

**THE MANUFACTURE OF INCANDESCENT GAS MANTLES.**  
BY JACQUES BOYER.

The original Welsbach mantle was produced by incinerating a cotton or woolen fabric impregnated with solutions of the nitrates and acetates of lanthanum, yttrium, and zirconium. The inventor soon added to these salts the oxide of thorium, which enormously increases the luminosity. This invention marked a notable advance in the art of illumination, but the mantles, being mere gossamer tissues of ash, were exceedingly fragile. In recent years many attempts have been made to improve the texture and composition of

ric of the Hella mantles is made from ramie fiber on knitting machines of the usual type. It comes to the Paris factory thoroughly washed, in lengths of 7 or 8 inches. These are first placed in perforated jars of coarse earthenware, which are plunged into vats containing a solution of the nitrates of thorium and cerium, and the vats are put into an oven in which, in the final stage of the process, a vacuum can be established, in order to force the solution into the fibers.

After impregnation the mantles are passed through a wringing machine composed, essentially, of two rollers covered with ebonite and soft rubber and adjusted

inclined plate of glass, from which a second operative takes them up and lays them in a porcelain dish.

On leaving the wringer each mantle still contains about 5 grammes (77 grains) of the impregnating solution. It goes next to an operative who reinforces the upper end by brushing it with a solution of nitrate of zirconium, aluminium, glucinium, or magnesium. The reinforced mantles are laid on wooden gratings to dry, and are finally stretched over conical glass forms mounted, in groups of 20, on boards, which are placed in large chambers heated to 122 deg. F., where they remain until the mantles are completely desiccated.



Fig. 4.—Capping machines.



Fig. 5.—Shaping machines.

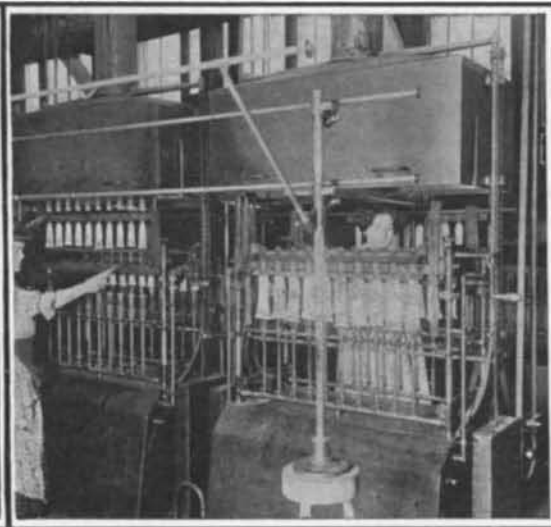


Fig. 6.—Incinerating machine.



Fig. 1.—Impregnating the mantles with collodion.

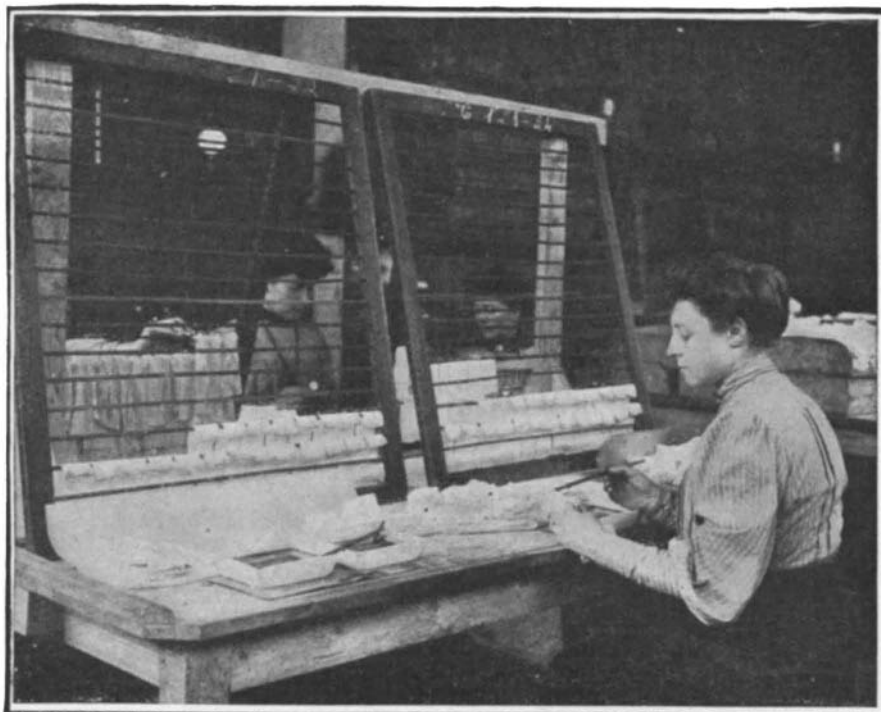


Fig. 3.—Reinforcing the mantles.

