(No Model.) 2 Sheets—Sheet 1.

H. J. BELL.

MANUFACTURE OF GAS INCANDESCENTS.

No. 390,057. Patented Sept. 25, 1888.

Fig. 1.

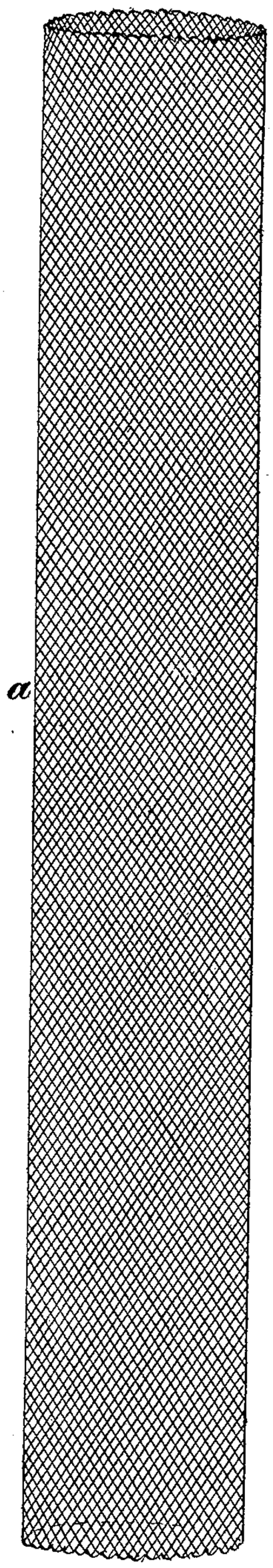


Fig. 2.

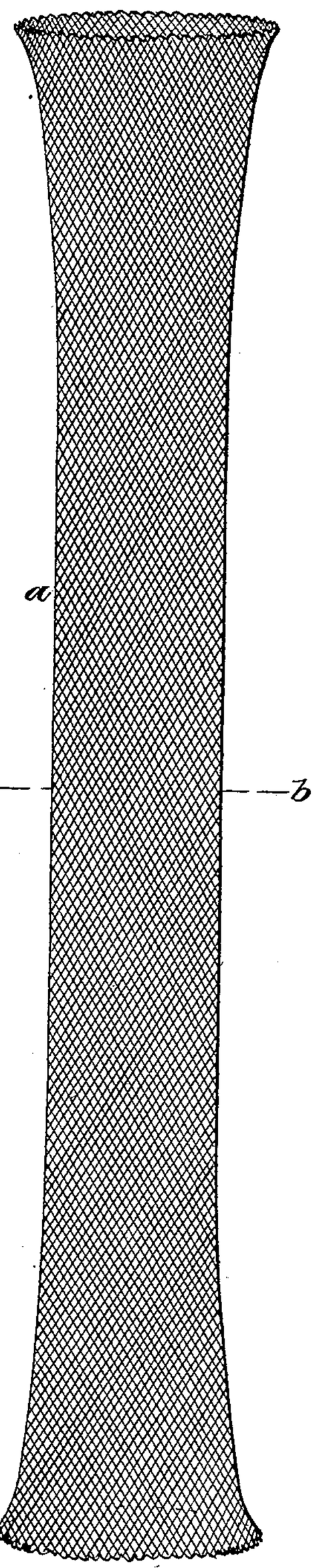
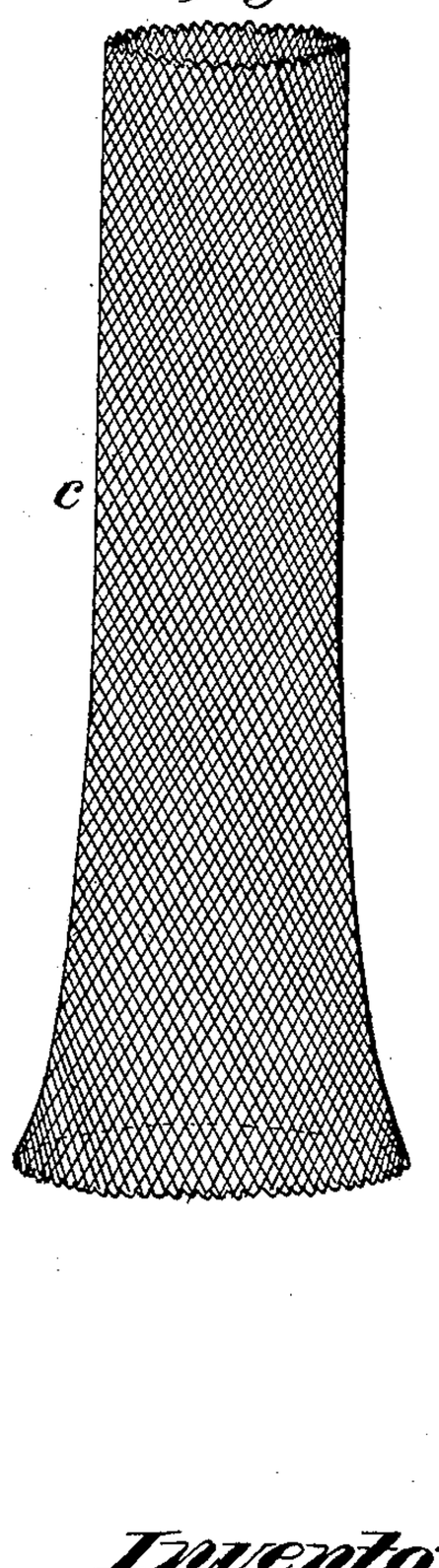


