5th. Never file any saw to too sharp or acute angles under the teeth, but on circular lines, as all saws are liable to crack from any sharp corners.

6th. Keep your saw round so that each tooth will do its proportional part of the work, or if a reciprocating saw, keep the cutting points jointed on a straight line.

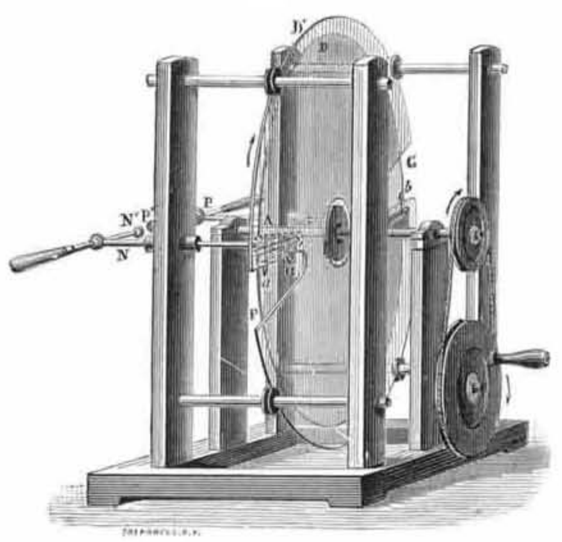
7th. The teeth of all saws wear narrowest at the extreme points; consequently, they must be kept spread so that they will be widest at the very points of the teeth, otherwise saws will not work successfully.

8th. Teeth of all saws should be kept as near a uniform shape and distance apart as possible, in order to keep a circular saw in balance and in condition for business.

NEW ELECTRICAL MACHINES.

In the accompanying illustrations, taken from a new work on static electricity, published in France by M. Mascart, are represented the latest forms of the Holtz, Carré, and Thomson electrical machines. The Holtz machine, Fig. 1, acts as a continuous electrophorus. It consists of a vertical plate, D, of thin glass varnished with gum-lac, which is

Fig. 1.

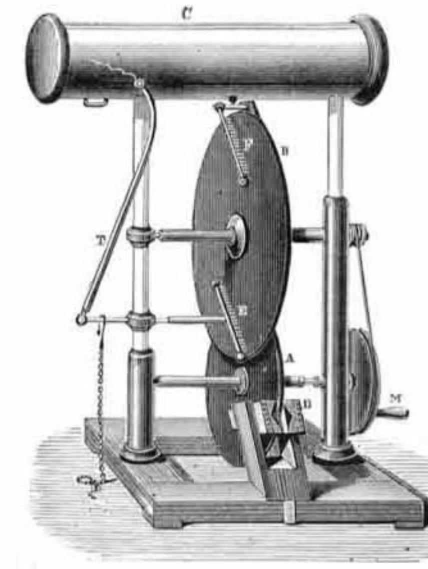


rotated at a speed of from 5 to 10 revolutions per minute. In face of this plate and at a short distance from it is a fixed plate, D', slightly larger and pierced with a central opening, through which passes the axis of rotation. In this plate are made two rectangular apertures, F and G, at the extremities of the same diameter. On one of the sides of each one of these apertures is attached a layer of paper, A, applied on both sides and having one or two projecting portions, *a*, terminating in the openings, F and G. The two layers, A and B, serve as inducers, and are symmetrically disposed with reference to the axis of rotation. The first is represented in dotted lines in the engraving, in order to exhibit the portions in rear of it. On the other side of the movable plate are placed two insulated conductors, P and N, terminated by combs, which are directed toward the paper layers. These two conductors may be united by a kind of exciter with ebonite sleeves, the arms of which may be approached or withdrawn at will.

