THE GRAMOPHONE.

Among instruments for recording and reproducing speech and other sounds, the invention of Mr. Emil Berliner, of Washington, D. C., known as the gramophone, is remarkable as being distinct from the others in both form and principle. The gramophone was one of the early modern talking machines. It was nearly perfected when the latest form of phonograph appeared. Since that time it has been improved, and we understand that recent trials of the instrument in Europe have proved very successful.

Fig. 1 shows the recording apparatus; Fig. 2 the reproducer; Fig. 3 a print from an electrode taken directly from a gramophone record plate; and Fig. 4 shows the record of the vowels greatly magnified.

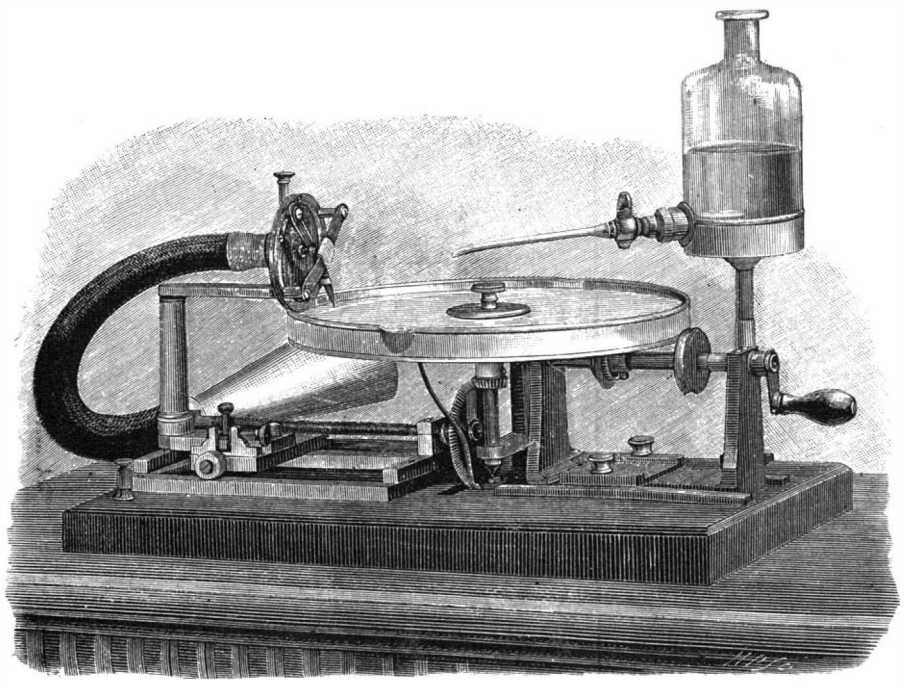

Fig. 1.—BERLINER'S GRAMOPHONE—THE RECORDER.

In this machine a central apertured disk of zinc is used for receiving the record. The disk, which is covered with an extremely thin film of wax, is mounted on a vertical spindle within an etching trough which revolves with the spindle. The recording stylus, the diaphragm, and the mouth tube are mounted on a carriage, which is moved toward the center of the zinc disk by a screw, taking its motion from the spindle carrying the disk. Motion is imparted to the record disk by a friction wheel on the horizontal shaft at the right of the engraving. This shaft is provided in the present case with a hand crank by which the plate is revolved. The same shaft is also provided with a pulley for receiving a belt from a suitable motor, when it is desired to operate the machine by power.

As the record disk is revolved, sounds uttered in the mouth tube cause the diaphragm to vibrate, and the stylus is moved in a direction parallel with the face of the record surface, forming in the wax film a sinuous line representing the sounds uttered in the mouth tube. As the plate revolves, the stylus and parts connected with it are carried forward toward the center of the disk, thus forming a spiral sinuous line in the wax film. When the record is complete, the stylus is removed and acid is admitted to the etching trough, from the bottle supported at the right of the machine. As soon as the plate is sufficiently etched, the trough is removed, the acid is returned to the bottle, the wax film is dissolved off, and the plate is transferred to the reproducing apparatus shown in Fig. 2.

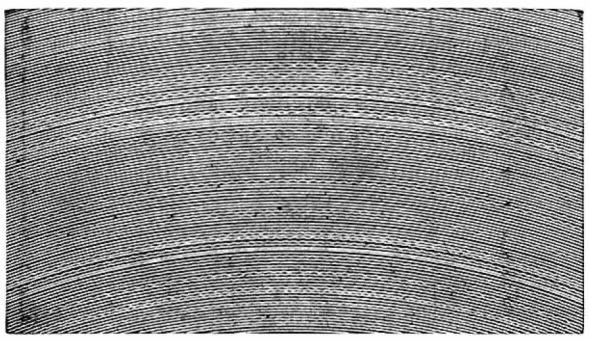

Fig. 3.—PRINT FROM SECTION OF GRAMOPHONE PLATE.

