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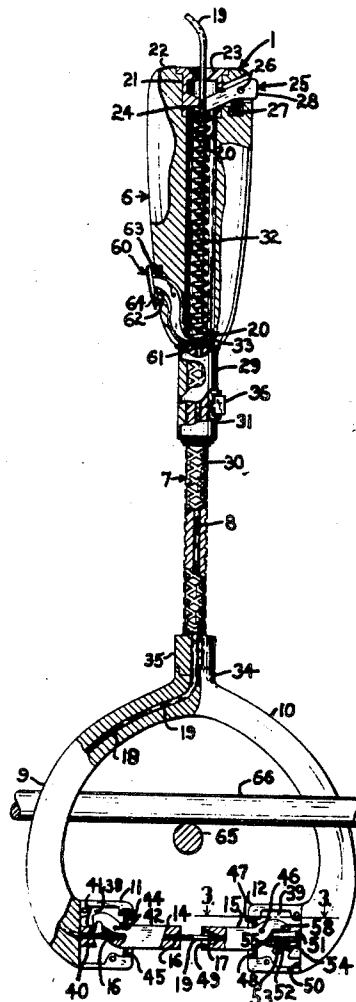
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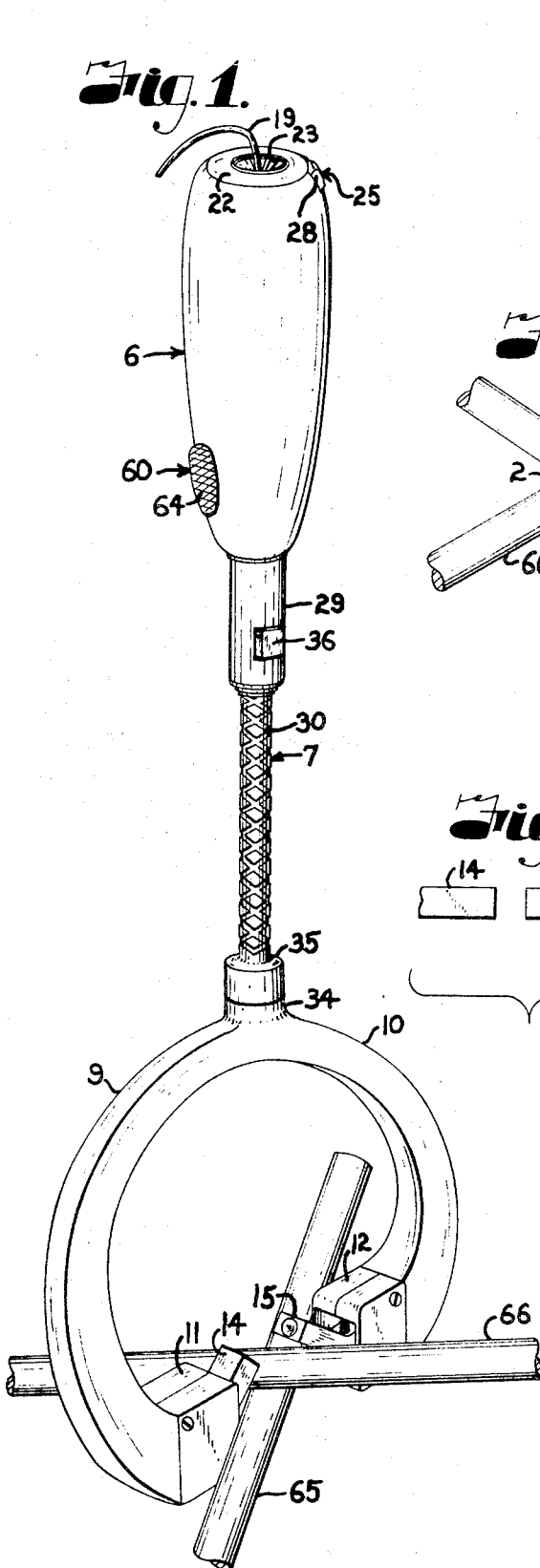
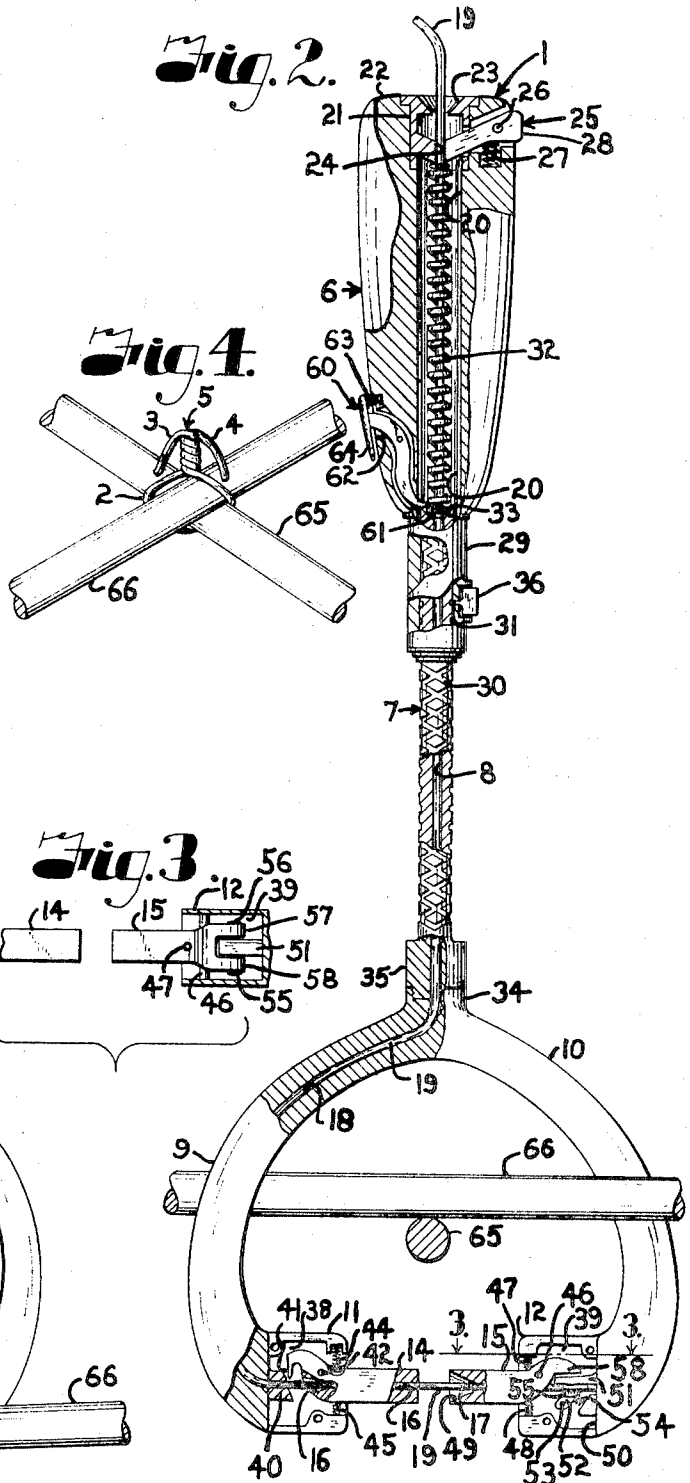
[54] **WIRE-TYING TOOL**
 11 Claims, 4 Drawing Figs.

