AMERICAN ACADEMY OF SCIENCES.

This select body met at Columbia College, New York city on October 28, when Professor Joseph Henry read an interesting paper upon sound, with especial reference to its employment for

FOG SIGNALS.

The principal part of the paper related to abnormal phenomena of sound, of which a number of instances were given. In many instances the sound from a fog signal is heard at a great distance, while it is inaudible at a much smaller distance. This was attributed to the effect of the wind on the sound. As a general rule the sound is heard at a less distance in opposition to the wind, but in one case the sound is always heard at a distance of nine miles against the wind during a northeast snow storm. This anomalous case is accounted for by an upper stratum of wind in an opposite direction to the one at the surface. Another principle which is applicable to the explanation of several of the abnormal phenomena of sound is that it diverges much more rapidly than light, so that a beam of sound produced by a powerful instrument swells out into a cone of sound, and it is on this account that reflectors have not been found to be of much use in enforcing the sound of fog signals.

Our sea coast is the largest in the world, extending over more than 10,000 miles, and a considerable portion of this distance is beset with dense fogs. On the northwestern portion of the Atlantic coast, whenever the wind blows from a southerly direction, it wafts the warm, moist air from over the Gulf Stream to the cold current coming from the arctic region, and passing along our coast between the Gulf Stream and the land; and thus, in the intermingling of the warm and cold air, the vapor of the former is condensed into fog. On the western coast, when the wind blows directly from the Pacific across the colder current from the north, a fog is similarly produced. Fog signals, therefore, are almost as important as lighthouses. Accordingly the Lighthouse Board has devoted much attention to this subject; and however our lights may compare with those of other nations, our fog signals are superior to any elsewhere adopted. They consist principally of three instruments, all founded on the principle of resounding cavities, in which the air itself is the sounding body as well as the conductor of sound. The instruments are: (1). The fog trumpet, furnished with a reed and blown by air condensed by an Ericsson caloric engine. (2). The siren trumpet, blown by steam from a high pressure tubular boiler. (3). The ordinary locomotive whistle of large size, blown also by a high pressure engine. These instruments can be heard in perfectly still air at a distance of from fifteen to twenty-five miles.

ON THE CONSTITUTION OF THE SUN'S SURFACE—BY PROFESSOR C. A. YOUNG.

Professor Young, in a brief extemporaneous address, placed before the Academy his latest views on that subject. Every one is aware, he thought, of the fact that, in the present state of science, it is impossible to regard the sun as anything but a gaseous body: the law of density, it seemed to him, could not be reconciled with the solid constitution of that body; and it is difficult to see how it could be liquid, as the liquids of which we know it must be composed are largely metallic liquids. It is safe to say we know that it is mainly gaseous. Another thing might be said. The luminous surface from its appearance has something of the nature of cloud. We find rapid changes in the appearance and constitution of the surface. It is impossible to consider it anything but flocculi floating in gas. But when we come to examine the overlying chromosphere with the telescope, we find evidence of violent outbursts from beneath, of extreme intensity. At first sight, it was thought that it might be only an apparent motion, or the same kind of motion that we see when a flame jumps up from a coal fire, and simply is communicated among particles already in position. But that would not account for the disturbance of the spectrum lines. It is not uncommon to find displacements of the spectrum lines indicating motion (in a line that joins the mass with the observer) of one hundred, and sometimes two or three hundred, miles per second. There is every reason to suppose that these masses, which we see—masses thrown vertically from the sun,—have really velocities of a corresponding magnitude. The question that pressed upon his mind was to reconcile that with the cloudy character of the photosphere. If anywhere, the explanation, he thought, was to be found in the condensation that goes on the photosphere. If the heat of sun is anything very great (it would melt about 40 feet of ice a minute over the whole surface), the amount that is turned from vapor into liquid, that is, the amount of condensation over the surface of the sun, is something very enormous. On the surface of the earth a shower that gives us two inches in an hour is something tremendous. The rain descends in buckets. But the rate is exceedingly small compared with the rate of condensation on the surface of the sun.

