Oct. 1, 1957 C. E. MORAN 2,808,135

METAL POLE STRUCTURE AND METHOD

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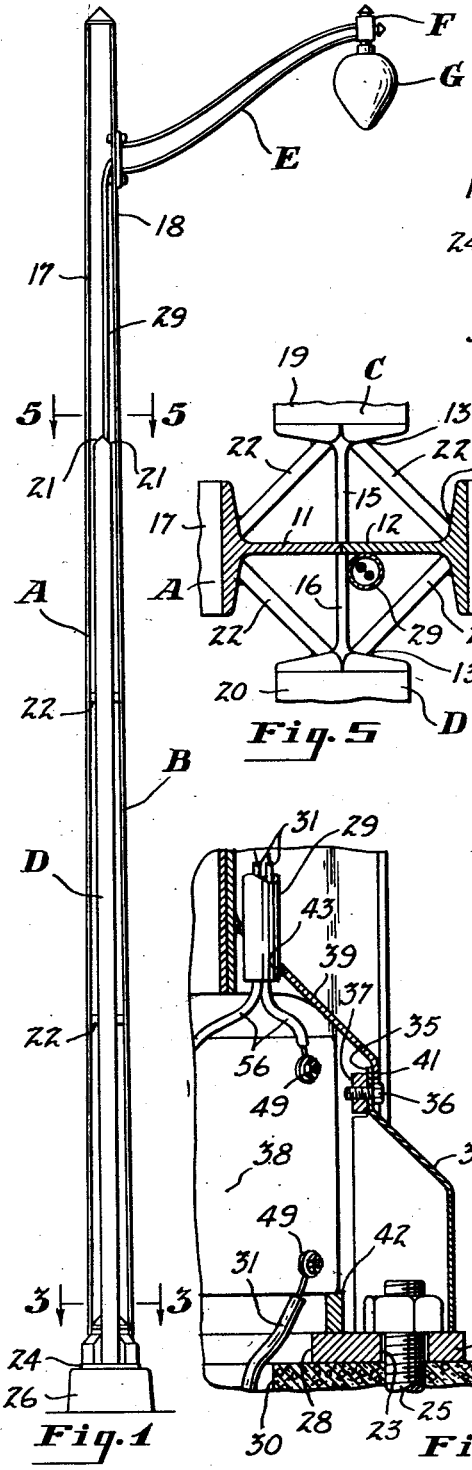

Fig. 1

Fig. 5

Fig. 4

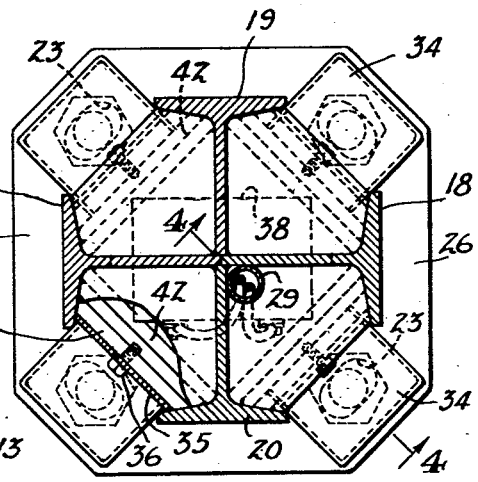

Fig. 3

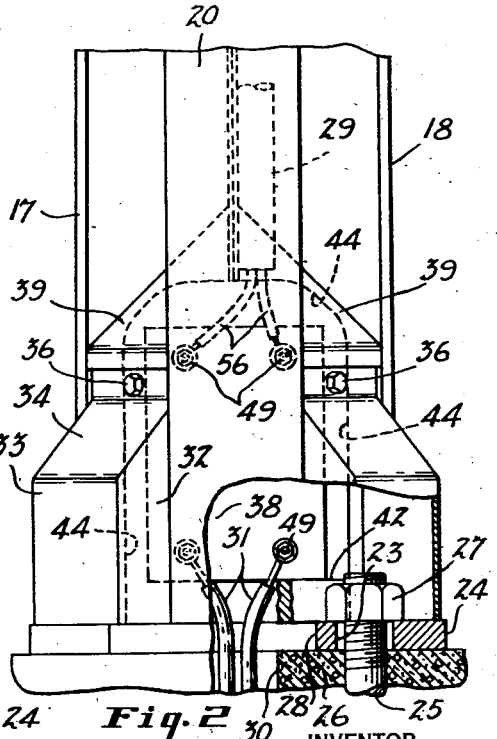

Fig. 2

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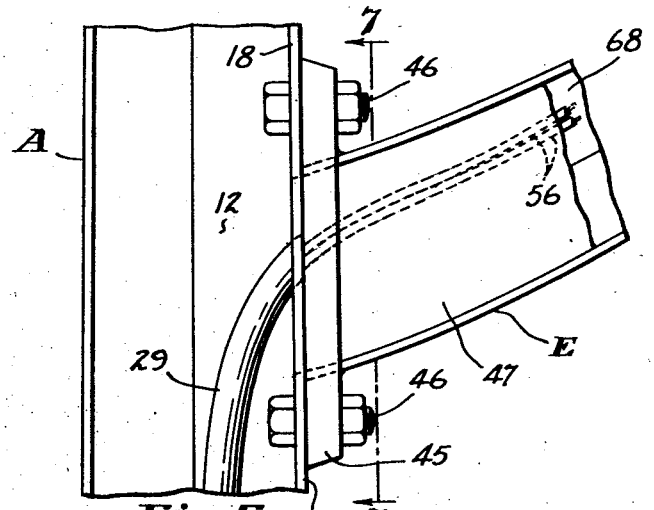

Fig. 6

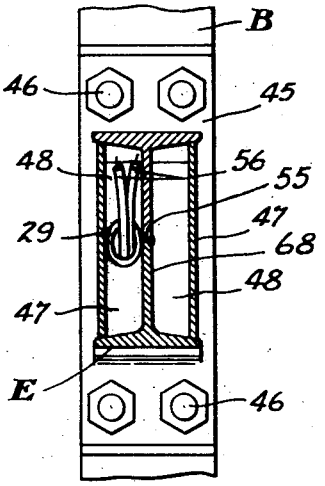

Fig. 7

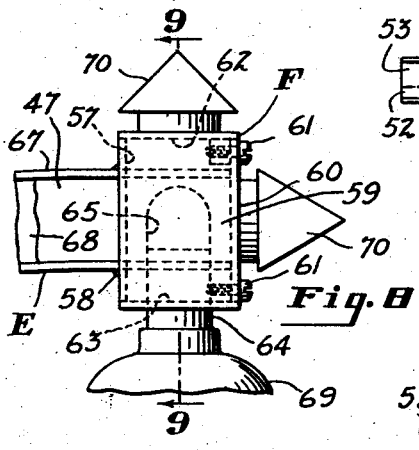

Fig. 8

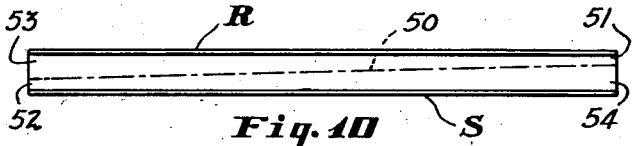

Fig. 10

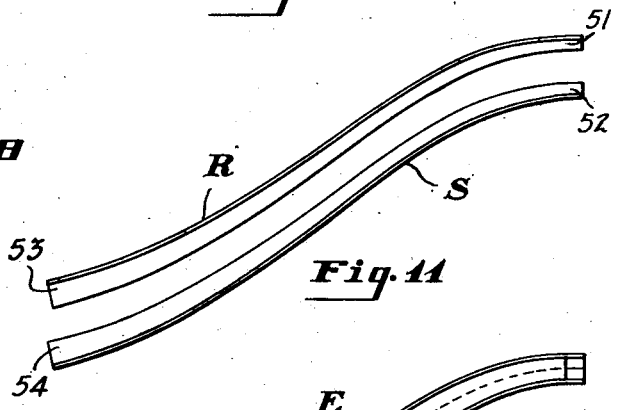

Fig. 11

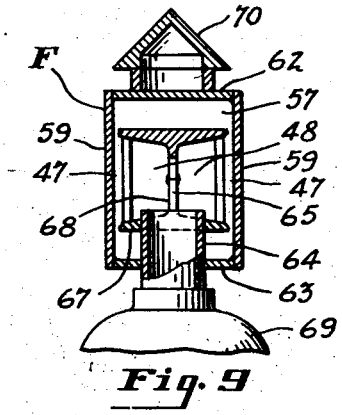

Fig. 9

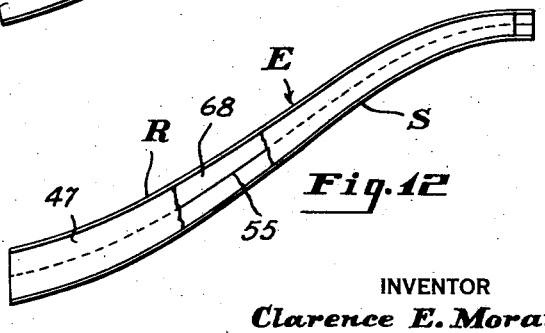

Fig. 12

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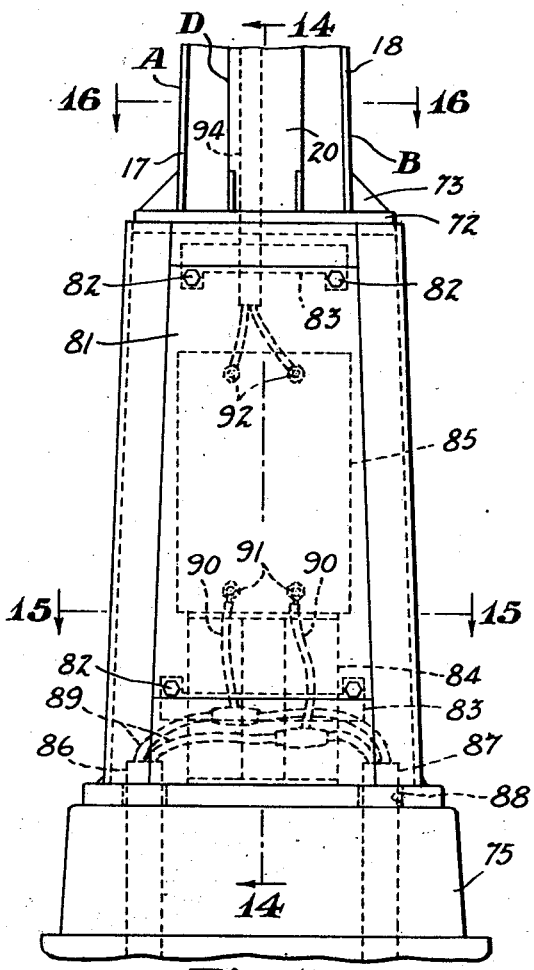

