereon said handles are slidably pivotally mounted, and a cam for moving said plunger, said cam being disposed between the handles so that they fulcrum with respect to opposite sides thereof and transmit pressure thereto in proportion to the pressure applied to the handles and thence to the jaws, the sides of said cam being formed rearwardly converging so that a forward thrust is communicated thereto and to the plunger when the handles apply pressure to the opposite sides of the cam as stated.

10. A tool of the class described comprising a frame member, a pair of handles pivoted near their one end on opposite sides of the frame member for swinging movement of the free ends toward and away from each other, a pair of work gripping jaws, a yoke member extending crosswise between the jaws and pivoted to the latter intermediate their ends, the jaws being pivoted to the handles in spaced relation to their pivots on the frame member for operation by the handles by toggle action, a plunger reciprocable in a hole provided in the yoke member and extensible between the gripping ends of the jaws, the frame member having slots thereon to provide for movement of the pivots for said handles, a cam on the plunger having rearwardly converging side faces, and means on the handles at their pivotal connections with the frame member having bearing contact with the cam faces, whereby outward movement is arranged to be com-

municated to the plunger in the closing of the handles and said plunger is adapted to exert a pressure proportionate to the pressure exerted on the handles.

11. A tool as set forth in claim 10 wherein the last mentioned means comprises rollers mounted on said handles, there being cross-pins on said handles providing mountings for said rollers, the ends of said pins being entered in the slots in the frame member for pivotal connection of the handles with the frame member.

12. A tool as set forth in claim 10 including a coiled compression spring fitting about the plunger between the cam and yoke member and serving normally to hold the yoke member in a predetermined spaced relation to the cam with the plunger disposed in retracted position relative to the jaws.

13. A tool of the class described comprising a pair of handles arranged to be opened and closed, a pair of gripping jaws arranged to be closed by closing the handles, a frame member, said handles having sliding pivotal connections near their ends with said frame member, toggle connections between said jaws and the ends of said handles for closing the jaws in the closing of the handles, a plunger movable outwardly in a median plane between the jaws, and cam means operable by the handles for moving the plunger outwardly relative to the jaws in the sliding of the handles on the frame member.

14. A tool of the class described comprising, in combination, a pair of handles arranged to be opened and closed whereby to open and close gripping jaws associated therewith, a plunger guided for movement outwardly in a median plane between the jaws, and a cam for moving said plunger, said cam being disposed between the handles so that the latter bear on opposite sides thereof and transmit pressure thereto in the application of pressure to the handles in the closing thereof, the sides of said cam being formed rearwardly converging so that a forward thrust is communicated thereto and to the plunger in the closing of the handles.

15. A tool of the class described comprising, in combination, a central member having a plunger projecting forwardly therefrom, a cross-member through which the outer end of said plunger projects, a pair of gripping jaws pivoted intermediate their ends to the opposite ends of the cross-member, and a pair of handles for operating said jaws pivoted at their forward ends to the rear ends of said jaws and pivoted near their forward ends on opposite sides of said central member, said central member having rearwardly converging slots provided therein and said handles being slidably pivotally mounted therein, whereby to permit forward movement of the plunger with the central member in the closing of the handles.

16. A tool as set forth in claim 15 including a coiled compression spring fitting about the plunger between the cross-member and the central member tending normally to urge said members apart so that the plunger is disposed in retracted position relative to the jaws.

17. A battery terminal puller comprising a pair of jaws for gripping a terminal from the sides, a pair of handles for closing and opening the jaws whereby to grip a terminal therebetween, a push member for engaging the top of the battery post, and means having a shiftable, common point of reaction, for operating the push member by the handles under a pressure varying proportionately to that applied to the jaws.

18. A battery terminal puller comprising a pair of related handles having jaws to grip a terminal from the sides, said jaws being arranged to be closed on the terminal by a predetermined movement of the handles relative to one another, a push member movable outwardly to bear on top of the battery post, and means comprising a shifting fulcrum for operating the push member by the handles under a pressure varying proportionately to that applied to the jaws.

19. A battery terminal puller comprising a pair of related handles having jaws to grip a terminal from the sides, said jaws being arranged to be closed on the terminal by a predetermined movement of the handles relative to one another, a push member to engage the top of the battery post, and means shifting its point of reaction for operating the push member by the handles under a pressure varying proportionately to that applied to the jaws.