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140/118;119
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B21f 7/00, B21f 15/02, B21f 15/04
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ABSTRACT: A wire-tying tool for forming a wire loop around articles to be tied together and for twisting together side-by-side portions of the loop to form a wire tie wherein the tool has a handle mounted on an elongate shaft having a wire passage therethrough and a pair of opposed arcuate arms mounted on one end of the shaft and having the free ends of the arms in spaced-apart aligned relation with the spacing therebetween being greater than a transverse dimension of articles to be tied together. A finger is pivotally mounted on the free end of each of the arms and each of the fingers has a wire passage therethrough with the passages being alignable with a wire passage through one of the arms to receive a wire from the wire passage through the shaft and handle. The wire is fed into the fingers and the arms and fingers are rotated to twist together the wire tie by operation of the handle and movement of the fingers is operative to cut the wire after the tie has been made.





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WIRE-TYING TOOL

The present invention relates to a wireworking device and more particularly to a wire tying and twisting tool for securing together a plurality of articles, such reinforcing bars or rods used in reinforced concrete construction.

The principal objects of the present invention are: to provide a wire-tying tool for forming a wire loop around articles to be tied together and for twisting side-by-side portions of the loop to form a wire tie and cutting the wire to separate the wire tie from the wire within the tool; to provide such a wire-tying tool adapted to tense or stretch the wire sufficiently to prevent kinks and to effect a tight wire tie around the articles to be tied together; to provide such a wire-tying tool wherein feeding wire into the tool and forming the wire loop and twisting the side-by-side portions together and cutting the tie from the wire within the tool are sequence manipulations of the tool; to provide such a wire-tying tool which is a portable handtool of simple operation, durable construction, and which is particularly adapted for the proposed use.

Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawings wherein are set forth by way of illustration and example certain embodiments of this invention.

FIG. 1 is a perspective view of a wire-tying tool embodying features of the present invention.

FIG. 2 is an elevational view of the wire-tying tool with portions broken away to better illustrate the component parts.

FIG. 3 is a fragmentary sectional view taken on line 3-3, FIG. 2, showing structure for releasing the wire tie.

FIG. 4 is a perspective view of a completed wire tie securing together a pair of reinforcing bars or rods such as used in reinforced concrete construction.

Referring more in detail to the drawings:

The reference numeral 1 generally designates a wire-tying tool for forming a wire loop 2 around articles to be tied together and for twisting together side-by-side portions 3 and 4 of the loop 2 to form a wire tie 5 wherein the tool 1 has a handle 6 mounted on an elongate shaft 7 having a wire passage 8 therethrough and a pair of opposed arcuate arms 9 and 10 mounted on one end of the shaft 7 and having the free ends 11 and 12 of the arms 9 and 10 respectively in spaced-apart aligned relation with the spacing therebetween being greater than a transverse dimension of articles to be tied together. Fingers 14 and 15 are pivotally mounted on the free ends 11 and 12 of the arms 9 and 10 respectively and the fingers 14 and 15 each have wire passages 16 and 17 respectively therethrough with the passages 16 and 17 being alignable with a wire passage 18 through one of the arms, for example, arm 9, to receive a wire 19 from the wire passage 8 through the shaft 7 and handle 6. The wire 19 is fed into the fingers 14 and 15 and the arms 9 and 10 and the fingers 14 and 15 are rotated to twist together the wire tie 5 by operation of the handle 6 and movement of the fingers 14 and 15 is operative to cut the wire 19 after the tie 5 has been made.

In the illustrated embodiment, the handle 6 is an elongate tubular member having a bore 20 extending longitudinally therethrough. A wire receiving and guiding structure 21 is mounted within the bore 20 at a free end 22 of the handle 6 to receive the wire 19 from a suitable reel or other source (not shown) and guide same into the fingers 14 and 15 mounted on the free ends 11 and 12 of the arms 9 and 10. The wire receiving and guiding structure or member 21 has a funnel portion 23 at the free end 22 of the handle 6 to guide the wire 19 into a groove 24 within the wire receiving and guiding structure or member 21.

It is necessary to hold the wire 19 within the handle 6 to prevent withdrawal of the wire 19 from the wire-tying tool 1 during movement and use thereof. Therefore, a dog 25 is mounted within the handle 6 and has one end thereof positioned to engage the wire 19 and hold same in clamping engagement within the groove 24 whereby when the handle 6 is

moved along the shaft 7 toward the arms 9 and 10, the wire 19 will be moved through the bore or wire passage 8 which extends longitudinally through the elongate shaft 7 and into the wire passage 18 which extends longitudinally through the one arm 9 and into the wire passages 16 and 17 in the fingers 14 and 15. The dog 25 is pivotally mounted intermediate its ends, as by a pin 26, and suitable resilient means, such as a spring 27, is mounted in the handle 6 to urge an inner end of the dog 25 into engagement with the wire 19 to hold same in clamping engagement within the groove 24. An end portion 28 of the dog 25 extends outwardly from the exterior surface of the handle 6 whereby the dog 25 may be manually disengaged from the wire 19 whereby the wire 19 may be withdrawn from the wire-tying tool 1 or the handle 6 may be moved along the shaft 7 without feeding the wire 19 into the fingers 14 and 15.