Now these droplets so produced would at first descend in fillets, with an accelerated velocity, and therefore growing slenderer as they fall. But soon they would come down to a place where the atmosphere and gases are denser. The materials they would encounter in the first 300 or 400, and still more in the first 3,000 or 4,000, miles would become denser, and the motion would be retarded. They would thicken in it. Besides whatever weight of liquid drops down from the clouds in a minute, that amount of gas must travel upward in order to maintain an equilibrium. That would cause the currents passing upward to be extreme in their rapidity, and the retarding effect would be still greater. It is probable that a good deal of the descending liquid would be evaporated at that point. But it seemed to him likely that the fillets would thicken and begin to coalesce, in which case they would form sheets. In that case we might get a surface something like a sheet of water at Niagara. The mass of the whole sheet would be vertical, and descend until a portion of the sun would be reached where the rapidity of the evaporation would equal the rapidity of the descent. Then it would be something like a series of descending ponds without any bottom to them. If their velocity were retarded entirely, their whole weight would be supported by the underlying atmosphere. The pressure would be something enormous. The gases would be forced up through them, the whole being in the condition of a liquid breaking up, the gas probably taking portions of the liquid and throwing them up. This theory is compatible with that of the gaseous constitution of the sun. But we do not know what to do with the sun spots on this theory any better than on any other theory. Possibly they may be partly solid matter, as has been asserted. In that case, you might get a mass floating on the top of a more liquid portion. One element, which we are much at a loss about at present, is to determine what amount of the sun's mass is to be referred to condensation, and what to dissociation.

Among other papers presented and discussed was one upon

RECENT FISH COMMISSION EXPLORATIONS,

by Professor A. S. Packard Jr., in which some results of the late cruise of the United States Coast Survey steamer Bache, in the shape of rare marine animals, were described. Near Portsmouth the dredge brought up a sea cucumber, *molpodia borealis*, new to the American coast, and tubes of a worm which occurs at the greatest depths off Norway. The latter came from the coldest abyss found during the expedition. The same author also read a paper on the "spiracles of insects," in which the conclusion he has arrived at is that, no known hymenopterous larvæ—that is, the bees and wasps—have more than two pairs of spiracles on the thorax. Certainly at least, on evolution principles, it is considered, we are perhaps warranted, from the indications in existing caterpillars, in concluding that the ancestral type of lepidopterous larvæ was provided with two pairs of thoracic spiracles.

Professsor Hilgard, on the subject of

MEASUREMENT OF VOLUME,

said that the kilogramme which was originally determined to be the weight of a cubic decimeter (61·027 cubic inches) of water, was not an accurate standard, and that there was an uncertainty of 100 milligrammes in its theoretic value. It is proposed to use a cylinder having a hight of a quarter meter and a circumference of one meter. The weight of water displaced by it will be nearly 20 kilogrammes, which can be weighed to 10 milligrammes—equivalent to half a milligramme in a kilogramme or to a fraction of one two-millionth. The circumference is to be measured by developing it upon a railway and comparing with a meter. The two rails are a little further apart than half the length of the cylinder.

A communication was also received from Rear Admiral Sands, stating that the preparation of instruments, etc., for the observation of the approaching transit of Venus was in satisfactory progress, and that everything will be in readiness at an early day.

Cyrus Wakefield.

Probably few men have ever contributed more largely to the material prosperity of those around them than Mr. Cyrus Wakefield, the announcement of whose sudden death we notice in recent New England journals. As is well known, he was an extensive dealer in rattan furniture, with headquarters in New York and Boston, and a large manufactory in Wakefield, Mass., a town named after him and to which he presented a fine public hall. He was preëminently a self-made man, clear headed, active and tireless in business, and apparently capable of performing labors far in advance of the capabilities of ordinary individuals. Always charitable toward others, his relations with the large number of his employees was constantly friendly and cordial, while, throughout his life, his efforts in the cause of education were untiring. About two years ago he gave $100,000 to Harvard College, to erect the building which now bears his name. He was also one of the projectors of the Boston *Globe*, and a large operator in real estate in the last mentioned city.

Mr. Wakefield was born in Roxbury, N. H., in 1811, and was consequently sixty-two years of age at the time of his decease. He was also an inventor, and had taken a number of patents of no mean value in relation to his own business.

Inter-Planetary Communication.

Mr. Charles Cros, in a communication to the French Academy of Sciences, thinks that the approaching transit of Venus will afford an excellent opportunity for establishing communication with the inhabitants of that planet—if any exist. He says: "It is possible that among the dwellers on the surface of Venus there may be some who are astronomers, to whom it may occur that the passage of their world across the sun's disk will attract our curiosity. Hence it is reasonable to suppose that these savants will perfect means to transmit signals to us precisely at the instant when they determine that multitudes of earthly telescopes are turned in their direction."

