Dec. 7, 1948. D. C. HUBBARD 2,455,490

TOOL FOR APPLYING ARMOR RODS TO ENERGIZED CONDUCTORS

Filed Feb. 12, 1947 2 Sheets-Sheet 1

Fig. 1

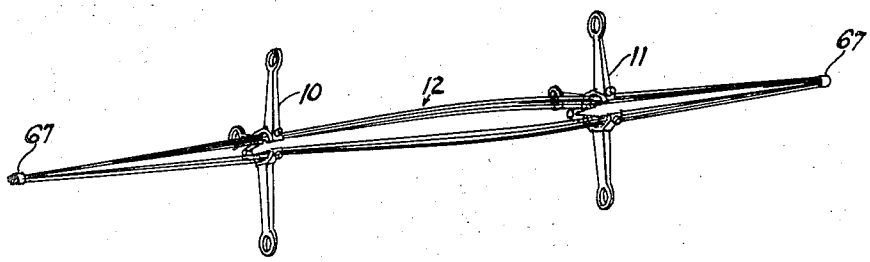


Fig. 2

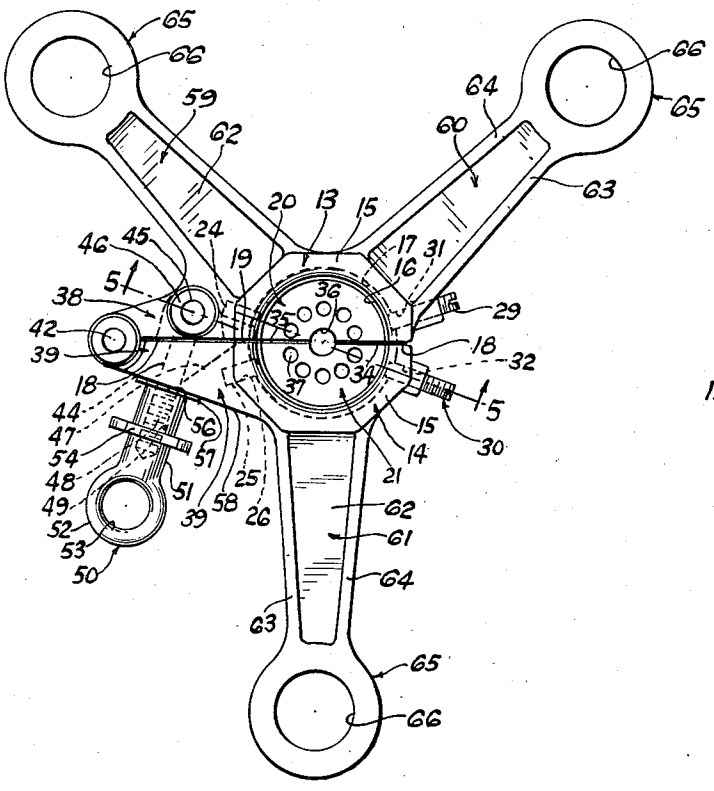
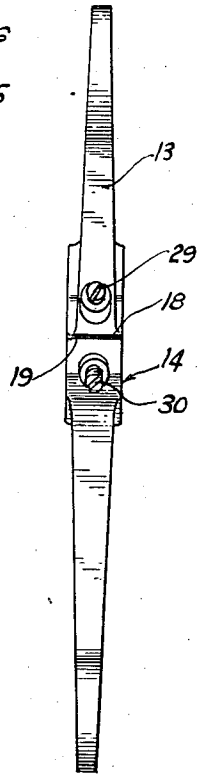


