

also no opportunity for the filtering through of small portions of dissimilar air, and, if portions do descend into the lower levels, they are broken up, diffused, and dispersed. Still, in the colder half of the year, if the lower wind blows from between east and north, and does *not* extend to a great height, a strong mist may be produced by its being mixed with detached portions of the westerly upper current, which take a long time to be thoroughly incorporated and dissolved, and contain more vapour than they can hold invisible in contact with the cold surface-breeze. Thus the prevalence of much haze with a north-easterly gale indicates an equatorial upper current, and the polar wind is apt to be replaced by it before long. With regard to showery weather, it may almost be said to be the opposite of hazy weather, and for the following reasons:—First, as we have seen above, showers are produced by the upward projection of lower air, containing a good deal of vapour, into upper cold air of the same kind. Then, they are often the expression of a state of the atmosphere when the interchange between the upper and lower strata proceeds by large ascending columns and large down-rushes, instead of by small convection currents, and ascending and descending filaments over a very large area. The clearness of the air with a showery north-east wind is quite surprising, for it is sufficient to banish to a great extent even London smoke. Here, again, the north-east wind prevails to a great height, and the air is homogeneous and rather dry. When a shower or even a cumulus cloud passes over a large town, the smoke is seen to be drawn up in a moving column to the height of the cloud. Probably the chief cause of the clearness of a showery north-east wind is the prevalence, as in other cases, of the same wind in the upper regions, so that there is no admixture of strange threads in its composition, no strands of extra-humid particles to be rendered visible by incipient condensation.

(3) Winds between south-west and north. These are, on the whole, clear for a similar reason, for it has been shown that the upper currents in Great Britain usually move from between south-west and north-west. If, as occasionally happens, an east wind blows overhead, they are very far from transparent.

(4) Fine settled summer weather, with westerly or southerly winds, is clear not only for the reason above stated, but on account of the general moderate dryness of the atmosphere. In such weather, barometric pressure is frequently highest over Spain or France, and our upper currents are accordingly from north-west, becoming warmer as they advance southwards and increasing in capacity for moisture. There would be no condensation if portions of these currents were to descend into the lower air.

(5) Settled easterly or northerly winds, with either clear sky or high clouds moving from those directions. Haze does not form where the wind is steady, the air dry and homogeneous up to a great height, and equilibrium stable, for there is nothing to lead to condensation except at the particular level of saturation where clouds are manifested.

(6) Easterly or northerly winds with a high continuous cloud canopy moving in the same direction, small range of temperature, and steady conditions; or, with detached cumulus in the daytime, and clear nights. The same remarks apply here as to the last.

(7) North-west wind, reaching that point from west or south, is particularly clear. Great transparency in this case is not a sign of rain, but rather of fair weather. It is probably due to its agreement in general direction with upper currents, the increasing dryness as it reaches warmer latitudes, and to the uniformity and equilibrium attained by passing over the ocean.

F. A. R. RUSSELL.

THE PULSION MECHANICAL TELEPHONE.

(FROM A CORRESPONDENT.)

A NEW mechanical telephone of extraordinary power has recently been exciting considerable attention in London and some other cities and towns in this country. It is of American origin, like so many other modern improvements of exceptional character, being the invention of one Lemuel Mellett, I believe of Boston, U.S. There have been many previous mechanical telephones, as your readers are aware, some of which have obtained much publicity for a short time, and then have been heard of but little more; but having had opportunities of experimenting frequently with the new instrument, and observing its vocal power, so to speak, under very various circumstances, I cannot doubt that it has a great future before it.