Fig. 13

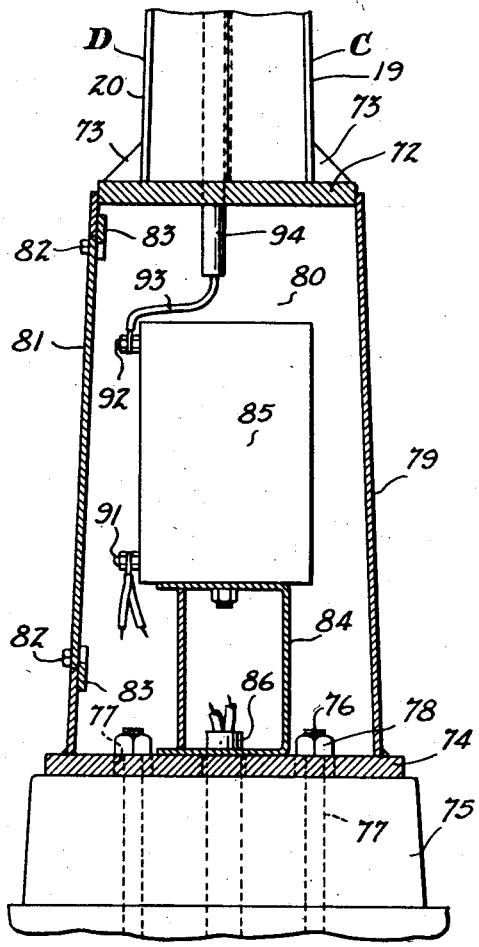

Fig. 14

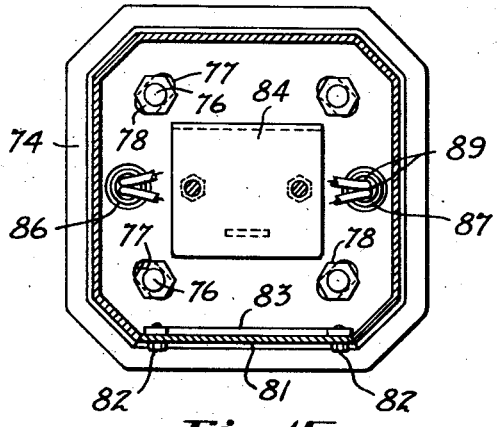

Fig. 15

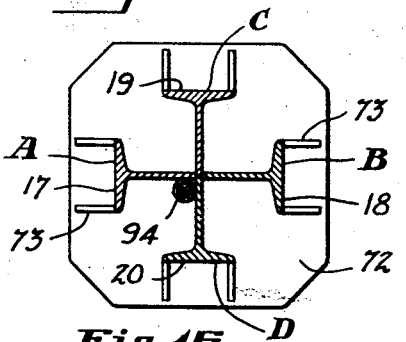

Fig. 16

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METAL POLE STRUCTURE AND METHOD

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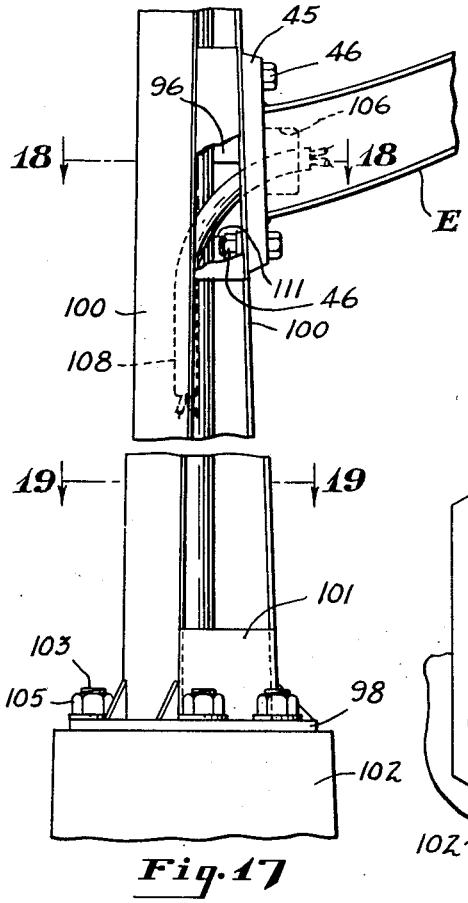

Fig. 17

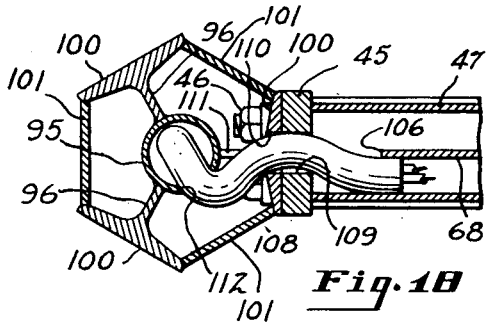

Fig. 18

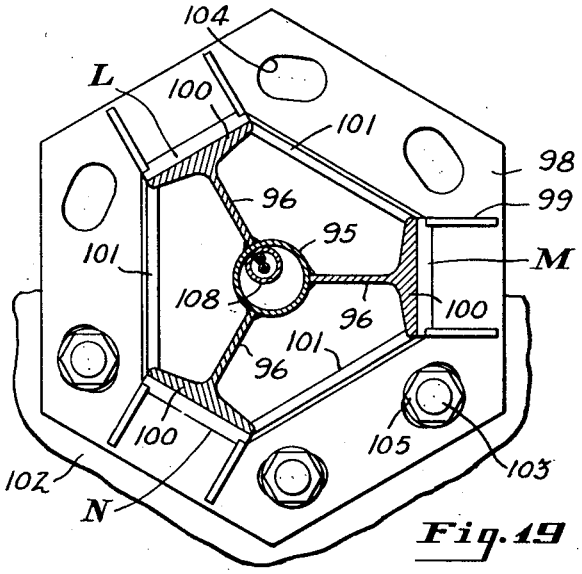

Fig. 19

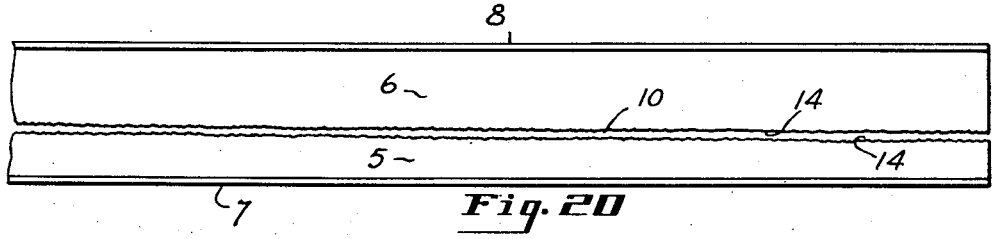

Fig. 20

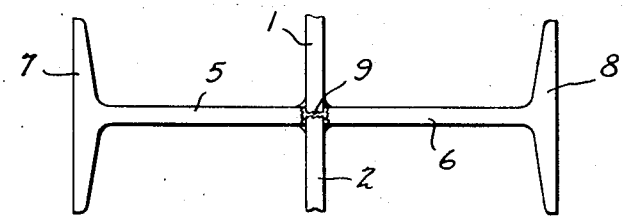

Fig. 21

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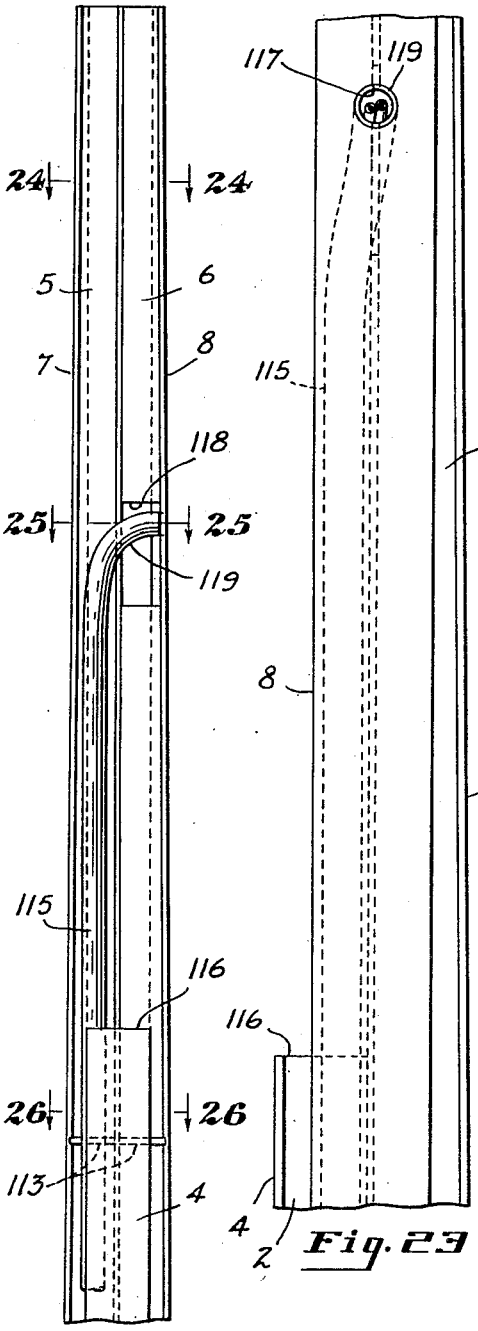

