

May 26, 1942.

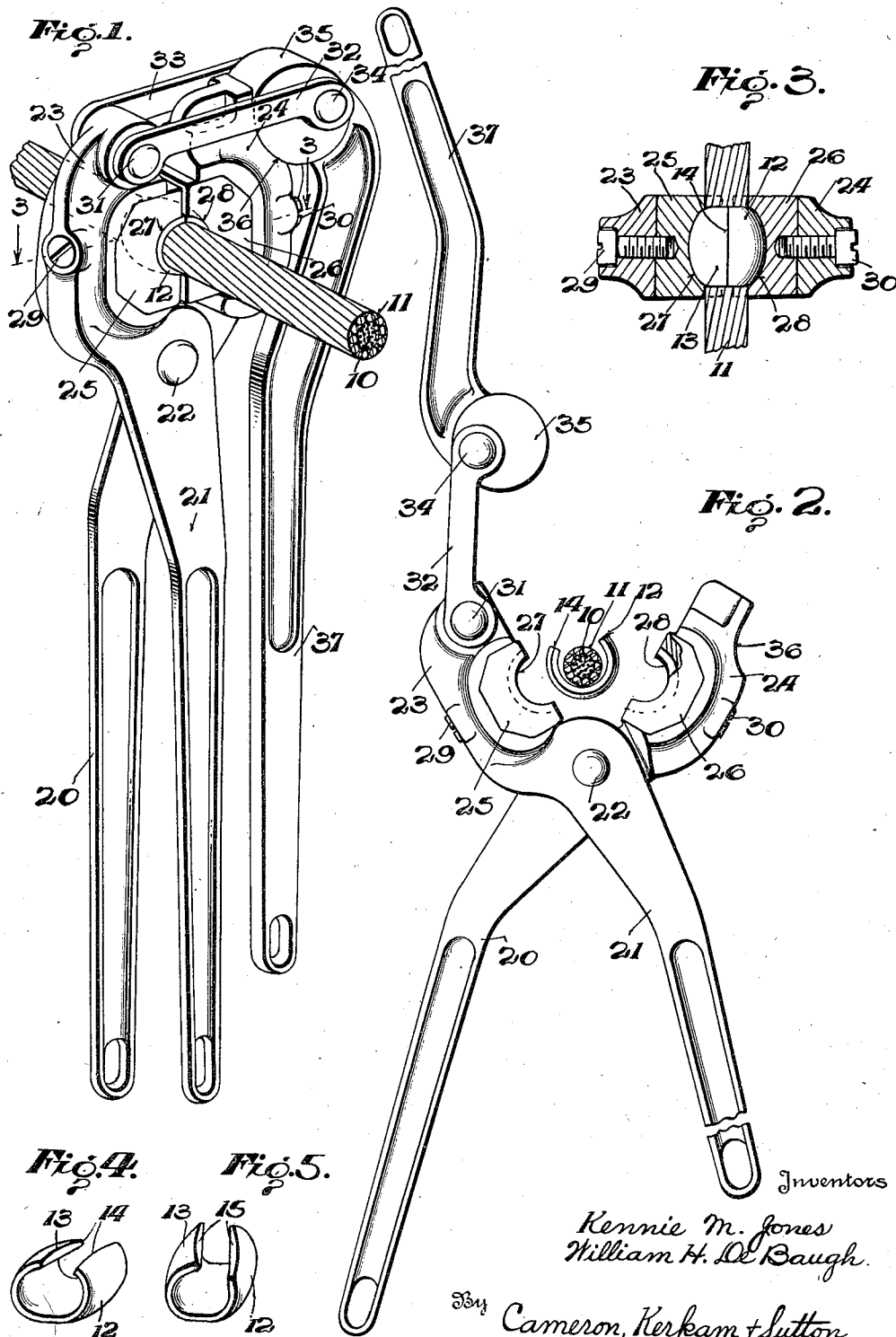
K. M. JONES ET AL

2,283,933

APPARATUS FOR APPLYING CLIPS

Filed July 3, 1940

2 Sheets-Sheet 1



May 26, 1942.