Fig. 3



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Fig. 4

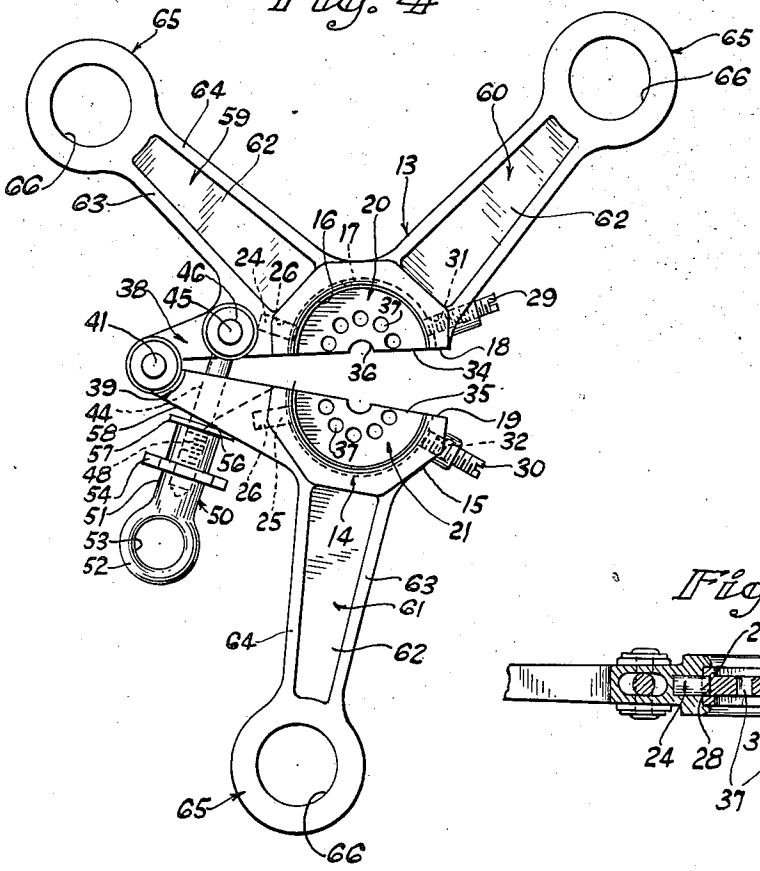
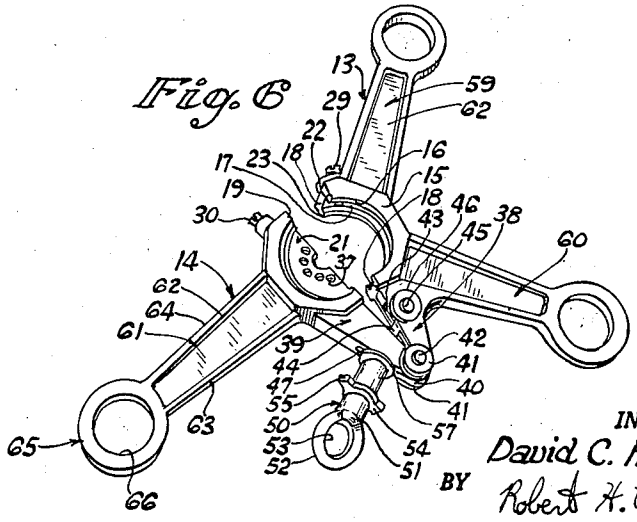


Fig. 5

Fig. 6



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TOOL FOR APPLYING ARMOR RODS TO ENERGIZED CONDUCTORS

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14 Claims. (Cl. 57—10)

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The present invention relates to tools for applying armor rods to energized conductors, and is particularly concerned with the application of armor rods which are bendable and which are to be tightly wrapped about an energized conductor, such as a high tension line.

One of the objects of the invention is the provision of simple tools for the application of bendable armor rods to an energized conductor which permit the use of the same dies as are used in hand tools, and which are adapted to be operated by means of standard auxiliary tools, such as clamp sticks, disconnect sticks, etc., which are already in the possession of the user.

Another object of the invention is the provision of an improved armor rod applying tool which is simple to operate, and which is provided with a pair of half frames or jaws adapted to be held in open position and to be supported and manipulated by means of a clamp stick so that the rod wrapping frames may be assembled with the rods in a preliminary operation, mounted upon a pair of clamp sticks and then applied to the energized line conductor without the necessity for cutting off the power.

Another object of the invention is the provision of improved linemen's tools for wrapping armor rods on energized conductors, which are easier to operate than the devices of the prior art, and which permit the application of the clamp stick or disconnect stick to the armor wrapping frame at a multiplicity of different points about the frame so that force may be applied most advantageously by a push or a pull, instead of requiring lateral movement of the stick, and so that the tools may be easily manipulated in places where the energized conductor is inconveniently located.

