

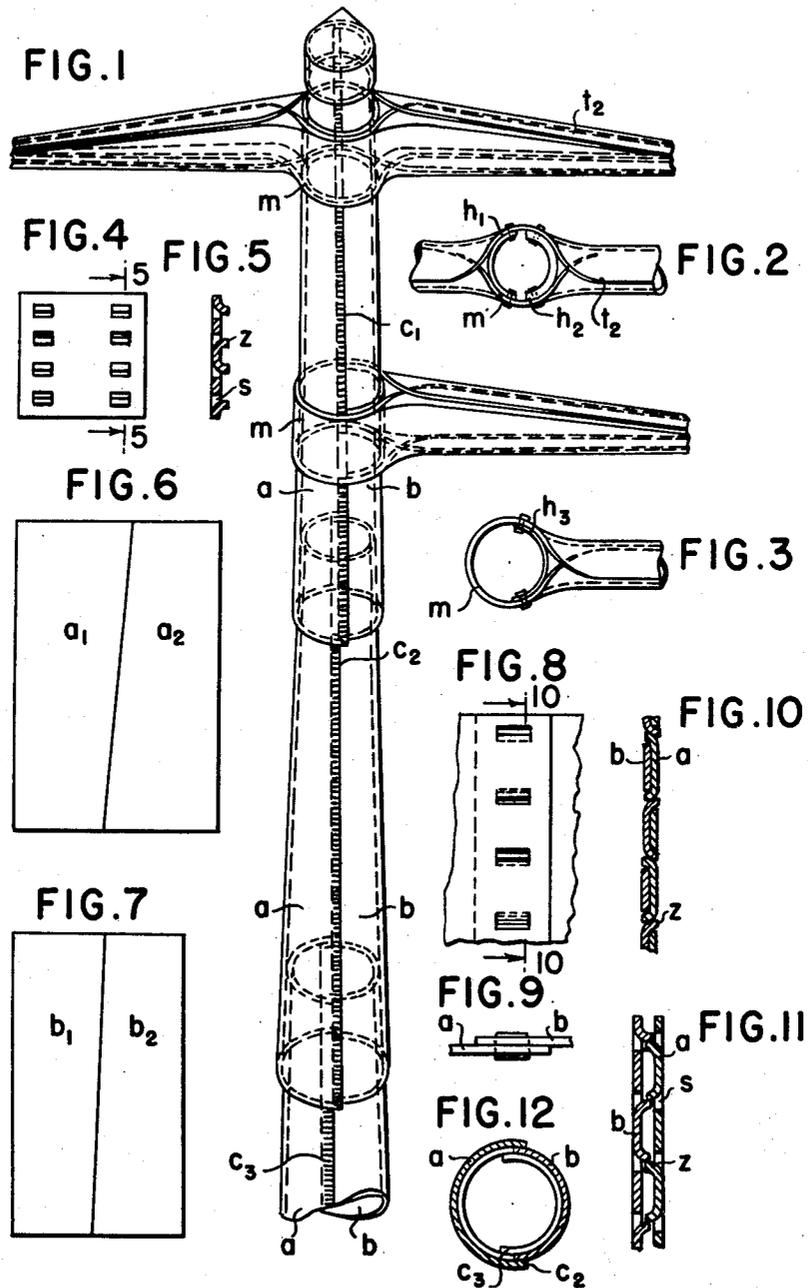
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TUBULAR POLE

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**TUBULAR POLE**

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The invention is concerned with a novel construction of poles, for any carrying and suspending purposes such as for carrying electric lines, street lamps, or the like. More particularly, the invention is concerned with tubular poles composed of a number of conical, upwardly tapering tube lengths, telescoped together, said tube lengths consisting of sheets bent and joined together by seams formed by the length edges of the sheets.

More particularly it is an object of the invention to utilize to the fullest extent the material of the blanks and to shape it into the proper form without any waste of material. It is a further object of the invention to provide closure and securing means at the seam edges of the blanks which make possible the closing of the bent sheets to form the desired tube lengths or units by simple means and to prevent them effectively from opening.

A further object of the invention is a structure of the seams such that the tubular sections or lengths of the poles are prevented at their telescopic joints from being turned or pivoted relatively to one another, and, furthermore that within the joints, where the tube lengths or units are telescoped together, the inner ends of the tubular pieces may not bend or fold in and the pole thus collapse, as might otherwise occur with thin-walled tubes made of sheets the edges of which overlap each other at the seams, or the seams of which are otherwise thickened or re-enforced, or are welded.