When the apparatus is operated, the conductors, P and N, are connected by bringing in contact the balls, P' and N'. The movable disk is then turned in a direction contrary to that of the paper points, and one of the layers, *a*, is electrified. For the latter purpose a plate of ebonite, electrified by rubbing with the hand or with cat skin, may be used The fluid, supposed to be carried to *a*, persists as long as the machine is in operation, but disappears as soon as the latter stops, so that to begin again it is necessary to prime the instrument anew.

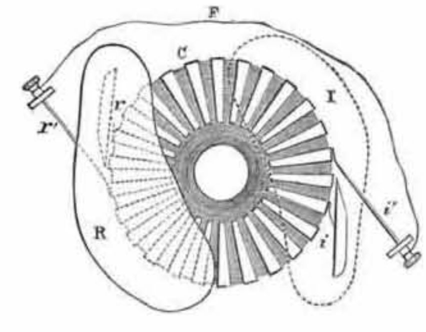
In the Carré machine, represented in Fig. 2, this difficulty

Fig. 2.



is sought to be avoided. The disk, A, of ebonite or glass passes between two leather cushions, D, and is carried directly on the axle of the crank, M. A pulley on the same shaft communicates, by means of a cord, rapid rotation to another and larger ebonite disk, B. In face of the latter are two combs, E and F; the second of which is opposed to a fixed leaf of ebonite furnished with paper layers, terminating in points and designed to serve as a second inducer, as in the Holtz machine. The upper comb communicates with

Fig. 3.



an insulated conductor, C, and the lower comb is also insulated, or communicates with the soil. An arm, T, serves as exciter.

The remainder of our illustrations relate to the Thomson machines. Figs. 3 and 4 represent what is known as the charge reproducer. A wheel, C, of ebonite carries a certain number of insulated metallic plates, disposed in sectors on the two faces, and appearing at the circumference like the teeth of a gear wheel. Two metallic plates, I and R, bent so as to envelop completely half of the wheel (one of these is indicated by dotted lines), serve both as inducer and receiver, that is to say, they act by induction on an intermediary conductor, F, and then receive by effect of the motion the electricity so developed. Hence it results that the charge of each of them augments at first in geometric progression, as in all analogous apparatus. Two receiving springs, *i* and *r*, communicating separately with the metallic envelopes in the interior of which they are placed, receive the electricity carried by the different sectors and communicate it to the corresponding envelopes. Two other springs, *i'* and *r'*, called conductors, placed behind the former ones with reference to the direction of rotation of the wheel, are connected by the wire F.

Fig. 4.

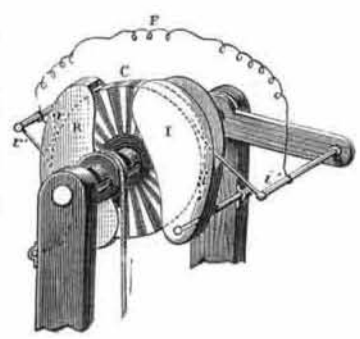
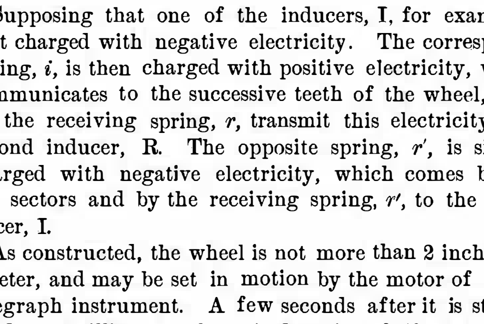


Fig. 5.



Supposing that one of the inducers, I, for example, be first charged with negative electricity. The corresponding spring, *i*, is then charged with positive electricity, which it communicates to the successive teeth of the wheel, which, by the receiving spring, *r*, transmit this electricity to the second inducer, R. The opposite spring, *r'*, is similarly charged with negative electricity, which comes back by the sectors and by the receiving spring, *r'*, to the first inducer, I.