Another object of the invention is the provision of improved wrapping tools by means of which armor may be applied to energized conductors quickly in a minimum amount of time and with a minimum number of operators.

Another object of the invention is the provision of improved armor applying tools for energized conductors which are sturdy, simple in construction, capable of manufacture at a low cost, and which are adapted to be used for a long period of time without repair or replacement of its parts.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings, in which similar characters of reference indicate similar parts throughout the several views.

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Referring to the two sheets of drawings accompanying this specification,

Fig. 1 is a view in perspective, showing the armor rods assembled and threaded through the dies of two of the rotating frames, the ends of the rods being taped together to provide a unitary assembly that can be applied to the energized conductor by means of clamp sticks;

Fig. 2 is a side elevational view of one of the die supporting frames shown in Fig. 1;

Fig. 3 is a front elevational view of the die supporting frame of Fig. 2;

Fig. 4 is a view similar to Fig. 2, with the frame and dies in open position;

Fig. 5 is a transverse sectional view, taken on the plane of the line 5—5 of Fig. 2, looking in the direction of the arrows;

Fig. 6 is a view in perspective of one of the open die supporting frames, with one die half removed.

Referring to Fig. 1, this shows an assembly of die supporting frames 10, 11 and a plurality of armor rods or wires 12, which have been assembled preliminary to their application to an energized conductor, such as a high tension line conductor.

The construction of the frames is shown in Figs. 2–6. Each die supporting frame comprises a half frame member 13 above and another half frame member 14 below. The half frame members 13, 14 are each formed with a central body 15, which has a half circular recess 16 provided with a half annular groove 17.

The central body portions 13, 14 are provided with opposed flat edges 18, 19 so that the two body portions 13, 14 may be brought into position adjacent each other, with the two half bores 16 having their side walls in registry with each other to form a complete circular bore which has a complete annular groove 17 adapted to receive the two die halves 20, 21.

The width of the annular groove 17 (Fig. 5) is sufficient to receive the die halves 20, 21 so that the inwardly projecting annular flanges 22, 23, which border each of the bores 16, engage outside of the die halves 20, 21, to prevent axial movement of the dies in the frames.

In order to prevent movement of the die halves 20, 21 out of their recesses or grooves 17, the frame bodies 13, 14 are provided with a pair of metal pins 24, 25 frictionally secured in bores 26 in the bodies 13, 14, and having an end portion 27 projecting outwardly into the annular groove 17.

Pins 24, 25 are located on the left side, adja-

cent the flat edges 18, 19 of the two frame bodies 13, 14; and the die halves 20, 21 are provided with cylindrical recesses 28 for receiving these projecting portions 27 of the pins 24, 25.

The bodies 13, 14 of the frames are provided with set screws 29, 30, which are threaded into threaded bores 31, 32, also located adjacent each other and adjacent the flat edges 18, 19 of the bodies 14, 15, so that the set screws 29, 30 are almost diametrically opposite to the pins 24, 25.

Set screws 29, 30 also project into the groove 17, as will be seen in Fig. 5; and the die halves 20, 21 are provided with cylindrical bores 33 located in their peripheries at a point suitable to receive the set screws 29, 30. Thus the die halves 20, 21 may be placed in the grooves 17, with the pins 24 and 25 in their sockets 28, when the set screws 29, 30 are driven home, into the recesses 33, the die halves 20, 21 are firmly secured in the two half frames 14, 15.

The die halves 20, 21 comprise half circular members, each of which is provided with a flat side 34, 35 and a half circular aperture 36 for receiving the energized conductor on which the frame and die are to rotate. The die halves are also provided with a multiplicity of apertures 37, preferably equally spaced from each other and all located at substantially the same radius about the central aperture 36 for receiving the armor rods or wires that are to be wrapped about the energized conductor.

Various patterns and arrangements of the apertures 37 for the armor rods may be employed, depending on the type of wrapping desired; but that which has been selected to illustrate the invention is adapted to be used in wrapping ten rods about the energized conductor.

The size and structure of the bodies 14, 15 and their grooves 17 is preferably such that these frames will receive the same dies which are provided in hand tools that are made by the manufacturers of armor rods, so that the present tool does not require any new dies, and may be employed with dies which the user already has.