The handle 6 has a mounting portion 29 on the other end thereof for operatively engaging a guide track 30 on an exterior surface of the shaft 7 for effecting relative rotative movement between the handle 6 and the shaft 7 in response to movement of the handle 6 along the shaft 7 to rotate the arms 9 and 10 to twist the wire 19 to form the wire tie 5, as later described. In the illustrated structure, the mounting portion 29 is tubular and has a pawl 31 therein positioned to engage within the guide track 30 for effecting the relative rotative movement between the handle 6 and the shaft 7, as later described, and the guide track 30 has a path which effects relative rotation between the shaft 7 and the handle 6 whereby movement of the handle 6 along the shaft 7 toward the arms 9 and 10 feeds the wire 19 and movement away from the arms 9 and 10 turns the arms 9 and 10, as later described.

It is desirable to guide the movement of the wire 19 from the wire-receiving structure 21 into the wire passage 8 through the shaft 7 to effect straight feeding of the wire 19, therefore, an elongate helical spring 32 is mounted within the bore 20 and has opposite ends thereof seated on facing surfaces of the wire-receiving structure 21 and the shaft 7 with the wire 19 moving through the center of the helical spring 32.

The bore or wire passage 8 through the shaft 7 has a funnel portion 33 at one end thereof to receive the wire 19 from the guide spring 32 in the bore 20 of the handle 6 and guide same into the bore or wire passage 8 through the shaft 7. The other end of the shaft 7 is mounted in a socket 34 intermediate the ends of the arms 9 and 10. In the illustrated structure, the socket formed in the arms 9 and 10 is internally threaded to receive an externally threaded enlarged portion 35 at the other end of the shaft 7 opposite the end having the funnel 33 therein.

It is desirable that the shaft 7 be free to rotate within the mounting portion 29 of the handle 6 during feeding of the wire 19 into the wire-tying tool 1 and that the arms 9 and 10 rotate with the shaft 7 during wire tying operations to twist together the side-by-side portions 3 and 4 of the wire tie 5, therefore, suitable ratchet means 36 are positioned in the mounting portion 29 of the handle 6. The ratchet means 36 may be adjusted to permit free movement of the shaft 7 within the mounting portion 29 as when the handle 6 is moved toward the arms 9 and 10 to feed the wire 19 into the tool 1 and the ratchet means 36 may be adjusted to engage the pawl 31 to effect rotation of the shaft 7 and arms 9 and 10 relative to the handle 6 as when the handle 6 is moved away from the arms 9 and 10. The ratchet means 36 permit rotating handle 6 relative to the shaft 7 and the arms 9 and 10 when an article to be tied is positioned to prevent rotation of the arms 9 and 10.

The arms 9 and 10 extend outwardly from diametrically opposed sides of the socket 34 and are arcuate members and are joined together to form a generally C-shaped member having the socket 34 intermediate the ends thereof. In the illustrated structure, the arms 9 and 10 have chambers 38 and 39 within the free ends 11 and 12 thereof for pivotally supporting the fingers 14 and 15 respectively.

After the wire tie 5 has been formed, as later described, it is necessary to cut the wire 19 to permit the separation thereof from the wire 19 within the tool 1, therefore, the tool 1 has

wirecutting means associated therewith. In the illustrated structure, the chamber 38 mounted on the free end 11 of the arm 9 has a wire-supporting surface 40 positioned therein for supporting the wire 19. The finger 14 has a cutter blade 41 positioned in a spaced-apart relation with an edge of the surface 40 to form a shear whereby the finger 14 may be pivoted to move the cutter blade 41 toward and beyond the edge of the surface 40 to cut or shear the wire 19 positioned therebetween.

