

**IMPROVED BORING AND FACING MACHINE.**

We illustrate a novel boring and facing machine constructed by Messrs. George Waller & Co., of Southwark, London, as given in *Engineering*. It was designed more particularly for the manufacture of gas exhausters, but it is also applicable to a wide range of work. The head slides upon two vertical pillars, and can be raised and lowered by a screw operated by a handwheel. Upon the face of this slide there is mounted a cross-slide, carrying two vertical spindles, one within the other, and each driven separately. The inner spindle is actuated by the cone pulley shown to the left, and is provided with a feed motion after the manner of a drill. The outer spindle carries a large face-plate at its lower end, and on this is a ring of bevel teeth into which a pinion on a horizontal shaft gears. The face-plate carries a tool-box provided with a tappet motion for effecting the feed. The apparatus is shown in the view boring a flywheel and facing up the periphery at the same time, and it is evident that there is a great variety of jobs in which it will prove of great service.

**The Electricity of the Lightning Flash.**

When Franklin made his celebrated experiment with the kite, he demonstrated not only that the flash of lightning was simply an electrical discharge, but also its identity with the high tension electric spark produced by a frictional machine. The existence of electricity in the atmosphere appears to be the result of manifold causes. It is apparently a reservoir which receives the energy dissipated by the various processes of nature. The evaporation of water impregnates the atmosphere with minute vapor particles charged with the electric fluid. These currents of warm, moist air being lighter than the cold, dry air, are constantly ascending from the earth, and particularly during the middle and after portions of the day. As these currents rise in succession, the moist air ascends higher and higher in the atmosphere, and, losing heat, is no longer able to retain the moisture with which it is charged.

Condensation then takes place, and a cloud is formed which increases in volume as long as the currents continue to ascend. These cloud masses are each charged with electricities of different tension, and usually differing also from that of the earth. The tendency to restore the disturbed electrical equilibrium causes a discharge between the two clouds, or the cloud and the earth, as the case may be, as soon as the difference in tension is sufficient to overcome the resistance of the air. As

The entire danger from lightning is when the discharge is between the earth and the cloud. While this discharge is beyond man's control, it is within his power to direct such an electric current so that it shall be harmless. He cannot avert it, but he can, by providing a suitable conductor, prevent in many cases the actual flash, by substituting a silent discharge, or transfer the current through a channel which will be uninjured by its passage. This is the mission of the so-called "lightning rod." There are a number of instances on record where the principle of the lightning rod has been carried out accidentally, with disastrous results, owing to the nature of the conductor. One

The resistance offered by the bodies of the persons completing the circuit was too great, however, for their safety. It often happens that the rods are so carelessly adjusted and maintained that they are inefficient for the protection of the building so equipped. But the value of a properly constructed rod is proved by the experience of the British navy, where no loss has occurred since the adoption of a lightning conductor. The ships are probably struck as often as formerly, but in the absence of an electric explosion, no damage is done.