The bodies 13, 14 of the frames are each provided with a laterally projecting web 38, 39, the end portions of which are provided with hinge formations 40, 41 for receiving a pintle 42, whereby the two webs 38, 39 are pivotaly mounted with respect to each other.

The hinge formation 41 is bifurcated, and hinge formation 40 is received between the formations 41, as will be seen in Fig 6; and the ends of the pintle 42 may be riveted over. The web 38 is provided on its flat side 18 with a slot 43 of sufficient width and depth to receive the eye bolt 44, the upper end of which comprises an eye which is pivotally mounted upon a pintle 45.

The pintle 45 may be riveted over at both of its ends, and the web 38 may be provided with a pair of cylindrical bearing formations 46 for the pintle 45.

The web 39 of the lower frame half 14 is also provided with a through slot 47 for passing the shank of the eye bolt 44. The eye bolt 44 has a lower threaded end 48, which is adapted to be received in the threaded bore 49 of an actuating member 50.

This actuating member comprises a substantially cylindrical body 51 and an enlarged eye 52, having an aperture 53 of the usual size employed on hot wire clamps and other members that are actuated by clamp sticks. The cylindrical body 51 preferably supports a radially projecting flange 54 intermediate its ends, and the flange has a pair of diametrically opposite radial lugs 55, which engage in appropriate grooves in the ends of a clamp stick head so that the eye 52 may be drawn into the clamp stick head until the lugs 55 engage in the grooves; and the actuating member 50 is fixedly secured in the clamp stick head.

The actuating member 50 preferably has a plane end surface 56 for engaging a washer 57, which engages the flat lower edge 58 on the web 39. It should also be noted that the slot 47 in the web 39 is of sufficient length to allow only a limited amount of pivotal movement of the entire frame on the eye bolt 44, thus preventing the frame from tipping to one side or the other and the eye bolt from sliding beyond the limits of the ends of the slot 47.

Each of the central bodies 15 of the two half frames 13, 14 is preferably provided with one or more radially projecting arms 59, 60, 61. As the threaded actuating member 50 projects downwardly on the lower half frame member 14, this half frame member is preferably provided with only one arm 61, while there is room on the upper half frame member 13 for two such arms 59, 60.

The arms 59—61 may each be formed with a thin central web 62 bordered by laterally projecting reinforcing ribs 63, 64, and each arm carries at its end an eye structure 65, having an aperture 66 of sufficient size to receive the tool end of an ordinary disconnect stick.

Such a disconnect stick is a common tool in the lineman's kit, and therefore no additional tools are required. Disconnect sticks customarily have a laterally projecting cylindrical lug at the tool end, this lug being provided with a relatively small head. Therefore, the apertures 66 are larger than the aperture 53 in the eye 52 of the actuating member 50. The reason for this is that the eye 52 of the actuating member 50 is intended to be used with a clamp stick, but the arms 59—61 are intended to be actuated by means of disconnect poles, which are more readily applied and removed.

The method of use of the armor applying tools is as follows: The frames are provided with their dies and moved to the open position of Fig. 4 by turning the actuating member 50 in a counterclockwise direction so that it retracts on the eye screw 44. Then the armor rods or wires 12 are threaded through the apertures 37 and arranged in the manner shown in Fig. 1, with the two frames suitably spaced from each other to begin wrapping operations.

The ends of the armor rods 12 are brought into the same plane and secured together by means of adhesive tape, indicated at 67. This makes a unitary assembly that can be mounted on a pair of clamp sticks, the clamp sticks engaging the eyes 52 of each frame. This prevents the rods from sliding out of the assembly while the unit is handled and placed on the energized conductor by means of clamp sticks, and also while the first turns are being taken to twist the armor rods on the conductor.

The tape is left on the rods during the first twisting operation, preferably until a short section of conductor is covered with twisted rods, so that the twisted portions of the rods will hold them to prevent any longitudinal movement of one rod with respect to the other, and the rods will not be disarranged while the operator is removing the tape, which is also done by means of a tool mounted upon an insulating stick or pole.

The clamp sticks are preferably so manipulated that the eye 52 is drawn into the clamp stick head

and the lugs are drawn into the appropriate groove in the end of the clamp stick head so that each frame is fixedly secured on one clamp stick.

