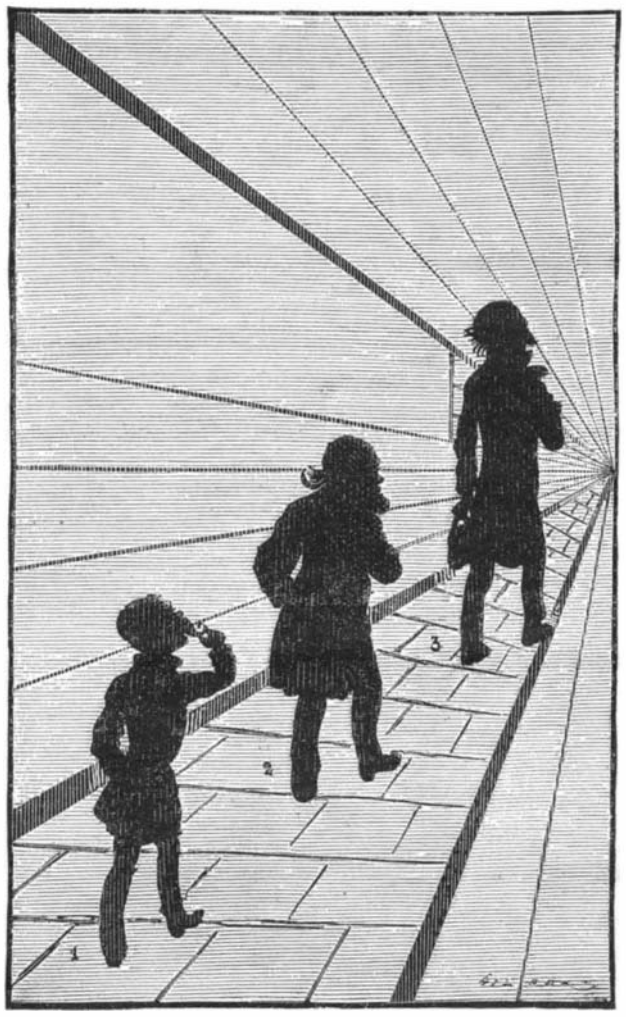
A CURIOUS OPTICAL ILLUSION.

Which is the tallest of the three persons figured in the annexed engraving? If we trust to our eyes, we shall certainly say it is No. 3. But if we take a pair of compasses and measure, we shall find that we have been deceived by an optical illusion. It is No. 1 that is the tallest, and it exceeds No. 3 by about 0·08 inch.

The explanation of the phenomenon is very simple. Placed in the middle of the well calculated vanishing lines, the three silhouettes are not in perspective. Our eye is accustomed to see objects diminish in proportion to their distance, and, seeming to see No. 3 rise, concludes therefrom that it is really taller than the figures in the foreground.

The origin of the engraving is no less curious than the engraving itself. It serves as an advertisement for an English soap manufacturer, who prints his name in vanishing perspective between each of the decreasing lines, and places the cut thus formed in a large number of English and American newspapers. The soap merchant completes this curious advertisement by giving a name to the three figures. No. 1 is Lord Churchill, No. 2 is Salisbury, and No. 3 is Gladstone.—*La Nature.*



AN OPTICAL ILLUSION.

WEBER'S ELECTRIC SIREN.

The demonstration of the origin of tones and the determination of the number of vibrations that corresponds to each of them are of the highest importance for the study of the relations that exist between the different ones, from an acoustical point of view, as well as from that of the theory of music. Such study has been made either by acoustical or by optical methods, and the results are no longer subject to any doubt.

An apparatus intended for verifying such results will, then, have scarcely any value unless it gives something new. The siren which we now propose to describe differs from all analogous apparatus, in that the medium set in vibration and the mode of setting it in vibration are new, and that the cause and effect are at an arbitrary distance. Like other sirens, it gives at will one or several tones, and the interval between these may be fixed in advance. In its simplest form it consists essentially of the following parts: Of a toothed wheel, (Fig. 1), which revolves around an axis, A, and against the perimeter of which rests a spring, one of the extremities of which is fixed and communicates with a wire, while the other alternately touches a tooth and a hollow filled with an insulating substance. The wire connected with the spring runs to one of the poles of a pile. The other pole communicates with a telephone, T. The electric circuit is then closed in starting from the pile, to pass through the telephone to the axle, A, the wheel, and the spring to the other pole of the pile. If the wheel is revolving, the circuit will consequently be closed or open according as the spring is bearing against a tooth or an insulating hollow.