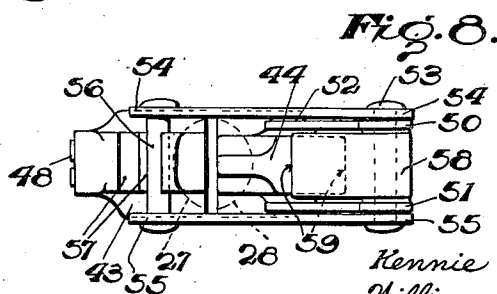
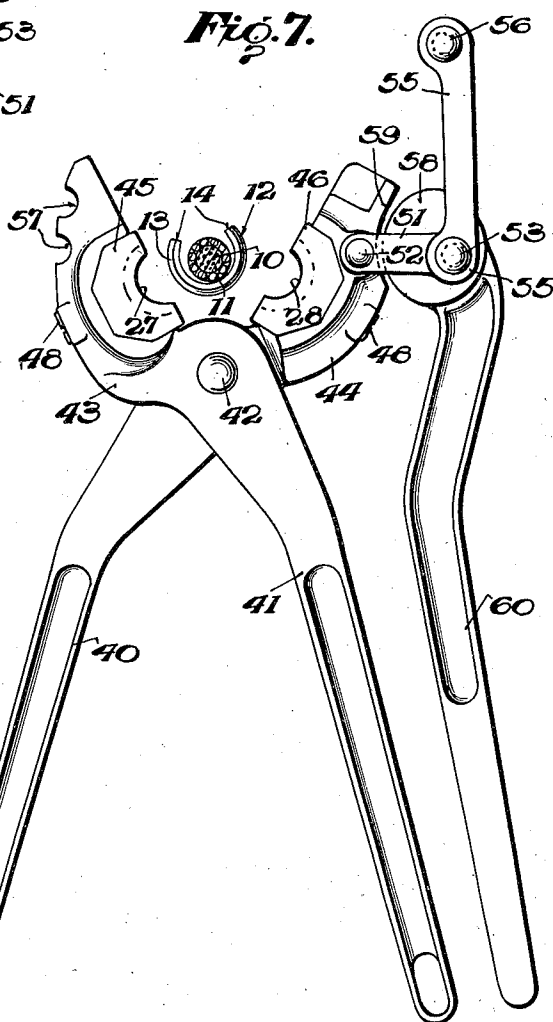
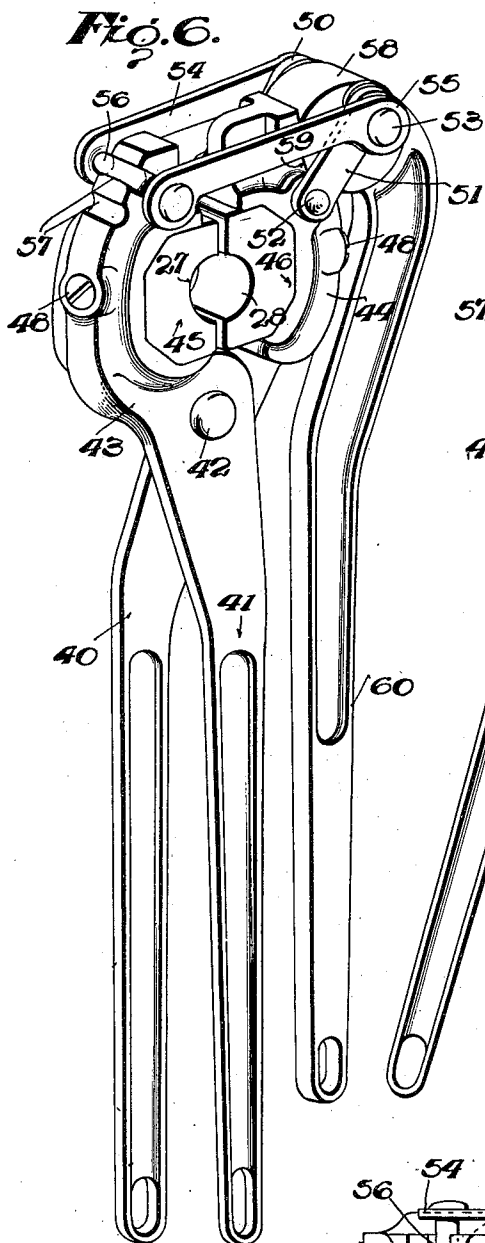
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2 Sheets-Sheet 2



