May 14, 1940. P. N. DANN 2,200,874

BOX CONNECTOR

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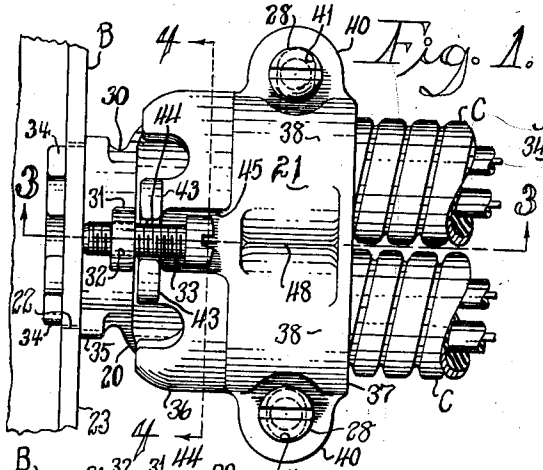


Fig. 1.

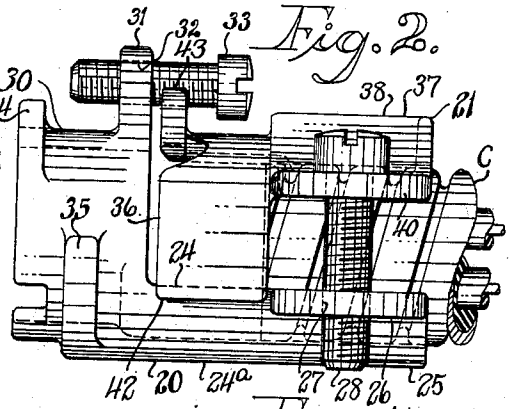


Fig. 2.

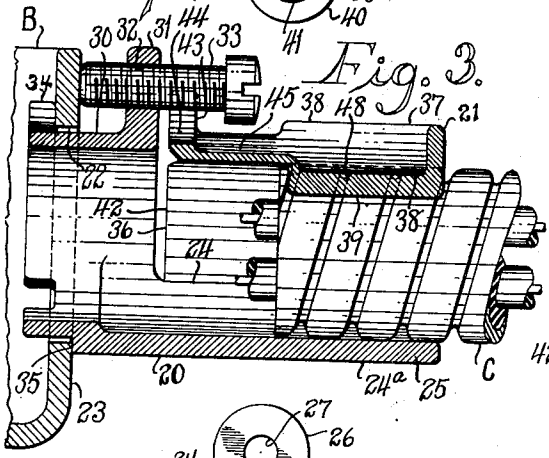


Fig. 3.

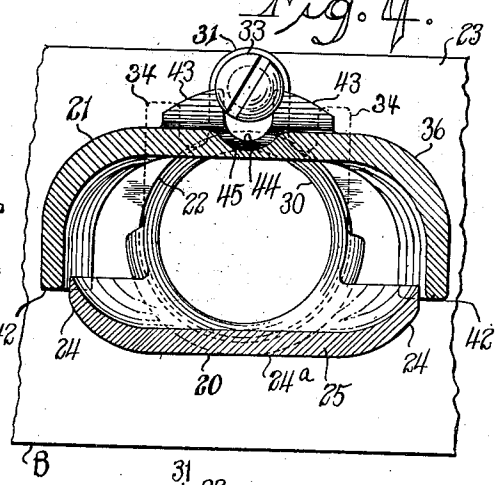


Fig. 4.

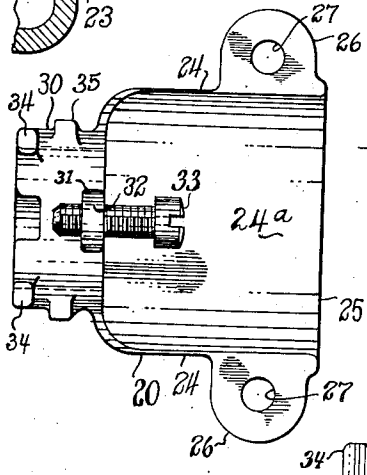


Fig. 5.

