the science that showed the least promise of usefulness. The idea that it could ever be serviceable through weather forecasting had not been broached, or, if it had been timidly suggested, was received with derision. The very Scriptures pronounced against it. Wherefore, then, should human life and public treasure be sacrificed to no good purpose?

But once again in the history of science the incredible has come to pass. The seemingly useless has proved to be of the utmost value. Weather prophecy has risen almost to the dignity of a governmental bureau, and affairs of national importance—agriculture and commerce, social and political movements—are largely regulated with reference to the daily report of "probabilities." And as fast as men come to understand that Arctic observations are necessary for the perfection of our already enormously useful weather service, they cease to look upon Polar explorations as something akin to foolhardy venturesomeness or scientific folly. The advancement of meteorological science is now something that appeals to every man's everyday interests; and when the exponents of the science say that the great weather factory of the northern hemisphere may lie around the Pole, and that the causes of many of our most destructive storms may be there at work, the reply is, "Go and see, and good luck go with you. If you want money for the work, you shall have it." It is yet—though it may not always be—impossible to prevent disastrous storms; but the damage they do can be largely prevented through timely warning of their approach. And it is possible that Howgate's colonies may be converted into permanent international meteorological stations, reporting daily by telegraph, and so be enormously beneficial to commerce, agriculture, and other industries, even if they should utterly fail on the score of mere geographical exploration. At any rate the scheme meets the hearty approbation of all thoughtful people, and it is to be hoped that the proposed appropriation for its furtherance will be sufficiently liberal.

THE PHONOGRAPH.

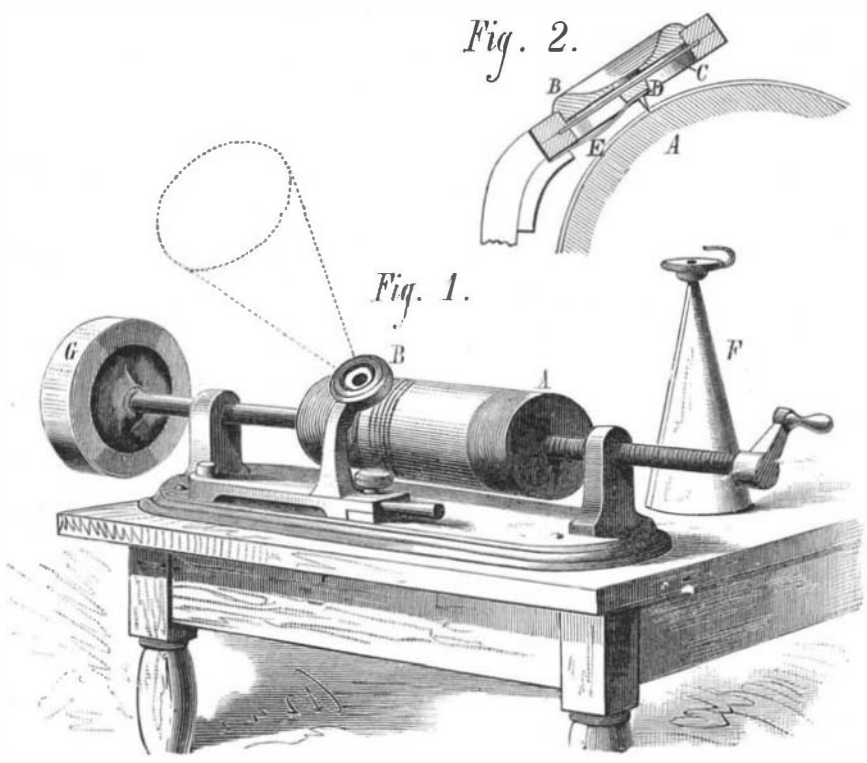
It is a peculiar feature of the Edison phonograph that no mere description can impart any really adequate idea of its performances. Fully familiar as we are and have been with the machine since its inception, it is still impossible for us to listen to it without a feeling of astonishment and a well defined doubt that our senses are not deceiving us. The extreme simplicity of the contrivance enhances this notion. There is nothing in the half articulated monotones of the complicated Faber apparatus to excite surprise, because, although illogically, the hearer half expects that such an assemblage of intricate mechanism will produce more startling results than it does; but here is really nothing but a revolving cylinder covered with a sheet of tinfoil, and a speaking tube; no levers, no springs, no keyboards, no artificial lips or larynx, no bellows. If we lived in 1678 instead of 1878 the life of Mr. Edison would not be worth a moment's purchase; in fact, he would have been resolved into carbonic acid, hydrogen, and his other constituent gases long ago in the flames set apart for earthly communers with his satanic majesty.