Inventors

Kennie M. Jones
William H. De Raugh

By Cameron, Herkam & Sutton
Attorneys

UNITED STATES PATENT OFFICE

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APPARATUS FOR APPLYING CLIPS

Kennie M. Jones and William H. De Baugh, Baltimore, Md., assignors to Line Material Company, Milwaukee, Wis., a corporation of Delaware

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13 Claims. (Cl. 140—55)

This invention relates to an apparatus for applying clips, such as for securing armor rods to electrical conductors or the like, and more particularly to a clip and clip applying tool of the pincer type. While the clip and clip applying tool of the present invention have particular utility in applying clips to armored conductors, they are also available for and adaptable to other uses as will be apparent to those skilled in the art.

Where electric conductors are suspended or otherwise supported from insulators projecting from transmission towers, poles, masts, or other suitable supports, it is usual practice to distribute the stress on the conductor at its mounting over an appreciable length of the conductor by wrapping the conductor in what are known as armor rods that are suitably applied to the conductor by an armor rod wrench and die and which are then tightly clamped to the conductor. Heretofore it has been the practice to clamp the armor rods to the conductor by means of a clamping element slotted at its opposite ends to receive a double ended U or V-shaped bolt which is placed over the armored conductor and locked in the slots of the clamping element by nuts applied to the ends of the bolt. The application of such a clamping device to the armored conductor with necessity of applying nuts to the ends of the bolt to tighten said element and bolt in clamping engagement with the armor rods is not only time consuming and laborious owing to the manipulations involved but sometimes fraught with danger to the linemen when such conductors are being run in adjacency to current-carrying conductors.

It is an object of this invention to eliminate the aforesaid manipulations and facilitate a more rapid and satisfactory clamping of the armor rods in place.

Another object of this invention is to provide for clamping armor rods to a conductor by means of a clip that may be bent into clamping engagement with the armor rods by a readily operated hand tool of the pincer type.

Another object of this invention is to provide an improved clamping element of the clip type for securing armor rods to the conductor.

Another object of this invention is to provide an improved clamping element of the clip type for application to structures having contours of other than circular cross-section, as where more than one conductor is to be clamped.

Another object of this invention is to provide a hand tool whereby armor rods may be clamped to conductors by the use of clips of readily bendable metal which may be placed about the armored conductor and then tightly squeezed into the desired clamping engagement with the armor rods.

Another object of this invention is to provide a tool whereby clips may be applied to clamp armor

rods to a conductor by relatively simple operations involving a minimum expenditure of time and effort.

Another object of this invention is to provide a clip applying tool which enables clips to be rapidly and efficiently applied to the parts or elements to be clamped and which is available for or may be readily adapted to the application of clips or similar elements to other structures such as structures of non-circular cross-section, as where more than one conductor is involved, or for applying clips in other environments.

Other objects of the present invention will appear as the description of the invention proceeds.

The tools and clips of the present invention are capable of receiving a variety of mechanical expressions, some of which are illustrated on the accompanying drawings. For purposes of illustration, the invention is described with considerable particularity in connection with the clamping of armor rods about a conductor but it is to be expressly understood that the clips and clipping tools described herein may be used to clamp structures comprising more than one conductor as well as applied to other uses. The drawings are accordingly not intended to be construed as definitions of the invention, reference being had to the appended claims therefor.