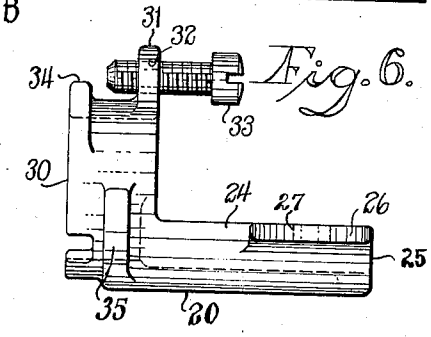


Fig. 6.

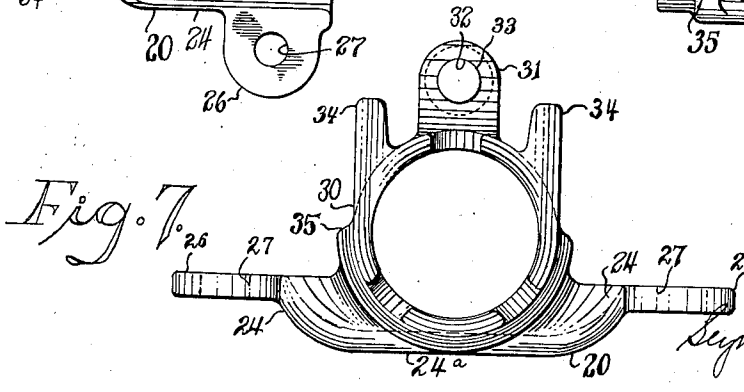


Fig. 7.

Inventor
Paul N. Dann
by Seymour Earl Nichols
Attorneys

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BOX CONNECTOR

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Fig. 8.

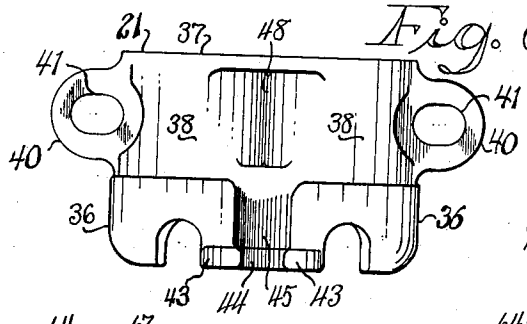


Fig. 9.

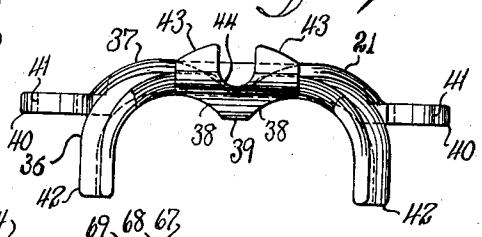


Fig. 10.

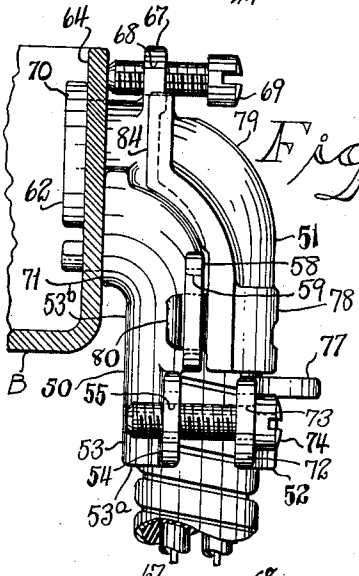


Fig. 11.

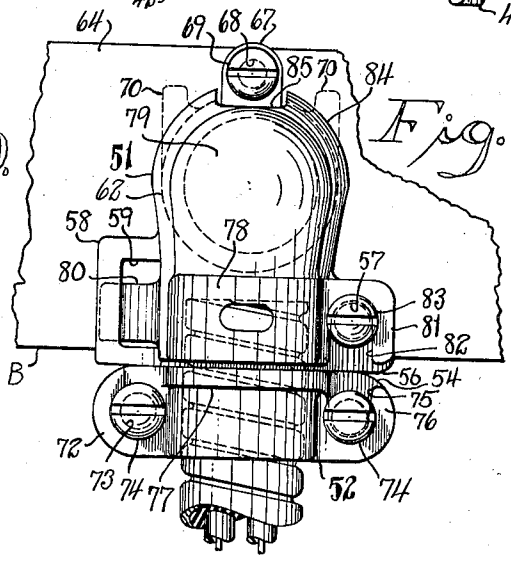


Fig. 12.

