C. K. HARDING.

INVERTED INCANDESCENT MANTLE.

APPLICATION FILED JUNE 30, 1909.

982,958.

Patented Jan. 31, 1911.

Fig. 2.

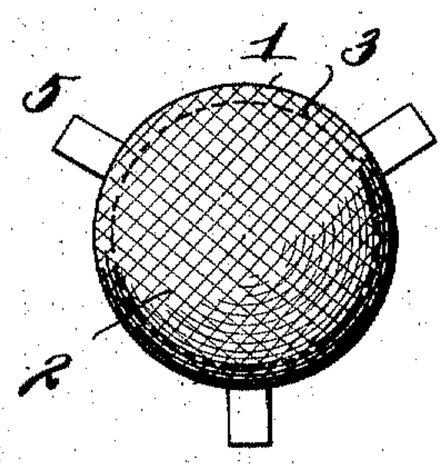


Fig. 1

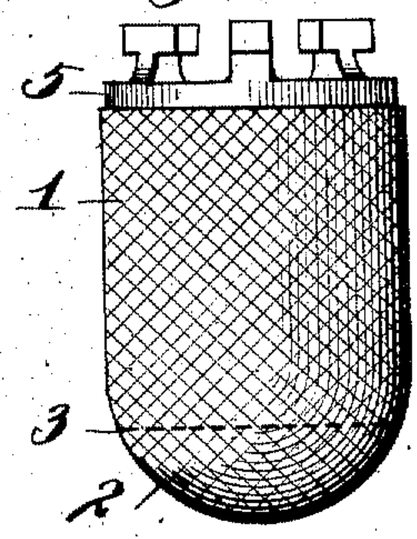
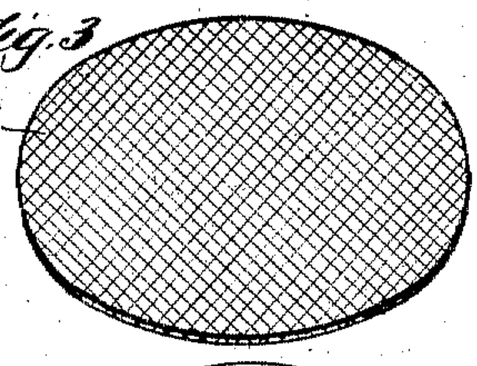


Fig. 3



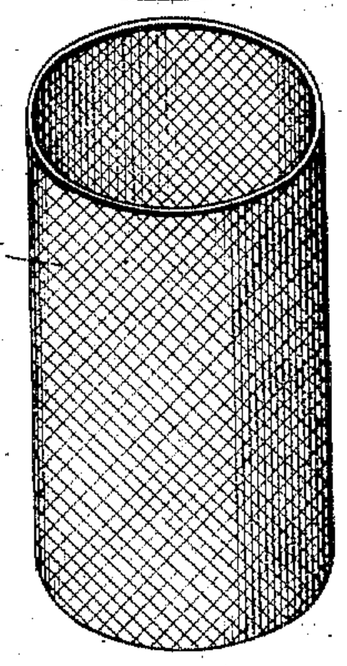
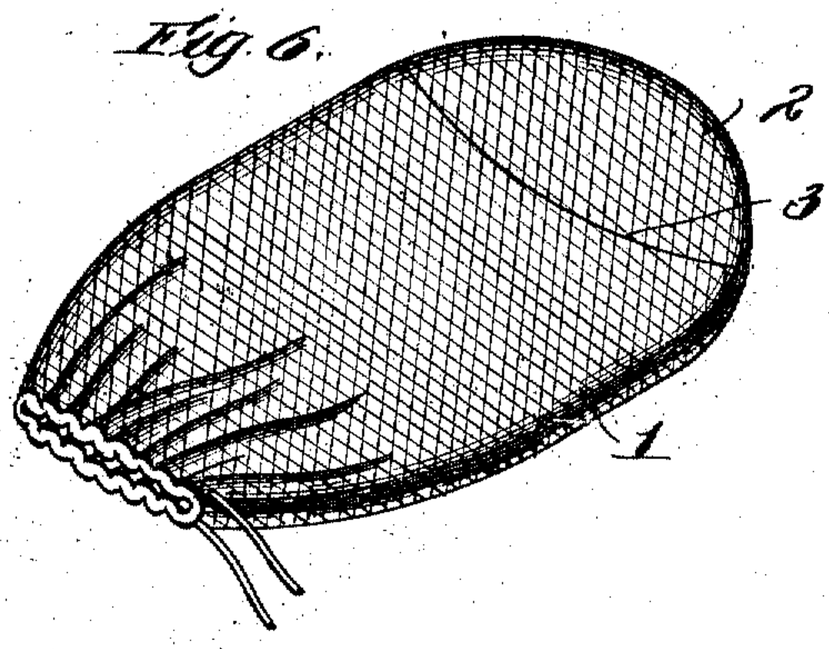