Fig. 22

Fig. 23

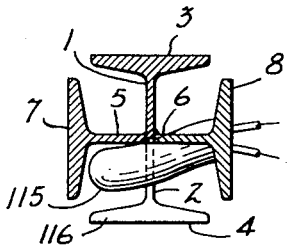

Fig. 24

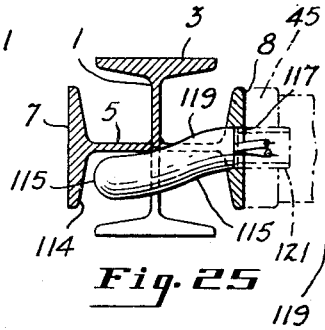

Fig. 25

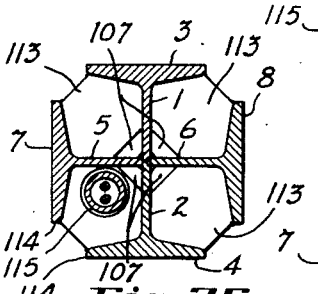

Fig. 26

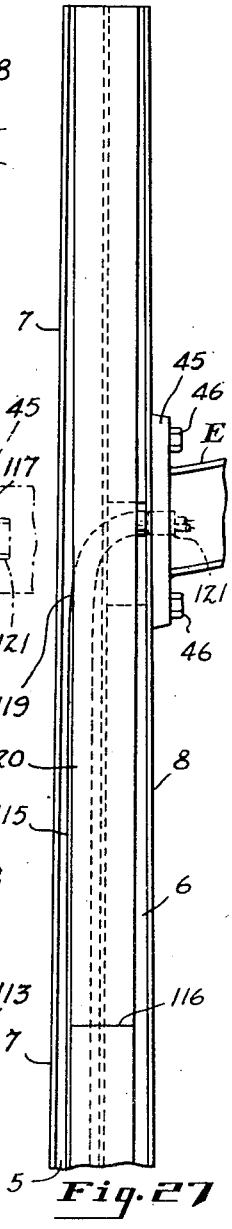

Fig. 27

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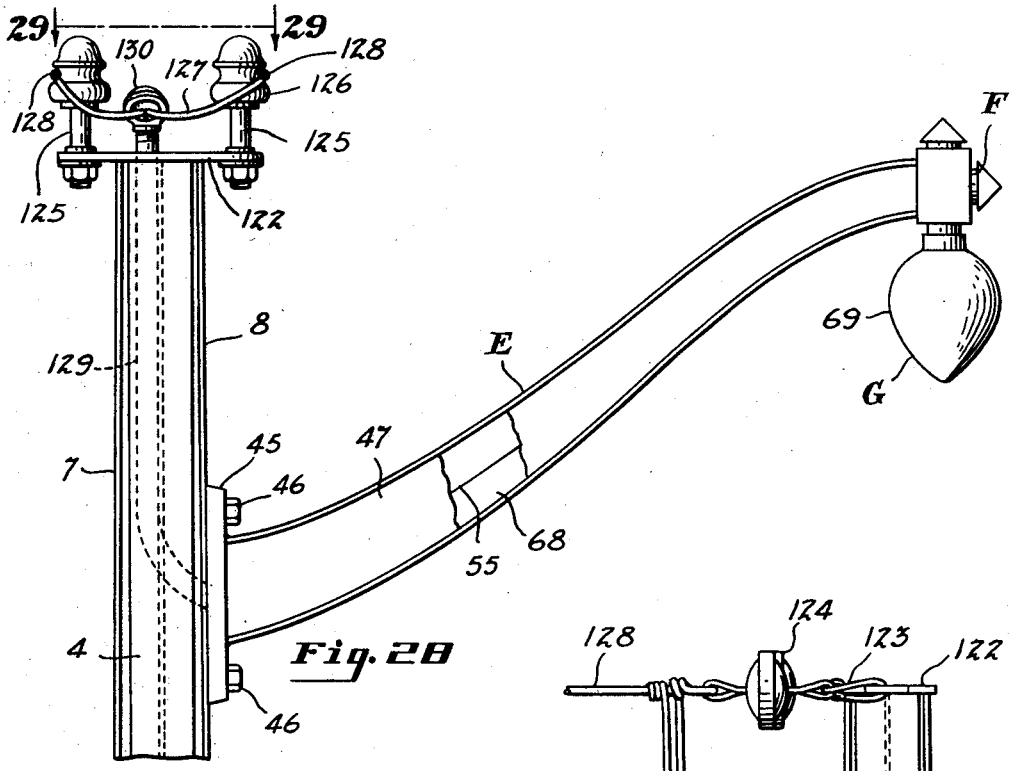

Fig. 28

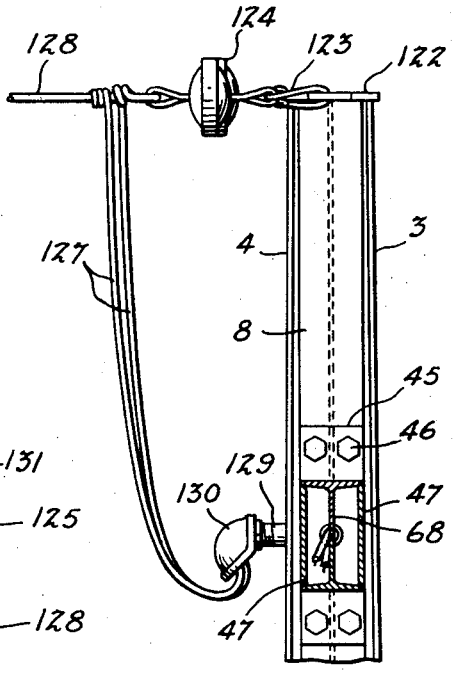

Fig. 30

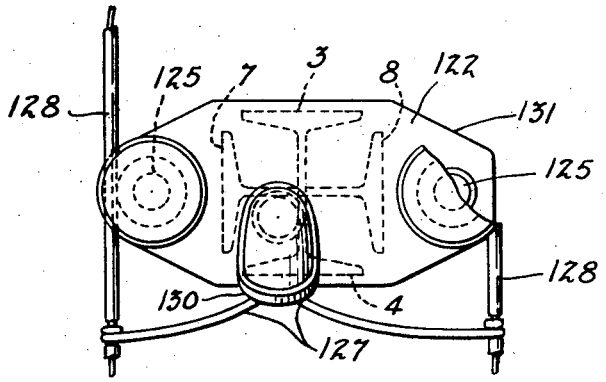

Fig. 29

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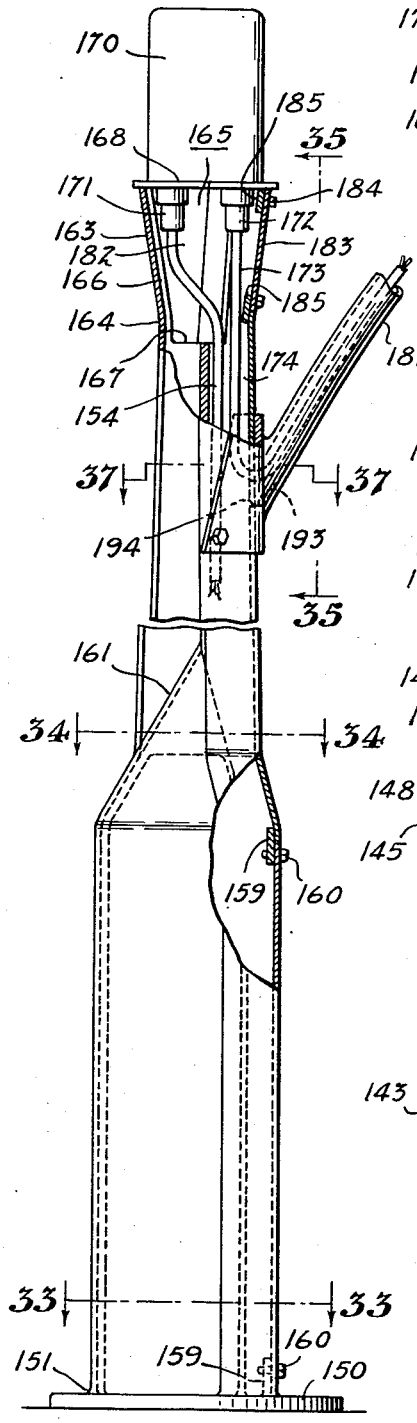

Fig. 31

Fig. 32

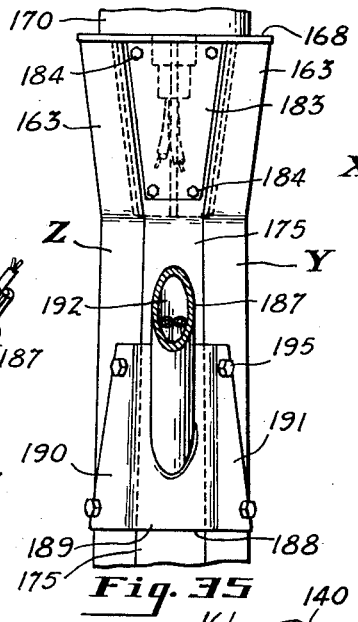

Fig. 35

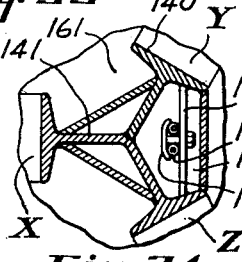

Fig. 34

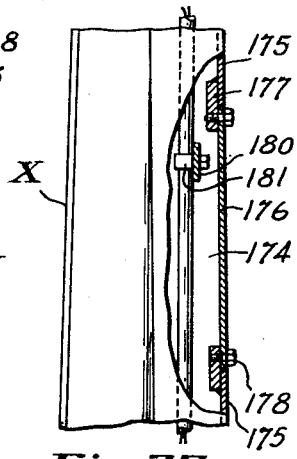

Fig. 36

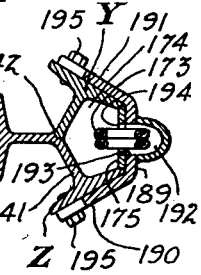

Fig. 37

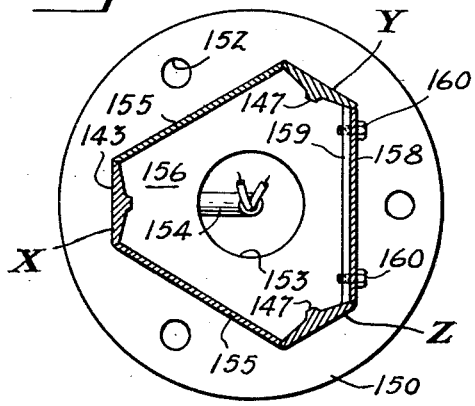

Fig. 33

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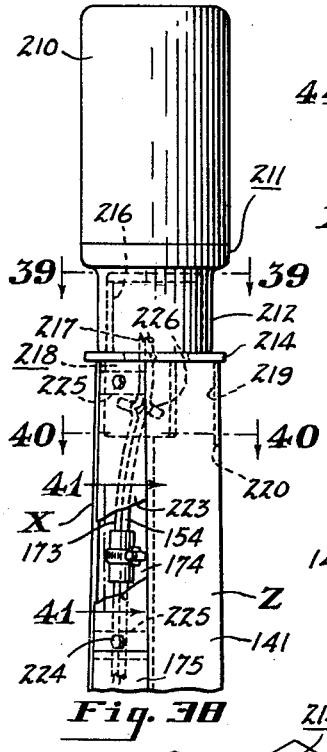