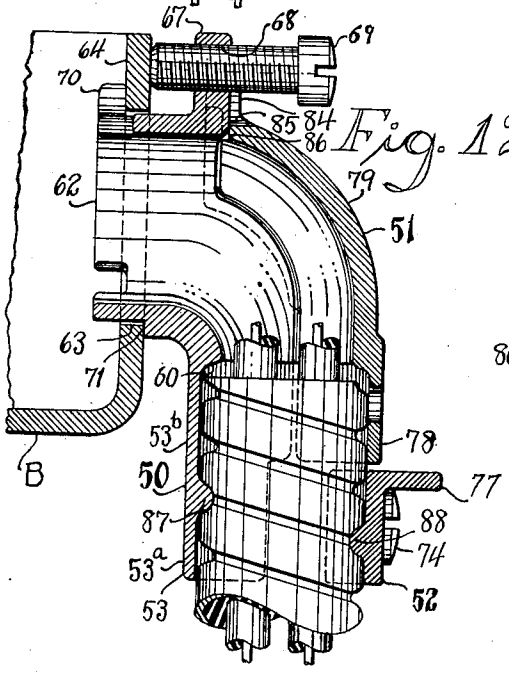
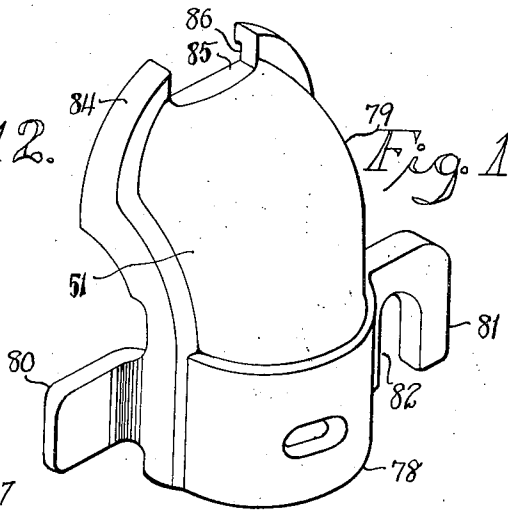


Fig. 13.



Inventor
by Paul N. Dann
Seymour Earl Nichols
Attorneys

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UNITED STATES PATENT OFFICE

2,200,874

BOX CONNECTOR

Paul N. Dann, New Haven, Conn., assignor to The Rattan Manufacturing Company, New Haven, Conn., a corporation of Connecticut

Application November 16, 1938, Serial No. 240,615

3 Claims. (Cl. 285—6.5)

The present invention relates to box connectors of improved type for the connection of non-rigid conductor-carriers with an electrical device such as an outlet or junction-box or the like. More especially, this invention is concerned with providing box-fittings of superior construction and arrangement for receiving and gripping flexible electric cables.

An object of the present invention is to provide a superior box-fitting which is constructed and arranged to be clamped to a junction-box or the like by operation of a member exteriorly of the box, and in which operation of the securing-member may be performed without interference.

Another object of this invention is the provision of an improved box connector constructed and arranged to secure maximum accessibility to and convenience of tool-operation of a securing-member exteriorly of a junction-box or the like.

A further object of the present invention is to provide a superior box connector in which placement of a member thereof having capacity for accommodating-positioning relatively to a securing-member for the accommodation of cable and conductors, may be secured without interference with movement of the said securing-member adjacent thereto.

Another object of the present invention is the provision of a superiorly constructed and arranged box connector in which displacement of a member thereof toward an exteriorly-arranged securing-member may be effected without interference, protective-enclosure of conductors may be maintained, and unhindered operation of the securing-member may be secured.