In the telephone there will be an identical series of attractions and freeings of the vibrating disk, whence will result a tone. The pitch of the latter, and the corresponding number of vibrations, will be directly proportional, then, to the number of teeth in the wheel, and to the velocity of the axle's revolution. The intensity of the tone, the amplitude of the vibrations of the telephone disk, is a function of the intensity of the electric current, and variable from one telephone to another.

The *timbre*, or the number, the pitch, and the intensity of the tones that are added to the principal one, depends upon the constancy of the pile, upon the perfection of the wheel, and upon the quality of the telephone.

The siren, as Dr. Weber actually constructs it, consists of fifteen toothed wheels fixed upon the same axle. They all have the same diameter, 1·5 inches, and are all at an equal distance apart, say one-eighth inch. The number of teeth varies from one wheel to another, it being 24 in the first, 27 in the second, 30 in the third, and so on—each of the following having a number that corresponds to the successive tones of the same scale up to the fiftieth. The space between the wheels and that between their teeth is filled in with a very hard insulating mass. The surface of the cylinder thus formed is carefully turned so as to have it very smooth. The surface of the teeth alone is visible, and each coincides with the surface of the cylinder. A crosspiece that joins the supports in which the cylinder revolves carries the fifteen springs. Each of these latter runs in the plane of the corresponding wheel, and consequently bears alternately against a tooth and a hollow of it. A number of wires equal to that of the springs establishes a communication of the latter with the same number of binding screws arranged upon the board that carries the whole. A brush spring causes the current to enter the axis of the cylinder. This bears against the latter, and also communicates with the sixteenth binding screw. It is at this latter that ends one of the wires coming from the telephone—the other extremity being connected with the pile. The most convenient arrangement of the pile is this: The number of elements is equal to that of the wheels, or one of the multiples thereof, and their negative poles communicate and connect with a wire from the telephone. The positive pole of each element (or of each series of elements), on the contrary, is connected with a binding screw, and by the latter with one of the springs corresponding to one of the wheels,

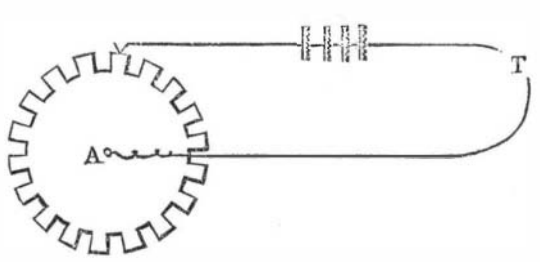


Fig. 1.

