Cuthbert Gordon in 1758—that is, if we can give credence to a patent specification of that date. It was brought out as a substitute for archil and was prepared from three ingredients, a lichen found growing on rocks, a plant named *muscus rupibus*, which also is found growing on scattered rocks where it can find a small quantity of earth, and *muscus pyxidatus*, a plant growing on marshy ground. These are dried, ground in a mortar, mixed with spirit of wine and spirit of soot, to which is added quick-lime; this is allowed to digest for 14 days, when the composition is ready for use; or if the digestion be allowed to proceed for 28 days then a more solid product was obtained. What spirit of soot was is rather doubtful, most probably an ammonaical liquor.

A method of preparing "orchell" was devised in 1763 by George Davy, who prepared a spirit from wine by distilling it with alum, potashes, and lime. This "spirit," of course, is a weak ammoniacal liquor. Here Davy used ingredients which were of no use in promoting the reaction, in fact the alum was harmful rather than otherwise. The "spirit" so obtained was used to treat a rock or stone moss, the digestion being allowed to continue for nine days, when some Spanish white was added, after which it was allowed to work together for another nine days, and finally mixed with salt, saltpetre, and sal ammoniac.

The name of Edward Bancroft is an honored one in the annals of textile coloring. He was one of those patient investigators who were not content with doing things as their fathers had done before them, but wished to get to the bottom of the processes they worked, and to find out the real action which takes place. On his labors much of modern dyeing has been founded—to him English dyers owe the best methods of dyeing with cochineal, the use of quercitron bark, of the American hickory or walnut tree, and of the West Indian red mangrove tree. The two latter are not now used in dyeing. He was one of the first to point out the real function of such mordanting bodies as alum, tin, salts, copperas, bluestone, in dyeing, and that many other substances at that time added by dyers to their dye-baths were of no use. He left behind a record of his work in "The Philosophy of Permanent Colors," first published in 1794—a book well worth reading even to-day. To him we owe the division of dyes into the two main groups, "substantive" and "adjective." We have even now somewhat transgressed on the space at our disposal, without, however, by any means exhausting the subject, to which we may return on some future occasion.

ELECTRIC POWER IN TEXTILE MANUFACTURE.

The question that every mill manager and engineer must consider is this. We have an excellent steam plant or a suitable water power at the mill, delivering power by ordinary belt transmission throughout the mill. It is in good condition and good for a great many years, and is paid for; and if its lines of shafting are out of line or level, that can easily be corrected; and it is a reliable power, and for many years has never caused a stoppage of the mill of any account. It is, in fact, a reliable means of transmitting power and not costly to maintain. The question is, whether or not there is any advantage in substituting for this transmission that of electric transmission in any of its various forms. To make such a change there must be good reasons, and not only must the new power be more reliable, which it hardly can be, but it must be less costly to install and less costly to maintain, and possess these advantages to such a degree as to pay for taking out the old and putting in the new.

The claims of superiority for electricity are always based upon the assumption that a belt transmission is decidedly wasteful of power and costly to maintain. Is this so? asks "Engineer," in a recent number of the *Boston Journal of Commerce*. Taking an ordinary cotton or woolen mill, the entire friction load of the mill varies from 18 to 30 per cent; and this includes not merely the friction due to the weight of the shafting in its boxes, but also the friction due to the tension of the belts from the various counters, and this is by far the greater portion of the friction load. Taking an indicator card with the load on and the load off, means simply when the machines are at work, as against when they are not at work. Such a friction load includes, therefore, everything except the load of the machines, and includes also the internal friction of the engine itself. It does not seem to matter very much in actual practice whether the shafting is light and run at a high speed, or slow and run at a slow speed, the friction load shows no important change. The writer has tested old mills with heavy, slow-running shafting, that nearly every one would say would show a heavy friction card, and also modern mills specially designed with light, fast-running shafting that looked almost as though it would run itself, and yet the older mill showed the least friction load, and this, I believe, is the experience of many mill engineers. This friction loss should not be more than 25 per cent. in the ordinary textile mill, and the managers that will permit a greater amount by imperfect alignment and other causes would just as surely carelessly handle an electric transmission and make it also more expensive than it ought to be. It is this 25 per cent. that is set up, and the inference would be that with electricity this is nearly all done away with. But when we come to consider the facts, the loss of energy by the use of a generator is quite as much, and it seems to me instead that the balance is on the side of the belting. The methods proposed for electric transmission are to generate the current at the central engine-room, or water power, and to carry the current to various rooms. The proposition is not seriously urged, to place a motor upon each machine in a cotton mill, for that would be a costly proceeding, and even in the shops of the General Electric Co., where the idea would be expected to be carried to its fullest development, a motor in each room drives the shafting in that room, or for a considerable group of machines, thus transmitting the power through belts and shafting, and saving merely the actual friction of transmission from one room to another. If this is to be the method, then the friction of these shafts and belts should be added to the loss in the generator and dynamo, but which is seldom done. If the proposition is to simply put one, or possibly three or four, motors in a spinning, or carding or weaving room in a textile mill, retaining all the shafting in the room, it could not but result in a decided loss of power, for the transmission from room to room is hardly worth making much change over, and this is certainly the usual proposition.

Taking the ordinary mill, we have first the loss in friction of the engine itself, seldom less than 10 per cent. The actual power consumed in friction in the belt tower and in the shafting necessary to transmit from one room to another, would hardly be 10 per cent., and another 10 per cent., to take the worst cases, would be in the friction loss in driving the various counters and loose pulleys to the various machines. Of these items it is probable that the second one, of transmission from room to room, is almost always less than 10 per cent. of the friction load, and is the most constant because usually put up with more care and receiving more attention and lasting longer than the many small shafts and counter shafts. And as a matter of fact, this item is the only one the mill engineer finds he can save by electric transmission. By electric transmission an engine is to be operated as before, but generating electric current and this current to be transmitted over a wire to a motor and reconverted into rotary motion again, to drive a considerable amount of shafting, nearly as much as before, in fact. It is possible that lighter shafting could be used, but as the friction loss comes much heavier from the strain of the belts rather than the weight of the shafting, having lighter shafting will not be found of much advantage in the matter. The friction loss in that room will be about as much whether subdivided or not.

We have still retained, therefore, two important sources of loss, the loss in the engine and the loss in each room. And the only possible gain presented is that small loss of transmission from room to room. But against this slight gain is set the fact that there is a loss in the transmission of the current itself, even with no leakage, and again a loss of certainly 10 per cent. in reconverting the current into rotary motion in the motor. There is, first, the loss of changing the rotary motion of the engine into electricity, and no generator can be depended upon to constantly deliver over 90 per cent. of the power delivered from the engine, and no motor can be depended upon to continually deliver in another form more than 90 per cent. of the energy it receives in the shape of current. So there