It is a further object of this invention to provide a pole of the type described, in which very hard, thin sheets of ferrous or non-ferrous metal may be used, which sheets, as a rule, can be deformed only slightly and cannot be welded at all. The poles of the invention may, however, be manufactured without the use of any rivets, screws, without welding, or any supplemental or connecting members or means, and without any waste of construction material, from inexpensive hard sheet material which up to now could not be utilized for these purposes.

The invention is furthermore concerned with novel methods of manufacturing such tubular tubes.

In accordance with the invention, the connection of the sheets bent into two half shells or the closure of the seam is effected by means of one or more rows of tongues for mutual inter-engagement punched into the edges of the sheets and bent about their roots, off these sheets, thus opening in both overlapping edges slots of equal contour with the tongues, into which opposing slots opposite tongues may mutually be entered. The tongues are pressed off the sheets to an extent which slightly surpasses the thickness of the sheets, e. g. 1.2 times this thickness. The tongues of overlapping edges are disposed oppositely of each other and are of equal shape. These oppositely arranged tongues point in opposite length directions and project from the sheets towards each other so that the tongues of one half shell are pressed obliquely outwards and the tongues of the other half shell obliquely inwards.

The tongues thus formed are then brought into engagement by pushing the two half shells laterally over each other so that the co-operating edges are brought to overlap each other. The tongues of the one of the overlapping edges are pressed into the slots opened by the bending off of the tongues of the other edge and conversely, in the manner as exactly fitting safety bolts are inserted into their catches. When all the tongues have

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penetrated their opposite slots, the tongues are pressed down and compressed or upset through the application of high pressure. A very strong, tight and smooth seam is formed in an inexpensive manner without any supplemental material and without any waste.

The invention has for a further object the application of a subsequently hardening binding agent between the parts of the seam, between the overlapping edges and into the interstices between the interlocked tongues and between the tongues and slots, for filling the interstices or for weatherproofing the seam, or also for further securing the closure, or several of these purposes.

Advantageously, a soldering means, for brazing or for soft soldering, may be introduced, before the seam is being finally closed, between the overlapping, seam forming edges with their tongues and slots. These soldering means may be caused to flow while the seam is being compressed by using for instance electric resistance heating, or by heating the tools, or by utilizing the heat of the compressing. Otherwise, the seam, after it had been closed, ever according to the construction material employed, may be fixed and simultaneously protected against corrosion, by fire-zincing, spray-coating with melted zinc, melted pure aluminum or by other brazing or soft soldering.

A further object of the invention is the cutting of the blanks for the half shells in pairs from rectangular sheets, by oblique cuts and without any waste.

With tubular pieces at which the overlapped length seams are arranged at an angle relatively to the longitudinal axis of the tube length, the blanks of four half shells for two equal conical tube lengths may be obtained, without waste, from two sheets of differing widths by means of two oblique cuts dividing the sheets into equal parts, one shell to supply two equal half shells with the length edges to lie outwards in the seams, the other sheet to supply two equal half shells with the length edges to lie inwards in the seams. The connecting tongues of the seams formed by the overlapping edges may be staggered relatively to one another in two or more rows and the connecting tongues as well as the slots may be corrugated.

The invention will now be more fully described with reference to the accompanying drawings in which an embodiment of the invention is illustrated by way of example.

In the drawings:

Fig. 1 is an elevational view of the upper part of a tubular pole with three tube lengths telescoped together at two joints, and with a simple and a double cross arm;

Fig. 2 is a fractional top view of the median or collar part of the double cross arm of Fig. 1;

Fig. 3 is a similar view of the collar part of the simple cross arm of Fig. 1;

Fig. 4 is a plan view of an inner half shell of a collar for attaching a cross arm at the tubular pole, the half shell being shown as extended into a plane;

Fig. 5 is a section along line 5—5 of Fig. 4;

Figs. 6 and 7 are plan views of rectangular blanks of differing width with oblique cuts dividing the blanks into equal parts for equal half shells, the length edges of the half shells of Fig. 6 to lie outwards in the seams and those of Fig. 7 inwards;

Fig. 8 is a fractional plan view of a seam closed by overlapping length edges;

Fig. 9 is a top view thereof;

Fig. 10 a longitudinal section along line 10—10 of Fig. 8 showing the tongues pressed in the slots however before they had been pressed flat;

Fig. 11 is a similar longitudinal section of the seam, the tongues being inserted into the slots, however before being pressed together; and

Fig. 12 is a top view of the third telescoped joint.