If accurate and clearly enunciated repetition of the sounds made in it is the *ultima Thule* of the phonograph's capabilities, then it has already attained that point. Where it is open to improvement, and to this the attention of the inventor is now being devoted, is in augmenting the intensity of the sound. In form it is substantially the same as when it was first described in these columns; that is, it consists, as plainly shown in our illustration, Fig. 1, of a brass spirally grooved cylinder, A, mounted on a long horizontal screw, the cylinder being rotated and at the same time moved laterally by turning a crank on the end of its axis. The chief modification is the abolition of the receiving membrane, one diaphragm, B, serving the double purpose of vibrating in response to the voice, and so indenting by the diamond tipped point, D, attached to the spring, E, the tinfoil wrapped about the cylinder, and also revibrating in response to the movements mechanically imparted to it by the indentations already made passing under the point. It is evident that this change must materially improve the reproductive power of the apparatus, because the size and nature of the membrane materially affect the vibrations it makes, and where two membranes are used a slight dissimilarity between them might result in considerable alteration in the sound emitted. Now, however, the same diaphragm revibrates, and the sound is modified perhaps as little as can be expected, the modification fortunately being in intensity and not materially in quality. The loss is manifestly due, first, to the inability of the rigid plate of metal, C, employed as a diaphragm to register the lateral vibrations which take place in direction parallel to its own plane; and second, in its vibrations being checked in amplitude by the friction met in overcoming the resistance of the foil, its own inertia, and in some degree probably the elasticity of the rubber pads in which it is held, as shown in the section, Fig. 2. Still a rigid plate seems to be a necessity, for it is doubtful whether a thin membrane, such as gold beaters' skin, while responding more fully to the sound waves, would support the point in making its indentations; that is, it is likely that it would yield itself before the tinfoil could be impressed deeply enough. This, therefore may be another subject for further investigation and possible improvement.

As it is, even now, the phonograph will meet the most sanguine anticipations of any one that hears it. The first model that was brought to our notice certainly talked, that is, it produced sounds, the *timbre* of which was unquestionably that of the human voice; but, as we said at the time, it required some previous knowledge to distinguish what was said. The speech was the lispings of infancy. At present previous explanation is wholly needless. The machine repeats the voice with perfect articulation and with every inflection, so that the tones may be recognized as those of the speaker who made them.

Through the courtesy of Mr. W. S. Applebaugh, who has charge of the apparatus now on exhibition in this city, we have been enabled to make as thorough an examination of all its peculiarities as we could desire. At our request the exhibitor sang into the machine an entire verse, and it was repeated as often as the cylinder was readjusted. Sounds of coughing, clearing the throat, knocks, noises of all kinds, were as accurately reproduced. A curious effect is produced by whistling, the apparatus giving forth every note clearly and fully; but more remarkable still is it to hear two voices at once come from the machine. The exhibitor first sang a verse which was registered, and then running the cylinder back talked so that the indentations produced by the speech vibrations came over those made by the song. The instrument repeated both utterances simultaneously, each, however, being clearly distinguishable. Another odd performance is turning the cylinder the wrong way, and making the machine talk the language backward.

The only means now used for magnifying the sound as it is emitted is the funnel-shaped resonator, F, attached to the speaking orifice. Mr. Edison, however, is busily experimenting upon some adaptation of compressed air, by which the sound waves, he thinks, may be intensified. He says that he can in time make the machine talk so loudly that it can be used on vessels to warn off other ships during fogs, and his last astonishing proposal is that he shall construct a huge phonograph to go in the great bronze statue of Liberty which is to be erected in New York Harbor, so that the metal giant can make a speech audible over the entire bay. In view of what Mr. Edison has already accomplished, his success in this respect would not surprise us.



THE PHONOGRAPH.

TREE WASTE AND ITS SEQUENCE.

The matter of forest tree culture and preservation is in rather an anomalous state in this country. At one end of the national domain, people are planting trees and studying every means to turn denuded lands back into forests; at the other, woods are being felled and a small war is in progress against the Government on account of its preventive efforts. In Massachusetts societies are organized to stimulate the preserving and renewing of forests; in Louisiana, Alabama, Florida, and Montana, the authorities are denounced as interfering with the best interests of the people, because an endeavor is made to stop the wholesale denuding of public lands and sale of the timber for private benefit. With the legal aspects of this question of forest destruction in the South and West, it is not our province to deal, but the considerations in favor of protecting woodlands are of importance not merely to every agriculturist, but to every one, and they should be fully realized by all who believe that the only value of forests lies in the amount the wood will fetch per cord.