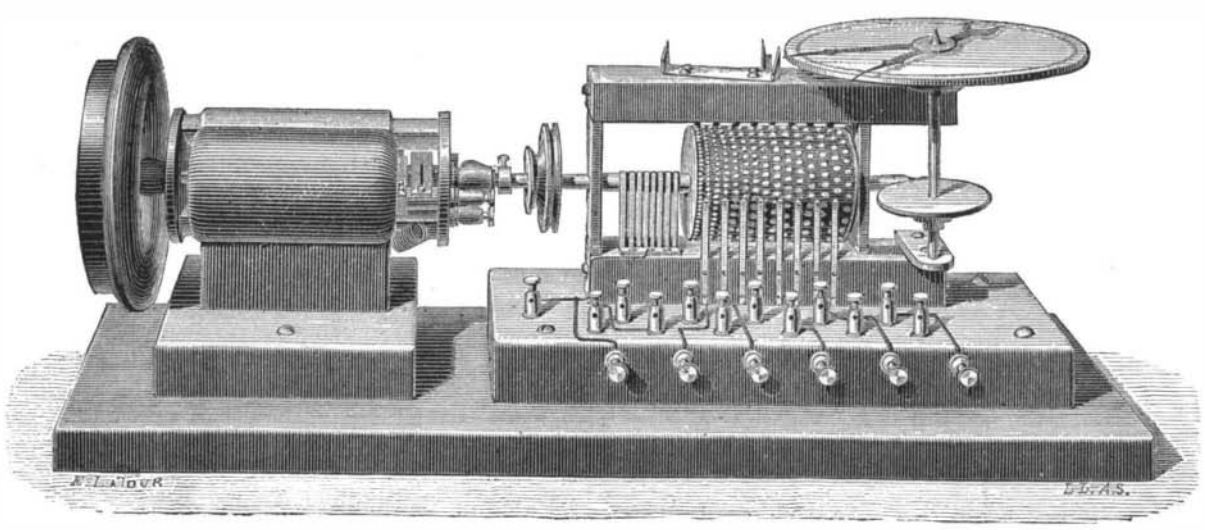


Fig. 2.—WEBER'S ELECTRIC SIREN.

In certain cases, especially if the resistance in the circuit is great, it is advantageous to use induced currents for the telephone. To this end, we place near the siren and pile an induction coil whose primary bobbin is in the same circuit with the battery and siren, while the secondary one is connected only with the telephone.

For counting the number of vibrations that correspond to a certain tone in a given time, the axis of the siren carries an endless screw with which gears a 150-toothed wheel. The same axle that carries this wheel carries still another one, placed higher, upon which are traced two radii. Alongside of this latter, at the same height and nearly touching it, there is fixed a small disk, which is provided with a mark. In order to determine the number of revolutions of the axle of the siren, the process is as follows: The desired tone being produced, the index radius of the upper wheel will pass before the mark on the fixed disk. At this moment there is set in motion a seconds pendulum or the hands of a chronometer. Just at the moment the upper wheel is passing with its index radius before the mark for the second or third time, the hands are stopped. The chronometer tells the time that it takes the upper wheel to make one or two revolutions, or the time that it takes the axle of the siren to make 150 or twice that number. In this way, and with the number of the teeth of the siren wheel, we have all that is necessary for calculating the number of vibrations that corresponds to the tone.

The axle of the siren may be revolved by any motor whatever. In the engraving, Fig. 2, the motor shown coupled with the siren is an electro-dynamic one, constructed by Mr. Hipp according to an American model.—*Condensed from La Lumiere Electrique.*

Corks.

Corks are divided into four classes according to their thickness:

1. Thick corks, having more than 31 millimeters in diameter.
2. Ordinary or commercial, from 25 to 40 millimeters.
3. Bastard corks, from 23 to 25; and
4. Thin cork, less than 23 millimeters.

Each class is again divided by the French and Spanish merchants, according to their quality and to the fineness of the cork.

In the cork tree plantations of Lot et Garonne, Catalonia, and the Mediterranean region generally, a forest kept in good condition and worked for ten years will yield two-thirds of good ordinary corks, and one-third of thick and thin cork, the whole being of the average price of 60 francs per cwt.

A cork of good quality should be white, tawny, or pink, with a close, fine grain, and free from cracks. Wet plantations give a soft, flabby description of product.

The powder of cork is met with in trade under the name of *liegine*, and is used in place of lycopodium for healing skin cuts, etc. The waste resulting from the manufacture of bottle corks is made useful by being mixed with plaster, etc., for partitions, filling walls, and other purposes. It also produces an excellent kind of charcoal, which is said to be good for gunpowder manufacture.

Linoleum is a composition of cork powder and linseed oil. Sometimes cork powder is found highly adulterated with sawdust and clay. Cork leather is made from India rubber and cork powder; it is much used for waterproof articles.

Catalonia and Algeria possess the cork oak in great quantity, and it is successfully cultivated in Corsica, in the French departments of Var, Lot et Garonne, and elsewhere. It grows about 200 years, and attains some 30 to 40 feet in height as an average, though trees as high as 65 feet are met with here and there.

The virgin cork is the suberous bark; it has little commercial value, being only used for marine buoys, fishing net floats, ornamental flower pots and ferneries, and for making Spanish black. The bark reaches its proper thickness in about eight years, but a tree is not unbarked until it is twenty or thirty years old. A young tree will give six to eleven pounds of cork, while an old tree will yield 250 to 350 pounds.

The manufacture of corks for bottles dates from the seventeenth century; machinery is now largely used for this purpose, by means of which one man can turn out about 5,000 to 6,000 corks a day.