Fig. 38

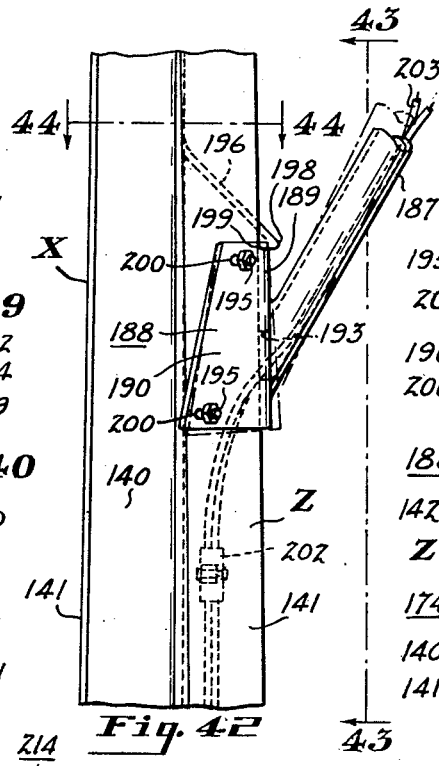

Fig. 42

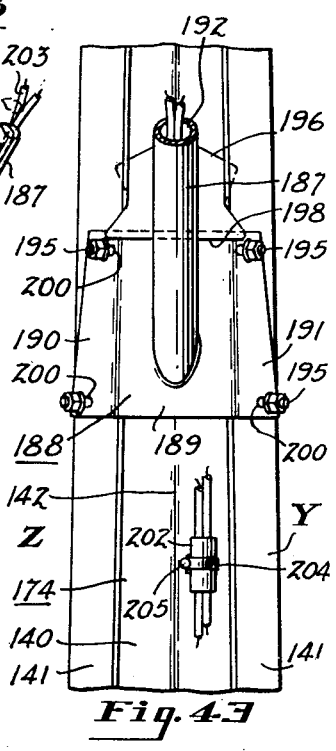

Fig. 43

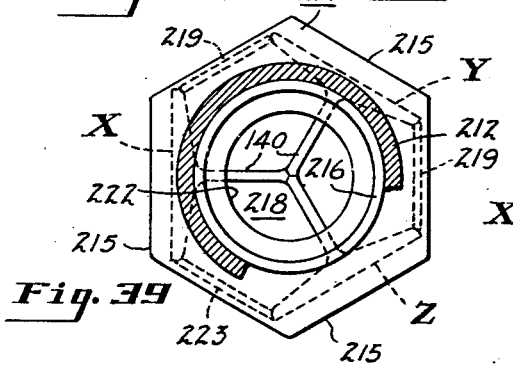

Fig. 39

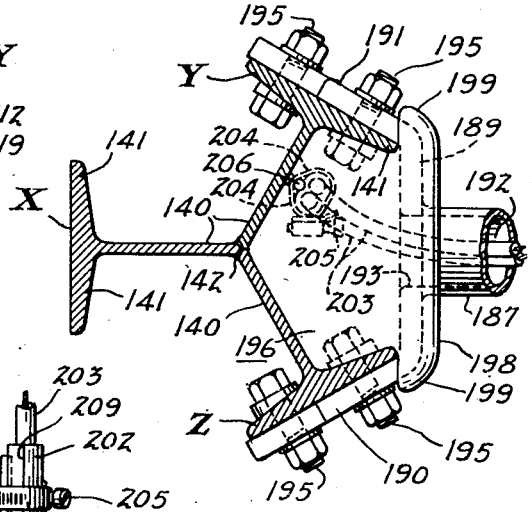

Fig. 44

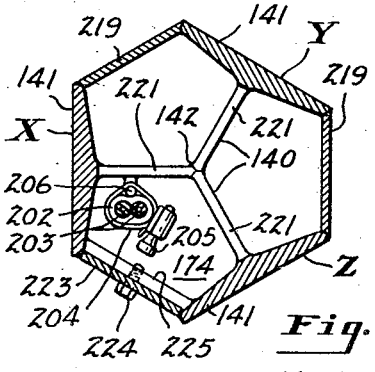

Fig. 40

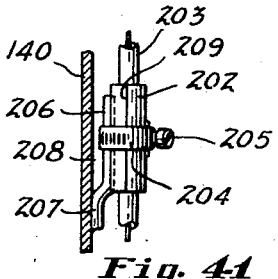

Fig. 41

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United States Patent Office 2,808,135 Patented Oct. 1, 1957

2,808,135

METAL POLE STRUCTURE AND METHOD

Clarence E. Moran, Canton, Ohio, assignor to Utility Pole Company, a corporation of Pennsylvania

Application January 30, 1951, Serial No. 208,534

2 Claims. (Cl. 189—23)

This invention relates to pole structures and more particularly to fabricated metal poles and methods of making the same. Metal poles are well known for use as supports for telephone and telegraph wires, power lines, and street lighting. Such poles, particularly those fabricated from rolled or drawn steel shapes, have met with considerable favor because of their great strength, durability, and uniformity. The present invention is concerned with fabricated metal poles so made up from standard rolled metal sections that considerable economy of both material and labor is realized. Although it is contemplated to fabricate poles in accordance with the principles of the present invention by using rolled sections of steel, it is also intended to make poles of this character using other metals such as aluminum.

One of the principal objects of the invention is to provide a generally improved fabricated metal pole and a method of making the same which has relatively great strength and durability and can yet be made economically and with a minimum expenditure of time and material.

Another object is to provide fabricated metal poles having improved bases for attaching the same to foundation structures and which incorporate junction or wiring boxes in which electrical connections can be made.

Another object is to provide for poles of the character mentioned an improved fixture supporting arm and a method of making the same from standard rolled metal sections.

Another object is to provide an improved lamp attaching fixture for use on a supporting arm formed of rolled metal sections, the lamp fixture being arranged to close the end of the arm and to serve also as a junction or wiring box.

Another object is to provide an improved pole structure which incorporates wiring runways. More specifically, it is sought to provide cheap, inconspicuous, enclosed runways for wiring in poles of the type that are fabricated of members having webs and flanges. In one aspect of the invention the members having the webs and flanges are symmetrically arranged about a central tubular conduit and rigidly secured thereto, the center conduit providing the enclosed raceway for wiring. In another aspect of the invention the members having the webs and flanges are rigidly secured together in generally symmetric relation about a common axis providing partially enclosed spaces between adjacent members. Filler strips secured across the spaces between adjacent members enclose such spaces or portions thereof, providing the desired wire raceways which extend longitudinally of the pole structure.

Another object is to provide an improved pole structure incorporating members having webs and flanges in which portions of the flanges of the members, or some of them, are displaced outwardly to provide an enlarged chamber within the pole. In a preferred arrangement the flanged members are arranged in symmetric relation about the longitudinal axis of the pole and portions of the flanges are offset outwardly by bending operations. The webs of the members adjacent the displaced flange portions are relieved or cut away to provide greater clearance space internally of the pole. In a specialized aspect of this phase of the invention, the adjacent edges of the flanges are connected by filler plates to provide an enclosed chamber on the pole axis, one of the plates being removable for access to the chamber.

Another object is to provide an improved bracket for carrying a fixture arm on a pole of the type comprising a number of symmetrically arranged flat surfaced members in which the flat surfaces of the pole members are angularly disposed. This aspect of the invention is particularly concerned with the provision of an arm bracket attachable at spaced points to a plurality of the pole members to distribute stresses. More specifically, it is sought to provide an arm bracket which extends in bridging relation between adjacent members of the pole and provides for the running of wires or conduits through the bracket into a raceway or another conduit disposed in the space between the adjacent members of the pole.

Another object is to provide, in combination with poles of rolled metal sections, improved crown plates or top members for universal use in attaching insulators and other wire supporting devices to the poles.

More specifically, the invention provides improvements in poles and pole manufacturing methods of the following nature: poles of assembled rolled sections in which certain of the sections are of less than full pole length in combination with lamp or wire supporting arms secured to the poles beyond or above the ends of the short rolled sections; reinforcing elements bridging gaps between parts of the rolled sections in such fashion as to resist turning and twisting of the pole; reinforcing members used in fabricated poles in which some of the rolled members of the pole are shorter than others and the reinforcing elements are so arranged that the long members of the pole are laterally stabilized by the shorter pole members; and an improved method of assembling rigid tubular electrical conductors in fabricated poles.

Other objects and advantages reside in certain novel features of construction and arrangements of parts pertaining to the general improvement and simplification of metal poles, parts, and accessories formed of standard rolled metal sections, and will become apparent as the following detailed description of the invention proceeds. This description is made in connection with the accompanying drawings forming a part of this specification and in which like parts throughout the several views are indicated by the same numerals of reference.

In the drawings:

Figure 1 is an elevational view of a pole used for street lighting;

Fig. 2 is a fragmentary elevational view, on an enlarged scale, partly in section and with parts broken away and removed, showing the pole base;

Fig. 3 is a horizontal section taken substantially on the line 3—3 of Fig. 1 and enlarged with respect to that figure;

Fig. 4 is a sectional detail of a portion of the pole base showing the electrical wiring conduit;

Fig. 5 is a horizontal section taken substantially on the line indicated at 5—5 of Fig. 1 and enlarged with respect to that figure;

Fig. 6 is a fragmentary elevational view on an enlarged scale showing the construction for attaching the fixture supporting arm to the pole;

Fig. 7 is a fragmentary detail, partly in section, taken substantially on the line indicated at 7—7 of Fig. 6;

Fig. 8 is a fragmentary elevational view on an enlarged scale, showing the lamp supporting fixture;

Fig. 9 is a sectional detail of the lamp fixture taken substantially on the line indicated at 9—9 of Fig. 8;

Figs. 10–12 show successive steps in the process of making a curved fixture supporting arm from a length of standard rolled metal section, Fig. 10 showing the manner in which the length of metal section is cut longitudinally, Fig. 11 showing the pieces of the metal section bent to the desired shape with one of them reversed, and Fig. 12 showing the reversed and bent pieces joined by a continuous welded seam;

Fig. 13 is a fragmentary elevational view showing a modified base construction, suitable for fabrication by a welding process;

Fig. 14 is a sectional view taken substantially on the line indicated at **14—14** of Fig. 13;

Fig. 15 is a horizontal sectional detail taken substantially on the line **15—15** of Fig. 13;

Fig. 16 is a horizontal sectional detail taken substantially on the line indicated at **16—16** of Fig. 13;

Fig. 17 is a fore-shortened fragmentary elevational view of a modified pole construction;

Fig. 18 is a horizontal sectional detail with parts broken away and removed taken substantially on the line indicated at **18—18** of Fig. 17;

Fig. 19 is a horizontal sectional detail taken substantially on the line indicated at **19—19** of Fig. 17;

Fig. 20 is a diagrammatic view illustrating the manner in which a standard rolled metal section is divided into component parts for assembly into the improved fabricated pole of the present invention;

Fig. 21 is a transverse sectional view through one of the poles of the present invention showing the manner in which the several parts are assembled;

Fig. 22 is an elevational view showing a fragmentary portion of the upper end of a pole, illustrating the process of assembling a rigid wiring conduit in the pole;

Fig. 23 is an elevational view corresponding to Fig. 22, showing another side of the pole on a slightly enlarged scale;

Fig. 24 is a transverse sectional view taken substantially on the line **24—24** of Fig. 22 and enlarged with respect to that figure;

Fig. 25 is a transverse sectional view taken substantially on the line **25—25** of Fig. 22 and enlarged with respect to that figure;

Fig. 26 is a transverse sectional view taken substantially on the line **26—26** of Fig. 22 and enlarged with respect to that figure;

Fig. 27 is a view corresponding to Fig. 22, showing the completed pole with a fixture supporting arm attached;

Fig. 28 is an elevational view of the upper portion of the pole, showing an optional crown plate or top member for attaching wire supporting insulators to the pole;

Fig. 29 is a plan view of the crown plate, partly in section and with parts broken away and removed, this view being taken substantially on the line indicated at **29—29** of Fig. 28 and enlarged with respect to that figure;

Fig. 30 is a fragmentary elevational view, partly in section and with parts broken away and removed, showing the top portion of a pole and an optional use of the crown plate or cap member;

Fig. 31 is a foreshortened elevational view of a three-member fabricated pole of modified construction showing an expanded base, an expanded tip, a wire raceway and a modified form of arm bracket, this view being partly in section and having parts broken away and removed;

Fig. 32 is a diagrammatic elevational detail showing the manner in which one of the pole parts or members employed in the embodiment of Fig. 31 is cut and bent in making the expanded base;

Fig. 33 is a horizontal sectional detail through the expanded base of the three-member pole of Fig. 31, this view being taken substantially along the line indicated at **33—33** of Fig. 31 and enlarged with respect to that figure;

Fig. 34 is a fragmentary sectional detail taken substantially along the line indicated at **34—34** of Fig. 31 and enlarged with respect to that figure;

Fig. 35 is a fragmentary elevational detail, partly in section and with parts removed, showing the expanded tip and the arm bracket, this view being taken substantially along the line indicated at **35—35** of Fig. 31 and enlarged with respect to that figure;

Fig. 36 is a fragmentary elevational detail partly in section and with parts broken away and removed, of a central portion of the pole of Fig. 31, showing the enclosed wiring raceway and the removable closure therefor;

Fig. 37 is a transverse sectional detail taken substantially along the line indicated at **37—37** of Fig. 31;

Fig. 38 is a fragmentary elevational view with parts broken away and with parts removed of the top portion of a pole modified to accommodate a pole top transformer;

Fig. 39 is a sectional view with parts broken away and with parts removed taken substantially along the line 39—39 of Fig. 38 and enlarged with respect to that figure;

Fig. 40 is a sectional detail with parts removed taken substantially along the line indicated at **40—40** of Fig. 38, this view being drawn to substantially the same scale as Fig. 39.