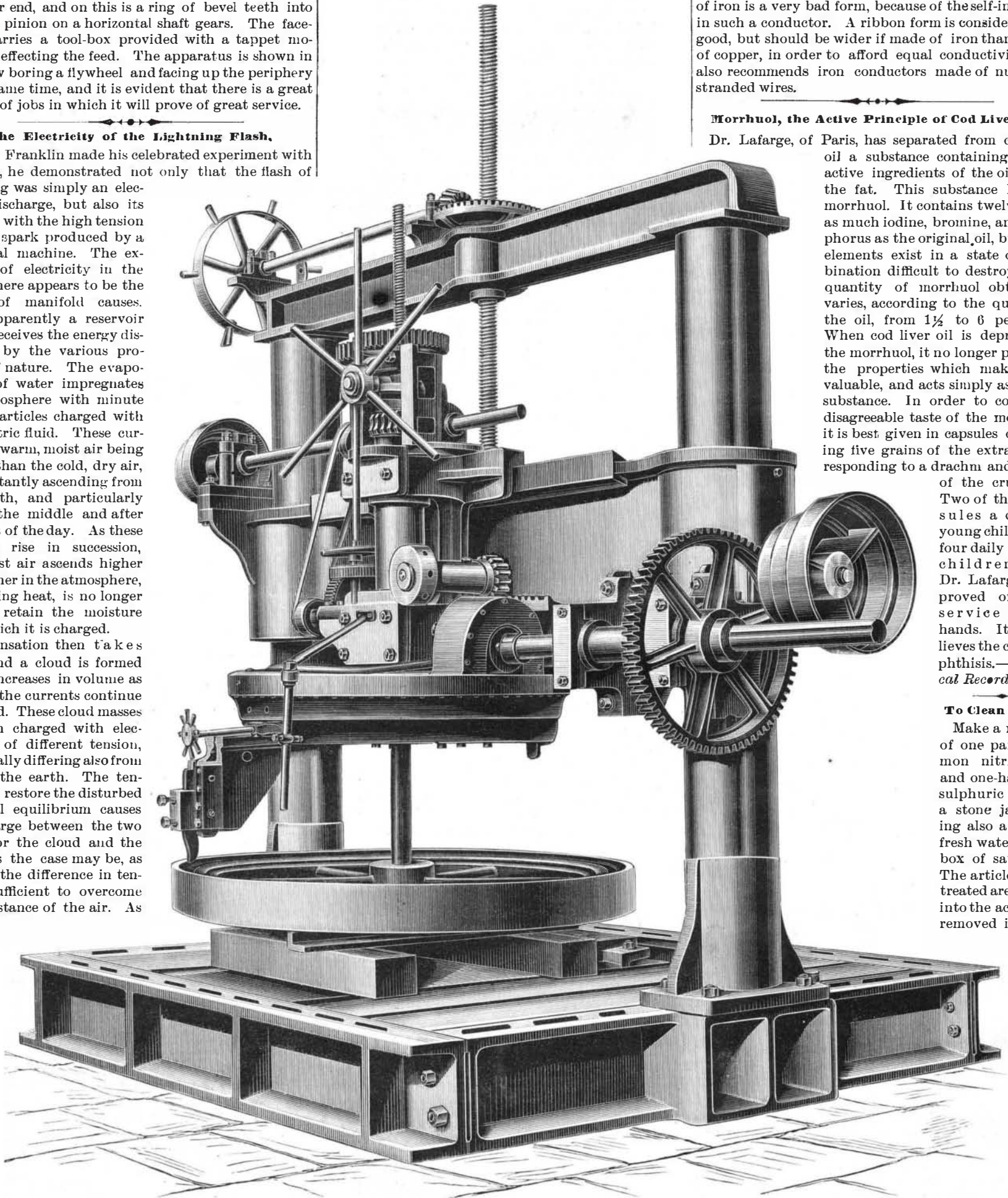
The best form of conductor is one which offers the least possible resistance to the passage of the current. Prof. Hughes, who has given the subject careful study, states as the result of his experiments that a solid rod of iron is a very bad form, because of the self-induction in such a conductor. A ribbon form is considered very good, but should be wider if made of iron than in case of copper, in order to afford equal conductivity. He also recommends iron conductors made of numerous stranded wires.

**Morrhual, the Active Principle of Cod Liver Oil.**

Dr. Lafarge, of Paris, has separated from cod liver oil a substance containing all the active ingredients of the oil except the fat. This substance he calls morrhual. It contains twelve times as much iodine, bromine, and phosphorus as the original oil, but these elements exist in a state of combination difficult to destroy. The quantity of morrhual obtainable varies, according to the quality of the oil, from 1½ to 6 per cent. When cod liver oil is deprived of the morrhual, it no longer possesses the properties which make it so valuable, and acts simply as a fatty substance. In order to cover the disagreeable taste of the morrhual, it is best given in capsules containing five grains of the extract, corresponding to a drachm and a half of the crude oil. Two of these capsules a day in young children, or four daily in older children, have, Dr. Lafarge says, proved of great service in his hands. It also relieves the cough of phthisis.—*Medical Record*.

**To Clean Brass.**

Make a mixture of one part common nitric acid and one-half part sulphuric acid in a stone jar, having also a pail of fresh water and a box of saw dust. The articles to be treated are dipped into the acid, then removed into the

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the resistance of the air is dependent upon distance and humidity, it usually happens that the over-charged cloud discharges into one of less tension and in comparative proximity. Of the many thunderstorms occurring every summer, and the frequent flashes of lightning with which they are accompanied, there are probably comparatively very few discharges which ever reach the earth at all. The interchange in the large majority of cases is between two clouds or between two bodies of air of opposite tension. The damage done by lightning would be much in excess of its present total were this not the case. From the passage of the spark from cloud to cloud we need no protection, for the earth is entirely without the circuit.

notable case, probably familiar to some of our readers, occurred many years ago in Brittany, where the church bells were rung at the approach of a storm, in order to warn the people. In several of these churches during the course of the storm, the towers were struck while the bells were still ringing, and the unfortunate persons who had hold of the ropes were either killed or severely injured. Other churches, the bells of which were silent, escaped harm. An explanation of the incident is found in the fact that the large mass of metal of the bells, being in imperfect connection with the ground through the hempen rope and the bell tollers, offered a better conductor for the passage of the electricity than the surrounding air.

water, and finally rubbed with saw dust. This immediately changes them to a brilliant color. If the brass has become greasy, it is first dipped in a strong solution of potash and soda in warm water; this cuts the grease so that the acid has free power to act.

CAST IRON pulleys may be lagged with leather without the use of rivets, by first brushing over the surface with acetic acid, which will quickly rust it and gives a rough surface; then attach the leather to the face of the pulley with cement composed of one pound of fish glue and one-half pound of common glue.