In this apparatus the record plate is mounted on a vertical spindle and revolved as in the other case. The diaphragm of the reproducing instrument carries a stylus which follows the spiral groove in the plate, thus causing vibrations in the diaphragm similar to those produced by the sounds uttered in the mouth tube of the recording instrument. The diaphragm cell and reproducing stylus are carried upon the smaller end of the trumpet, which is delicately pivoted on a standard and counterbalanced so that the reproducing stylus exerts only a slight pressure upon the record plate. The volume of sound issuing from the trumpet is great. Instrumental and vocal music are faithfully reproduced. It is obvious that the records formed by this instrument are permanent, and the plates capable of being stored in a very small space.

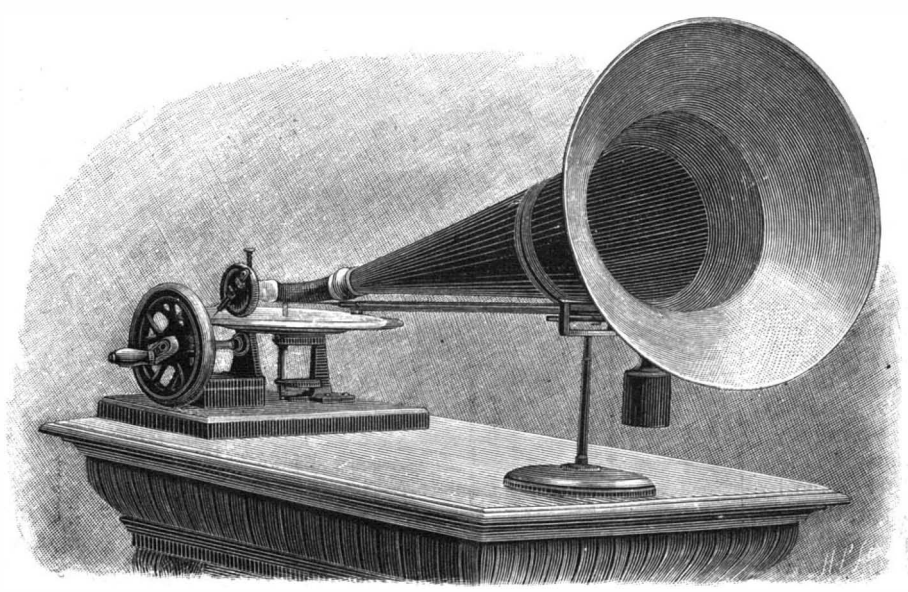

Fig. 2.—BERLINER'S GRAMOPHONE—THE REPRODUCER.

Danger in Wet Cellars.

Scarcely anything is more prejudicial to good health than wet cellars. Rheumatism, bronchitis, pneumonia, and malarial affections, including neuralgia and sciatica, are some of the dangers to be apprehended. Damp cellars mean foul and noxious air, and should be sedulously avoided. Now, before the rains come, while the water or moist line is considerably below the surface, is the proper time to prevent these evil influences. Drain tiling, laid outside and a foot below the base of the foundation, and running diagonally across the cellar, and connecting with the outside drains, and thence leading to the street drain or some low ground, is the best and perhaps only safe way to drain, not only the cellar for a foot below its surface, but the outlying ground for several feet in all directions from the house. This drain, while having a free outlet, should furnish no opportunity to put into it anything but what is extracted from the soil. It should never, on any conditions, have any connection with sewage, nor receive any kitchen slops or surface water, and should be well below the frost line. If possible, the cellar floor and the sides of the wall, as high as the surface of the ground outside, should be well cemented. It is well, owing to the great porosity of brick, if used for foundation walls, to have intervening layers of cement, so as to prevent, as far as possible, the upward passage of the water by absorption. This drain should be laid as far as possible from the well, lest in some way its contents should be emptied in the well and contaminate the drinking water. The expense of such drainage and wise precaution would be but a trifle—especially if, by its neglect, a protracted sickness, with its doctor, and drug and nurse bills, and eventually a funeral, should be prevented.

The soundest wisdom and strictest economy favor the adoption of all measures that lessen, or reduce to a minimum, the dangers from preventive diseases.—*Monthly Bulletin Iowa State Board of Health.*

Foam.