Fig. 41 is a fragmentary elevational detail partly in section showing a wire or cable supporting device, this view being taken substantially along the line **41—41** of Fig. 38 and enlarged with respect to that figure;

Fig. 42 is a fragmentary side elevational view of a portion of a steel pole showing part of a fixture arm and an adjustable bracket for securing the arm to the pole;

Fig. 43 is a fragmentary front elevational view of the pole portion, bracket and fixture arm of Fig. 42, this view being taken substantially along the line indicated at 43—43 of Fig. 42; and

Fig. 44 is a sectional detail with parts removed taken substantially along the line indicated at **44—44** of Fig. 42 and enlarged with respect to that figure.

The pole structures of the present invention are formed of standard rolled metal members of the I beam type, the beams being split longitudinally. Each beam is cut on the bias or diagonally through the web so that the severed web portions each taper uniformly from one end to the other. The beam sections are then positioned in a symmetrical arrangement with the cut edges of the web portions disposed in a common zone. The wide web portions are all located at one end of the pole and the narrow web portions are all located at the other end thereof. A weld, preferably continuous, along the adjacent or abutted cut edges of the web portions secures the several pieces together to form the pole structure.

One of the features of the present invention relates to the method of cutting I beams and assembling the resulting parts so as to produce a pole that is substantially uniform and symmetric in section at all points along its length. This method is described with reference to Figs. 20 through 27, although it is also applicable to the manufacture of others of the poles shown in different figures of the accompanying drawings. The longitudinal bias cuts are made in the webs of the two companion I beams in such manner as to provide four I beam parts each substantially of T shape, one pair of such parts having relatively wide web portions **1** and **2** and integral flanges **3** and **4** and the other pair of beam parts having relatively narrow web portions **5** and **6** and integral flanges **7** and **8**.

The terms relatively narrow and relatively wide refer only to the differences in the widths of the web portions which differences in the aggregate correspond to the thickness of the webs of the original I beams. In other words, the aggregate width of the web portions **5** and **6**

is less than the aggregate width of the web portions 1 and 2 by an amount equal to the thickness of the webs.

In assembling the I beam parts the latter are arranged so that the pair having the relatively wide web portions are disposed with such web portions substantially in a common plane and the edges of the flanges abut along a line of connection. The other pair of I beam parts are then disposed on opposite sides of the abutted web portions.

Thus when the cut edges of the web portions 1 and 2 are abutted together along line of connection 9 and are disposed substantially in a common plane and the web portions 5 and 6 are then disposed substantially in a common plane at right angles to the plane of the web portions 1 and 2 are brought together so that the cut edges thereof abut against opposite sides of the web portions 1 and 2, a structure of uniform and symmetric section results. The abutted web portions are brazed or welded together along a common zone of abutment to form a rigid pole structure having strong resistance to bending in all directions. The spacing apart of the web portions 5 and 6 by an amount or distance corresponding to the thickness of the web portions 1 and 2 compensates for the differences in the widths of the web portions of the several I beam parts.

The I beam parts having relatively narrow and relatively wide web portions may be formed from identical I beams in several ways. According to one aspect of the invention, the longitudinally extending bias cuts are offset laterally an amount corresponding substantially to half the web thickness, thus cutting each I beam into similar parts, one part having a relatively wide web and the other part having a relatively narrow web. In assemblying the several parts into a pole structure the relatively wide web parts of two I beams are selected for the pair of web parts 1 and 2, mentioned above, and the relatively narrow web parts of the same two I beams are selected for the pair of web parts 5 and 6, mentioned above.

Another method of obtaining I beam parts having relatively wide webs and relatively narrow webs is to sever one or the first of the I beams by a bias rough cut which divides the web portion of the I beam into relatively wide tapered portions 1 and 2 having rough, jagged edges which facilitate the subsequent single pass mass welding of the several I beam parts, preferably by submerged arc electric welding. Another or second I beam is also severed by a rough cut, made as by a burning torch, which removes or cuts out a quantity of metal from the beam flange, leaving a gap or space 10 (Fig. 20) between the web portions of the beam and forming rough jagged edges 14 along the web.

In the cutting of the steel beams the operation is performed, as by the use of the aforesaid cutting torch or gaseous flame, in such manner as to provide the jagged edges referred to. For simplicity, the welded edges in the other figures of the drawings are shown smooth, it being understood that in each instance the edge or edges to be welded are in a rough or jagged condition, such as results from cutting with an acetylene or other gas torch. By placing together such rough cut edges, or by placing such an edge against a smooth plate or a welded seam, there is provided a multiplicity of closely spaced, irregular pockets or recesses. In the subsequent welding operation the welding material flows into and is trapped in some of the pockets that have closed bottoms, while other recesses or openings serve as passageways communicating with the far side of the joint to permit the welding material from the melting electric welding rod to flow through and form a bead or cove on the far as well as the near side of the weld joint. The range or jagged edges are also beneficial in welding the pole parts together in a machine of the type that advances the work with an electric arc welding rod on one side and a dam or dams on the other side, since the through openings provided permit the molten welding rod material to flow through the seam area to the dam or dams.

Fig. 20 represents a standard rolled steel I beam having flanges disposed in spaced parallel relation and normally connected by an integral web. To form a pole the web is slit or cut longitudinally of the I beam, the cut starting closer to one flange than the other and continuing in a substantially straight line diagonally across the web, or on the bias, and terminating at the opposite end of the beam adjacent the other flange. This divides the web into a portion 5 integral with the flange 7 and a portion 8 integral with the flange 8. The web portions 5 and 6 are alike and of the same size, the wide end of one being disposed adjacent the narrow end of the other. In making the longitudinal cut to sever the web a strip of metal is removed from between the web portions 5 and 6 so that the aggregate width of the web portions is less than the width of the original web by an amount approximately equivalent to the web thickness and indicated by space 10. The angle of the cut made in the first I beam may correspond to that shown in Fig. 20, the loss or removal of metal of the web along the cut being reduced or held to a minimum so that the aggregate width of the web is not objectionably reduced. The web portions thus formed from the second I beam are identical, and by reason of the burning out or removal of metal, are narrower than the web portions of the first severed beam. Thus the pole is cut and assembled of I beams one of which furnishes the parts having the wide web portions 1 and 2 and the other of which furnishes the parts having the narrow web portions 5 and 6.

The first method of cutting the I beams, involving cuts which are offset in each I beam, is particularly suited to the manufacture of poles which have four I beam parts extending throughout the entire height or length of the pole. The second method, involving the burning or cutting out of metal, is useful in making poles having one pair of I beam parts longer than the other pair. Such a pole is illustrated in Figs. 1 through 7 in which a pair of relatively long I beam parts or halves A and B are disposed with their webs 11 and 12 substantially in a common plane and with their cut edges in abutment throughout the length of the pole. The web portions 11 and 12 are tapered throughout their length, the narrow ends thereof being disposed at the top of the pole and the inside ends thereof being at the bottom of the pole. These web portions correspond to the relatively wide web portions 1 and 2 previously described in connection with Fig. 21.

A pair of relatively short I beam parts C and D are arranged on opposite sides of the beam parts A and B with their webs 15 and 16 disposed substantially in a common plane. The cut edges of the webs 15 and 16 of the beam parts C and D are abutted against opposite sides of the web portions 11 and 12 of the beam parts A and B. The four cut edges of the several web portions are secured together in the central zone of the pole by a continuous line or lines of brazing or welding.

In cross section the four part pole somewhat resembles a maltese cross, flanges 17 and 18 of beam parts A and B and flanges 19 and 20 of beam parts C and D being disposed to face outwardly and partially enclose the web portions of the pole. The upper ends of the short beam flanges 19 and 20 are bevelled as indicated at 21.

At spaced intervals along the length of the pole a number of reinforcing or bridge elements 22 are secured across the angle between adjacent web portions. These bridge elements may be in the form of metal plates the ends of which are welded as indicated at 13 into the corners between the web portions and flanges of the several beam members. Some of the effects of the bridge elements 22 are to resist relative movement toward and away from one another of the several beam parts com-

prising the pole and, at vertically spaced zones, to consolidate the pole into a box-like structure. Besides strengthening the pole, the bridge elements are capable of retaining conduits and wiring within the angles between adjacent web portions of the beam parts. They also serve as holding points for grappling or handling the pole in erection.

Across the bottom of the pole is disposed a base plate **24** to which the ends of the beam parts are welded. The base plate desirably is of octagonal plan form as shown in Fig. 3 and is made of heavy metal such as steel. A number of elongated apertures or openings **23** are formed in the base plate to receive attaching bolts or studs **25** that are embedded as in a concrete foundation **26**. Nuts **27** are tightened down on the bolts against the base plate to secure the poles in place. The base plate is also formed with a central opening **28** to accommodate wires **31** which extend upwardly through opening or passage **30** in the foundation **26** for supplying electrical current to the lighting fixture carried by the pole. The elongated openings **23** in the base plate permit shifting and slight angular movement of the pole structure on the foundation **26** in adjusting the pole into alignment with other poles.

The attaching studs **25** for holding the base of the pole are disposed outside the enclosure formed by the pole flanges **17**, **18**, **19** and **20**, so that the nuts **27** are accessible for turning by a wrench. Over the nuts are disposed metal covers or closures in the form of open faced boxes each having side walls **32**, a rear wall **33** and a slanting top wall **34**. The boxes are open across the bottom to receive the nuts and bolts and are slidingly received between the spaced parallel edges of the adjacent flanges of the pole. The upper edges of the slanting top walls **34** are formed with upright extensions **35** apertured to receive cap screws **36** which fasten the box closures to cross elements **37** welded at their ends to the inside surfaces of adjacent pole flanges. Above the cross elements **37** closure plates **39** are fitted slantingly in the angles between the adjacent beam parts of the pole to seal off the lower portions of the inter-beam spaces. At their lower ends the pole webs **11**, **12**, **15** and **16** are cut away below the closure plates **39** to provide junction or wiring chamber **40** which is continuous with the interiors of the closure boxes that cover the attaching bolts. The webs are cut away any desired amount sufficient to provide clearance for a transformer or relay box **38** received within the chamber **40**. Preferably, the webs are but partially cut away so that edges **44** of the webs project into the wiring chamber and the portions of the webs that remain provide the necessary stiffness and reinforcement for the pole flanges. The lower edges of the closure plates **39** are formed with depending lips **41** which overlap the upper edges of the extension flanges **35** of the closure boxes to provide a water shed or seal. One of the closure plates is apertured at **43** to accommodate a wiring conduit **29** received in the angle between adjacent pole webs. The transformer or relay box **38**, housing conventional electrical devices, carries suitable insulated terminals **49** to which the input wires **31** and output wires **56** are connected, the latter extending upwardly through the conduit **29** to the lamp or fixture which is later described herein.