The open sides of the frames are, of course, on the same side, and thus the assembly of wires and frames may be lifted by means of the clamp sticks and applied to the energized conductor. The clamp sticks are then rotated in a clockwise direction, drawing the eye screw **44** into the threaded actuating member **50** and driving the two frame halves of each frame against each other to close the dies, with the aperture **36** around the energized conductor.

The clamp sticks are then removed from the eyes **52**. Thereupon one operator may take a disconnect stick and engage it in an aperture **66** in one of the arms of one frame, for holding that frame in fixed position. The other operator may then successively apply his disconnect stick to the eyes **65** of the arms on the other frame, and may push or pull, as the case may require to rotate the other frame and twist the wires **12** about the energized conductor.

After a single complete turn, or a few turns, the frame which has just been rotated is held still, and the other frame is rotated. When a short section of the energized conductor has been covered with twisted armor rods, so that the rods can no longer move lengthwise with respect to each other, and the rods and conductor are bound together as a unit, then the tapes **67** are removed. The alternate holding of one frame and rotation of the other frame then continues until the frames progress to the ends of the wires and slide off the ends of the armor wires, which have been wrapped tightly about the energized conductor.

The frames are then removed by means of a clamp stick, which is again used to open the frames to the position of Fig. 4, and threaded clamping members are applied to the ends of the armor wires to clamp them tightly about the energized conductor and to prevent the armor wires from becoming loose.

It will thus be observed that I have invented improved tools for applying armor rods or wires to energized conductors, these tools being capable of manipulation by means of ordinary clamp sticks and disconnect sticks. My armor rod applying tools are very simple and may be manufactured at a very low cost, as they are adapted to apply the same dies that are used in hand devices, which the user may already have, and it is not necessary to purchase new dies. Neither is it necessary to purchase any other tools, as the lineman's kit always includes clamp sticks and disconnect sticks.

While I have illustrated a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. The method of applying armor rods to energized conductors which comprises supporting a plurality of armor rods in two pairs of die halves spaced from each other, the die halves being open and the rods being arranged in substantially half circular formation in each die half, securing the ends of the rods together at each end of the assembly, mounting the die halves upon insulating sticks, applying the die halves to an energized conductor with said insulated sticks, closing the die halves by means of said insulated sticks to mount the die halves rotatably upon said energized conductor, removing the insulated sticks, removing the securing means at each end of the armor rods, holding one of the dies in fixed position, while the other die is rotated by means of the insulated stick, and alternately holding each die in fixed position, while the other die is rotated, until the dies pass off the ends of the rods and the rods are spirally wound on the energized conductor, and securing the ends of the wound armor rods in position by applying a clamping member to each end of the armor rod assembly.

2. In a tool for applying armor rods to energized conductors, the combination of a pair of die halves, each die half being formed with a half circular central groove adapted to form a central aperture when the die halves are closed against each other, the said dies having a plurality of armor rod holes arranged in a circle about said central aperture, a supporting frame for each of said die halves, said frame being provided with a pair of half annular grooves, each groove supporting a die half, means for fixedly securing the die half in each of said groves, means for mounting each of said frames in a unit on a clamp stick, and means projecting from said frames and adapted to be engaged by an insulated stick for holding the frame in fixed position or for effecting a rotation of the frame to wind armor rods on an energized conductor.

3. In a tool for applying armor rods to energized conductors, the combination of a pair of die halves, each die half being formed with a half circular central groove adapted to form a central aperture when the die halves are closed against each other, the said dies having a plurality of armor rod holes arranged in a circle about said central aperture, a supporting frame for each of said die halves, said frame being provided with a pair of half annular grooves, each groove supporting a die half, means for fixedly securing the die half in each of said grooves, means for mounting each of said frames in a unit on a clamp stick, and means projecting from said frames and adapted to be engaged by an insulated stick for holding the frame in fixed position or for effecting a rotation of the frame to wind armor rods on an energized conductor, said latter means comprising three metal arms extending substantially radially and provided with eyes at their ends.