20. A battery terminal puller comprising a pair of related handles having jaws to grip a terminal from the sides, said jaws being arranged to be closed on the terminal by a predetermined movement of the handles relative to one another, a push member movable outwardly to engage the top of the battery post, and means comprising a shifting fulcrum providing an operating connection between said handles and said push member for giving movement to the push member while the jaws are held closed on the terminal by the handles, said means being so constructed that the force applied by the handles to the push member varies proportionately with but is always less than the force applied thereby to the jaws to close the same on the terminal, so that the greater the pressure exerted on the battery post to lift the terminal the tighter the hold of the jaws on the terminal.

21. A pulling and pushing tool comprising, in combination, a pair of related handles having jaws for gripping a work piece therebetween under pressure applied to the handles, a pusher also operable by the handles

and operating between the jaws for simultaneously applying pressure on an element of the work, and means comprising a shifting fulcrum for communicating pressure to the pusher varying proportionately to the pressure applied to the jaws.

22. A pulling and pushing tool comprising a pair of related handles having pulling jaws for gripping a piece of work therebetween, said jaws being dependent for their closing pressure upon the closing pressure applied to the handles, and means for simultaneously exerting a pull on said jaws, comprising a pusher to apply pressure to an element of the work, and means comprising a shifting point of reaction for operating said pusher by said handles with a force varying proportionately to the closing pressure applied to the jaws.

23. A pulling and pushing tool comprising a pair of related handles having gripping jaws arranged to be closed on a piece of work therebetween under hand pressure applied to the handles, a pusher movable outwardly to apply pressure to an element of the work, and a cam action operating connection between the handles and the pusher comprising a shifting fulcrum for said handles, whereby the pusher is adapted to exert a pressure varying proportionately to the closing pressure applied to the jaws by the handles.

24. A pulling and pushing tool comprising a pair of holding jaws, a pair of handles for closing and opening the jaws whereby to grip a piece of work therebetween, a push member for applying pressure to an element of the work, and means comprising a shifting fulcrum for the handles to move the push member when the resistance to closing of the jaws becomes greater than the resistance to the pulling movement of the jaws, the shifting fulcrums permitting the necessary movement of the handles to communicate movement to the push member, without giving further closing movement to the jaws.

25. A pulling and pushing tool comprising a pair of related handles having holding jaws to grip a work piece therebetween under pressure applied to the handles, a pusher also operable by the handles to apply pressure to an element of the work, and means shifting its point of reaction providing an operating connection between the handles and pusher so that the closing pressure on the handles is divided between the jaws on the one hand and the pusher on the other in a predetermined ratio.

26. A pulling and pushing tool comprising a pair of related handles having holding jaws to grip a work piece therebetween under pressure applied to the handles, a pusher also operable by the handles to apply pressure to an element of the work, and means shifting its point of reaction providing an operating connection between the handles and pusher so that the closing pressure on the handles is divided between the jaws on the one hand and the pusher on the other in a predetermined ratio, the jaws being closed under heavier pressure than is applied by the pusher whereby to retain their grip on the work.

27. A pulling and pushing tool comprising a pair of related handles having holding jaws to grip a work piece therebetween under pressure applied to the handles, a pusher also operable by the handles to apply pressure to an element of the work, and means having a shiftable common point of reaction providing an operating connection between the handles and pusher so that the closing pressure on the handles is divided between the jaws on the one hand and the pusher on the other in a predetermined ratio.

28. A pulling and pushing tool comprising a pair of related handles having holding jaws to grip a work piece therebetween under pressure applied to the handles, a pusher also operable by the handles to apply pressure to an element of the work, and means having a shiftable common point of reaction providing an operating connection between the handles and pusher so that the closing pressure on the handles is divided between the jaws on the one hand and the pusher on the other in a predetermined ratio, the jaws being closed under heavier pressure than is applied to the pusher whereby to retain their grip on the work.

29. A pulling or pushing tool comprising a pair of related handles having gripping jaws to hold a piece of work therebetween, a pusher also operable by the handles to apply pressure on an element of the work, and means comprising a shifting fulcrum permitting the handles to adjust themselves relative to the jaws while applying closing pressure thereto and to apply operating pressure to the pusher varying proportionately to the pressure on the jaws.

30. A pulling or pushing tool comprising a pair of related handles having gripping jaws to hold a piece of work therebetween, a pusher also operable by the handles to apply pressure on an element of the work, and means comprising a shifting fulcrum permitting the handles to adjust themselves relative to the jaws while applying closing pressure thereto and to apply operating pressure to the pusher varying proportionately to the pressure on the jaws, the pressure applied to the pusher being always less than the pressure applied to the jaws.

In witness of the foregoing I affix my signature.

FRED L. BORCHERT.