The finger 14 is an elongate member which is pivotally mounted intermediate its ends, as by a pin 42, and the finger 14 has the wire passage 16 extending longitudinally therethrough to receive the wire 19 from the free end 11 of the arm 9. The wire passage 16 has a funnel portion 43 to receive the wire 19 from the wire-supporting surface 40 in the chamber 38 and guide same into the wire passage 16.

Resilient means, such as springs 44 and 45, are mounted in the chamber 38 and engage the finger 14 to position same in a position having the wire passage 16 therethrough aligned with the wire passage 18 through the arm 9 to provide positive feeding of the wire 19 into the finger 14. The springs 44 and 45 are also adapted to position an exterior portion of the finger 14 to extend outwardly from the chamber 38.

The finger 15 is pivotally mounted in the chamber 39 on the free end 12 of the arm 10 as by a pin 46. Suitable resilient means, such as springs 47 and 48 are mounted in the chamber 39 and engage the finger 15 to position same in a position having the wire passage 17 extending longitudinally therethrough in an aligned relation with the finger to receive the wire 19 therefrom. In the illustrated structure, the wire passage 17 has a funnel portion 49 in the exterior end thereof to receive the wire 19 from the wire passage 16 through the finger 14. The wire 19 is moved through the wire passage 17 until the end thereof engages an interior wall 50 of the chamber 39.

It is necessary to securely hold the wire 19 within the chamber 39 to prevent withdrawal thereof during tying operations, therefore, a wire-guiding surface 51 is mounted within the chamber 39 and has a suitable groove therein to receive the wire 19 from the wire passage 17 through the finger 15 and to direct the wire 19 into engagement with the interior wall 50 of the chamber 39. A dog 52 is pivotally mounted within the chamber 39 to engage the wire 19 and hold same in clamping engagement with the wire-guiding surface 51 particularly during forming of the wire tie 5. In the illustrated structure, the dog 52 is pivoted about a pin 53 and the dog 52 is urged into engagement with the wire 19 by suitable resilient means, such as a spring 54.

After completion of the wire tie 5, it is necessary to permit withdrawal of the portion of the wire remaining within the fingers 14 and 15, therefore, it is necessary to release the dog 52 from the portion of the wire 19 within the chamber 39 preferably substantially simultaneously with the cutting of the wire by the cutter blade 41. The wire-guiding surface 51 is illustrated as a relatively narrow member and the dog 52 has end portions in the form of ears 55 and 56 extending outwardly beyond the edges of the wire guiding surface 51. The ears 55 and 56 are engaged by tines 57 and 58 formed in the interior end of the finger 15 when said interior end is moved toward the dog 52 and beyond the wire-guiding surface 51 to thereby overcome the resistance of the spring 54 and disengage the dog 52 from the wire 19.

Safety means are provided to prevent uncontrolled feeding of the wire 19 through the respective passages particularly during handling and moving of the wire-tying tool 1 as effected by movement of the handle 6 toward the arms 9 and 10. In the illustrated structure, a latch member 60 is pivotally mounted on the handle 6 and has one end 61 thereof extending into the bore 20 through an aperture 62 in the handle 6. The end 61 of the latch member is normally positioned to engage the one end of the shaft 7 adjacent the spring 32 and funnel portion 33 therein to prevent movement of the handle 6 relative to the shaft 7. Suitable resilient means, such as a spring 63, engage the latch member 60 to urge an exterior por-

tion 64 thereof away from an exterior surface of the handle 6 and to urge the end 61 thereof inwardly through the aperture 62.

Particularly for safety and ease of use, it may be desirable that the exterior surface of the handle 6 be knurled or corrugated to furnish a satisfactory grip to an operator. It is also preferred that the wire 19 move smoothly through the respective wire passages, therefore, they may have a suitable smooth lining having a low coefficient of friction, such as graphite or Teflon or the like.