A number of cross ties **42**, corresponding to the bridge elements **22**, are disposed across the angles between the adjacent beam parts and are secured as by welding to the edges of the pole flanges and also to the base plate **24**. The ties **42** establish a strong connection between the pole parts and the base plate, resist turning and twisting of the pole parts relative to the base plate, and, as shown, may serve as supports for the transformer box **38**. Additionally, the cross ties **42** act as dams to prevent the ingress of water into the bottoms of the wiring chamber **40**, thus preventing flooding of the wiring passage **30**.

On the upper end of the pole is secured a laterally extending cantilever arm E carrying on its outer end a fixture F to which is attached a conventional lamp assembly G. The arm E is in the form of a tapered I beam curved to the desired shape and welded or otherwise secured at its inner or base end to a plate **45** disposed flatwise against flange **18** of beam part B and secured to the latter by bolts **46**. These bolts pass through the flange **18** on opposite sides of the web **12**, the plate **45** being of substantially the same width as the flange **18** and extending above and below the base end of the arm E. The conduit **29** housing the electrical wires **56** registers with aligned openings in the pole flanges **18** and the arm base **45**, the wires being carried along the length of the arm adjacent the web of the latter either with or without a protective conduit. Cover plates **47** parallel the arm web and are disposed in spaced relation on opposite sides of the latter. These plates have the same shape as the web of the arm and along their edges are welded or otherwise secured to the inside surfaces of the top and bottom flanges of the arm, providing internal chambers **48** throughout the length of the arm which accommodates conduit such as the wiring conduit **29**, or which houses wires without the use of conduit.

In making the curved arm E an I beam is cut or slit longitudinally through the web thereof. The cut, indicated at **50** (Fig. 10), is made on the bias to separate the I beam into substantially identical parts R and S having ends **51** and **52**, respectively, the web portions of which are relatively narrow, and ends **53** and **54**, respectively, the web portions of which are relatively wide. The severed beam portions R and S are then separately bent to the desired contour or shape, one of the parts being first reversed with respect to the other so that the narrow web end **52** of the beam part S is disposed adjacent the narrow web end **51** of the beam part R.

The bending of the two beam parts in separate operations into the ogee shaped curves is performed with much less force or effort than required to deform or bend a solid or unsevered I beam. The beam parts are bent so that when placed alongside one another, as shown in Fig. 11, with their narrow web end portions adjacent one another at one end of the assembly and with their wide web end portions adjacent one another at the other end of the assembly, they have approximately the same ogee or double curve configuration. Thereafter, the beam parts are brought together with the webs thereof in edgewise abutment and are welded together along the line indicated at **55** (Fig. 12). The arm ends are then trimmed.

This method of forming the fixture arm avoids the use of costly bending and forming equipment and produces a tapered curved beam of great strength and considerable eye appeal with a minimum expenditure of time and material.

The fixture F is secured on the outer end of the arm E as by welding. This fixture comprises a number of metal plates welded together along their edges. Rear plate or wall **57** of rectangular shape is formed with a rectangular opening or aperture so as to be receivable over the end of the arm E. The rear wall is welded to the arm E at **58**. Side walls **59** of rectangular shape are welded along their rear edges to the rear wall **57** and between their front edges receive a front cover plate **60** which is removably mounted by cap screws **61** threaded into bosses carried by top wall **62** and bottom wall **63** of the fixture assembly. A tubular conduit **64** extends through a closely fitted opening in the bottom plate **63** and upwardly within the fixture F into a cutout **65** in the end of the arm E. The cutout may extend through the entire width of bottom flange **67** of the arm E and part way, preferably more than half way, through composite web **68** of the arm. The tubular conduit **64** is welded in place in the bottom plate **63** and may also be welded to the arm E to provide a rigid structure for supporting a lamp assembly G threaded on the lower

end of the conduit. The electrical wires **31**, which extend through the conduit **29** in the pole and through the same conduit in one of the wiring raceways or chambers **48** in the arm E, are extended or lead through the passage in the conduit **64** and into the lamp assembly. In threading the wires **31** through the conduit **29** and into the lamp, the cover plate **60** of the fixture bracket F is removed, the chamber within the fixture F serving as a wiring box for making any connections that may be necessary. Pointed ornaments or caps **70** of generally pyramidal shape may be secured as by welding on the different wall plates and cover plate of the fixture F.

A modified form of base structure or assembly is illustrated in Figs. 13 through 16. In these figures the pole comprises the assembled beam parts A, B, C and D previously described in connection with Figs. 1 through 7 and numbered accordingly. The bottom ends of the beam parts are squared off and welded to a base plate **72** of octagonal shape in plan form. Gusset plates **73** of triangular shape are welded in the angles between the flanges of the beam members and the top surface of the base plate **72** so as to reinforce and strengthen the joint between the pole and the plate.

A steel footing plate **74** of heavy section, octagonal in plan form but of larger size and greater area than the base plate **72**, is supported on a suitable foundation such as a monolithic concrete pedestal **75**. Bolts **76** embedded in the concrete **75** extend upwardly from the top of the pedestal through elongated holes or apertures **77** in the footing plate **74**, the latter being held in place on the bolts by nuts **78**.

The base plate **72** is disposed above and in spaced parallel relation to the footing plate **74**, being supported by upright side plates **79** which extend between the base and footing plates. The top and bottom ends of the side plates are welded to the base and footing plates and to one another along their meeting edges forming a relatively large enclosed chamber **80** below the bottom of the pole. A removable closure plate **81** is fitted into an opening in one side of the base structure, being secured by cap screws **82** threaded into retaining elements **83** welded to the inside of short side plates which provide the opening for the cover plate.

Within the chamber **80** an electrical control device or a transformer **85** is supported on a bracket **84** which rests on the footing plate **74**. Conduits **86** and **87** of a two wire parallel lighting system are brought upwardly through the concrete pedestal **75** and are received through enlarged openings **88** therefor in the footing plate **74**. Wires **89** extending through the conduits **86** and **87** are connected by short lead wires **90** to lower or input terminals **91** of the transformer **85**. Upper or output terminals **92** of the transformer are connected to wires **93** which extend upwardly within a conduit **94** to the lighting fixture carried by the pole. The conduit **94** corresponds to the wiring conduit **29** previously described and is received through an opening provided therefor in the base plate **72**.

The arcuate slots **77** in the footing plate **74** permit slight twisting of the assembled pole structure on the pedestal **75** after erection. Such shifting of the pole facilitates alignment of any fixture arm or lighting fixture that may be carried by the same with the corresponding parts of other poles along the same street or boulevard in a manner similar to the corresponding adjustment of the pole described in connection with the Figures 1 through 7.

In Figures 17 through 19 is illustrated a modified pole structure wherein bias cut I beam parts are assembled around and welded to a central tubular member or conduit **95**. Three identical beam parts L, M and N formed from bias cut I beams in the manner previously described, are disposed with their webs **96** equidistantly spaced about the central conduit member **95** in radial relation to the latter. The webs **96** are uniformly tapered throughout their lengths so that the assembled pole structure tapers from bottom to top and has a pleasing symmetrical appearance. Although it is preferred to employ three beam parts in this type of pole structure a lesser or greater number of beam parts may be used as desired for reasons of economy or greater strength.

The bottom of the pole is squared off and welded or otherwise secured to a base plate preferably of hexagonal form. Triangular gusset plates **99** are welded in the angles between the base plate and flanges **100** of the I beam parts L, M and N. Bridge elements **101** are disposed across the spaces between adjacent edges of the flanges **100** and are welded to the latter. The bridge elements **101** may be placed at intervals throughout the length of the pole and function similarly to the bridge elements **22** previously described in connection with Figures 1 through 7. The lowermost set of the bridge elements are placed against the base plate **98** and are welded to the latter so as to strengthen the connection between the base and the bottom of the pole structure. In erecting the pole the base plate **98** is mounted on a concrete pedestal **102** in which are embedded a series of upstanding bolts **103** that are received through elongated openings **104** in the base plate **98**. Nuts **105** are received on the threaded ends of the bolts to secure the base plate on the latter. The pole and base can be turned a few degrees on the pedestal **102** in aligning the pole or the lighting fixture carried thereby with other poles or fixtures, the elongated openings **104** permitting slight movement or shifting of the base plate on the bolts **103**.

The fixture arm E previously described may be utilized on the pole structure of Figures 17 through 19, the plate **45** of the arm being bolted in the manner described to one of the beam flanges **100**. The composite web **68** of the fixture arm is cut away adjacent the plate **45** as indicated at **106** to accommodate a wiring conduit **108** which corresponds to the conduit **29** previously described. This conduit extends through a central opening **109** in the base plate **45** of the arm E and through a mating opening **110** in the flange **100** of the pole part. Adjacent the hole or opening **110** the beam web **96** is relieved or cut away as indicated at **111** to provide an opening which receives the conduit **108**. The conduit is also bent to extend through a lateral opening **112** formed in the central member or conduit **95** of the pole structure. Thus the wiring conduit **108** extends downwardly through the interior chamber or passage within the central member **95** of the pole and ends in a wiring or junction box at the base of the pole, which may correspond to one of the junction boxes previously described, or continues into a subterranean junction box below or removed from the pedestal **102**. In the latter case the wiring conduit **108** extends through a suitable opening or passage provided in the pedestal **102** which is continuous with the opening or passage of the central member **95** of the pole.

The web cutouts **106** and **111** in the arm E and in the pole structure which accommodate the wiring conduit may be eliminated or avoided by using an arrangement such as that shown in Figs. 6 and 7. The structure of Figs. 6 and 7 may, on the other hand, be modified by employing central openings in the base plate **45** of the arm and in the flange of the beam part of the pole in combination with cut away or relieved webs corresponding to the construction shown in Figs. 17 and 18. It is the purpose of the present disclosure to show alternate constructions for installing electrical wiring conductors in the poles.

In poles assembled in accordance with the principles of the present invention and which have relatively narrow webs or relatively wide flanges, or both, the edges of the flanges are disposed relatively close together or even touching one another at the small or upper end of the pole. When the adjacent edges of the flanges of the beam parts are thus disposed relatively close together

some difficulty is experienced in assembling rigid wiring conduits in the angles between the web portions of the poles. The closely spaced flange edges prevent movement of the wiring conduits laterally into the interior of the pole structure while the curved or lateral end portions of the conduits interfere with the operation of threading the conduit axially into the pole through one end of the latter.