In accordance with the invention, two equal blanks  $a_1$ ,  $a_2$  for half shells  $a$  with length edges to lie outwards in the seam and at the tube to be produced, are separated from the blank by an oblique cut through a normal rectangular sheet as shown in Fig. 6. These sheets may be of a material up to now not employable for the production of tubes, e. g. of iron sheets of high carbon contents or of extra hard alloyed and tempered aluminum sheets.

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As illustrated in Fig. 7, the blanks  $b_1$ ,  $b_2$  for two half shells, with the length seams to lie inwards at the finished tubes, are cut in a similar way by a less inclined cut from a smaller sheet. Any waste of material is thus avoided.

The straight blanks  $a_1$ ,  $a_2$ ,  $b_1$ ,  $b_2$ , thus produced are shaped along the whole of their length edges with tongues or tongue groups  $z$ , as illustrated in Figs. 4, 5 and 8 to 11, by means of proper tools, advantageously on an eccentric press, or between two wheels provided with knives. The tongues  $z$  are bent about their roots under a proper angle out of the plane of the sheets. After the tongues  $z$  and the corresponding slots  $s$ , opened by the bending off of the tongues, have been applied to the blanks, the blanks  $a_1$ ,  $a_2$ ,  $b_1$ ,  $b_2$ , are pressed into semi-circular or semi-oval shells  $a$  and  $b$ , for instance on a rounding off machine. In this bending process the connecting tongues of the smaller half shells  $b$  should point or be directed outwards and the connecting tongues of the larger half shells  $a$  inwards. Pairs of one half shell  $a$  and one half shell  $b$ , each, are so joined together that a conical tubular unit or pole section  $c$ , Fig. 1, is produced at which both length edges of the half shell  $a$  from the wider sheet lie to the outside and overlap by the width of the seams the length edges of the inner half shell  $b$  made from the narrower sheet. The connecting tongues  $z$ , which in both half shells point in opposite length directions, will then slide along one another as illustrated in Fig. 11. The tongues, in this displacement for closing the connection, will thus mutually and positively guide one another into locking position.

When the edges then are pressed together for securing the closure, each tongue  $z$  of the outer half shell, as Fig. 10 illustrates in section, will precisely and accurately be guided in the cut or slot of the inner sheet edge through its inclined position on the one hand and through the counter tongue at the inner sheet edge on the other hand and will be pressed, tightly fitting, into position. Concomitantly, each tongue  $z$  of the inner sheet edge through its inclined position and through the counter-tongue of the outer sheet edge will be guided accurately fitting into the opposite cut of the outer sheet edge and pressed into it, tightly fitting, since all the tongues and all the cuts are of equal contour and are produced by the same tool and are equally spaced apart from one another.

Through the punching or cutting process, the tongues  $z$  have been stretched to a slight extent and the edges of the slots have been slightly countersunk through the penetration of the punch. Owing to these characteristics, the tongues after having fully penetrated the slots protrude over the edges of the slots  $s$ , and when the pressure applied is sufficiently high will be upset within the slightly countersunk edges.

An extremely solid and tight seam will thus be produced without any waste of material or without application of supplemental material and without any heat treatment. The material during this process does not suffer any reduction of its stressability or its strength, contrariwise, these characteristics are even enhanced through the cold deforming process under high pressure.

The conical tube lengths  $c$  produced in accordance with the invention are put or telescoped together in the manner of the known conical connections, so as to form a tubular pole tapering towards its top. As illustrated in Fig. 12, at the joint, where the wider end of a subsequent tube piece  $c_2$  is pushed over the narrower end of the preceding tube piece  $c_3$ , in accordance with a development of the invention, the length edges of the inner half shell of the tube piece  $c_2$  will adjoin or bear against the length edges of the outer half shell of the tube piece  $c_3$ . The pieces thus may be slid together and circular poles are fully secured against turning or pivoting of the parts against one another. The length seams of the individual tube pieces  $c_3$ ,  $c_2$ ,  $c_1$ , are inclined at a proper angle relatively to the longitudinal axis of the pole so that the adjoining overlapped seams do not overlap one another and do not interrupt the ideal form of the curvature of the circular or oval cross section. The telescoped tube ends fit closely, on the whole circumference, without any break in the smooth appearance, which otherwise, in other constructions is unavoidable. The tendency of the surface at the end of the inner tube piece in conventional connections to bend or fold in, when the pole is subjected to high bending stress, thus is removed and the strength of the whole pole increased.