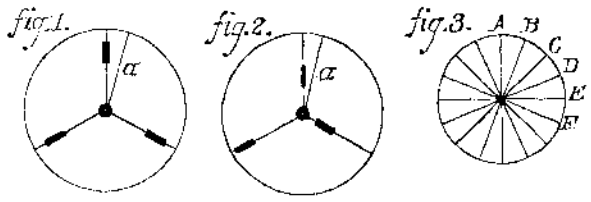
A writer in *La Nature*, commenting on this novel idea, suggests that it would be better to reverse relative positions, and for Venus substitute Mars. That is to say, when to the Martial inhabitants our globe appears to be crossing the sun's face, we should do something to attract their notice. As Mars is an older planet than the earth, it is supposed that its inhabitants are wiser than we, and hence better able to comprehend our signals than those existing on more youthful Venus.

It would be more satisfying to the inquisitive mind if M. Charles Cros or the correspondent of our contemporary would kindly ventilate their plans somewhat more in detail. We have heard somewhere of a scheme for signaling to the moon by means of long black platforms, arranged on wheels and placed on the extended snowfields of Siberia; and, if we remember rightly, it was proposed to roll these about to make the letters of the Morse telegraphic alphabet. How the assumed lunar inhabitants were to interpret the symbols was not explained. Somebody has also suggested huge mirrors arranged to send flashes of light to our satellite.

These ideas are all very nonsensical, but rather pale in absurdity before that of M. Cros. The moon, to be sure, is only about 240,000 miles away, and our big telescopes carry us to within a hundred miles of its surface; if that million dollar instrument is ever made, probably we shall be able to see with reasonable distinctness whether clusters of habitations exist thereon. But Venus and Mars are respectively thirty and forty-nine millions of miles distant from our planet, and it is only by careful observation that the movements of vast glaciers on Mars are estimated, or spaces near the poles, of forty thousand square miles extent, detected; and even the phenomena noted are merely supposed to be due to the causes ascribed.

Engine Turning with the American Chuck.

Looking at the American chuck, we see that the three teeth are worked to and from the center by a spiral coil, and that, when in correct working order, these teeth are drawn in regularly by winding up the screw, so that at any one time they are all exactly the same distance from the center. Now, by unwinding the screw, these teeth can be removed from the body of the chuck. I removed the teeth, and, putting two of them back into their proper places, I gave the screw one or two complete turns round; then I replaced the third tooth, and the position of the teeth was as shown in Fig. 2. Fig. 1 being the usual position.



The wood is first turned on the true center (Fig. 1), each end being turned down so that the block assumes the form of a right cylinder. The chuck is now altered as shown, and the wood put in and made fast. It is evident that, when the lathe is put in motion, the wood will revolve on a new center; and, by moving the wood round regularly in the chuck, a series of circles can be described as with the eccentric chuck.

In order to keep these circles at a regular distance from each other, I filed a line, *a*, on the face of the chuck, and drew lines across the base of my wood, passing through the center, as shown in Fig. 3. Putting each of these marks—A, B, C, D, E, etc—in turn against the line, *a*, a regular distance was maintained; and by alternating the tooth which I took out, I was enabled to describe a variety of patterns.—*W. E. P., in the English Mechanic.*

The Water Supply of Paris.

Two new artesian wells have been in course of construction for some years in Paris, one at the Butte-des-Cailles, the other on the Place Hébert. The former has been sunk to a depth of 1,725 feet, and it is expected that water will be obtained at 1,890; its cost will be about $125,000. The other well, like that completed after so many years' labor at Passy, presents great difficulties; and although the work is pushed on with activity, the progress is not more than 16 feet per month; and it is believed that 18 months' time will be required to finish the work. The boring tools now in use are worked by means of a steam engine of 40 horse power; a load of excavated soil takes from seven to eight hours to raise it to the surface. The object of this well is not so much the increase of the water supply of the city as the establishment of public baths and wash houses at a cheap rate, as the water, as it issues from the well, will be of about the temperature of 95° Fah.

PROFESSOR HITCHCOCK, of Amherst College, recently explored Miles' Cave, in Salisbury, Mass, with a guide. Hundreds of feet below the surface their torches were suddenly extinguished, and as there was no means of relighting them they remained below for hours. The professor fainted on emerging.

AT the late fair of the St. Louis Agricultural and Mechanical Association, there was a large display of flour samples. The flour was arranged in open barrels without brand or mark by which it could be identified as the product of any particular mill. Thus prepared, a committee, consisting of practical millers, subjected the samples to the severest tests, and made their award. The Anchor Mills, of St. Louis, received the highest award.

SPEAKING of the scheme to warm the Erie canal, the Boston *Post* thinks the invention might be applied to agriculture. "There is no reason," it says, "why the farmers should lose six months in the year just to whim the season." Why not go farther and melt the barriers to the open polar sea?