Still another object of this invention is to provide a box-fitting of superior construction and arrangement for free and convenient operation of an exteriorly-arranged securing-member to cause a wall of a junction-box or the like to be securely clamped between rigidly-united means of the box-fitting to secure improved mechanical and electrical connections between the box and flexible cable secured in the box-fitting.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

Fig. 1 is a top plan view of a straight form of box connector embodying the present invention and shown inserted in and clamped to a wall of a junction-box or the like;

Fig. 2 is a side elevation of the box connector shown in Fig. 1, detached from the junction-box or the like;

Fig. 3 is a cross-sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 1;

Fig. 5 is a top view of the coupling-member of the box connector illustrated in Figs. 1 thru 4;

Fig. 6 is a side elevational view of the coupling-member shown in Fig. 5;

Fig. 7 is an inner end view of the coupling-member;

Fig. 8 is a top plan view of the cap-member of the box connector shown in Figs. 1 thru 4;

Fig. 9 is an inner end view of the cap-member;

Fig. 10 is a view in side elevation of an angle-type box connector embodying the present invention and shown clamped in place to a junction-box or the like;

Fig. 11 is a front view of the box connector shown in Fig. 10;

Fig. 12 is a cross-sectional view taken on the line 12—12 of Fig. 11 on an enlarged scale; and

Fig. 13 is a perspective view of the cap-member of the angle-type box connector.

Referring first to Figs. 1 thru 9 of the drawings, the present invention is shown therein embodied in a straight-type box connector. This box connector comprises two separable members, a body- or coupling-member generally designated by the reference character 20 and a cap-member designated as a whole by the reference character 21. The coupling-member 20 is arranged for insertion through a knockout-opening 22 in a wall 23 of a junction-box or the like indicated by the reference character B (Figs. 1, 3, and 4), and to be clamped in place against the said wall. Co-operating with the coupling-member 20, the cap-member 21 combines therewith to enclose and grip the end-portion of an electric cable such as the armored cable designated herein by the reference character C, whereby the conductor or conductors carried in the cable C may be connected with suitable leads or the like (not shown) in the box B.

As is particularly well shown in Figs. 4 and 7, the coupling-member 20 includes an elongated portion which is substantially U-shaped in cross-section and comprises side-wings 24—24 which extend longitudinally at the respective opposite

sides of a substantially-flat central portion 24a.

The said coupling-member 20 adjacent its outer end constitutes a cable-grip portion 25 adjacent which the side-wings 24—24 are provided with laterally-extending clamp-ears 26—26. The said clamp-ears 26—26 respectively have threaded openings 27—27 extending therethrough for receiving clamping-screws 28—28, as will more fully appear.

At its inner end the said cable-grip portion 25 of the coupling-member 20 merges into and is rigidly united with a circumferential portion of the outer terminal of a bushing 30 which latter extends axially in the longitudinal direction of the body of the coupling-member 20.

Also provided at the outer terminal of the bushing 30, as is especially well shown in Fig. 6, is a mounting-lug 31, which is preferably formed integral with the said bushing and extends upwardly therefrom. The mounting-lug 31 is provided with a threaded opening 32 through which the shank of a securing- or binding-screw 33 is threaded for engaging with the exterior surface of the wall 23 of the junction-box B adjacent the opening 22 therein.

Arranged oppositely to the mounting-lug 31 at the inner terminal of the said bushing 30, as is clearly shown in Fig. 7, are spaced upwardly-extending abutment-fingers 34—34, which, too, are preferably formed integral with the said bushing. Formed on the exterior surface intermediate the terminals of the bushing 30 and extending circumferentially around the lower portion thereof is an abutment-flange 35.

As is clear the inner terminal of the bushing 30 is insertible through the knockout-opening 22 in the wall 23 of the junction-box B and the securing-screw 33 is axially movable to engage with the exterior of the said wall and operable to cause the abutment-fingers 34—34 to be drawn outwardly against the interior surface of the wall 23 oppositely thereto to clamp the said wall of the box B between the abutment-fingers 34—34 and the securing-screw 33 and against the abutment-flange 35 of the bushing 30.

It is to be observed, that in the above described arrangement, and as is particularly well shown in Figs. 6 and 7, the mounting-lug 31 for the securing-screw 33 is carried by a portion of the outer terminal of the bushing 30 which is opposite to and removed from the rigidly-united cable-grip portion 25 of the coupling-member extending longitudinally therefrom.