It may be clearly stated at once that the pulsion instrument is absolutely independent of all electrical aids or appliances, and therefore needs neither battery power to bring it into play, nor insulation of any of its parts to keep them effective. It consists solely of two cheap and simple instruments connected by an ordinary non-insulated wire of copper, or, better still, of a double steel wire, the two parts being slightly intertwined, say with about a single turn in a couple of feet. The wire (or wires) is simply looped to the instrument at either end, the connection being made in a few seconds. The instrument consists of a disk in combination with a series of small spiral springs inclosed in a case of some three or four inches in diameter. These springs, arranged in a manner that has been determined by experiment, and so as to produce harmonized vibrations, appear to possess the power of magnifying or accumulating upon the wire the vibrations which the voice sets up in the disk, and the wire seems to possess—undoubtedly does possess—the power of transmitting to great distances, and giving out upon a second pulsion instrument, the sounds of the voice.

The ability of this simple system of springs, disks, and wires to convey conversational and other sounds to considerable distances with great clearness and distinctness, reproducing the very tones of the voice and the qualities of musical sounds with but little reduction or modification, is most surprising, and to none more so than to the many men of science who have been recently experimenting with it.

The writer of this notice cannot, perhaps, do better than state his own experiences with this system. After examining and experimenting over several short lengths of wire, some of them exceeding a mile and a half, he last week went to the Finchley Road Station of the Midland Railway, from a point near to which a line had been conveyed to near the Welsh Harp Station, a distance of three miles by the line of railway, and of more by the track of the wire, which for the larger part was carried by the telegraph-posts, to which it was attached by very simple means. Conversation through this length of line, of over three miles, was exceedingly easy; indeed, so powerfully was the voice transmitted, that an ordinary hat sufficed for all the purposes of the second instrument, without going near to which conversation was carried on repeatedly by means of the hats of three gentlemen who were present, the tops of which were merely placed against the telephone wire.

I then went into the garden of the "Welsh Harp," where a short length of wire had been led between two points, the wire on its way from one point to the other being twice tightly twisted, at an interval of some yards, round small branches of trees, of about 1 inch in diameter, being wound round and round the branch three times in each case. Strange to say, this tight twisting of the wires round the branches in no way interfered with the transmission of the voice from end to end of the wire.

A third and last experiment was made with a wire laid obliquely across the Welsh Harp lake, and allowed to sink to, and rest upon, the lake bottom. The length of the line was roughly estimated at about one-third of a mile, and from end to end (excepting a few yards at each end where the wire was led from the water's edge to the telephone box) the wire was completely immersed, and without any other support than the bottom of the lake offered it. Yet, notwithstanding this immersion of the whole wire, conversation was carried on through it by means of the pulsion instruments without the least difficulty. In fact, the voice came through the immersed wire, and the longest wire (of over three miles) previously mentioned, with greater purity and mellowness than through shorter lengths.

I must leave to others to explain, and if necessary to discover, the scientific grounds of the success of this extraordinary little instrument. Looking, however, at its practical capabilities as exemplified above, it is not surprising that Post Office, police, railway, and other commercial people, are already overwhelming with applications those who are arranging to supply the new telephone, which from its extreme simplicity is manifestly a cheap one.

NOTES.

No fewer than 1810 patients bitten by dogs were treated at the Pasteur Institute in the year ending October 31. There were thirteen deaths.

THE *Daily Graphic*, the first number of which will appear on January 4, will be interesting from a scientific as well as from a popular point of view. Twenty years ago, when the *Graphic* was started, so bold an enterprise would have been impossible. At that time the pictures in illustrated journals were produced only by the old method of wood-engraving, which could not, of course, supply all the needs of a daily illustrated paper. By means of various scientific processes, drawings can now be so rapidly and effectively reproduced, that the issue even of a daily illustrated journal may be safely undertaken. The new paper is likely to afford a very striking instance of the influence of these processes on art and journalism.

THE Government of New South Wales has adopted an entirely new scheme of technical education. The present Board of Technical Education is to be abolished, and technical schools will be placed under the direct control of the Education Department. A sum of £50,000 is to be expended in the erection and equipment of a new Technical College and Museum in Sydney, while branch technical schools will be established throughout the country districts. It is estimated that £50,000 will be required annually to carry out the new arrangements.