4. In a tool for applying armor rods to energized conductors, the combination of a pair of die halves, each die half being formed with a half circular central groove adapted to form a central aperture when the die halves are closed against each other, the said dies having a plurality of armor rod holes arranged in a circle about said central aperture, a supporting frame for each of said die halves, said frame being provided with a pair of half annular grooves, each groove supporting a die half, means for fixedly securing the die half in each of said grooves, means for mounting each of said frames in a unit on a clamp stick, and means projecting from said frames and adapted to be engaged by an insulated stick for holding the frame in fixed position or for effecting a rotation of the frame to wind armor rods on an energized conductor, the said frames being pivotally mounted upon each other in such manner that the die halves may be separated to be placed upon an energized conductor or brought together to be rotatably mounted upon said conductor.

5. In a tool for applying armor rods to ener-

gized conductors, the combination of a pair of die halves, each die half being formed with a half circular central groove adapted to form a central aperture when the die halves are closed against each other, the said dies having a plurality of armor rod holes arranged in a circle about said central aperture, a supporting frame for each of said die halves, said frame being provided with a pair of half annular grooves, each groove supporting a die half, means for fixedly securing the die half in each of said grooves, means for mounting each of said frames in a unit on a clamp stick, and means projecting from said frames and adapted to be engaged by an insulated stick for holding the frame in fixed position or for effecting a rotation of the frame to wind armor rods on an energized conductor, the said frames being pivotally mounted upon each other in such manner that the die halves may be separated to be placed upon an energized conductor or brought together to be rotatably mounted upon said conductor, said means for mounting upon a clamp stick comprising a pair of threaded members acting on said frames and provided with an eye for engagement with the clamp stick.

6. In a tool assembly for wrapping armor rods on energized conductors, the combination of a pair of supporting frames, each of said frames comprising a pair of separable members pivotally mounted with respect to each other, a pair of die halves, one half being fixedly mounted on each of said members, and each die half being provided with a semi-circular series of apertures for armor rods, and a centrally located groove, so that the die halves form a central aperture adapted to receive the energized conductor when the members and die halves are closed, means for mounting each frame upon an insulated tool, the frames being spaced from each other and supporting a plurality of armor rods in said armor rod apertures to provide a unitary assembly which may be lifted to the energized conductor by said insulated tools.

7. In a tool assembly for wrapping armor rods on energized conductors, the combination of a pair of supporting frames, each of said frames comprising a pair of separable members pivotally mounted with respect to each other, a pair of die halves, one half being fixedly mounted on each of said members, and each die half being provided with a semi-circular series of apertures for armor rods, and a centrally located groove, so that the die halves form a central aperture adapted to receive the energized conductor when the members and die halves are closed, means for mounting each frame upon an insulated tool, the frames being spaced from each other and supporting a plurality of armor rods in said armor rod apertures to provide a unitary assembly which may be lifted to the energized conductor by said insulated tools, and three radially extending arms adapted to be engaged by an insulated operating stick, whereby each frame may be alternately held still, while the other frame is being rotated by another insulated operating stick.

8. In a tool assembly for wrapping armor rods on energized conductors, the combination of a pair of supporting frames, each of said frames comprising a pair of separable members pivotally mounted with respect to each other, a pair of die halves, one half being fixedly mounted on each of said members, and each die half being provided with a semi-circular series of apertures for armor rods, and a centrally located groove, so that the die halves form a central aperture adapted to receive the energized conductor when the members and die halves are closed, means for mounting each frame upon an insulated tool, the frames being spaced from each other and supporting a plurality of armor rod apertures to provide a unitary assembly which may be lifted to the energized conductor by said insulated tools, and three radially extending arms adapted to be engaged by an insulated operating stick, whereby each frame may be alternately held still, while the other frame is being rotated by another insulated operating stick, each of said arms being provided at its end with an eye adapted to receive the tool end of a disconnect stick.

9. In a tool assembly for wrapping armor rods on energized conductors, the combination of a pair of supporting frames, each of said frames comprising a pair of separable members pivotally mounted with respect to each other, a pair of die halves, one half being carried by each of said members, and each die half being provided with a semi-circular series of apertures for armor rods, and a centrally located groove, so that the die halves form a central aperture adapted to receive the energized conductor when the members and die halves are closed, means for mounting each frame upon a clamp stick, the frames being spaced from each other and supporting a plurality of armor rods in said armor rod apertures, means for securing the ends of the armor rods together to provide a unitary assembly which may be lifted to the energized conductor by said clamp sticks, one of said members on each frame being provided with an eye bolt pivotally mounted in a slot and projecting into a slot in an adjacent member, and said means for supporting the frames upon clamp sticks comprising a threaded member engaging a threaded portion of said eye bolt and engaging against an adjacent surface on the adjacent member, to drive the members together.