In using the wire-tying tool 1, the arms 9 and 10 and the fingers 14 and 15 are positioned around the article or articles to be tied together, such as reinforcing bars or rods 65 and 66 for reinforced concrete construction, by positioning the tool 1 above the rods 65 and 66 and moving same downwardly to engage the fingers 14 and 15 with the rods which moves the exterior ends of the fingers 14 and 15 upwardly to permit the tool 1 to move the fingers 14 and 15 beyond or below the rods 65 and 66. During this downward movement the latch member 60 and the handle 6 are positioned as shown in FIGS. 1 and 2 with the end 61 engaging the free end of the shaft 7 to prevent movement of the handle 6 along the shaft 7.

The wire 19 is then inserted through the funnel portion 23 in the free end 22 of the handle 6 and the wire 19 is fed into the wire passages 8 and 18 of the shaft 7 and arm 9 by moving the handle 6 from the position shown in FIGS. 1 and 2 toward the arms 9 and 10 after moving the exterior portion 64 of the latch member 60 toward the exterior surface of the handle 6 to move the end 61 out of engagement with the shaft 7. The dog 25 within the handle 6 engages the wire 19 in a manner which permits feeding of the wire and prevents withdrawal of the wire unless the end portion 28 thereof is manually moved to disengage the dog 25 from the wire 19. The springs 44 and 45 and the springs 47 and 48 align the wire passages 16 and 17 through the fingers 14 and 15 respectively to receive the wire 19 therethrough when the handle 6 is moved toward the arms 9 and 10. During the wire-feeding movement of the handle 6 the ratchet means 36 is positioned to allow free movement of the handle 6 along the shaft 7 without turning the shaft 7 and the arms 9 and 10. After the wire 19 has been fed through the fingers 14 and 15 and the free end thereof moved to engage the wall 50 of the chamber 39, the exterior portion 64 of the latch member 60 is released to allow the end 61 thereof to engage in the guide track 30 to prevent movement of the handle 6 along the shaft 7. When the wire is in a position having the end thereof engaging the interior wall 50 of the chamber 39, the wire-tying tool 1 is raised to engage the reinforcing bars 65 and 66 with the upper surfaces of the fingers 14 and 15 to form a wire loop 2 therearound with the exterior ends of the fingers 14 and 15 positioned above the reinforcing rods or bars 65 and 66 with the exterior ends of the fingers 14 and 15 pointing downwardly. The handle 6 is moved to a position adjacent the arms 9 and 10 by disengaging the end 61 from the guide track 30 and the ratchet means 36 is positioned to engage the pawl 31 in the track 30 to effect relative rotation between the shaft 7 and the handle 6. The handle 6 is then held against rotation and moved along the shaft 7 away from the arms 9 and 10 to turn the arms 9 and 10 with the shaft 7 to thereby twist together the side-by-side portions 3 and 4 of the loop 2. After completion of the travel of the handle 6 along the shaft 7, the wire-tying tool 1 is moved downwardly to engage the fingers 14 and 15 with the reinforcing bars 65 and 66 to move the cutter blade 41 toward the edge of the surface 40 thereby cutting the wire 19 within the chamber 38 and simultaneously the tines 57 and 58 engage the ears 55 and 56 of the dog 52 to disengage the dog 52 from the wire 19 within the chamber 39, thereby bending down the free ends of the portions 3 and 4 and separating the finished wire tie 5 from the wire-tying tool 1. Raising the wire-tying tool 1 withdraws the end portions 3 and 4 of the wire tie 5 from the fingers 14 and 15 respectively and the wire-tying tool 1 is thereby ready to move to another location.

It is to be understood that while I have illustrated and described one form of my invention, it is not to be limited to the specific form or arrangement of parts herein described and shown.