Fig. 4.

Fig. 6.



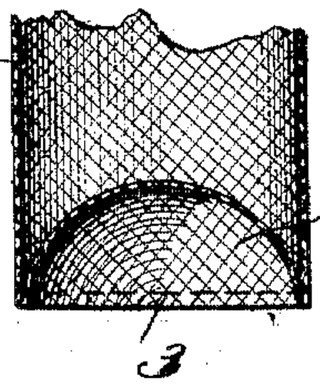


Fig. 5.

Fig. 7.

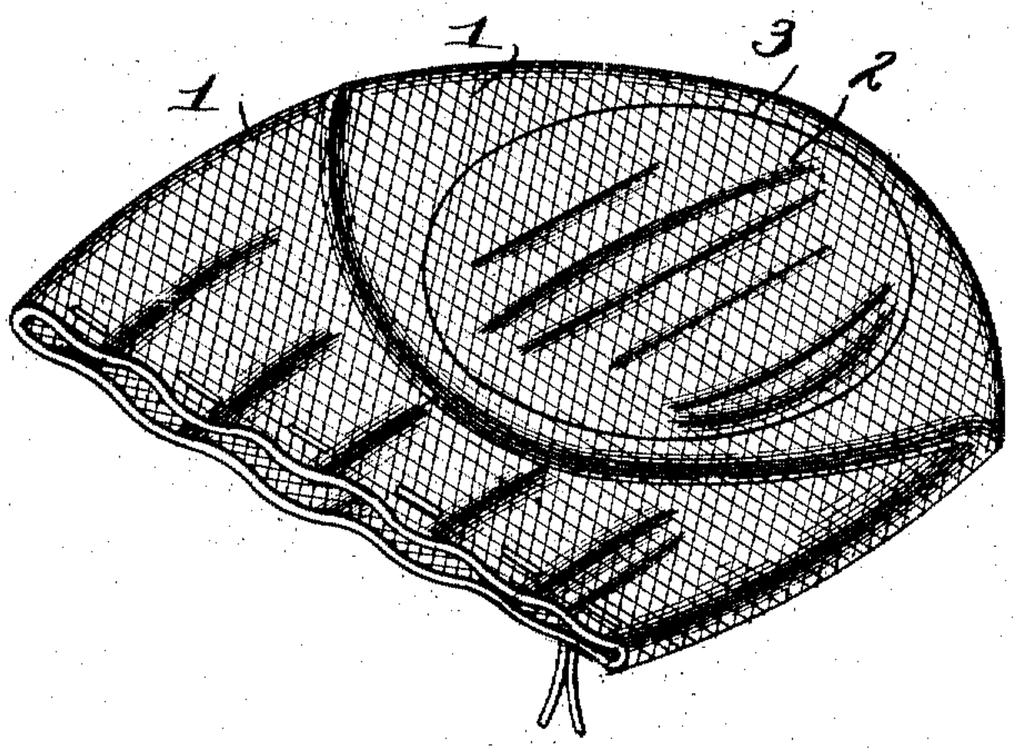
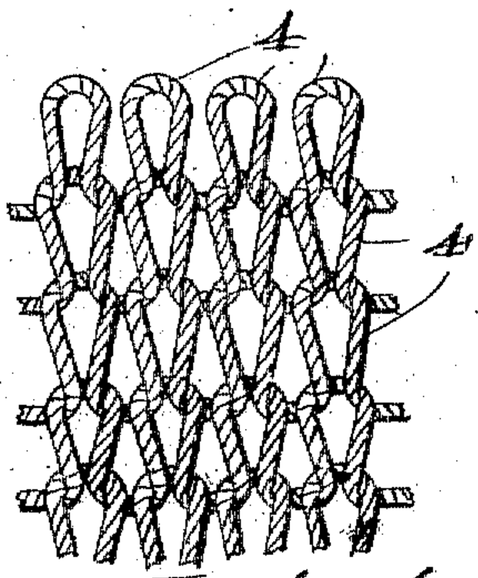


Fig. 8.