Fig. 3.



Witnesses.
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J. A. Rutherford

Inventor.
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Atty.

(No Model.) 2 Sheets—Sheet 2.

H. J. BELL.

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Fig. 4.

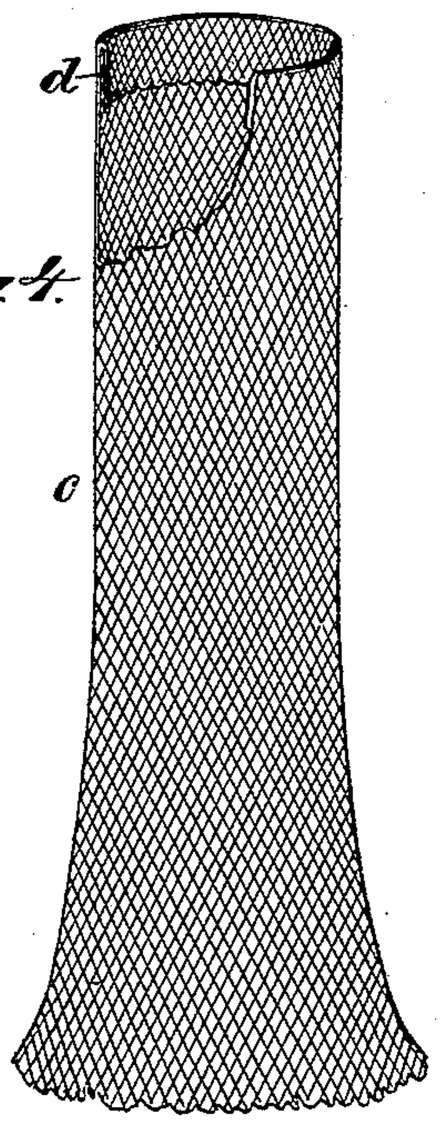


Fig. 5.