Cross arms or pole heads for carrying transmission lines, street lamps, or the like, are provided with sleeves

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or collars for attaching them at the pole. These collars correspond as to their form or width to the form or width of the pole at the place where the arm or head is to be secured, see Figs. 1 to 3. These cross arms  $t$  are seated by being telescoped on the pole from above in the same way and with the same advantages as any tube piece on the other, secure against bending and turning.

Figs. 1 and 2 illustrate a cross arm  $t_2$  for two transmission lines. At the cross arm, which consists of two parts, there are secured the two half shells  $h_1$  and  $h_2$  in such a manner that these half shells connect the cross arm parts and with them together form a conical collar or sleeve embracing the pole, the length edges of the seams of the half shell  $h_2$  bearing against the outer edges of the length seams of the tube piece  $c_1$ .

Fig. 3 illustrates a simple cross arm which is mounted about the pole, at  $m$ , in such a manner that it itself forms the one half of the collar. The inner half shell  $h_3$  closes the collar and bears with its length edges against the outer edges of the length seams of tube piece  $c_1$ , thus preventing any turning or pivoting of the cross arm. The connecting seams of the collars and of the cross arms all are advantageously executed in accordance with the invention, in the same manner as the seams connecting and closing the half shells of the individual tube pieces of the pole.

Figs. 4 and 5 show the inner half of a collar, extended into a plane, for securing the cross arms to the pole. All the connecting tongues  $z$  of the collars or their halves, which are to be connected with the cross arms, are directed outwards and all the connecting tongues of the cross arms are directed inwards.

The overlapped seams with their connecting tongues and slots may be coated, before the seam is being closed, with a subsequently hardening binding means or agent which, when solidified or hardened, will oppose the opening of the seams and may also protect the parts thus coated against adverse effects of the weather. The binding means may also be in the form of a strip or wire to be inserted into the seam. The binding means may further be a solder which, during the compression of the seam, may be melted through electric resistance heating in the manner of resistance welding, or by otherwise heating the tools, or by utilizing the heat of the pressure applied to the seam.

The overlapping edges which had been closed and form the seam, ever according to the material employed, may be fixed and protected against corrosion by fire-zincing, spraying of melted zinc, melted aluminum or other brazing or soft soldering.

I claim:

1. In a pole structure composed of a number of upwardly tapering tubular pole sections, each pole section having an upwardly tapering frusto-conical shape and consisting of circularly curved metal sheets each having a longitudinal marginal portion overlapping the longitudinal marginal portion of the adjacent sheet, each of said two overlapping portions having a longitudinally aligned row of cut-out tongues projecting angularly away from the sheet surface and forming adjacent to each tongue an opening of the same contour as said tongue, the openings in each row being alternately above and below the tongues and the tongues having a height substantially equal to the thickness of said sheet, the tongues of each marginal portion being compressed in the direction of their height and engagement with the respective openings of the other portion and forming a rigid lap seam together therewith.

2. A cross-armed pole structure, comprising a tubular member having an upwardly tapering frusto-conical shape and having longitudinal lap seams, a horizontal hollow cross arm comprising two half-shell shaped parts, said two parts forming together a frusto-conical collar embracing said tubular member and joining said arm with said member, said two parts having two respective vertical marginal portions overlapping each other, each of said two overlapping portions having a longitudinally aligned row of cut-out tongues projecting angularly away from the marginal portion and forming adjacent to each tongue an opening of the same contour as said tongue, the openings in each row being alternately to one and the other side of the tongues and the tongues having a height substantially equal to the thickness of said parts, the tongues of each marginal portion being compressed in the direction of their height and in fastening engagement with

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the respective openings of the other portion and forming a rigid lap seam together therewith.

3. A tubular pole structure, comprising a sheet structure of metal, said sheet structure having two longitudinal marginal portions overlapping each other, each of said two overlapping portions having a longitudinally aligned row of cut-out tongues projecting angularly away from the sheet surface and forming adjacent to each tongue an opening of the same contour as said tongue, the openings in each row being alternately above and below the tongues and the tongues having a height substantially equal to the sheet thickness, the tongues of each marginal portion being in tight engagement with the respective openings of the other portion and forming a rigid lap seam together therewith.

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