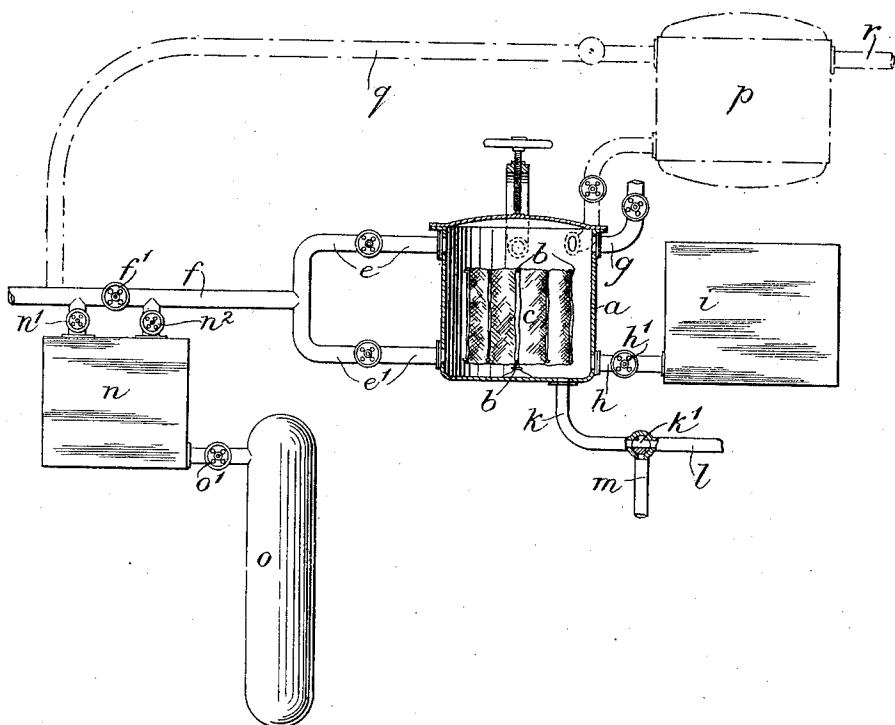


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 MANUFACTURE OF INCANDESCENT MANTLES.
 APPLICATION FILED JAN. 20, 1910.

965,057.

Patented July 19, 1910.



Witnesses:
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UNITED STATES PATENT OFFICE.

ANDREW GEORGE ADAMSON, OF LONDON, ENGLAND, ASSIGNOR TO SAID ANDREW GEORGE ADAMSON AND D. M. STILL AND SONS LIMITED, OF LONDON, ENGLAND.

MANUFACTURE OF INCANDESCENT MANTLES.

965,057.

Specification of Letters Patent.

Patented July 19, 1910.

Application filed January 20, 1910. Serial No. 538,992.

To all whom it may concern:

Be it known that I, ANDREW GEORGE ADAMSON, a subject of the King of Great Britain and Ireland, residing at Hatton Garden, in the city of London, England, have invented Improvements in the Manufacture of Incandescent Mantles, of which the following is a specification.

This invention has reference to improvements in the manufacture of incandescent mantles, and has for its objects to obviate uncertainty of results and waste of material, to reduce to a minimum the time taken to complete the process, and to produce a mantle finer in structure and more tenacious in character than that usually obtained by other processes.

My improvements relate to various steps in the process of manufacture and to the method of carrying out the process, but, although I consider it desirable to carry out the process as hereinafter described, some of my improvements may be employed in the manufacture of mantles without other improvements forming parts of my present invention.

One improvement is the use of a mixture of steam with a gas such as ammonia, or with the vapor of any organic base capable of converting the salts of the rare earths into oxids, such as pyridin or the like, or an admixture of such, as a precipitant wherewith to precipitate the oxids from the nitrate salts held in the body of the impregnated fabric. Another improvement is the use of such gases or vapors without steam as precipitants for converting into oxids the salts in the body of fabric contained in a vacuum chamber. Another improvement is the treatment of the fabric before its impregnation with the salts of the rare earths, with steam so as to expand its strands and open its fibers.

In order that the nature of my invention may be understood I will now describe a method or process embodying my improvements.

The accompanying drawing illustrates in a diagrammatic manner an apparatus which may be employed in carrying out the invention, but it is to be understood that the apparatus may be variously constructed.

In the treatment of the material (hereinafter referred to as fabric) for the manufacture of mantles, the fabric is placed in a

chamber so constructed as to withstand alternately internal pressure due to the admission of steam thereto, and external pressure due to the production of a vacuum therein, the fabric being so supported in the chamber as to allow the easy access of liquids, vapors, and gases to its entire body.