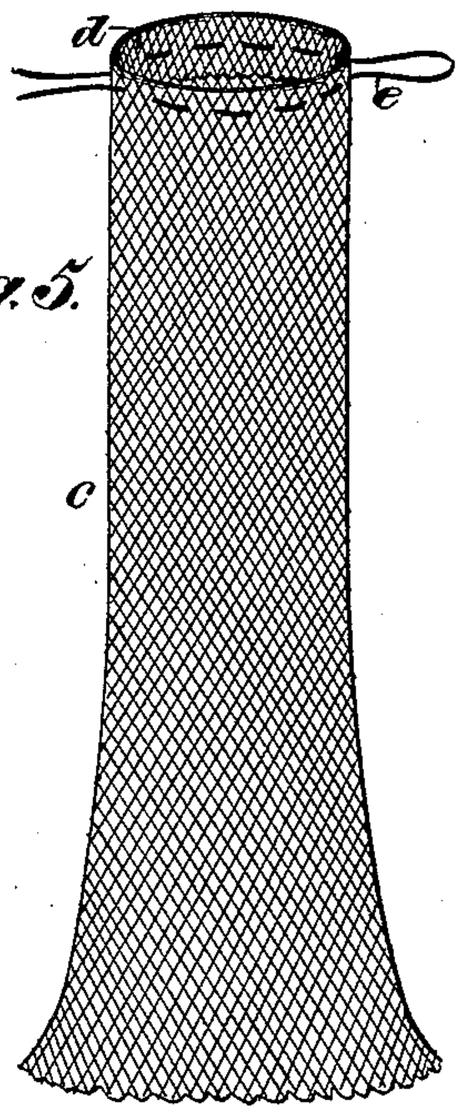


Fig. 6.

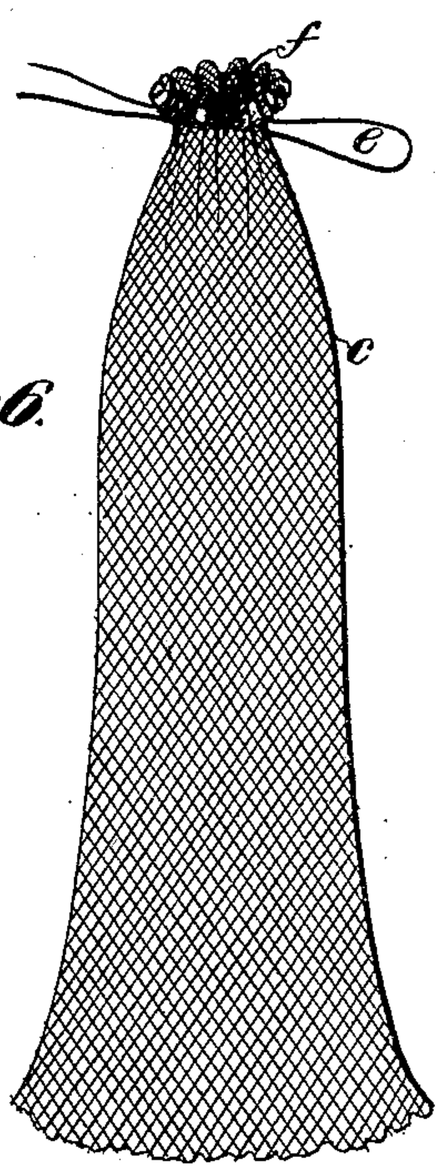
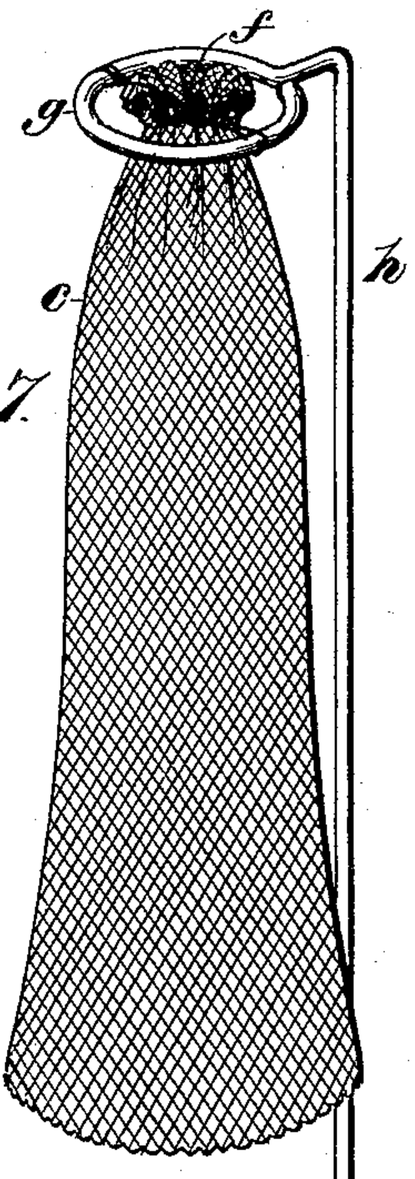


Fig. 7.



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UNITED STATES PATENT OFFICE.

HAROLD J. BELL, OF WOODBURY, NEW JERSEY, ASSIGNOR TO THE WELSBACH INCANDESCENT GAS LIGHT COMPANY, OF NEW JERSEY.