What I claim and desire to secure by Letters Patent is:

1. A wire-tying tool comprising:
 - a. a handle having a wire passage therethrough;
 - b. a pair of opposed arcuate arms mounted on said handle and having a wire passage extending through one of said arms, said arms terminating in spaced apart ends with the spacing therebetween being greater than a transverse dimension of articles to be tied together;
 - c. a finger pivotally mounted on the free end of each of said arms, each of said fingers having a wire passage therethrough;
 - d. means associated with said fingers and said arms for positioning said wire passages through said fingers in an aligned relation with the wire passage through said one arm to receive a wire therefrom;
 - e. means associated with one of said fingers for receiving and gripping the wire during tying thereof; and
 - f. means associated with the other of said fingers for cutting said wire after tying the articles together.
2. The wire-tying tool as set forth in claim 1 wherein said handle includes:
 - a. an elongate shaft having a bore extending longitudinally therethrough and a guide track on an exterior surface thereof, said bore through said shaft communicating with said wire passage through said one arm;
 - b. a tubular member sleeved on said shaft; and
 - c. means within said tubular member and engageable within said guide track for effecting relative rotative movement between said shaft and said tubular member in response to movement of said tubular member along said shaft.
3. The wire-tying tool as set forth in claim 2 including:
 - a. a wire-guiding member within said tubular member; and
 - b. a dog within said tubular member, said dog being positioned to engage a wire within said tubular member and hold same in clamping engagement with said wire-guiding member whereby movement of said tubular member along said shaft toward said arms effects feeding the wire into said fingers.
5. The wire-tying tool as set forth in claim 3 wherein:
 - a. said tubular member is an elongate member having an aperture therethrough intermediate the ends thereof; and
 - b. said dog is pivotally mounted in said aperture and has one end portion within said tubular member for engaging said wire and an other end portion extending outwardly of the exterior surface of said tubular member whereby said dog may be moved out of engagement with the wire during movement of said tubular member toward said arms to avoid feeding excess wire into said fingers.
5. The wire-tying tool as set forth in claim 4 including:
 - a. said arms being joined together to form a generally C-shaped member having a socket intermediate the ends thereof to rotatably receive said handle; and
 - b. means engageable with said shaft for preventing relative rotation between said handle and said arms when the arti-

- cles to be tied are within the space defined by said arms and said fingers and for effecting relative rotation between said handle and said arms and fingers to twist the wire around the articles to be tied when said articles are outside said defined space.
6. The wire-tying tool as set forth in claim 1 wherein:
 - a. each of said free ends of said arms has a chamber therein;
 - b. each of said fingers are elongate members pivotally mounted intermediate their ends; and
 - c. an end portion of each of said fingers extends into said respective chambers.
7. The wire-tying tool as set forth in claim 6 wherein said wirecutting means includes:
 - a. a wire-supporting surface positioned within the chamber at the free end of the arm having said wire passage therethrough for receiving and supporting the wire thereon; and
 - b. a cutter blade positioned on the end portion of said finger within said chamber at the free end of the arm having said wire passage therethrough, said cutter blade being positioned in spaced-apart relation with an edge of said wire-supporting surface and movable toward said edge of said surface to cut a wire therebetween.
8. The wire-tying tool as set forth in claim 7 wherein said wire-gripping means includes:
 - a. a wire-guiding surface within the other chamber; and
 - b. a wire-gripping dog within said other chamber positioned to engage the wire therein and hold same in clamping engagement with said wire-guiding surface.
9. The wire-tying tool as set forth in claim 8 wherein:
 - a. said wire-gripping dog within said other chamber has end portions thereof extending beyond said wire-guiding surface;
 - b. said wire-gripping dog is pivotally mounted within said other chamber; and
 - c. the end portion of said finger within said other chamber is shaped to engage said end portions of said wire-gripping dog to move same out of engagement with the wire when said end portion of said finger is moved beyond said wire-guiding surface while engaging said end portion of said wire-gripping dog.
10. The wire-tying tool as set forth in claim 2 wherein:
 - a. said fingers are pivotally mounted intermediate their ends and extend outwardly from the free ends of said arms; and
 - b. ratchet means are mounted in said tubular member and engageable with said shaft for permitting rotation of said tubular member relative to said arms when said handle is moved toward said arms and for effecting rotation of said arms when said tubular member is moved away from said arms.
11. The wire-tying tool as set forth in claim 2 including:
 - a. a latch member mounted on said tubular member and having an end thereof engageable with said shaft to prevent movement of said tubular member along said shaft; and
 - b. means engageable with said latch member for urging said end into engagement with said shaft.