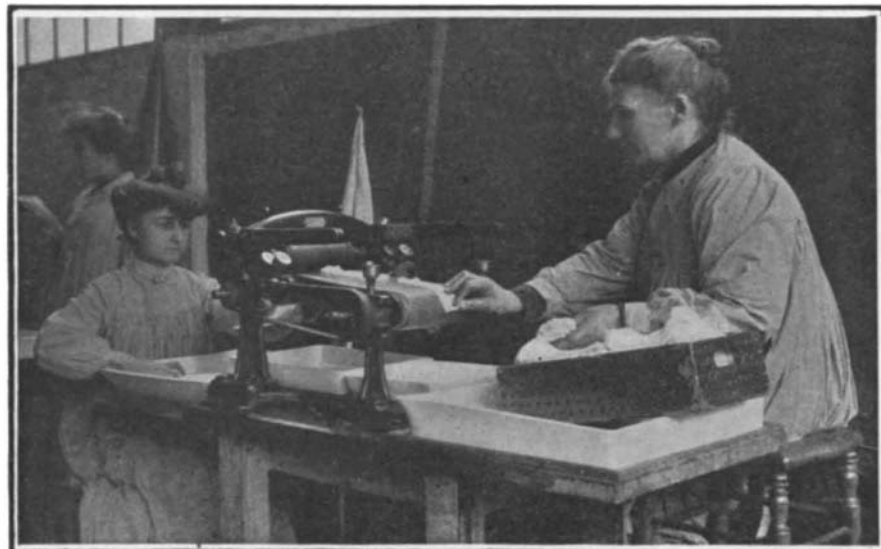


Fig. 2.—Wringing the mantles to remove the excess solution.

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incandescent mantles, in order to diminish their fragility. The latest improvements in the manufacture of these delicate contrivances are described and illustrated in this article.

The modifications adopted by the Hella Company, of Paris, are designed especially to increase the strength of the mantles. For this purpose the top of the mantle is surrounded by a metallic cap, which offers great resistance to fracture. The result is a great increase in the life of the mantle. Furthermore, as the photographs show, nearly all the operations of this new establishment, which controls the patents of M. Wasmuth, are performed by machinery. The tubular fab-

to give any desired clearance by means of a system of screws and spiral springs. The solution which is pressed out of the mantles is caught in shallow earthen dishes placed under the rollers, which are turned either by a hand crank or by power transmitted by a belt and wheel. The wet mantles are carried to the rollers by an endless belt, on which they are laid, snugly, by the girl attending the machine. The pressing or wringing must be performed in a smooth and regular manner in order to prevent the formation of wrinkles, which would cause inequalities in strength and speedy fracture. As the mantles emerge from between the rollers, on the opposite side, they fall on an

From this stage onward the manufacture of the Hella mantles differs radically from the ordinary process. Instead of sewing the top of the mantle to a fiber of asbestos, for the purpose of fixing it to the nickel support, it is attached to a metallic mounting consisting of two parts, the head and the netting, both of which are composed of an infusible alloy. The mounting is attached with the aid of the "capping machine" shown in one of the photographs. The operative places the netting, and then the mantle, on a mandrel, and raises the latter until the top of the mantle is at the level of a set of needles which, on being brought together, "gather" the fabric. The head