MANUFACTURE OF GAS INCANDESCENTS.

SPECIFICATION forming part of Letters Patent No. 390,057, dated September 25, 1888.

Application filed March 21, 1888. Serial No. 267,988. (No model.)

To all whom it may concern:

Be it known that I, HAROLD J. BELL, a citizen of the United States, residing at Woodbury, in the county of Gloucester and State of New Jersey, have invented new and useful Improvements in the Manufacture of Gas Incandescents, of which the following is a specification.

My invention hereinafter described relates to improvements in the manufacture of incandescing devices, such as are known as "mantles" in the Welsbach system of incandescent gas-lighting. These mantles are composed of a net-work of incombustible and infusible earthy oxides, and are made by saturating a loosely-woven fabric of cotton threads with a solution of the salts of the rarer metals, which produce earthy oxides, and subsequently burning out the woven foundation fabric in such a manner as to leave a skeleton-like frame or mantle composed entirely of a net-work of the earthy oxides that result from the decomposition of the metallic salts contained in the saturating or impregnating solution.

My improvements in the manufacture of incandescing mantles are illustrated in the annexed drawings, in which—

Figure 1 represents a piece of cotton webbing woven tubular and cut transversely to a length sufficient to make a predetermined number of mantles, preferably two in each piece, without waste. Fig. 2 represents the same piece of webbing after it has been saturated with the impregnating solution of metallic salts, the fabric being shown somewhat shrunken by the operations of saturating and drying. Fig. 3 shows a mantle-length of fabric produced by cutting the saturated and dried piece of webbing, Fig. 2, midway its length. Fig. 4 illustrates the manner of re-enforcing the upper end of the mantle-length by folding the upper portions inward. Fig. 5 shows the mantle fabric with a platinum wire sewed or threaded through or around its re enforced or turned-in end. Fig. 6 shows the mantle fabric with its upper end contracted and formed into a rounded aperture on the platinum-suspending wire. Fig. 7 shows the mantle fabric suspended on a rod or wire ready for being subjected to heat for the purpose of destroying the foundation webbing.

Heretofore in the manufacture of mantles it has been customary in preparing the fibrous net-work to weave it in long cylinders, which are subsequently, but before saturation, cut into lengths each suitable for only one mantle, then to sew around one end a piece of bobbinet or other suitable material, after which the mantle is turned, and through the end around which the bobbinet has been sewed there is threaded a small platinum wire, by which this end is drawn together, leaving an aperture, and by which the mantle is subsequently attached to the rod which supports it over the gas-exit. To this method of preparing mantles there are certain objections, growing out of the fact that the mantle is cut, and is re-enforced by the bobbinet and turned before being saturated with the impregnating-fluid in course of its preparation for use as an incandescing device. This can be done by hand only with great difficulty, care, and expense, and for purposes of economy involves the use of metallic machinery whose contact is injurious to the mantle. Moreover, it is very desirable to avoid sewing on the bobbinet or other re-enforcing material at that end of the mantle which is to be threaded, and which will serve as its upper end, as the greater thickness caused thereby diminishes the illuminating power of the mantle. To overcome this, as well as many other objections of a kindred nature, I have devised the following method of preparing the mantle up to that stage at which the saturated fibrous material is shaped or formed for burning out the foundation webbing.

According to my invention the tubular-woven netting, carefully and thoroughly cleansed by washing in warm alkaline and acid solutions and rinsing, is cut into pieces having each a length, as shown in Fig. 1, sufficient for forming, preferably, two mantles. The netting, webbing, or tubular fabric may of course be woven in any convenient lengths, and should be thoroughly cleansed before cutting into short pieces. While for convenience I prefer in the first step of my invention to have the netting cut into mantle-lengths, yet a good result can be attained by cutting the netting into longer pieces, care being taken, however, that it is made of such lengths as will cut evenly into single mantles.

The piece of the tubular-woven netting *a*, Fig.