Referring in detail to the drawings, wherein the same reference characters are employed to designate corresponding parts in the several figures,

Fig. 1 is a perspective view of one embodiment of the tool of the present invention illustrated as applied to the clamping of a clip around an armored conductor;

Fig. 2 is a face view of the tool of Fig. 1 with the parts in separated relationship preparatory to applying a clip to the armored conductor;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 is a perspective view of one form which the clip may take;

Fig. 5 is a perspective view of an alternative form of clip;

Fig. 6 is a perspective view of another embodiment of the clip applying tool;

Fig. 7 is a face view of the clip applying tool of Fig. 6 with the parts in separated relationship preparatory to applying a clip to an armored conductor; and

Fig. 8 is an end view of the structure of Fig. 6.

As shown, the conductor, which may be of any suitable size and construction and composed of any suitable number of strands, but which is diagrammatically illustrated as a single thick strand 10, is provided in the usual way and by the use of any suitable tools, as the armor rod wrench and die now in use, with any suitable number of armor rods 11 wrapped around the conductor 10. In conformity with the present in-

vention said armor rods 11 are clamped to the conductor 10 by the use of clips 12 in place of the clamping elements heretofore employed as before referred to.

Said clips may be made of any suitable metal or alloy that can be bent readily into clamping engagement with the elements to be held, and they may be formed in any suitable way, as by cutting suitable lengths from a continuous strip of the clip material formed in any suitable way as by rolling, extrusion, etc. Each clip is in the form of a band bent into an open loop having a gap such that the elements to be clamped may pass between the opposed faces of said gap. The contour of the inside of the loop is such that when the gap is closed the said elements are firmly held. The sections adjacent to the gap are shaped so that upon closure of the gap these sections are pressed into at least one of the elements to be clamped, thereby providing a tight engagement between the clip and said elements.

In the case where armor rods are to be clamped to a conductor, the clip is roughly C-shaped with the ends of the C bent inward slightly, so as to effect the gripping action, when the gap is closed, described above. The band is preferably arcuate in cross-section at its outer face so that it is thicker intermediate its width than at the edges, as shown at 13 in Fig. 4, although if preferred said band may approximate a rectangle in cross-section. The cuts by which the individual clips are severed from the strip of clip material are preferably at substantially a right angle to the length of the strip, as shown at 14 in Fig. 4, but if preferred the cut may be formed diagonally to the direction of the band so that the gaps between the ends of the clip, as shown at 15 in Fig. 5, will be diagonally disposed with respect to the clip. The band of each clip as severed from the strip may be bent in any suitable way into the form required as above explained but leaving a gap between the opposed faces at the extremities of the band as before referred to.

Referring first to the form of clip applying tool disclosed in Figs. 1 to 3 inclusive, said tool is composed of a pair of handle members or arms 20 and 21 suitably pivoted at 22 and extended to provide opposed jaws 23 and 24, here shown as suitably recessed to receive and retain half die members 25 and 26 respectively. Said half die members are suitably shaped at their inner faces 27 and 28 to receive and bend a clip 12 into the desired clamping engagement with the element to be clamped, exemplified by an armored conductor. In order to render the tool readily available for applying clips to armored conductors of varying sizes, the half die members are preferably made easily removable from the jaws 23 and 24 so that they can be replaced by other half die members of suitable size, and to this end said half die members 25 and 26 are retained in the jaw members 23 and 24 by screws 29 and 30 which pass through apertures in the jaw members and into threaded apertures provided in the half die members as shown in Fig. 3.

Pivoted at 31 to the left-hand jaw member 23, as viewed in the drawings, are a pair of links 32 and 33, and pivoted at 34 at the opposite ends of said links 32 and 33 is a cam 35, shown as an eccentric, adapted to engage in and cooperate with an arcuate seat 36 formed in the outer face of the right-hand jaw 24 as viewed in the drawings. Said cam 35 has formed thereon or suit-

ably attached thereto a handle member or arm 37 which is adapted to extend into adjacency with the handle members 20 and 21 when cam 35 is engaged in seat 36 and rotated toward said arms 20 and 21 for tightening the clip on the armored conductor.