MR. E. W. COLLIN has been deputed by the Government of Bengal to make inquiries as to the present condition of technical education in Bengal, and to find out what steps should be taken by the Government towards its advancement in that Presidency. The Civil Engineering College at Seebpore, an institution for the training of overseers and civil engineers, is supported by the Bengal Government, but it does not appear that there are any means at present in Bengal for the technical training of artisans. Mr. Collin has addressed a circular to various public bodies asking for information, and he will submit a report on the question about the end of the year.

MR. G. BERTIN is to deliver, at the British Museum, a series of four lectures on the religion of Babylonia. The first lecture will be given on November 26, and the others on the three following Tuesdays, at 2.30 p.m.

MR. G. B. SCOTT, of the Indian Survey Department, who has lately been employed on a survey of the Wards Estates in Bengal, has been placed in charge of the new Cadastral Survey of Upper Burmah.

THE next *conversazione* of the Royal Microscopical Society will be held on Wednesday, the 27th instant, at 8 o'clock.

MR. THOMAS CHILD, who has just returned from Peking, has sent us very beautiful photographs of the two interesting old astronomical instruments at the Peking Observatory. These instruments are the most ancient of the kind in the world, having been made by order of the Emperor Kublai Khan in the year 1279. They are exquisite pieces of bronze work, and are in splendid condition, although they have been exposed to the weather for more than 600 years. They were formerly up on the terrace, but were removed down to their present position to make way for the eight instruments that were made by the Jesuit Father Verbiest in 1670, during the reign of the Emperor K'ang Hsi, of the present dynasty.

THE metric system of weights and measures having been adopted in the Photographic Office of the Indian Survey, a series of tables for the conversion of these measures to British, and *vice versa*, has been prepared by Colonels Thuillier and Waterhouse, Surveyor-General and Assistant-Surveyor-General of India. The scope of the tables, however, has been extended so as to meet, as far as possible, the ordinary requirements of general and scientific reference. The multiples and fractions of the British and metric units have each their equivalent expressed in the other, so that the number requiring to be converted may be multiplied directly by the decimal fraction representing the equivalent value of one unit of the required denomination. The relative equivalents are given for the conversion of measures of length, weight, and capacity, cubic and square measures, and of British-Indian and metric weights. There are also a few miscellaneous tables that may be found generally useful.

It is well known that whales can remain a long time under water, but exact data as to the time have been rather lacking. In his northern travels, Dr. Kücckenthal, of Jena, recently observed that a harpooned white whale continued under water 45 minutes.

THE elephant skeleton set up in the front hall of the Madras Museum is 10 feet 6 inches high, and it has been stated that this is the skeleton of the largest elephant ever killed in India. Mr. Edgar Thurston, Superintendent of the Museum, in his latest Report, says that this is a mistake. Mr. Sanderson gave 10 feet 7½ inches as the largest elephant he had met, and there is a still larger one in the Indian Museum, Calcutta.

SOME fragments of a gigantic elephant's tusk (we learn from the *Rivista Sci. Ind.*) were lately obtained by Signor Terrenzi, the tusk having been found in the yellow Pliocene (marine) sands of Camartina, Narni. It must have been about 10 feet long. One piece (which seems to have been near the base) measured about 2 feet round at the thickest. The tusk had been broken up by the peasants, and distributed as an infallible remedy for tooth-ache and for belly pains in cattle! It probably belonged either to *E. meridionalis*, Nesti, or to *E. antiquus*, Falc. The finding of elephant remains in the Pliocene marine sands of Italy is not new, but it is rare.

A REMARKABLE paper on "The Ethnologic Affinity of the Ancient Etruscans," by Dr. Daniel G. Brinton, was read before the American Philosophical Society on October 18, and has now been issued separately. Dr. Brinton's attention was specially called to the subject during a sojourn of some months in Italy, early in the present year, when he had an opportunity of studying many museums of Etruscan antiquities. The object of the