If any one is disposed to think that our forests are inexhaustible, at least for a long period to come, he has only to cast his eye over the woodland map in General Walker's valuable statistical atlas to perceive his delusion. He will see that the number of heavily wooded tracts having 360 or more acres of timber to the square mile is startlingly small. The area of all such districts is equal only to about that of the Atlantic States, and the remainder of the country, fully four fifths, has no timber, the map showing a uniform blank. Now consider the enormous amount of lumber used yearly in manufactures. Nearly $144,000,000 is invested in the sawn lumber industry alone, that is, the production of laths, shingles, and boards. Add to this the fact stated by Professor Brewer that wood forms the fuel of two thirds of the population, and the partial fuel of nine tenths the remaining third, and some general idea of the enormous drain constantly in progress upon our forests will be reached. This, however, is only the direct draught for purposes of utility. Immense areas of woodland are yearly denuded by forest fires, large tracts are purposely burned as a speedy way of clearing, and thus the wooded regions are rendered more and more sparse. If forest fires were prevented as far as is practicable, if trees were constantly being planted, and if the reckless denudation of woodlands could be stopped by the laws already in existence, but apparently not enforced, there is little doubt but that we possess timber enough to supply indefinitely all our needs either as fuel or for manufacturing purposes; but save in isolated instances trees are not being planted, we have no schools of forestry such as exist in Europe to encourage sylviculture, and as the recent proceedings in Congress have shown, a part of the population claims the right for private ends to denude the woodlands now owned by the whole country, and defenders in the Legislature are not wanting to support them.

We have already taken occasion to point out the dangers which result from tree destruction. The exact relation of forests and rainfall is not definitely settled; but there are very numerous cases on record where the destruction of forests has resulted in the production of desert wastes, and where trees have been replanted humidity has returned. It is laid down, however, by such authorities as Dr. J. Croumbie Brown, of Scotland, and others who have made especial studies of the subject, that "within their own limits and near their own borders forests maintain a more uniform degree of humidity in the atmosphere than is observed in cleared grounds. They tend to promote the frequency of showers, and if they do not augment the amount of precipitation they probably equalize its distribution through the different seasons." "In India," says Mr. B. G. Northrop, in a late address before the Connecticut State Board of Agriculture, "three quarters of a million people have been starved to death since the forests have been cut off, causing the springs to dry up."

It is needless to multiply warnings of this kind. In the thickly settled countries of Europe each generation is bound by law to leave the forests in as good condition as it found them. Forests are protected from fire and they are regarded as public property. Until we adopt some similar course, each succeeding generation will transmit to posterity woodlands more and more depleted. The result is only a question of time. The natives of parts of South Africa tell of giant trees and forests, fertile lands, and abundant floods and showers, all existing or occurring in a region now little more than a dry and arid desert; such will be the traditions of our own descendants. As the soil becomes unfit for agriculture, migrations will follow, favored regions will receive an overplus of population which cannot obtain all its supplies from the soil, and dependence upon other nations for necessaries of life, the first step downward in a country's decadence, is taken. Exhaustion of resources must ultimately succeed, and with it the end of national existence.

ASTRONOMICAL NOTES.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., Saturday, March 30, 1878.

The following calculations are adapted to the latitude of New York city, and are expressed in true or clock time, being for the date given in the caption when not otherwise stated.

PLANETS.

	H.M.		H.M.
Mercury sets	7 09 eve.	Saturn rises	5 27 mo.
Venus rises	3 58 mo.	Uranus in meridian	9 20 eve.
Mars sets	11 08 eve.	Uranus sets	4 12 mo.
Jupiter rises	3 01 mo.	Neptune sets	8 28 eve.

FIRST MAGNITUDE STARS.

	H.M.		H.M.
Antares rises	11 28 eve.	Sirius in meridian	6 07 eve.
Regulus in meridian	9 29 eve.	Procyon in meridian	7 00 eve.
Spica rises	7 23 mo.	Aldebaran sets	10 54 eve.
Arcturus in meridian	1 41 mo.	Algol (2d-4th mag. var.) sets	11 36 eve.
Altair rises	0 46 mo.	Capella sets	2 46 mo.
Vega rises	9 06 eve.	7 stars (cluster) sets	10 36 eve.
Deneb rises	10 08 eve.	Betelgeuse sets	11 41 eve.
Alpheratz sets	7 24 eve.	Rigel sets	10 06 eve.

REMARKS.

Venus is upon the boundary between *Aquarius* and *Capricornus*, being about 5° southwest of the λ. Mars is about 7° directly north of Aldebaran in the Hyades being a trifle north of the earth's path. Uranus is 1° 5′ north and 9m. west of Regulus.

IT is intended to form in Paris a commercial and industrial museum, where the public will find samples of raw materials from all parts of the world, and samples of articles produced therefrom.