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UNITED STATES PATENT OFFICE.

CHARLES KNOX HARDING, OF CHICAGO, ILLINOIS.

INVERTED INCANDESCENT MANTLE.

982,958. Specification of Letters Patent. Patented Jan. 31, 1911.

Application filed June 30, 1909. Serial No. 505,274.

To all whom it may concern:

Be it known that I, CHARLES KNOX HARDING, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Inverted Incandescent Mantles, of which the following is a specification.

This invention relates generally to incandescent structures for lighting made by what has been generally known as the Welsbach process, which consists of impregnating a knitted fabric of cotton or other fibrous cellulose with solutions of the refractory earths, which are to constitute the finished mantle. The dimensions of this impregnated fabric are usually from 100 to 200 per cent. greater than that of the finished product after the cellulose and other volatile matter is burned out, but this large structure is fashioned and formed approximately to such shape as will produce the desired form of the finished mantle after it has been shrunken.

My invention relates particularly to an improved construction of inverted mantles having an open topped cylindrical body portion and a hemispherical closed lower end that possess advantages not attained by mantles manufactured prior to my invention.

Among the objects of my invention is to produce an inverted mantle of more symmetrical shape and having its lower portion consist of a uniform thickness of fabric without seams whereby this most useful portion of an inverted mantle can be uniformly and entirely raised to the highest incandescence.

To attain these ends and other useful results I employ the features in the construction, the arrangement and configuration of the several parts as will appear hereinafter, more fully described and claimed and shown in the accompanying drawings, which illustrate one embodiment of my invention and in which—

Figure 1 shows a side elevation and Fig. 2 an end view of a finished burned off mantle. Fig. 3 is a perspective view of an elliptical piece of mantle fabric from which the lower portion of the mantle is formed. Fig. 4 is a perspective view of a length of knitted tubular fabric of which the upper portion of the mantle is formed. Fig. 5 is a detail section showing the tubular portion and lower portion in position to be seamed together. Fig. 6 is a perspective view of a fabric mantle and Fig. 7 is a similar view of a fabric mantle made in accordance with my invention and folded in a way that may be employed where it is intended to be placed in a flat envelop for the market. Fig. 8 is a detail view, enlarged about 10 diameters, of a section from the perpendicular side of an incandescent mantle formed from a knitted fabric.

Prior to my invention both upright and inverted incandescent mantles have generally been made from a tubular knitted fabric which has special properties which peculiarly fit it for the purpose of the ordinary upright mantle. The typical mantle fabric has 88 loops around a circumference of 5 inches, and about 11 chains of loops to the inch of length, so that a square inch of fabric has more than three times as many threads running lengthwise as it has crosswise. This unequal distribution of the amount of thread materially facilitates the forming of cylindrical mantles, for though the shrinkage might be considered uniform in the lineal dimensions of the thread, the vertical shrinkage is only resisted by the force of gravity while the pressure of the gas flame within the mantle prevents it from shrinking nearly as much circumferentially. It has been demonstrated that a square section of knitted fabric best adapted for upright mantles and having the major portion of its threads running in the perpendicular direction when burned off and subjected to a uniform gas pressure would produce a rectangular section in the resulting burned out structure, having dimensions at least fifty per cent. greater along the lines of least resistance. Most of the inverted mantles in practical use have been made from tubular knitted fabric, the lower end being formed by gathering the lower edge of the tube and drawing it to the center. This resulted in a thickening or bunching of the goods at and around the center of the lower portion of the mantle. In many cases, considering that quite a portion of the material forming the whole circumference of the tube had to be drawn into practically one mass at the center

of the lower surface of the mantle, there was left at that point and in the form of plaits and gathers for considerable distance around that point an accumulation of material two or three times as heavy and dense as the average thickness of a similar area of the other parts of the mantle. To obviate this, especially for heavier mantles made of coarser thread, goring has been employed; that is from two to six curved seams have been sewn through two adjacent layers of fabric from a point above the bottom where the diameter was to be retained, to a point in the center axis at the bottom. These gores permit a quantity of the stock to be cut out and also take up some in the seams which turn in at right angles to the plane of the mantle surface. As a greater number of these gores are employed the shape of the sewn fabric as well as the shape of the resulting mantle after burning off, becomes progressively more symmetrical. But the seams running to the center of the lower portion of the mantle are objectionable and the more seams employed the more objectionable they become, so that in many self shaping mantles, commonly called fabric mantles, the symmetry is often sacrificed by avoiding too many seams.