As constructed, the wheel is not more than 2 inches in diameter, and may be set in motion by the motor of a Morse telegraph instrument. A few seconds after it is started it produces brilliant sparks. A dry pile of 40 elements, the two poles of which were placed in communication separately with the two conductors, sufficed to charge the machine or suddenly to reverse the electrical signs.

Thomson's tension equalizer, Fig. 5, works like a series of contacts by a proof plane, in order to establish on a conductor the tension which exists in the surrounding atmosphere. A disk of ebonite, C, turning around a vertical axis, carries a certain number of metal pins, on which are applied two springs, R and R', in communication with the two electrodes of an electrometer. If one of these springs is submitted to the influence of an electrified body, the keys which detach themselves from it in succession carry continuously electricity of contrary sign to that of the inducing body, until the electric density at the extremity of the spring becomes null. If the two springs are at the same time submitted to the influence of two conductors at different tensions, equilibrium will be attained at the end of a certain time, and quite rapidly, because the electricity carried off at one of the springs is taken to the other. The difference of tension of the two springs, or of the two electrodes of the electrometer, will be proportional to that of the two inducing bodies.

In Fig. 6 we represent another Thomson machine, in which T is a metallic tube, communicating with the soil. This is placed in the interior of a metal cylinder, I, which may be termed the inducer, having negative tension. This tube is electrified positively; and if liquid drops are allowed to escape therefrom, they carry with them contrary electricity, which is reproduced indefinitely. These drops fall into another metal cylinder, R, the receiver, which has a funnel within. The electricity of the drops expands over the surface of the receiver, and the drops escape in a neutral state from the spout of the funnel. The charge of the receiver then augments more and more until sparks are produced between the cylinders, or until the drops no longer fall into the receiver, on account of their being thrown off laterally by the electric repulsion which they encounter. Under such conditions it is necessary to maintain the tension of the inducer, I, by a foreign source. But it will easily be seen that two similar apparatus may be disposed so as to react one on the other, and to augment reciprocally their electric charges.

Fig. 6

For this purpose the receiver, R (Fig. 7), of the first, communicates with the inducer, I', of the second, and the receiver, R', of the second with the inducer, I, of the first. The drops which fall from the second inducer, I', are then charged with negative electricity, which is collected in the receiver, R', which augments the charge of the first inducer,

Fig. 7.

I. Two conductors are united with the interior covering of two Leyden jars, A and B. These jars are covered exteriorly with tin, and contain a certain quantity of concentrated sulphuric acid. In the liquid are plunged lead rods terminating below with leaden plates. The rods are surrounded with glass tubes, and pass through an ebonite cover, so that the absolutely dry air contained in the bottles is not affected by the atmosphere. If the glass (Glasgow flint) is of good quality, the insulation of the bottles may be so perfect that the electric loss may not exceed one one-hundredth of the charge, in three or four days.

Under these conditions, one of the jars being electrified at a tension so weak as not to be appreciable but with a very delicate electrometer, the valves are opened in order to allow the water to escape drop by drop. These drops become subdivided into very small ones, which separate by their mutual repulsion. After a few minutes a rapid succession of sparks is produced in some part of the apparatus. It is stated that the loss of electricity in this apparatus is so small that a single drop falling from each tube every three minutes is sufficient to maintain the charge constant indefinitely.

New Method of Preserving Fish.

The flesh of fresh fish, either raw or boiled, is cut in thin slices and plunged in a bath of water strongly acidulated with citric acid. After two or three hours soaking, the fish is removed and dried, either in the air or under moderate heat. In the latter case one hour is sufficient; in the former there should be an exposure of five or six days. M. D'Amelie states that fish thus treated will keep anywhere for an indefinite period, and that it becomes as hard as wood. To prepare it for use three or four days' soaking in fresh water is necessary.

MR. RICHARD HANKS, a coal miner, living near Galesburg, Ill., is reported to have dug out of the earth, fifty feet below the surface, the entire carcass of a petrified mastodon, sixteen feet long and nine feet high, in almost perfect shape.

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