The clip having been applied loosely to the armored conductor as shown in Fig. 2, the tool with its jaws 23 and 34 sufficiently spaced apart to pass over the clip is applied to the clip and the half die members 25 and 26 are squeezed together by manipulation of the arms 20 and 21 sufficiently to bend the clip about the armored conductor. In initially gripping the clip as aforesaid the arm 37 with its cam 35 and the links 32 and 33 have been swung around the pivot 31 in an anticlockwise direction as viewed in the drawing sufficiently so that said arm 37 and links 32, 33 do not interfere with the ready gripping of the clip between the jaws 23, 24. For compactness of illustration the links 32, 33 and the arm 37 have been shown as moved only part way toward that position which they normally assume during the initial gripping of the clip, as the arm 37 may be swung nearly if not quite to a position at right angles to the plane which bisects the angle between the jaws 23 and 24.

The clip having been initially gripped by the jaws 23, 24 as aforesaid, the links 32 and 33 and the arm 37 are swung in a clockwise direction until the cam 35 is engaged with the seat 36, in which position the arm 37, now to the right of the arms 20 and 21 as viewed in the drawings, is located in juxtaposition to said last-named arms. Arm 37 may then be moved toward the arms 20, 21 by use of one or both hands, and during this movement of the arm 37, by reason of the cooperation of the cam 35 with the seat 36, the two jaws 23 and 24 are pressed toward each other to a further extent, causing the half die members to squeeze the clip into its final clamping position in which it grips tightly the armored conductor. Owing to the mechanical advantage arising from the use of the cam 35, with its relatively long force-applying arm 37, the clip may be squeezed into clamping engagement with the armored conductor, with the desired degree of tightness to prevent displacement of the clip, without an undue expenditure of effort.

In the embodiment shown in Figs. 6, 7 and 8 a pair of handle members or arms 40 and 41 are pivoted at 42 and suitably extended to form jaws 43 and 44 which carry half die members 45 and 46 as in the embodiment of Figs. 1 to 3. These elements of the tool may be of the same construction as more particularly described in connection with the embodiment of Figs. 1 to 3, and as in that embodiment the half die members may be removably retained in the jaws by screws 48.

In this embodiment of the invention, however, the third handle member and the elements associated therewith are pivoted on the right-hand jaw, as viewed in the drawings, instead of the left-hand jaw, as viewed in Figs. 1 to 3, a construction which has the advantage that in closely confined spaces the third arm does not have to be swung over the jaws, from one side to the other thereof, to effect the final gripping or clamping action. In this embodiment a pair of links 50 and 51 are pivotally mounted at 52 on the jaw 44, and pivotally mounted at 53 on the outer extremity of said links are a second pair of links 54 and 55 which are connected at

their extremities by a pin 56 adapted to engage in one or more depressions 57 in the jaw 43. Also pivoted on the axis 53 is the cam or eccentric 58 designed to engage and cooperate with an arcuate seat 59 formed in the jaw 44. Projecting from or suitably attached to the cam 58 is the third handle member or arm 60 for applying the final gripping or clamping force.

In this embodiment the clips are applied to the armored conductor and the half die members 45 and 46 gripped therearound by manipulation of the arms 40 and 41 to apply the initial bending force to the clips as in the embodiment of Figs. 1 to 3. This brings the jaws 43 and 44 sufficiently together so that by rotation of the links 50 and 51 around their pivot 52, in an anti-clockwise direction, the links 54 and 55 may be moved from the position shown in Fig. 7 to the position shown in Fig. 6 in which the links 54 and 55 embrace the ends of the jaws 43 and 44 and the pin 56 is engaged in one of the depressions 57. This movement of the parts around pivot 52 also brings the cam 58 into contact with the arcuate surface 59, and then by movement of the arm 60 toward the arms 40 and 41 the final gripping force may be applied to the jaws, the cam 58 reacting against the arcuate seat 59 and through the links 54 and 55 on the pin 56 applied to the opposite jaw so as to force the jaws into their ultimate gripping position wherein the clips are squeezed tightly about the armored conductor, as more particularly described in conjunction with the embodiments of Figs. 1 to 3.