In a preferred embodiment of my invention I employ a piece of tubular knitted fabric of the ordinary or typical construction for the upper tubular part of the inverted mantle, No. 1, Fig. 4, as shown in the drawings, and a separate elongated disk cut lengthwise from knitted mantle fabric, No. 2, Fig. 3, gathered around its outer edge into a semispherical or cup shape. This piece, No. 2, is inserted in the edge of the tubular piece, No. 1, as shown in Fig. 5 of the drawings, and sewn around its edges, united with the edges of the tube by a seam, shown at 3.

In use, the fabric is reversed, leaving a small portion of the edges beyond the seam on the inside of the mantle. The mantle may now be mounted on a carrying ring, No. 5, shown in Figs. 1 and 2, the fabric burned out and the mantle shaped and hardened in the same way as the ordinary gathered or gored mantles. The result is a mantle of perfect shape with no objectionable obstructions in the central part of its lower surface, as illustrated in Figs. 1 and 2. The circular seam is shown at No. 3 and is of somewhat smaller diameter than the main cylindrical portion of the mantle.

I do not wish to confine my invention to any particular relative size or proportion, as the area of the lower surface formed below the seam may vary to a considerable extent and the lower edge of the tubular portion may be drawn in toward the center very readily and may stand in as much as one-third the distance to the center.

Fig. 6 illustrates a form of fabric mantle gathered at the top upon an asbestos string to be tied around an inverted burner tube, and consists of the tubular body portion, No. 1, and the lower portion made of the piece, No. 2 united by the seam shown at No. 3.

Fig. 7 is a perspective view of a fabric mantle folded in a way to permit illustrating the arrangements of its parts, the lower piece, 2, being united to the tubular portion, 1, by the circular seam, 3.

In illustrating my invention thus far I have shown that I prefer to use a separate piece of fabric for the bottom, but I do not wish my invention to be strictly construed as covering only the use of a distinctly separate piece of fabric for the lower portion of the mantle, as a fabric identical in character with that from which the tubular body is made may be used but in this case the elliptical piece would have to be about twice as long as it is wide. I have found in practice that it is advantageous to use for the bottom piece a knitted fabric of a somewhat different character from that employed for the tubular part.

In Fig. 8 I have shown the detailed view of a portion of a cylindrical mantle. In the original fabric from which it was made the loops were considerably longer in an up and down direction and were drawn together until the two sides of the loop touched each other in a lateral direction.

For the bottom pieces of my inverted mantle I prefer to use a knitted structure in which the loops of each chain are somewhat farther apart and having a materially increased number of chains to the inch.

As the whole lower portions of inverted mantles are subjected to a uniform pressure, I prefer to have the lower portion made from a knitted fabric, having its threads disposed more uniformly in the direction of its length and width, in which case the disk (2 shown in the drawings) would more nearly assume the form of a true circle; but inasmuch as there is always some difference in the transverse and lineal shrinkage of knitted mantle fabrics when they are in the form of the impregnated knitted fabric and after the volatile matter has been burned out, I prefer to make the disk slightly oval or elliptical to compensate for this subsequent shrinkage and assure a finished mantle of the most symmetrical shape.

Within recent years there have been some material improvements in methods of manufacturing mantles over the methods heretofore referred to as the Welsbach process. In some cases the thorium, in other chemical compounds than the nitrate in aqueous solutions is employed and artificial silk or threads spun from viscous cellulose solutions are incorporated with these various thorium compounds which produce incandescent

structures that do not undergo such a severe transformation when the fabric is incinerated and in many cases these structures may be placed on the burners by the consumer and the fabric burned out and formed on the lamp on which they are to be used.