Cooperating with the coupling-member 20 just above described is the cap-member 21 therefor, which is constructed and arranged to extend longitudinally along and transversely across the cable-grip portion 25 of the said coupling-member.

The cap-member 21 comprises an inner closure-portion 36 and an outer cable-grip portion 37, the latter cooperating in the form of box connector here shown to secure two armored cables C in place in the connector.

For the above purpose the cable-grip portion 37 is formed to provide two concavo-concave sections, as is shown particularly well in Fig. 9, and which, in the assembled relationship of the parts, constitute two longitudinally-extending cable-conforming sections 38—38 opening toward the said coupling-member 20. Along adjoining longitudinal edges thereof the said cable-conforming sections 38—38 meet in an internal spacing-rib 39 and at the opposite longitudinal edge of each of the said cable-conforming sections a laterally-extending ear 40 is provided. The ears 40—40 are arranged to register with the clamp-ears 26—26 of the coupling-member 20 and are provided with elongated or oval openings 41—41 for the passage of the clamping-screws 28—28 therethrough and into the threaded openings 27—27 of the clamp-ears 26—26 to detachably secure the coupling-member 20 and the cap-member 21 together. The clamping-screws 28—28 also serve to clamp the end-portions of the cables C between the respective cable-grip portions 37 and 25 of the cap-member 21 and the coupling-member 20 so as to firmly secure the cables C to the box connector. As will be clear, the displacement of the cap-member 21 from the coupling-member 20 toward the securing-screw 33 is determined by the diameter of the cable accommodated therebetween. As shown, the respective opposite longitudinal edges of the cable-conforming sections 38—38 and the projecting side-wings 24—24 extend each toward the other and space the body portions of the cap-member 21 and the coupling-member 20 apart to provide entrance for the armored cables C therebetween.

In the described detachably-secured relationship of the cap-member 21 to the coupling-member 20, the closure-portion 36 of the said cap-member, as is shown particularly well in Figs. 2, 3 and 4, is located intermediate the said coupling-member 20 and the axially-movable securing-screw 33 and is arranged to cooperate with the said coupling-member to provide a protective enclosure for conductors leading from the cables C into the junction-box B.

As is shown particularly well in Fig. 4 the said closure-portion 36 is provided at the respective opposite sides thereof with skirt-portions 42—42 which extend in overlapping relation to portions of the side-wings 24—24 which comprise part of the coupling-member 20. Preferably the said closure-portion 36 is also provided at the inner end thereof adjacent the outer terminal of the bushing 30, with spaced abutment-fingers 43—43 which project upwardly from the body of the said closure-portion toward the securing-screw 33. The said abutment-fingers 43—43 of the cap-member 21 are spaced apart to provide an accommodation-recess 44 therebetween. This accommodation-recess 44 is aligned with and opens toward the securing-screw 33, and is wider than the diameter thereof. The said accommodation-recess 44, in the arrangement here shown and described, is aligned with a second accommodation-recess 45 slightly larger than the recess 44 just referred to, and which extends outwardly therefrom in the closure-portion 36 in substantial alignment with the path of the said securing-screw 33.

In the straight-type box connector here being described location of the cap-member 21 in its cable-accommodating position is secured by placement of the cap-member bodily between the securing-screw 33 and the coupling-member 20. The longitudinally-extending accommodation-recess 45 of the closure-portion 36 merges into a longitudinally-extending depression 46 formed in the cable-grip portion 37 by the adjoining convexly-curved exterior surfaces of the cable-conforming sections 38—38 thereof. In this manner there is provided, in effect, a continuation of the said accommodation-recess 45 which extends substantially throughout the length of the exterior surface of the cap-member in substantial axial alignment with the securing-screw 33.

The described details of the peculiar construc-

tion and arrangement of the cap-member 21, which provides a longitudinal recess in the co-extending cable-grip portion 37 and closure-portion 36 thereof and a transversely-extending recess between the spaced abutment-fingers 43—43 thereof adjacent the bushing 30, permit the cap-member 21 to be located in its cable-accommodating position adjacent to the securing-screw 33 without interference with the placement thereof being caused by the said securing-screw. Also as a result of the described structure, the said cap-member 21 in its cable-accommodating position adjacent the axial path of the securing-screw will not hinder the operation of the said securing-screw, as by means of a suitable tool inserted in a slot in the head of the securing-screw, the tool being freely operable to effect unhindered turning of the securing-screw 33.