In Figs. 22 through 27 is illustrated an improved method for assembling wiring conduits in poles of the type assembled from I beam parts. The pole may be of the type described in connection with Figs. 20 and 21 having tapered webs 1, 2, 5 and 6, and longitudinally extending flanges 3, 4, 7 and 8. The web portions are welded or otherwise joined together along a central zone extending throughout the length of the pole. At the upper end of the pole, shown in Figs. 22 through 27, the edges of the flanges are closer together than at the base of the pole, the flanges having edges 114 disposed relatively close together. Between the flanges there is not sufficient space to permit the lateral or sideways passage of wiring conduit 115 (which corresponds to the wiring conduit 29 previously described). To assemble the wiring conduit in a pole of this type one of the beam parts making up the pole structure has an end portion 120 (Fig. 27) cut away or removed. This portion of one of the beam parts is removed either prior to the assembly and welding of the pole structure or after the four beam parts have been assembled into a pole. For example, the beam part having the web portion 2 and the flange portion 4 has a portion cut away at one end beyond line 116 which indicates the extent or height of the one beam part in the initial pole assembly. The other three beam parts are of full length and may be welded together along the central zone of connection.

One of the beam parts adjacent that side of the pole from which a portion of one of the beam parts has been cut or removed, as the beam part having the web portion 6 and the flange portion 8, is utilized for attachment to the pole of the base plate 45 of the fixture arm E. Such beam part is formed with an aperture 117 centered in the flange 8 and with an adjacent cutout 118 in the web 6 to accommodate the end of the curved upper portion 119 of the wire conduit 115.

The length of the beam portion thus cut away or removed from one of the I beam parts of the pole prior to assembly, or removed from the end of the pole after assembly, is determined by the size of the conduit to be used. At and below the cut off the spaces between adjacent flange edges 114 are each sufficiently wide to permit the conduit 115 to be moved laterally into the space in the angles between the adjacent web portions. In assembling the pole and the conduit 115 the latter is moved laterally into one of the spaces mentioned, for example into the space between the webs 2 and 5, with the upper curved portion 119 of the conduit extending across the plane of the webs 1 and 2. The curved conduit portion 119 is thus disposed in and extends across the web cut out 118 and the end of the conduit is fitted into the aperture 117 in the flange 8 so as to mate with a similar conduit 121 or with a wiring channel in the fixture arm E. The end of the conduit 121 in the arm E may be flush with the face of the attaching plate 45, or as shown, may extend beyond the face of the arm attaching plate to be received within the opening 117 of the pole flange 8 so as to locate the arm E in predetermined position on the pole.

Reinforcements in the form of flat steel plates 113 are secured as by welding in the angles between adjacent web portions. These reinforcements, in groups, may be spaced along the length of the pole, the several plates of each group being substantially co-planar. One of the reinforcement plates is apertured to receive the conduit 115 and clearances 107 in the corners of the pole angles permit the stringing or threading of other wires, not shown, that are held in place by the reinforcements.

The end portion 120 of the beam part which had been removed prior to assembly of the conduit within the web angle of the pole is next fitted into place, the web portion thereof being relieved or cut away adjacent the cut out 118 in the adjoining web to accommodate the curved portion 119 of the conduit 115. The bottom end of the replaced beam part 120 is abutted against and welded to the upper end 116 of the short beam part of the pole and is welded longitudinally to the other beam parts along the central zone of connection.

This method of assembly, in which an end portion of one of the I beam parts is removed or cut away prior to assembly in the pole structure of a curved or offset end wiring conduit, the removed beam portion being thereafter re-assembled and secured in place, effects appreciable economies in manufacture since the wiring conduits can be bent or formed to the desired shape by the use of suitable jigs and fixtures and may be readily fitted into place in the pole structure by moving the same laterally into the spaces between adjacent web portions of the poles rather than by threading them axially into the ends of the poles as would otherwise be required.

The poles of the present invention may be employed with overhead or aerial wiring as well as with underground or subterranean wiring. Cap or crown plates 122 (Figs. 28–30) to support wires on the poles are welded or otherwise secured flatwise against the squared off upper ends of the poles, these cap plates having marginal portions which extend laterally beyond the flanges of the beam parts of the poles. The ends of the cap plates are formed with openings optionally to receive wire fasteners 123 to which electrical insulators 124 may be attached or to receive posts 125 the upper ends of which mount electrical knob insulators 126. Lead-in wires 127 from power lines or wires 128 (secured either to the insulators 124 or on the insulators 126) are threaded into a wiring conduit 129 through an inlet guide or cap 130 screwed on to the end of the conduit. The conduit 129 is disposed in the angle between an adjacent pair of web portions of the pole structure and extends out through a suitable opening in the cap plate 122 as shown in Figs. 28 and 29 or, if desired, the conduit 129 may extend laterally from the pole structure between adjacent flanges thereof or through one of the flanges, as shown in Fig. 30.

The cap plate 122 serves as a closure for the top of the pole preventing the ingress of rain and snow and giving protection to the interior "chambers" of the pole structure. Furthermore, the openings in the cap for attaching the insulator posts 125 or connectors 123 serve as means of attachment for hooks or other devices used in hoisting the pole and manipulating the same during shipment and in erection. At the ends of the cap plates 122 the edges of the latter are tapered as indicated at 131 providing relatively narrow portions of metal around the insulator post holes so that interference with the power lines 128 is avoided and the threading and attachment of the wire connectors 123 is facilitated.

In Figs. 31 through 37 is illustrated a further modification of the invention which incorporates a number of structural features that can, if desired, be incorporated in a single pole, as illustrated, or utilized separately or in combination with the other features previously described in satisfying different pole requirements. This pole is of the three-member type, it being understood, of course, that the expanded flange and raceway features and the particular arm bracket structure are applicable to poles comprising two, four or a greater number of parts or members.

The main members or parts of the pole comprise T-section members X, Y and Z, each having a flange portion 140 and a web portion 141. The web portions are at right angles to the flange portions, the webs being integrally joined to the flanges along the center lines of

the latter. As previously explained, the pole parts may comprise rolled I beams of steel or other suitable metal that are each cut into two parts along diagonal lines through the webs. The pole parts X, Y and Z of Figs. 31 through 37 may correspond in general to the pole parts L, M and N previously described in connection with Fig. 19. In this modified version, however, the central tubular conduit is omitted and the cut edges of the web portions **141** are welded together along the longitudinal center line of the pole as indicated at **142**. This welding together of the parts of the three-member pole may be effected in the manner previously described in connection with the four-member pole.

At any desired location along the length of the pole the flanges of the pole parts are expanded outwardly or away from one another to increase the strength and stability of the pole and to provide a space or chamber on the pole axis for accommodating wiring, relays, a transformer, or similar controls. This radial expansion of the pole structure is conveniently accomplished at the base or butt end thereof. Fig. 32 shows the outlines in elevation of the bottom end of one of the pole parts X, Y or Z in broken lines. An end portion **143** of the flange **140** is displaced laterally to some position such as that illustrated by the full lines, such displacement being effected by bends **144** and **145**. Each of the expanded or laterally offset flange portions **143** is integrally connected to its corresponding principal flange portion **140** by a diagonal or sloping flange portion **148** which extends between the bends **144** and **145**.

The bending of the pole member webs in this fashion is facilitated by first making transverse cuts through those portions of the webs that are located adjacent the bend points or by removing such portions of the webs. In a preferred arrangement, which provides for a relatively large chamber on the pole axis, the webs **141**, or the major portions of the widths thereof, are relieved or cut away from a point adjacent the remote bend **144** through the bottom end of the pole base. Thus the webs **141** of the several pole parts terminate in transverse edges **146** adjacent the bends **144**. The longitudinal cuts through the web portions leave relatively shallow web portions **147** integrally joined to the outwardly displaced or expanded portions **143** of the pole flanges.

By suitable proportioning of the angularity of the bends **144** and **145** the offset flange portions **143** may be disposed in any desired angular relationship to the longitudinal axis of the pole and to one another. In the illustrated arrangement the offset flanges **143** are disposed in substantially parallel relation to the pole axis, although other or sloping arrangements are contemplated.

The bottom ends of the offset flanges **143** are welded at **151** to a heavy steel base plate **150** which may be circular, as shown, or any other desired plan form. The base plate is drilled or otherwise formed with openings **152** spaced about its outer edges to receive attaching bolts or studs in the manner described in connection with the base plates of the preceding figures. An opening **153** formed centrally in the base plate admits a wiring cable **154** containing electrical conductors supplying current to the lamp or whatever other device is to be carried by the pole.

Between the edges of the expanded portions **143** of the pole flanges are metal plates **155** which, together with the pole member flanges, enclose an axial chamber **156** at the base of the pole. The edges of the plates **155** are welded to the edges of the pole flange portions **143**. An access door or plate is disposed across one of the spaces between adjacent pole member flange portions, the plate being removably attached to welded-in-place cross members **159** as by means of cap screws **160**.

The top of the base chamber **156** is closed by slanting plates **161** which are disposed in the angles between the webs **141** of adjacent pole parts. These slanting plates are welded along their edges to the pole member webs and to the edges of the sloping flange portions **148** to secure the pole parts rigidly together and to seal the top of the chamber **156**. As shown in Fig. 31, the slanting plates **161** are disposed above the bottom edges **146** of the pole part webs so that the welding in place of the slanting plates secures the pole part webs strongly together at their lower ends.

A short distance below the top of the pole, end portions **163** of the pole part flanges are bent at **164** away from the pole axis and from one another in divergent relation in the provision of a top wiring chamber on the pole axis. The web portions **141** of the pole parts are optionally relieved or cut away at the upper end of the pole to provide a relatively large clear space or chamber **165** in the top of the pole. The cutting away of the pole part webs leaves relatively shallow web portions **166** projecting into the chamber **165**, these web portions extending throughout the length of the top chamber **165** to upper edges **167** of the principal webs **141** at or slightly below the level of the bends **164**.

Across the top of the pole and serving as a closure for the top of the chamber **165** is a steel cap plate **168** welded to the ends of the expanded flange portions **163** of the pole parts. Surmounting the pole is an electrical transformer assembly **170** comprising a casing or housing enclosing the customary core and coils. The terminals or connectors of the transformer extend downwardly into the pole top chamber **165** through suitable openings in the cap plate **168**. The electrical supply cable **154**, which may enter the pole structure through the base plate **150** as previously mentioned, extends upwardly through the pole from the entrance aperture **153** in the base plate, the electrical wires of the cable making suitable connection, within the chamber **165**, to the transformer primary terminals as through a fitting **171**. The transformer secondary is connected to terminals which project into the wiring chamber **165**. Electrical connection is made to such terminals by conventional means including a fitting **172** on the end of a cable **173**. The cable **173** extends downwardly through the chamber **165** and through a wire or cable raceway **174** continuous with such chamber.

To form the raceway **174**, which extends longitudinally of the pole structure, the space in one of the angles between the web portions **141** of adjacent pole members is sealed off by strips **175** of steel plate. These plate strips extend across the opening between the confronting or adjacent edges of the pole member flange portions **140** bordering the raceway space, the edges of the plate strips being secured to the flanges by longitudinally extending welds. At intervals along the length of the pole the plate strips **175** are discontinuous to provide access openings normally sealed as by a removable closure **176** (Fig. 36) secured to welded-in-place cross members **177** by cap screws **178**. At spaced intervals along the length of the raceway **174** are cable supports **180** disposed so as to be accessible through the openings that receive the closures previously mentioned and one of which is shown at **176**, Fig. 36. These cable supports may take the form of metal bars the ends of which are welded to the inside faces of the pole member flanges **140**. The cable or cables to be supported in the raceway are received under the arm or arms of a T-shaped fitting **181** that is tightened as by an adjusting nut to clamp the cables against the bar **180**.