As will be appreciated by those skilled in the art, the foregoing embodiments of clip applying tools may be adapted readily to the application of clips or the like to structures embodying more than one conductor and to other elements than conductors. The half die members may be readily removed for replacement, and said members may be selected of such size and configuration of cavity as to render the tool available for applying clips and other comparable elements in a variety of services. Therefore, while the tool of the present invention has been disclosed in a form particularly suitable for the applying of clips to armored conductors, and while said tool possesses especial utility when applied to such use, it is to be understood that in its broader expressions the tool of the present invention is not limited to such use.

It will therefore be perceived that in clamping armor rods to a conductor, the invention eliminates the difficulties and objections heretofore implicit in the use of clamps held in position by the application of nuts to bolt ends. Also a novel clip has been provided for effecting the desired gripping of the armor rods to conductors as well as for application to other structures. Furthermore, an improved tool has been provided whereby a clip may be readily gripped and initially bent to its initial clamping position by a pincer-like tool that has associated therewith means readily moved into operative position for exerting on the jaws of said tool a gripping pressure, which, because of the mechanical advantage implicit in the construction provided, can exert the necessary force to squeeze the clip or other comparable element into tightly clamped condition. At the same time the tool is of a type that may be easily manipulated and because of the character of operations involved it may be safely and satisfactorily used in the neighborhood of current-carrying conductors. Hence the

present invention involves many and important advantages not only in the facility but also in the safety with which armor rods and other elements may be secured in position while minimizing the time, labor and effort involved.

While the embodiments of the present invention illustrated on the drawings have been described with considerable particularity, it is to be expressly understood that the invention is not limited thereto, as the invention is capable of receiving a variety of mechanical expressions, as will now be apparent to those skilled in the art, while changes may be made in the details of construction, arrangement, proportion and size of the tool, and the clip of the present invention may be modified to meet the needs of the particular service to which it is applied, without departing from the spirit of this invention. Reference is therefore to be had to the claims appended hereto for a definition of the invention.

What is claimed is:

1. A tool for applying clips to conductors which includes a pair of handle members pivoted together and provided with opposed jaws, one of said jaws being provided with a cam seat, and means for tightening said jaws after they have been moved into initial gripping position by said first-named handle members including a cam for cooperation with said seat, means pivotally mounting said cam on one of said jaws and a third handle member extending from said cam and movable toward and away from said first-named handle members.

2. A tool for applying clips to conductors which includes a pair of handle members pivoted together and provided with opposed jaws, one of said jaws being provided with a cam seat, and means for tightening said jaws after they have been moved into initial gripping position by said first-named handle members including a cam cooperable with said seat, means pivotally mounting said cam whereby said cam may be swung across the gap between said jaws to engage said cam with said seat and a third handle member extending from said cam and movable toward and away from said first-named handle members.

3. A tool for applying clips to conductors which includes a pair of handle members pivoted together and provided with opposed jaws, one of said jaws being provided with a cam seat, and means for tightening said jaws after they have been moved into initial gripping position by said first-named handle members including a cam for cooperation with said seat, link means pivotally mounted on one of said jaws and on which said cam is pivotally mounted, said link means adapted to react between said cam when engaged with said seat and the opposite jaw, and a handle member extending from said cam and movable toward and away from said first-named handle members for applying a tightening pressure to said jaws through rotation of said cam.

4. A tool for applying clips to conductors which includes a pair of handle members pivoted together and provided with opposed jaws, one of said jaws being provided with a cam seat, and means for tightening said jaws after they have been moved into initial gripping position by said first-named handle members including a cam for cooperation with said seat, link means associated with said cam and extending between said cam and the opposite jaw for locking said cam in cooperation with said seat, and means for rotating said cam to draw said jaws to-

gether through the action of said link means including a third handle member extending from said cam and movable toward and away from said first-named handle members.