As will be apparent the provision of the accommodation-recesses 44 and 45 which partially receive the binding- or securing-screw 33, when the cap-member 21 is clamped in place over the cables C, permits the securing-screw just referred to, to be mounted closer to the axis of the bushing 30 with consequent increase in binding efficiency of the said screw 33. Furthermore the accommodation-recesses 44—45 enable a more compact and less bulky box connector to be produced with a minimum of loose parts.

To bring the adaptability of the improved construction and arrangement of the present invention more clearly into view, the novel features thereof are illustrated in Figs. 10 to 13 of the drawings, as applied to an angle-type box connector.

In the arrangement shown in the views just above referred to, the box connector is of the 90° angle-type and includes a coupling-member, designated generally by the reference character 50 and having a body-portion, a separable complemental cap-member, designated as a whole by the reference character 51, and a clamp-member indicated as a whole by the reference character 52.

The said coupling-member 50 comprises a cable-grip portion 53, semi-circular in cross-section, including as is especially well shown in Figs. 10 and 12, an outer cable-grip section 53*a* with which the said clamp-member 52 is arranged to cooperate, and an inner cable-grip section 53*b* with which the said cap-member 51 cooperates.

At the respective opposite sides of the outer cable-grip section 53*a* laterally-extending clamp-ears 54—54 are provided. The clamp-ears 54—54 have threaded openings 55—55 extending therethrough which cooperate to secure the said clamp-member 52 thereto, as will be described.

The said inner cable-grip portion 53*b* of the coupling-member 50, is provided at one side thereof with a laterally-extending connecting-ear 56 having a threaded opening 57 therethrough, and at its opposite side the said cable-grip section 53*b* is provided with a retainer-element 58 (see Fig. 11) having a longitudinally-elongated opening 59 therein for the purpose of securing the cap-member 51 in place on the coupling-member 50, as will more fully hereinafter appear.

In the interior of the coupling-member 50, and as is particularly well shown in Fig. 12, a cable-limiting shoulder 60 is formed which merges into a bushing 62 at an angle of approximately 90° to the longitudinal axis of the cable-grip portion 53, the said bushing being insertable through a knockout-opening 63 in a wall 64 of a junction-box or the like, indicated by the reference character B.

At the outer terminal of the bushing 62 and as in the arrangement heretofore described, an upwardly-extending mounting-lug 67 is provided with a threaded opening 68 through which the shank of a securing-screw or binding-screw 69 is threaded.

Also similar to the arrangement previously described, upwardly-extending abutment-fingers 70—70 are located at the inner terminal of the said bushing 62 oppositely to the said mounting-lug 67 thereon; and intermediate the terminals of the said bushing an abutment-shoulder 71 is provided on the lower circumferential exterior surface thereof.

As has been explained in connection with the form of the invention illustrated in Figs. 1 to 9 inclusive, the securing-screw 69 may be turned to draw the abutment-fingers 70—70 against the interior surface of the wall 64 of the junction-box B to clamp the said wall between the said abutment-fingers and the securing-screw and against the abutment-shoulder 71.

Detachably secured to the coupling-member 50 is the clamp-member 52 having a central body-portion, complemental to the outer cable-grip section 53*a* of the said coupling-member to provide entrance for and to cooperate in gripping a cable C therebetween.

The said clamp-member 52 at one side thereof, is provided, as is particularly well shown in Fig. 11, with a laterally-extending ear 72. The said ear has an opening 73 therethrough for one of two clamping-screws 74—74 which is arranged to pass therethrough and to be threaded through the opening 55 of a clamp-ear 54 of the coupling-member 50. At its opposite side the clamp-member 52 is provided with a slot 75 resulting in the formation of a hook 76 arranged to loosely enclose the shank of the other clamping-screw 74. This other clamping-screw 74 may be threaded through the opening 55 in the adjacent clamp-ear 54 of the coupling-member 50.