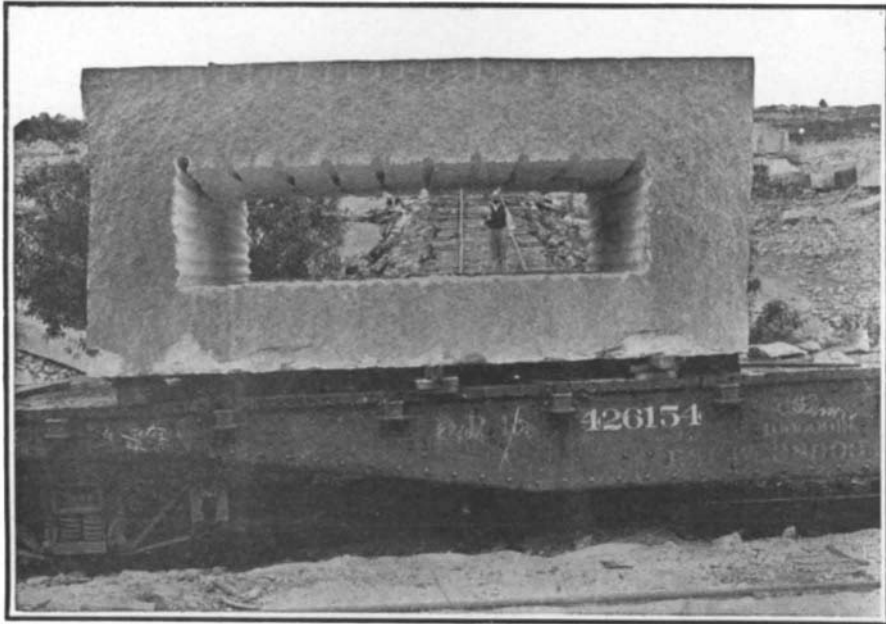
is then put on, and the mantle is clamped between two metal rings by pressing a lever. With this machine one woman can cap, or mount, 2,000 mantles in a day of nine hours.

The mounted mantles then go to the shaping machine, where they are put on forms and brushed by revolving brushes, which stretch them uniformly and

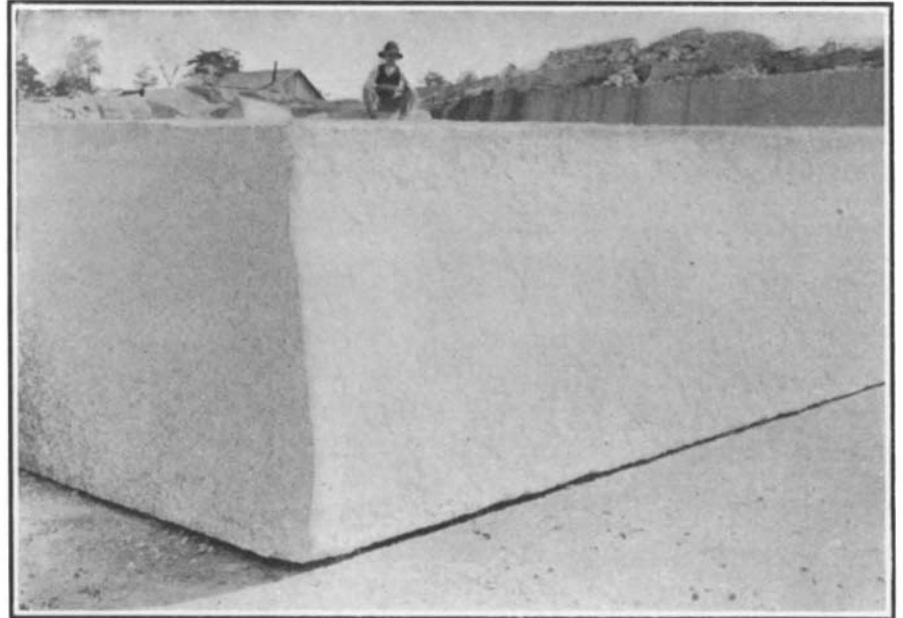
dipped in a trough of collodion about six feet long. The mantles then go to a drying room heated to about 110 deg. F., through which they are carried on endless chains in a circuitous path. The journey occupies half an hour, and terminates at a clipper which, operated by a woman by means of a crank and a lever, trims the mantles at the bottom to the desired length.

Mountain, about 1,000 feet high and four or five miles in circumference, a huge mass of granite similar to the Mt. Airy quarry lands, with the same scant vegetation.

The fact that these masses of stone show no ledges or bed planes whatever, and split readily and in straight lines in any direction, is taken advantage



The die for the Washington monument, Brooklyn, in the rough. Weight over 60 tons. Cored out to reduce the weight.



View of an enormous ledge, showing the seam at the bottom made by the "lifting process."

press them closely to the forms, while their metallic heads are forced into hoods which compress and tighten them.

Ten mantles at a time are lifted from the ten forms of the shaping machine by a rod and conveyed to the incinerating room, which, from the technical point of view, is the most interesting and original part of the establishment. By the employment of cams the

During the entire process of manufacture, the Hella mantles are never touched by the hands of the operatives. Even after they have been trimmed, they are lifted with rods for conveyance to the packing room, where a simple machine suspends each mantle in its carton in such a manner that it is perfectly protected from shocks, and can be shipped with safety to any distance. In use also these mantles appear to be stronger and more durable than those hitherto employed.

of to create artificial beds to work on. Large laminations or sheets of granite are separated from the mass at a single "lifting" operation, by successive use of powder and compressed air.