1, of the desired length for, say, two mantles, is saturated with a solution of an earthy metal or metals—such, for instance, as the nitrates of thorinum, lanthanum, zirconium, yttrium, or other rarer metals, either alone or in combination, the salts of such metals being used as are capable of producing on decomposition by heat an infusible earthy oxide or oxides that will be capable of emitting light by incandescence. After saturation with the selected impregnating solution of metallic salts the piece of net-work or foundation fabric *a* is dried by exposure to the air and becomes slightly shrunken, with its ends somewhat extended, as shown in Fig. 2, the distended ends being a result very difficult, if not impossible, to obviate at the points where the fabric is cut before saturation. Owing to the nature of the impregnating fluid or solution the saturated and dried fabric is left in a condition which admits of its being easily molded, and so that after being pressed between thumb and finger, or by other suitable means, it will retain its shape preparatory to cutting and folding for attaching the usual platinum-suspending wire. The saturated and dried fabric *a* is then cut transversely into suitable and uniform mantle-lengths, the division-line *b b* being preferably midway the length of the fabric, (shown in Fig. 2,) which, as before explained, is designed for making only two mantles. It will be observed that the mantle fabric *c*, as shown in Fig. 3, when cut after saturation, has one end close and of no greater diameter than before it was cut. This close or undistended end of the mantle fabric *c*, being comparatively smooth cut and even, is particularly adapted for forming the upper end of the mantle by which it is suspended. When the net-work *a*, Fig. 1, is cut into mantle-lengths before saturation, the difficulty of forming the mantle is increased, owing to the comparative distention and uneven shrinkage of both ends. By first saturating the mantle fabric and then cutting it into mantle-lengths the mantle can be easily molded or manipulated, and is now turned or folded in by hand at its small end, as shown in Fig. 4, so as to form a re-enforcement, *d*, by which it is strengthened at its upper end. If the mantle is cut before saturation, this turning in becomes a very difficult operation and cannot be done economically nor with the evenness of result attained by my method.

A platinum wire, *e*, is now threaded through the turned-in or re-enforced end *d*, as shown in Fig. 5, thereby securing the re-enforced portion and affording a means for suspending the mantle. The re-enforced or turned-in end of the mantle is now drawn together along the platinum wire toward its center, so as to form a round aperture, *f*, as shown in Fig. 6, after which the ends of the wire *e* are twisted adjacent to the mantle to hold it drawn, the rounded aperture *f* affording an exit for the products of combustion. The mantle is next suspended, as shown in Fig. 7, by means of the projecting ends of the platinum wire *e*, from a ring, *g*, on the upper end of a rod, *h*, and is ready to be exposed to the heat of a gas-flame, for the purpose of consuming the foundation fabric in the ordinary manner, as practiced in the manufacture of this class of incandescents.

The vertical support or rod *h* continues to suspend the mantle when reduced by combustion to a skeleton-like structure of earthy oxides, and may either be straight or follow such lines as desired.

It will be observed that the platinum wire *e*, being threaded about the middle of the turned-in or re-enforced portion of the mantle, leaves a skirt below it as far as the turned-in portion extends, which acts as an additional support for the body of the mantle, making it much stronger than the mantle strengthened in the usual way by having a piece of bobbinet sewed upon it. This manner of re-enforcing the mantle not only dispenses with bobbinet, but also avoids any necessity for using the strengthening fluid that is sometimes employed on the upper end of the mantle.

This method of manufacturing incandescent mantles effects a considerable economy of time and material, facilitates the manipulation of the mantle in its various stages, avoids many of the liabilities of injury to the mantle in the course of its manufacture, and results in the production of an incandescent device of more than ordinary strength, durability, and efficiency.

What I claim as my invention is—

1. In the manufacture of mantles or devices for incandescent illumination, the method of strengthening or re-enforcing the woven foundation fabric or webbing for the attachment of a platinum wire in the upper end of the mantle, which consists in folding or turning in the upper end of the mantle fabric after it has been saturated with a solution of metallic salts and dried, substantially as described.

2. The herein-described method of manufacturing mantles or devices for incandescent illumination, which consists in cutting a woven foundation fabric into lengths sufficient for making a predetermined number of mantles, then saturating said fabric with a solution of the salts of the rarer metals that produce earthy oxides, then cutting it into mantle-lengths, then folding or turning in one end of each mantle-length, then threading a platinum wire through the folded-in end of each mantle, then suspending each mantle from a support by means of said wire, and exposing the mantle to heat for the purpose of consuming the foundation fabric and reducing the mantle to a structure of infusible earthy oxides, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HAROLD J. BELL.

Witnesses:
G. R. TAGGART,
ROBERT S. CLYMER.