In the diagram, *a* indicates the chamber, *b* a removable frame for supporting the fabric *c*; this frame may conveniently comprise a number of radially extending T shaped arms with cords at top and bottom connecting the arms to the center member of the frame over which cords the fabric is wound. The chamber *a* has upper and lower connections *e*, *e*¹ to a steam supply pipe *f* with stop cock *f*¹, an outlet *g* to the atmosphere, a connection *h* to a reservoir or tank *i* containing a solution of the salts of the rare earths; a connection *k* having a cock *k*¹ by which the chamber *a* can be placed in communication at will with a water pipe *l* or a waste pipe *m*; *n* is a tank or vessel that is connected to the steam supply pipe *f*, on opposite sides of the stop cock *f*¹, through valve controlled connections *n*¹ *n*² and also to a precipitant gas or vapor reservoir *o* through a valve controlled connection *o*¹.

p is a vessel in which a vacuum can be produced by condensation therein of steam and which can be connected to the vessel *a* by a pipe connection controlled by a cock.

To remove matter which might prevent the fabric being readily impregnated by the salts to be used, the fabric may be washed in the ordinary way before being placed in the chamber *a*, or preferably after being placed therein. In either case, after the fabric has been washed and while it is supported in the chamber, steam is admitted to the chamber through the connection *e* and allowed to escape through the outlet *g* until all air is driven out; or this same result may be accomplished by producing a high vacuum in the tank *p* and exhausting the tank *a* by opening the controlling stop cock between *p* and *a* and thereafter admitting steam to *a* by means of valve *e*. The fabric is thus subjected to the action of a current of steam which will render its condition moist and warm and fully expanded at the same time all air will have been driven off or extracted from its interstices, and, at the same time, cause the strands of the fabric to become expanded and its fibers opened, thus permit-

ting a more perfect and instantaneous penetration of the solution of the salts subsequently admitted to the chamber from the reservoir or tank *i*, and enabling any weak spots in the fabric, arising from irregular twist in the spinning of the yarn of which the fabric is made, to be greatly strengthened by the deposition at such spots of a greater proportion of the salts than would otherwise be possible.

When the current of steam has been allowed to blow through the chamber *a* for a sufficient time to expel all the air therefrom, or the air has been extracted by means of the vacuum tank *p*, the outlet *g* is closed to allow the accumulation of pressure in the chamber, after which the connection between the chamber and the generator supplying the steam is closed by the stop cock *f*¹ or by the valve *e*. The chamber is then left to cool more or less slowly, or is cooled quickly by any suitable means. As soon as the pressure therein has become sufficiently reduced, by reason of condensation, the stop-cock *h*¹ on the connection *h* between the chamber *a* and the reservoir or tank *i* containing a solution of the nitrates of the rare earths, such as thorium, cerium, lanthanum, and the like, in proper proportions, is opened, and the nitrate solution is drawn into the chamber as further condensation of the steam proceeds. When the solution has risen in the chamber sufficiently to cover the fabric, the connection to the reservoir or tank *i* is closed, and the steam stop cock *f*¹ or *e* opened to again allow pressure to accumulate in the chamber. When this is accomplished, the stop cock *h*¹ is again opened, and the nitrate solution is driven out of the chamber *a* back into the reservoir or tank *i*. As the solution recedes in the chamber, the fabric is drained of surplus liquid while the fluid under pressure by which it is driven out, acting on the fabric as it becomes uncovered, absorbs sufficient moisture to fix the salts. In this way an equal distribution of the salts throughout the body of the fabric is secured. The fabric should at this point be carefully dried, preferably *in vacuo*, the highest vacuum possible being obtained, or it may be dried in any other convenient way. To enable drying to be readily effected in *vacuo* in the chamber *a*, the chamber *p* may be employed. This chamber is adapted to be connected to the chamber *a* and is provided with a steam supply pipe *q* and outlet *r* so that by driving out the air therein by means of steam and then allowing condensation to take place, a vacuum will be formed in the chamber *p*. Upon then opening the connection between the chambers *a* and *p* rarefaction of the air in the former will occur. To still further reduce the amount of air in the chamber *a* the operations can be repeated.

The hereinbefore described treatment of the fabric will be found advantageous even if the manufacture be completed at this point by the fabric being cut into lengths, shaped and finished preparatory to being burned off and hardened as in the ordinary or nitrate process. But it is preferred to convert the salts now contained in the body of the fabric into oxids by injecting into the chamber *a* (to which the dried fabric has been returned on its support if it has been removed for drying) steam under pressure mixed or mingled with the desired gas or vapor or admixture thereof. The steam at once expands and opens the fibers of the fabric and the precipitant gas or vapor penetrates throughout the entire body of the fabric and, owing to the hygroscopic character of the salts, the steam-saturated gas or vapor is very rapidly absorbed and causes a complete conversion of the nitrate salts into oxids in a thoroughly effective colloidal state. The chamber *a* is preferably freed from air by the admission thereto of steam that is afterward condensed therein or by causing the air to be exhausted therefrom by connection with the chamber *p* as hereinbefore referred to before the mixture of steam and precipitant gas or vapor is admitted. It is convenient to supply the steam saturated gas or vapor from the tank or reservoir *o* into which a volume of the desired gas or vapor, or admixture thereof, slightly in excess of the quantity required to convert the salts in the fabric into oxids is first introduced in any suitable way after which communication between the tank *o* and the steam generator is opened by opening the cocks *n*¹ and *o*¹ while the valve *f*¹ is closed so that the gas or vapor or admixture thereof will become saturated with steam under pressure before the connection between the tank *n* and the chamber *a* is opened and the contents of the tank caused, by the vacuum in the chamber *a* and the pressure in the tank or vessel *n* to flow quickly into the said chamber.