Loosening of the clamping-screws 74—74 enables the clamp-member 52 to be swung outwardly about the clamping-screw 74 associated with the ear 72 to cause the hook 76 to move outwardly and downwardly with respect to the clamping-screw 74 loosely enclosed thereby, and permit the cable C to be inserted. The said clamp-member 52 may thereafter be swung upwardly and inwardly over the said cable C and the clamping-screws 74—74 may be tightened to securely grip the said cable between the clamp-member 52 and the coupling-member 50.

Preferably at its inner end the said clamp-member 52 is provided with a segmental wall-portion 77, as is clearly shown in Figs. 10 and 12. The said wall-portion 77 extends outwardly transversely of the body of the said clamp-member and is arranged to substantially close the outer terminal of the cap-member 51 now to be described.

In the preferred arrangement, the cooperating cap-member 51 is detachably secured to the coupling-member 50 for movement relatively thereto to accommodate arranging and positioning of cable and conductors carried thereby, within the box connector.

As is especially well shown in Fig. 13 the said cap-member 51 includes a cable-grip portion 78, which at its inner end terminates in a rounded closure-portion 79.

The said cable-grip portion 78 is arranged to

complement the inner cable-grip portion 53b of the coupling-member 50 (see Fig. 12) and to cooperate therewith to receive and grip the cable C therebetween. At one of its opposite sides the said cable-grip portion 78 is provided with a laterally-extending finger 80 which is receivable in and movable in the retainer-member 58 of the coupling-member 50. At the opposite side thereof the said cable-grip portion carries a hook 81 which forms a slot 82 for loosely enclosing the shank of a connecting-screw 83. The slot 82 opens downwardly toward the slot 75 of the clamp-member 52 and is longitudinally elongated. The shank of the connecting-screw 83 passes through the said slot 82 and through the threaded opening 57 in the connecting-ear 56 to bring the head of the connecting-screw into engagement with the hook 81 and the adjacent side of the said cap-member 51.

With the connecting-screw 83 backed off the hook 81 and the shank thereof loosely enclosed by the slot 82 the cap-member 51 may be bodily longitudinally moved to cause the said hook thereof to shift with respect to the said connecting-screw and the finger 80 thereof to move along the retainer-member 58. Shifting of the cap-member 51 in this manner will cause the cable-grip portion 78 thereof to be moved longitudinally along the said cable-grip portion 53b of the coupling-member 50.

Referring to the drawings it will be observed that at its inner end the cap-member 51 is provided with a flange 84. For accommodating longitudinal shifting of the cap-member 51 toward the mounting-lug 67 and the securing-screw 69, the flange 84 of the said cap-member is provided with an accommodation-recess 85. The wall of the closure-portion 79 adjacent the said flange thereof is grooved or channeled to provide a second accommodation-recess 86 intersecting the accommodation-recess 85 and leading inwardly therefrom. With the described arrangement, the mounting-lug 67 for the securing-screw 69 may be received in the accommodation-recess 86 and the accommodation-recess 85 permits the cap-member 51 to be longitudinally shifted by providing the desired clearance for the securing-screw 69.

It will be clear from the foregoing description that the cap-member 51 cooperates with the coupling member 50 to provide a protective enclosure for conductors leading from the cable C, and to enclose the outer terminal of the bushing 62 through which the conductors pass to the interior of the junction-box B.

Without materially affecting the described protective enclosure for conductors carried by the cable C, the cap-member 51 may be moved relatively to the coupling-member 50, as has been described, in the direction of the mounting-lug 67 and the securing-screw 69 and the accommodation-recesses 85—86 provided in the said cap-member 51 will enable such movement to be effected without interference therewith by the securing-screw 69. In its shifted position the cap-member 51 will provide increased space for the positioning and arrangement of the bended portions of conductors and by reason of the accommodation-recesses 85—86 provided therein will not interfere with operation of a suitable tool to turn the securing-screw 69.

Provision is also made for insuring proper securement of the cable in place in the box connector and for this purpose abutment-ridges 87—88, are respectively formed on the facing interior surfaces of the coupling-member 50 and clamp-member 52. Twisting or turning of the cable in the box connector is thus prevented and good mechanical connection between the junction-box B and the cable C is thereby established.