The "lifting process" is causing much interest and attracting attention throughout the world.

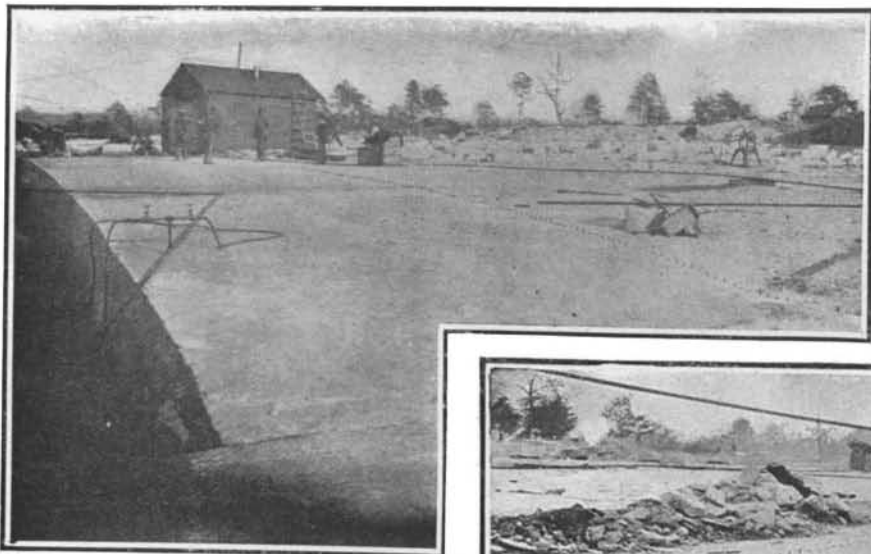
This process is applicable to quarries of large horizontal areas and in solid masses, and such conditions being almost ideal at the Mt. Airy quarries, the "lifting process" is altogether used. The tremendous advantage afforded by "lifting" can be readily understood, as by means of a "lift" granite of any desired area and of definite thickness can be made available for surface work and drilling.

The largest stone required for any possible construction could be produced thus; the weight of the larger stones now produced has to be reduced to the capacity of the largest equipment furnished by the railroads, by coring.

At the central power station in the quarries are two huge water-tube boilers, each of 210 horse-power.

These supply steam to the air compressor, which has a capacity of 2,000 cubic feet of free air per minute. This air is conducted by six-inch pipe lines running the entire length of the quarries. Lead lines distributing it to all parts of the quarries, make it available at all points for "lifting," as well as for use with pneumatic tools.

In the center of the area to be lifted, a drill hole two or three inches in diameter is sunk six or eight feet in depth (according to the required thickness of the stone). The bottom of the drill hole is enlarged into a pocket by



Ordinary ledges of varying thickness.

incinerating machine automatically performs several successive operations. After the fiber of the mantle has been consumed by the first ignition, the head of the mantle is decarbonized, and at the same time reinforced by the application of a flame of compressed gas, which reduces the nitrates of thorium and cerium to oxides. The burning of the interior follows. The burners ascend and descend five times inside the mantles, and give them their final form. The tops of the mantles, which were impregnated with an additional quantity of nitrates in the reinforcing process, are subjected to still another firing. The photograph shows, above the burners, a ventilator, which is lowered before the machine is started, so that it surrounds the burners and carries off all the products of combustion. The ventilator opens the gas cock as it descends and closes it as it rises. In the illustration the ventilators of the machines are raised, in order to show the interior. The entire process of incineration occupies about three minutes, and is applied to 20 mantles simultaneously.

The incinerated mantles are impregnated with collodion, in order to make them less liable to breakage in packing and transportation. This process, also, is effected by a machine, which executes all the necessary movements by means of cams, the mantles being supported by rods carried on endless chains and

tion of country at and around the vicinity of Mt. Airy is composed almost entirely of these rock masses. The Mt. Airy quarries are situated on a hill many acres in area, very gradual in slope and practically bare of vegetation, composed of a solid, homogeneous mass of moderately hard granite, which shows no ledges or bed planes whatever. Near these quarries is Stone



A common form of ledge.



A "lit" being split and drilled into required widths and lengths. THE "LIFTING PROCESS" IN THE QUARRYING OF GRANITE.

THE "LIFTING PROCESS" IN THE QUARRYING OF GRANITE

BY L. B. WARD.

Rocky masses in great abundance are to be found in North Carolina, some of its mountains being almost solid rock. The sec-