10. In a tool assembly for wrapping armor rods on energized conductors, the combination of a pair of supporting frames, each of said frames comprising a pair of separable members pivotally mounted with respect to each other, a pair of die halves, one half being carried by each of said members, and each die half being provided with a semi-circular series of apertures for armor rods, and a centrally located groove, so that the die halves form a central aperture adapted to receive the energized conductor when the members and die halves are closed, means for mounting each frame upon a clamp stick, the frames being spaced from each other and supporting a plurality of armor rods in said armor rod apertures, means for securing the ends of the armor rods together to provide a unitary assembly which may be lifted to the energized conductor by said clamp sticks, one of said members on each frame being provided with an eye bolt pivotally mounted in a slot and projecting into a slot in an adjacent member, and said means for supporting the frames upon clamp sticks comprising a threaded member engaging a threaded portion of said eye bolt and engaging against an adjacent surface on the adjacent member, to drive the members together, said threaded member also being provided with an eye for reception in a clamp stick and with laterally projecting lugs adapted to be fixedly received in a slot in the end of a clamp stick head.

11. In a tool assembly for wrapping armor rods

on energized conductors, the combination of a pair of supporting frames, each of said frames comprising a pair of separable members pivotally mounted with respect to each other, a pair of die halves, one half being carried by each of said members, and each die half being provided with a semi-circular series of apertures for armor rods, and a centrally located groove, so that the die halves form a central aperture adapted to receive the energized conductor when the members and die halves are closed, means for mounting each frame upon a clamp stick, the frames being spaced from each other and supporting a plurality of armor rods in said armor rod apertures, means for securing the ends of the armor rods together to provide a unitary assembly which may be lifted to the energized conductor by said clamp sticks, each of said die halves being mounted in a half annular groove in one of said members, and said groove being provided with diametrically opposite pins and set screws for engagement in the sockets in the die halves, to hold the die halves in said grooves.

12. The method of applying straight armor rods to an energized conductor, which comprises supporting the rods in a pair of die assemblies, said die assemblies each having a hole for each of the rods, and the holes being arranged in a circle whose center is located at an axial hole in said die assemblies, securing the ends of the rods together temporarily with the ends in substantial alignment with each other, arranging the die assemblies close to each other midway between the ends of the rods, opening the dies of each assembly to admit the conductor into each die assembly, closing the dies of each assembly on the conductor to mount the rods and dies rotatively upon the conductor, and rotating the two die assemblies in opposite directions to bend the rods spirally about the conductor as the die assemblies separate from each other.

13. The method of applying straight armor rods to an energized conductor, which comprises supporting the rods in a pair of die assemblies, said

die assemblies each having a hole for each of the rods, and the holes being arranged in a circle whose center is located at an axial hole in said die assemblies, securing the ends of the rods together temporarily with the ends in substantial alignment with each other, arranging the die assemblies close to each other midway between the ends of the rods, opening the dies of each assembly to admit the conductor into each die assembly, closing the dies of each assembly on the conductor to mount the rods and dies rotatively upon the conductor, and rotating the two die assemblies in opposite directions to bend the rods spirally about the conductor as the die assemblies separate from each other, and releasing the ends of the wires before the die assemblies approach said ends, so that the die assemblies may rotate spirally off the ends of the rods.

14. In a tool for applying armor rods, a pair of pivotally mounted frames, each frame having a half circular groove for receiving a half die, and each half circular groove being provided with a peripheral groove in which the die is mounted, a die in each of said frames, each die having a plurality of holes arranged in a half circle, and each die having a central groove whereby the central grooves form an aperture for receiving the conductor and the holes are arranged in a circle about the conductor for supporting armor rods, means for fixedly securing each die in its frame, and threaded means for moving one frame relative to the other, whereby the frames may be spread to separate the dies or brought together to close the dies.

DAVID C. HUBBARD.

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The following references are of record in the file of this patent:

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