wards the brown paper, the metal plate will be found to be strongly electrified, its charge being positive. When the brown paper is struck it becomes negatively electrified, and attracts positive electricity from the earth, through the finger into the metal plate. On removing the finger and then raising the brown paper the plate is left charged with positive electricity, and there is no negative electrification in the neighbourhood to interfere with the freedom of the charge. This apparatus may be regarded as a simple form of electrophorus.

The electrophorus consists essentially of a plate of ebonite, or of some resinous material, which is placed upon a metal "*sole*." A brass carrier plate, furnished with an insulating handle, can be placed on the disk of ebonite, when it nearly covers it. The ebonite is first electrified (negatively) by rubbing it with a cat's skin or fox's brush, the sole being in communication with the earth during the operation. The carrier plate is then placed on the ebonite. Although the brass plate rests on the ebonite disc it only *touches* at a few points, and the ebonite being an excellent insulator, the electricity is unable to pass from the ebonite to the carrier plate. Hence the carrier plate becomes electrified positively on its lower surface, and acquires a free negative charge on its upper surface. A connection is now made between the carrier plate and the earth, or between the carrier plate and the metal sole, when the free negative electrification leaves the carrier plate, which then possesses only the "bound" positive charge on its lower surface. The carrier plate is then removed from the ebonite, when its positive charge becomes free, and may be employed for charging Leyden jars, or for other purposes. The *energy* of the charge is derived from the work done in removing the carrier plate from the ebonite, during which operation the attraction of the positively electrified plate and the negatively electrified ebonite has to be overcome, in addition to the weight of the carrier plate. In Phillips' electrophorous the connection between the carrier plate and the sole is made automatically by a small brass pin, which passes through the ebonite to its upper surface, and is connected with the sole.

An ordinary electrophorus can be made to furnish negative electricity to a conductor by bringing the conductor into communication with the carrier plate immediately after placing it upon the ebonite. Phillips' electrophorus cannot, of course, be used in this way.

The chief use of the sole is to diminish the tendency of the negative electrification of the ebonite to escape into the air. The sole when in contact with the earth becomes positively electrified by induction, and the negative electrification on the ebonite prevents the latter from escaping into the air to the same extent as it otherwise would. When the carrier plate is placed on the ebonite and touched most of the positive electricity leaves the sole and comes into the carrier plate, because the latter is so much nearer to the upper surface of the ebonite than the sole is. On raising the carrier plate with its charge positive electricity returns into the sole from the earth. During the lifting of the carrier plate the sole must be in connection with the earth, otherwise the sole becomes inefficient. The action of the electrophorus will be best understood after mastering the conception of electric potential.

The phenomenon of induction above described explains why electrified bodies should attract small insulated conductors which are unelectrified. If a positively electrified body be brought near to an insulated pith ball the ball becomes electrified negatively on the side near the conductor, and positively on the opposite side. The negative electrification is attracted and the positive repelled by the charged body, but as the negative portion of the ball is nearer to the charged body than the negative portion the attraction *exceeds the repulsion*. If the light body is not insulated then the positive electrification escapes to the earth, and there is, therefore, no repulsion.

Inventions and Miscellaneous Notes.

Old Yew Trees. — Apropos of the age of yew trees, it is stated in "Chamber's Information" that "yews are believed to be the most ancient planted trees in Great Britain, and no doubt can exist that there are individuals of the species in England as old as the introduction of Christianity, and there is every reason to believe very much older. It is the opinion of Decandolle that, of all European trees, the yew is that which attains tht greatest age. The following are some of the more remarkable British specimens to which the attention of the curious has been directed. Those of the ancient Abbey of Fountains, near Ripon, in Yorkshire, which yews were well known as early as 1155. Pennant says, that in 1770 there were 1,214 lines in diameter, and consequently, according to Decandolle's method of computation, were more than twelve centuries old. Those of the churchyard of Crowhurst, in Surrey, on Evelyn's authority, were 1,287 lines in diameter. There are two remarkable yews still in the same cemetery, and if they be the same that Evelyn refers to, they must be fourteen centuries and a half old. The yew tree in Fortingal, in Perthshire, mentioned by Pennant in 1770, had a diameter of 2,588 lines, and consequently we must reckon it at from twenty six to twenty seven centuries old. The yew of Brabourn churchyard, in Kent, is said to have attained the age of 3,000 years. That at Hedsor, in Bucks, however, surpasses all others in magnitude and antiquity, measuring above 27 ft. in diameter; thus indicating the enormous age of 3,240 years.

A New Kind of Gunpowder.—Himly, in his efforts to discover a new kind of gunpowder that should possess more power than the ordinary powder, without the dangerous properties of the nitro-compounds like dynamite and that class, found that the best results were obtained with a mixture of salt-peter, chlorate of potash, and a solid hydrocarbon.

The new powder is made by mixing finely pulverized salt-peter, chlorate of potash, and coal tar pitch with enough benzol (from coal tar) to make a plastic paste or dough. This is formed into flat cakes by pressing it into moulds, and the benzol allowed to evaporate. The cakes are then granulated like any other gunpowder. Like ordinary powder, the grains are irregular and can be made of any desired size. Its specific gravity is 0.9, or a little more, agreeing with common gunpowder.

It is quite hard, and does not smut off even when damp. It will bear a heat greater than that of melting tin without change. It will not ignite by a single spark of short duration. If ignited in an open vessel, it burns rapidly with a white light. In a closed space it burns violently, and leaves behind a slight residue, producing but little smoke. A gun is not injured in the least by the products of its combustion.

The advantages of this powder over hose previously in use are essentially the following:

1. Ease and rapidity of manufacture.
2. There is no danger in making it.
3. Its freedom from any hygroscopic qualities, 100 grammes of it exposed to damp weather for four days in an open window showed no gain of weight with a delicate balance.
4. It is two and a half times more powerful than common powder.
5. The slight residue, leaving scarcely anything.
6. The fact that it gives off so little smoke as to be scarcely noticed, and what is formed is totally innocuous as contrasted with that from nitro-explosives.