In the described arrangements it will be perceived that substantial advantage is secured in providing on the bushing of a box connector mounting-means for a binding- or securing-member accessibly mounted exteriorly of a junction-box or the like to securely clamp the said box connector thereto. Proper connection is thus greatly facilitated with respect to time and convenience.

The disclosed relative arrangements, i.e., of a bushing secured to a junction-box and rigidly united with a portion of a coupling-member engaging and gripping a cable, results in material improvement in the quality of the required mechanical connections between a box and a cable and provides effective electrical connection also when metal-armored cables are employed.

It is also of advantage to make provision for relative shifting of a member of the box connector to secure increased space for the accommodation of cable or for the conductors carried thereby. At the same time the practical utility of such devices is improved where, as in the present arrangements, such accommodation-shifting may be accomplished and the desired protective enclosure for conductors may be maintained.

With the foregoing advantages the arrangements of the present invention combine the highly desirable features of providing for the securement of a box connector without occasioning interference between parts of the said box connector, and of providing maximum accessibility to the exteriorly-operable securing-means.

Observation may also be made of the fact that box connectors constructed and arranged in accordance with the present invention and fitted thereby to secure the advantages referred to herein, are further featured by being comprised of few parts. The parts of the box connector are of rugged construction and the arrangement thereof is compact with a view toward confinements with respect to space frequently encountered in the installation of junction-boxes or the like and connectors therefor.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. A box connector for electrical-cable comprising: a cable-engaging coupling-member including a nipple for bushing an opening in a box and having an abutment-finger at its inner end, an oppositely-arranged mounting-lug at the outer end thereof, and an outwardly-projecting securing-screw threaded through said mounting-lug for securing said box adjacent said opening, respectively between said inner abutment-finger and said outer securing-screw; a separable cable-engaging cap-member for said coupling-member having an extending-portion thereof between the coupling-member and said outwardly-projecting securing-screw; and adjustable clamping-devices for the separable coupling-member and cap-member; said cap-member being shiftable toward said outwardly-projecting securing-screw

and being constructed and arranged for positioning in non-interfering relation to operation of said securing-screw exteriorly of said box.

2. A box connector for electrical-cable comprising: a cable-engaging coupling-member including a nipple for bushing an opening in a box and having abutment-fingers at its inner end, an oppositely-arranged mounting-lug at the outer end thereof, and an outwardly-projecting securing-screw threaded through said mounting-lug for securing said box adjacent said opening, respectively between said inner abutment-fingers and said outer securing-screw; a separable cable-engaging cap-member for said coupling-member having an extending-portion thereof between the coupling-member and said outwardly-projecting securing-screw; and adjustable clamping-devices for the separable coupling-member and cap-member; said cap-member being shiftable toward said outwardly-projecting securing-screw and the said extending-portion thereof being provided with a recess located below and in alignment with said outwardly-projecting securing-screw, the cap-member being thereby constructed and arranged for positioning in non-interfering relation to operation of said securing-screw exteriorly of said box.

3. A box connector for electrical-cable comprising: a cable-engaging coupling-member including a nipple for bushing an opening in a box and having abutment-fingers at its inner end; an oppositely-arranged mounting-lug at the outer end thereof and an outwardly-projecting securing-screw threaded through said mounting-lug for securing said box adjacent said opening, respectively between said inner abutment-fingers and said outer securing-screw; a cable-engaging separable cap-member for said coupling-member having an extending-portion thereof between the coupling-member and said outwardly-projecting securing-screw; and adjustable clamping-devices for the separable coupling-member and cap-member; said cap-member being shiftable toward said outwardly-projecting securing-screw and the said extending-portion thereof being provided with a recess below and in alignment with said outwardly-projecting securing-screw, the cap-member structure defining said recess comprising segmental-flanges carried by said extending-portion thereof and spaced apart for positioning adjacent to and at opposite sides of said outwardly-projecting securing-screw, and the said cap-member being thereby constructed and arranged for positioning in non-interfering relation to operation of said securing-screw exteriorly of said box.

PAUL N. DANN.