In a lecture on "Foam," Lord Rayleigh insisted that foaming liquids were essentially impure, for pure liquids will not foam. For instance: neither water nor alcohol can be raised into a froth, although a mixture of the two may be to a certain extent. The addition of gelatine to water in the proportion of 1 in 100,000 develops the foaming quality quite noticeably. Of course, the best-known foaming liquid is a solution of soap, such as the children use for blowing bubbles. A liquid foams when its films have a certain durability. In all liquids these films exist, since a bubble as it rises is covered with a thin film. Now, the most striking property of films is their tendency to contract, and they may be regarded as being in the condition of a stretched membrane, as of India-rubber, with the difference that the tendency to contract never ceases. An air bubble will force the air back through the pipe, and a loop of silk floating on a film will be forced into a circle the moment the film inside it is ruptured. Oil forms a film on the surface of water, and covers it entirely, even if the mass of the oil be collected into drops. This is well shown by dropping a particle of oil on to a vessel of water lightly covered with sulphur flour. The sulphur will be immediately driven to the edge by the spreading film. The reason of this is that the tension of the water-air film is greater than the combined tensions of the water-oil and oil-air films, and consequently pulls out the oil film. It is possible to reduce the surface tension of water by mixing it with various substances, such as ether and camphor. Camphor scrapings placed on the surface of pure water enter into vigorous movements, because the dissolved camphor diminishes the surface tension of the water; but, if the water be contaminated by the least quantity of oil or grease, the motion ceases. Lord Rayleigh made several experiments to find what thickness of oil film would accomplish this: he found it to be about 1½-millionth of a millimeter. This thickness bears to an inch the same ratio that a second of time bears to half a year. Lord Rayleigh explains the calming action of oil on the sea as follows: As the waves advance, the surface has to submit to periodic extensions and contractions. At the crest of a wave the surface is compressed, while at the trough it is extended. So long as the water is pure, there is no force to oppose this; but, if the surface be contaminated, the contamination strongly resists the alternate stretching and contraction. It tends always, on the contrary, to spread itself uniformly, and the result is that the water refuses to lend itself to the motion which is required of it. The film of oil may be compared to an inextensible membrane floating on the surface of the water, and hampering its motion.

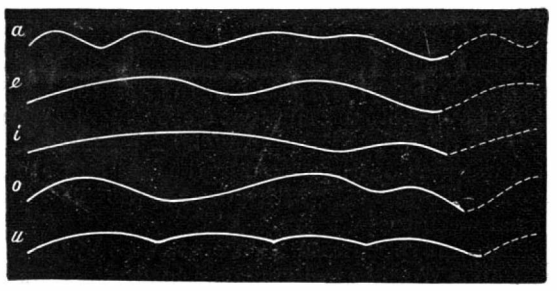

Fig. 4.—MAGNIFIED RECORD OF THE VOWELS.

Mixtures for Cleaning the Hands.

In chemical works, it is not an uncommon occurrence for one's hands to become so soiled with the various well defined and separate nastinesses to be found there as to be quite insusceptible of cleansing by ordinary soaps or soap powders. One or two chemists of our acquaintance, the *Chemical Trade Journal* says, use a mixture under these circumstances, which we publish for the benefit of those of our readers who care to try it. Take about two or three grammes of bleaching powder, the same quantity of soda ash, and about twice their bulk of sawdust. Completely saturate these with caustic soda liquor, say 10 or 15 Twaddell, and quickly rub over the hands. As soon as the desired effect is produced, rinse the hands with water. It is occasionally necessary to repeat the process, but, as a rule, one application suffices to make the hands perfectly clean. There is an odor of bleaching powder perceptible from hands thus treated, to which some may object, but this may be destroyed, and the appearance of the hands still further improved, by rubbing them over with a little sulphurous acid solution, or by rubbing first with a solution of sulphite or hyposulphite of soda, or sulphite of ammonia, and, while still wet from this, rubbing over with very dilute hydrochloric or sulphuric acid. The hands should be well washed with water, and a little ten per cent glycerine rubbed in to keep them soft.

Nitric acid stains on the hands still appear to defy all comers, except pumice stone, but inks and organic stains may—in the absence of bleaching powder—be generally removed by a mixture of chlorate of potash and hydrochloric acid.

GLUE FOR TABLETS.—For 50 lb. of the best glue (dry) take 9 lb. glycerine. Soak the glue for ten minutes and heat to solution and add the glycerine. If too thick, add water. Color with aniline.