The top chamber **165** may either be open through the spaces between the divergent flange portions **163** of the pole members or parts X, Y and Z or, as shown, the chamber may be closed, when desired, by tapered closure plates **182** disposed across the spaces between the edges of the divergent flange portions **163**, the edges of the closure plates being joined to the pole member flange portions by longitudinally extending welds. The upper edges of the closure plates are welded to the

underside of the cap plates 168. A removable plate 183 is provided between the spaced edges of two of the divergent flange portions 163 so that ready access may be had to the top pole chamber 165. This closure plate is secured by cap screws 184 to cross elements 185. The ends of the cross elements are welded to the inside faces of the pole member flange portions similarly to the manner of fastening the cross elements 177 that carry the access plates 176. The removable plate 182 is preferably disposed as a continuation of the uppermost of the steel plate strips 175 which seal off the wire raceway. Removal of the access plate 183 thus facilitates the threading of the cables or conduits through the raceway and the making of the connections between the cables 154, 173 and the terminals of the transformer 170.

At an intermediate point along its length, the pole has a laterally extending arm 187, this fixture arm comprising a hollow steel pipe or tube suitably curved to present a pleasant appearance and carrying on its end a lamp fixture (not shown). At its pole end the fixture arm is welded to a mounting bracket 188 which comprises a body portion 189 and divergent wing portions 190 and 191. The body portion is disposed in overlying relation to the wire raceway 174 with which hollow interior 192 of the fixture arm is in communication through an opening 193 in the body portion of the bracket and an aligned opening 194 in the underlying strip plate 175. The flat plate-like wings 190 and 191, each integral with the bracket body 189 and obliquely disposed relative thereto and to one another, are received flatwise against the flat flanges of the pole parts Z and Y, respectively. Bolts 195 extend through aligned openings in the bracket wings and pole member flanges to secure the bracket in place. The bolts securing each of the bracket wings are disposed one on each side of the plane of the web of the corresponding pole member. Figs. 31 and 35 show the oblique wing arm bracket on a pole having a top mounted transformer. In this arrangement, the wires 173 from the transformer extend downwardly through the wiring runway 174 to the aligned openings 193 and 194 in the runway cover and arm bracket where the wires enter the base of the fixture arm 187.

For use on a pole in which the wires extend upwardly to the fixture arm, the oblique wing bracket is arranged as illustrated in Figs. 42 through 44. In these figures, the steel plate strip 175 which covers the wire raceway 174 has been omitted for simplicity, it being understood that the raceways can be used in either the open or closed condition, although the closed arrangement previously described is generally to be preferred.

Above the fixture bracket 188, the space between the pole parts Y and Z is closed by a slanting sealing plate 196 which is welded along its edges to the webs 140 and the flanges 141 of the pole parts. The plate 196 is highest at the center or axis of the pole structure and slopes downwardly and outwardly so as to form a water shed for intercepting water running down the partially enclosed raceway from above the plate and to direct such water to flow outwardly through the space between the confronting flanges of the pole parts. The plate 196 extends outwardly beyond the body portion 189 of the bracket providing an overhang and a drip edge 198 from which run off water falls clear of the bracket.

As shown in Fig. 44, the slanting water shed plate 196 is somewhat hat-shaped in plan form and includes integral oppositely directed ear portions 199 which extend over the corners connecting the body portion 189 of the bracket to the wing portions. The projecting drip edge 198 extends in continuous curves along the projecting ears 199 so that the latter are effective in preventing the entry of water into the corner joints between the bracket and the pole parts.

As a refinement of the fixture arm bracket, the oblique wing portions 190 and 191 may be formed with horizontally elongated apertures or slots 200 for receiving the mounting bolts 195. The slots 200 permit slight rocking or tilting of the bracket relative to the pole so that the angularity of the arm 187 relative to the pole may be adjusted, as between the broken and full line portions shown in Fig. 42. This adjustment of the fixture arm is desirable, for example, when a series of poles are used to support lamps over a bridge or highway so that the individual lamps can be raised or lowered and brought into alignment. It can be accomplished after the pole structure and related components have been erected and assembled. The nuts on the bolts 195 are backed off or loosened enough to permit adjustment of arm and bracket, as by wedges driven between the bracket and the pole parts, or otherwise, after which the nuts on the attaching bolts are tightened to secure the arm and bracket in adjusted position.

For supporting electrical wires or cables in the runways of the pole, the mounting device illustrated in Figs. 38 and 40 through 44 may be employed in lieu of or in addiiton to the clamp shown in Figs. 34 and 36. The mounting device comprises a deformable tubular sleeve 202 which embraces the wires or cables to be supported, such as the insulated wires 203 extending upwardly through the raceway 174 from the base of the pole to and through the fixture arm 187. It is to be understood, of course, that this supporting device may be used in various places along the length of the pole and for supporting other wires or cables such as the wiring cables 154 and 173 shown in the earlier figures.

The sleeve 202, preferably several times greater in axial length than diameter, is made of a material such as synthetic rubber which not only is resistant to weathering but also is resilient and maintains an effective grip on the wire or cable embraced thereby. A constricting annulus or metal clamp 204 embraces the rubber sleeve so that the wires are frictionally gripped therein. This clamp may be a conventional hose clamp, preferably of the type having a worm wheel movement actuated by a rotary member 205. The deformable sleeve 202 is received flatwise against a vertical steel rod or bar 206 having a bottom offset portion 207 secured as by welding to one of the pole part webs 140 within the raceway 174. The clamp 204 embraces both the sleeve 202 and the rod 206 so that, when the clamp is tightened, the rod becomes partly embedded in the sleeve to establish a strong frictional grip on the rod by the sleeve which effectively resists relative longitudinal movement. Loosening of the clamp releases the frictional grip not only between the sleeve and the rod, but also between the sleeve and the wires or cables embraced thereby. Such loosening of the clamp annulus permits vertical adjustment or movement of the wires 203 relative to the holding device and also permits adjustment of the sleeve 202 relative to the rod 206. These adjustments and movements can all be effected while the holding device remains assembled and in embracing relation about the wires. A clearance 208 between the rod and the pole web 140 to which it is welded or otherwise secured is provided by the rod offset, the clearance accommodating the clamp band 204 and facilitating vertical adjustment of the clamp band on the rod. By reason of the cantilever support of the rod 206, the upper end of the latter is free so that the clamp 204 and the deformable sleeve 202 can be assembled on or removed from the rod while the clamp remains in embracing relation about the sleeve and wires. This arrangement permits a number of the sleeves and the clamps to be first assembled on the wires after which the clamps are received over the upper ends of the corresponding rods along the length of the pole and tightened to complete the installation. A vertical full length slit 209 in each of the sleeves 202 permits the latter to be split or opened for assembly about the wires or cables without any necessity for threading the sleeves over the ends of the wires. The clamps 204 have separable ends

which permit assembly about the sleeves after the stringing of the wires.

In Figs. 38 through 40 is illustrated a modified pole structure for use with a pole top transformer **210** of the type having a cast metal base **211**. The base **211** is formed with an integral depending socket portion **212** of circular cross section. To accommodate this type of transformer, the steel pole of the present invention is surmounted by a top plate **214** which may be of any desired shape to harmonize with the pole cross section, the hexagonal plan form illustrated in Fig. 39 being suitable for a three part pole. The plate, secured to the pole parts X, Y and Z as by welding, is formed with edges **215** which extend beyond and may parallel the faces of the pole part flanges **141**. Centered on the top plate and secured thereto in upright position as by welding is a relatively short cylindrical tube **216** received telescopically within the cylindrical socket **212** of the transformed base. Means such as set screws, not shown, fasten the transformer base onto the pole top tube **216**. It is to be understood, of course, that the transformer **210** rests by gravity on the pole top plate **214**, being centered or located by the tube **216**. The weight of the transformer retains the parts in assembled relation under normal conditions. The wire leads **217** from the primary and secondary coils within the transformer **210** extend downwardly through the transformer base **211**, through the socket **212**, through the pole top tube **216** and through plate aperture **222** into a wiring chamber **218** in the top of the pole just below the plate **214**. The wiring chamber is provided by removal of the upper ends of the pole part webs **140** just below the pole top plate **214** and is thus continuous with a wiring runway such as the runway or raceway **174**, previously described. Closure plates **219** are secured across the spaces between the flange portions **141** of adjacent pole parts to close off those sides of the wiring chamber other than the side continuous with the wire runway **174**. The closure plates **219** extend downwardly from the cap plate **214** to which they are welded, the bottom edges **220** of the closure plates being disposed slightly below upper edges **221** of the pole part webs **140**. That side of the pole top wiring chamber which opens between the pole parts defining the wiring runway is fitted with a removable closure plate **223** similar to the closure plate **182**, previously described. The closure **223** is held by cap screws **224** threaded into cross pieces **225**, the ends of the latter being welded to the insides of the adjacent pole part flanges. Within the wiring chamber **218** electrical connection is made as at **226** between the transformer lead wires **217** which extend downwardly into the chamber through the aperture in the pole top plate **214** and wires such as those in the cables **154** and **173**, previously mentioned, which extend upwardly into the wiring chamber through the runway **174**. The provision of the wiring chamber **218** within the pole top, in combination with the removable plate **223** permitting access to such wiring chamber, facilitates assembly and installation of utility poles of the present type when used for street lighting and similar purposes. The wiring connections between the transformer and the power and fixture leads are readily effected while the transformer is rigidly mounted on and supported by the top of the pole.

The principles of the present invention may be utilized in various ways, numerous modifications and alterations being contemplated, substitution of parts and changes in construction being resorted to as desired, it being understood that the articles and apparatuses shown in the drawings and described above and the particular methods set forth are given merely for purposes of explanation and illustration without intending to limit the scope of the claims to the specific details and process steps disclosed.

What I claim and desire to secure by Letters Patent of the United States is:

1. A steel pole comprising a plurality of T-sectioned members each having a substantially flat web and a substantially flat flange, said members being secured together by the edges of their webs in generally symmetric relation about the longitudinal axis of the pole, a relatively short portion of the flange of each of a plurality of the members being offset outwardly from the plane of another and relatively long portion of the flange of the same member, and portions of the webs of the members having the offset portions being discontinuous along a common zone adjacent said offset portions of the flanges to provide a clearance space on the axis of the pole.

2. A metal pole comprising a plurality of substantially T-sectioned members each having a substantially flat web and a substantially flat flange angularly disposed to the web, the members being secured together in generally symmetric relation about the longitudinal axis of the pole with their webs in radial relation to such axis providing V-shaped spaces between adjacent members, the edges of the flanges of the members being disposed in generally spaced confronting relation to the edges of the flanges of adjacent members, a portion of the web of each member being discontinuous in a common zone to provide a clear space on the axis of the pole, and closure means extending across the V-shaped spaces and between the said confronting edges of the flanges adjacent said clear space substantially to enclose the clear space.

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