5. A tool for applying clips to conductors which includes a pair of handle members pivoted together and provided with opposed jaws, one of said jaws being provided with a cam seat, and means for tightening said jaws after they have been moved into initial gripping position by said first-named handle members including a cam for cooperation with said seat, link means associated with said cam and swingable across the gap between said jaws into engagement with the opposite jaw for locking said cam in cooperation with said seat, and means for rotating said cam to draw said jaws together through the action of said link means including a third handle member extending from said cam and movable toward and away from said first-named handle members.

6. A tool for applying clips which includes a pair of handle members pivoted together and provided with opposed jaws, one of said jaws being provided with a cam seat, and means for tightening said jaws after they have been moved into initial gripping position by said first-named handle members including a cam for cooperation with said seat, link means extending between said cam and the opposed jaw for drawing said jaws together when said cam is moved, and means for moving said cam including a third handle member movable toward and away from said first-named handle members.

7. A tool for applying clips which includes a pair of handle members pivoted together and provided with opposed jaws, one of said jaws being provided with a cam seat, and means for tightening said jaws after they have been moved into initial gripping position by said first-named handle members including a cam for cooperation with said seat, means for pivotally mounting said cam from one of said jaws and movable over the gap between said jaws to engage said cam with said seat, and means for rotating said cam to draw said jaws together when said cam is engaged with said seat including a handle member movable toward and away from said first-named handle members.

8. A tool for applying clips which includes a pair of handle members pivoted together and provided with opposed jaws, one of said jaws being provided with a cam seat, and means for tightening said jaws after they have been moved into initial gripping position by said first-named handle members including a cam for cooperation with said seat, means for pivotally mounting said cam from one of said jaws, means movable over the gap between said jaws to engage the opposed jaw when said cam is engaged with said seat and means for rotating said cam to draw said jaws together including a handle member movable toward and away from said first-named handle members.

9. A pincer-like tool including a pair of handle members pivoted together and provided with opposed jaws, and means for positively drawing said jaws together after said jaws have been moved by said handle members into an initial gripping position including a rotatable

cam, a seat for said cam in one of said jaws, pivotally mounted means movable into position after said jaws have been moved into initial gripping position and operative to react between one of said jaws and said cam when said cam is rotated for pressing said jaws together, and means for rotating said cam including a third handle member movable toward and away from said first-named handle members.

10. A pincer-like tool including a pair of handle members pivoted together and provided with opposed jaws, and means for drawing said jaws together after said jaws have been moved into an initial gripping position including a rotatable cam, a seat for said cam in one of said jaws, means pivotally mounting said cam from the other of said jaws and movable over the gap between said jaws to engage said cam with said seat, and means for rotating said cam on said seat to press said jaws toward each other including a handle member movable toward and away from said first-named handle members.

11. A pincer-like tool including a pair of handle members pivoted together and provided with opposed jaws, and means for drawing said jaws together after said jaws have been moved into an initial gripping position including a rotatable cam, a seat for said cam in one of said jaws, link means pivotally mounted on the other of said jaws and pivotally carrying said cam at the free end thereof whereby said link means may be swung across the gap in said jaws to engage said cam with said seat, and means for rotating said cam on said seat to press said jaws together including a handle member movable toward and away from said first-named handle members.

12. A pincer-like tool including a pair of handle members pivoted together and provided with opposed jaws, and means for drawing said jaws together after said jaws have been moved into an initial gripping position including a rotatable cam, a seat for said cam in one of said jaws, link means for pivotally mounting said cam on one of said jaws, link means movable across the gap in said jaws and engageable with the other of said jaws, said last-named link means being pivoted at the axis of said cam, and means for rotating said cam to press said jaws together including a third handle member movable toward and away from said first-named handle members.

13. A pincer-like tool including a pair of handle members pivoted together and provided with opposed jaws and means for drawing said jaws together after said jaws have been moved into an initial gripping position including a rotatable cam, a seat for said cam in one of said jaws, means pivotally mounting said cam on one of said jaws, link means extending from said pivot and adapted to be swung across the gap between said jaws and engaged with the other of said jaws, and means for rotating said cam to press said jaws toward each other including a handle member extending from said cam and movable toward and away from said first-named handle members.

KENNIE M. JONES.

WILLIAM H. DE BAUGH.