The precipitant gas or vapor may be used without admixture with steam provided care be taken to withdraw air from the body of the fabric by creating a vacuum in the chamber before admitting the gas or vapor. It is preferable, though not essential, to treat the fabric with steam after the vacuum is formed so that the fiber of the fabric may be in an expanded and open condition which facilitates the passage of the gas or vapor to the salts. The gas or vapor may be used either hot or cold. When precipitation is completed, the fabric is washed, to remove the secondary products formed during the reaction, and, when dried, it may be cut into lengths and submitted to the usual subsequent treatment. The washing may be effected simply by alternately forcing water

from the pipe *l* into the chamber *a* and out of it through the pipe *m* a sufficient number of times, for instance by means of steam admitted through the connection *e*, or by other pressure. Steam pressure in some cases, may then be allowed to again accumulate in the chamber, and all the connections of the chamber then closed and the chamber again cooled. The drying of the fabric may then be effected either partly or wholly *in vacuo*.

This invention enables a more nearly perfect material to be obtained than heretofore in about an hour from beginning to end, and, owing to the employment of the almost constant temperature and moisture of steam at a given pressure, the attention and handling necessary where drying chambers are used are obviated, while, owing to the use of gas, or vapor, or admixture thereof, as a precipitant, whether steam saturated, or hot or cold, all risk of solution of the nitrate salts is avoided. The process, moreover, has the advantage that a larger amount of material can be prepared in a shorter time than is usually required, and that the operator's hands need never touch the fabric or solution during the whole process.

I wish it to be understood that I am aware that it has been proposed to employ ammonia gas and also vapors of organic bases as precipitants.

What I claim is:—

1. In the manufacture of incandescent mantles, expanding the strands and opening the fibers of the fabric by treating it with steam and then impregnating the steamed fabric while it is still moist and warm with salts of the rare earths.

2. In the manufacture of incandescent mantles treating the fabric impregnated with salts of the rare earths with a mixture of steam and gases or vapors under pressure that are capable of converting the said salts into oxids.

3. In the manufacture of incandescent mantles, removing air from the fabric impregnated with nitrate salts of the rare earths and then while thus *in vacuo* treating the fabric with a mixture of steam and gases or vapors that are capable of converting the said salts into oxids.

4. In the manufacture of incandescent mantles, treating the fabric with steam to condition it and remove air therefrom, impregnating it with a solution of salts of the rare earths by gradual immersion therein, causing the fabric to gradually emerge from

said solution into a fluid adapted to absorb moisture from the fabric as it emerges from the solution, and subsequently converting the salts into oxids.

5. In the manufacture of incandescent mantles, treating the fabric with steam to condition it and remove air therefrom, impregnating it with a solution of salts of the rare earths by gradual immersion therein, causing the fabric to gradually emerge from said solution into a fluid adapted to absorb moisture from the fabric as it emerges from the solution, and treating the fabric with gases or vapors that are capable of converting the salts into oxids.

6. In the manufacture of incandescent mantles, treating the fabric with steam to condition it and remove air therefrom, impregnating it with a solution of salts of the rare earths by gradual immersion therein, causing the fabric to gradually emerge from said solution into a fluid adapted to absorb moisture from the fabric as it emerges from the solution, and treating the fabric with a mixture of steam and gases or vapors that are capable of converting the salts into oxids.

7. In the manufacture of incandescent mantles, treating the fabric, while suitably supported in a chamber with steam to condition it and remove air therefrom, impregnating it with a solution of the salts of the rare earths admitted to the chamber and then driving out the surplus solution by fluid under pressure and adapted to dry or absorb moisture from the fabric as it is uncovered by the solution, substantially as described.

8. In the manufacture of incandescent mantles, treating the fabric, while suitably supported in a chamber with steam to condition it and remove air therefrom, impregnating it with a solution of the salts of the rare earths admitted to the chamber and then driving out the surplus solution by fluid under pressure and adapted to dry or absorb moisture from the fabric as it is uncovered by the solution, drying the treated fabric and then converting the salts therein into oxids by gases or vapors substantially as described.

Signed at London England this 7 day of January 1910.

ANDREW GEORGE ADAMSON.

Witnesses:

CARL R. LOOP,
H. D. JAMESON.

It is hereby certified that in Letters Patent No. 965,057, granted July 19, 1910, upon the application of Andrew George Adamson, of London, England, for an improvement in "The Manufacture of Incandescent Mantles," the name of the assignee was erroneously written and printed "D. M. Still and Sons Limited" whereas said name should have been written and printed *W. M. Still and Sons Limited*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 30th day of August, A. D., 1910.

[SEAL.]

F. A. TENNANT,
Acting Commissioner of Patents.