Large quantities of inverted mantle fabrics, made by the ordinary process, have been delivered to users of hydro carbon lighting systems in the form of impregnated mantles and known in commerce as soft mantles or fabric mantles. While my invention is particularly applicable as applied to mantles burned off and finished in the factory, it is especially desirable for fabric mantles which are to be burned off by the consumer who is without the skill and facilities of a mantle factory.

By applying my invention to fabrics made by the newer chemical processes, in which the shrinkage is very much less, and the strength of the resulting structure very materially increased, it will make a fabric mantle which will compare favorably with the factory finished mantles as commonly used at the present time.

As heretofore mentioned in the specification, the dimensions of an impregnated knitted mantle fabric are usually 100 to 200% greater than the dimensions of the finished product after the combustible matter has been burned out and the superficial area of a given surface of impregnated mantle fabric would be—say 150% larger than the superficial area of the structure remaining after the volatile matter had been burned out; but it has been clearly pointed out that the shrinkage is very materially different in the direction of the length and the width of knitted fabric or in the directions in which the most or the least of the threads are disposed. That is, a square inch of mantle fabric may have three times as many threads running lengthwise as it has crosswise and the shrinkage would be likely to be about 50% in lineal dimensions and 20% transversely, so that the area of a section of impregnated fabric would be represented by its length multiplied by its width, and the area of the structure resulting from burning out the same would be represented by multiplying 80% of its width by 50% of its length. The increased amount of shrinkage in the direction of its length of tubular knitted fabric does not interfere with the symmetry of ordinary upright mantles or the cylindrical body portions of inverted mantles as this increased shrinkage takes place on all sides of a cylindrical body which are of equal length but I prefer to form the elliptical end portion of a separate section of knitted fabric in which the threads are disposed somewhat more uniformly in the different directions so that an elliptical shape having its major axis not more than 50% greater than its minor axis may be employed, but where it is desirable to have a very open structure I can employ an ellipse having a length approximately twice its width.

Having now described my invention, what I claim is:

1. An inverted mantle formed from an elliptical shaped section of a single thickness cut lengthwise from knitted mantle fabric and an open topped cylindrical body portion composed of tubular knitted fabric having a major portion of its threads running lengthwise of the tube and having a seam uniting the lower end of said body portion to the circumference of the said elliptical section.

2. An inverted fabric mantle composed of an elliptical shaped section of a single thickness cut lengthwise from knitted fabric and a tubular body portion of knitted mantle fabric having the outer edge of the elliptical section united to the lower edge of the tubular body portion by a seam extending transversely around the lower end of said body portion whereby the increased shrinkage of the elliptical section in the direction of its length when the fabric is burned out will cause it to form a more nearly hemispherical closed end portion.

3. An inverted mantle having a closed end portion composed of an elliptical shaped section cut from a single thickness of knitted fabric and an open topped body portion formed from a tubular knitted fabric having a major portion of its threads extending lengthwise of the tube and having a seam running transversely around the lower edge of the said body portion and uniting its edge with the circumference of said elliptical end portion.

4. An inverted mantle consisting of an open topped body portion of tubular knitted fabric and having its lower end closed by an elliptical shaped section of a single thickness of knitted mantle fabric having a major portion of its threads extending in the direction of its major axis and having a seam running transversely around the lower edge of said body portion and uniting its edge with the circumference of the said elliptical shaped section.

5. An inverted fabric mantle composed of an open topped tubular body portion formed from knitted fabric and having a closed bottom portion formed from an elliptical shaped section of a single thickness of knitted mantle fabric attached to the lower edges of the said body portion by a seam running transversely around said lower edges and uniting said edges with the edges of the circumference of the elliptical bottom portion.

6. An incandescent fabric mantle comprising an open topped cylindrical body

portion, formed from tubular knitted fabric and a closed lower end portion formed from an ellipse-shaped section of a single thickness of knitted mantle fabric, having its circumference attached to the lower end of the said body portion by a seam; whereby the shrinkage in the direction of its length of the tubular portion results in a symmetrical cylindrical body portion, and the increased shrinkage in the length of the ellipse shaped lower end section results in a more nearly hemispherical closed lower end of the mantle.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses, this 28th day of June, 1909.

CHARLES KNOX HARDING.

Witnesses:
ALICE MAUDE FAIRCHILD,
NANETTA L. MCCALL.