A recent remarkable advance in the arrangements necessary for utilising the transmitting power of the electric fluid over the metallic nerves of speech we propose to bring briefly under notice.

In every electrical circuit, so far, the limit of usefulness has been restricted to the number of speaking stations or instruments that could effectively be placed in circuit upon the wire, and by the interference and confusion that arises when more than one instrument is used at the same time on such a circuit. To place upon an electrical circuit more than eight or ten instruments has been practically found impossible, the resistance of the instruments themselves being no small element of trouble, while the interference and interruption from multiple speaking has hitherto been found an insuperable difficulty, and one that has greatly tended to clip the wings and usefulness of our modern Mercury. A system that will obviate this trouble and enable any number of instruments to be placed in connection upon the same circuit without the possibility of interference or confusion, opens up a new era in the usefulness of the telegraph as applied to social purposes. It is such a system that will now be described, a system that promises to revolutionise the systems that at present spread over our chief manufacturing cities, and guard the security of property.

A simple illustration will explain the principles of this auto-kinetic system. Let us suppose a tramway to be laid down through the streets and suburbs of any of our large manufacturing centres; the two rails will thread the thoroughfares in every direction, and at each junction, or point of deviation down a bye street or other divergence, a set of points are laid. There is practically no limit to the number of these points that may be placed along the line; they may be one or one thousand. They remain quiescent and of no value as far as the effective running of the car upon the tramway is concerned until the car passes over the special set of points that happen to be required in the transit of the car from its starting-point to its destination. The other nine hundred and ninety-nine sets of points remain ready for use whenever the car has occasion to pass over them, and their presence does not in any way impair the usefulness of the tramway. The one set of points brought into use has been effective in so far that they have enabled the car to reach its destination, and, having been used for a moment, they have again reverted to their original position; while the fact of their being used has in no way affected the utility or efficiency of the remaining points should any be required to pass a car.

Again, suppose two or three cars to be running over various sections of the tramway at the same time, each car could pass over its points on its journey without detriment to the others, although all the cars might be passing points upon the tramway at the same instant of time; the using of these two or three sets of points would not interfere with the remaining 990 odd sets of points which at any moment might also individually be called into requisition. Now the system of electric circuits to be described may be likened to that of the tramway-line, with its accessory junctions and points. A system of two parallel wires is carried through a town. These wires in pairs may be supposed for the purpose of the present explanation to ramify continuously in every direction from a central station up this street and down that, and to embrace within their area the entire commercial and social community. Like the points in the tramway system, so upon the metallic circuit laid down, speaking instruments may be placed at various points and stations along the route, one or 1,000, because in the auto-kinetic system under notice, no instrument is in circuit unless it is, like the points on the tramway-line, being used. A car going over the points makes those points for the time being a portion of the tramway-line. So the circumstance of using the instrument upon the auto-kinetic system makes that instrument for the time being a portion of the electric circuit, and the wires are alone occupied by this transmission.

Should any second or third instrument in other portions of the circuit be brought into requisition at the same interval of time, no interference can take place. As no two cars could run over the same points on the tramway at the same moment, so no two instruments in the system under notice can speak at the same time, but the second or third instrument will automatically succeed the first in the order in which they stand along the line from the central station; just as two or three cars would pass the tram points in the order in which they had been placed upon the line.

The value of this new system of arranging metallic circuits and the instrumental connections, whereby the instrument is only a part of the electrical circuit so long as it is speaking, being thrown off immediately upon the cessation of the speaking current, cannot be estimated or appreciated except by a special reference to its practical development as regards the public and social telegraphy of a large city. This will be fully demonstrated in a subsequent paper by reference to the system of police, fire, and social telegraphs proposed to be shortly carried out for the Corporation of Glasgow, a system at once the most comprehensive and complete that has as yet been devised for affording multiple speaking stations upon the same conducting wires without possibility of interference or confusion.

(To be continued.)

OUR ASTRONOMICAL COLUMN

THE STAR LALANDE 19,034.—It is somewhat singular that this star, which was observed by Lalande, on March 21, 1797, and then rated 4½m. should have been so little observed since that year. It is not in Piazzi or Taylor, but it was observed three times by Argelander in the Bonn southern zones, viz., Z. 283, March 6, 1850, when it is called 6m.; in Z. 358, February 16, 1851, where we find it estimated 4m., and again in Z. 400, March 8, 1852, where it is 5m. These circumstances taken together appear to point to considerable variability. The star is in an isolated position on the borders of the constellations Hydra and Antlia. The mean of the Bonn observations gives for its position 1850·0, R.A. 9h. 34m. 26·40s., N.P.D. 112° 54′ 41″·0. Lalande's R.A. is one minute less than Argelander's—yet it looks right in the *Histoire Celeste*. Perhaps one of our meridional observers may find opportunity to revise its position and the star may be further recommended to attention on the score of probable fluctuation of light; though it should be remarked that there are other cases of discordant magnitudes in the Bonn southern zones for stars not yet entered on the list of variables, as in η Canis Majoris for instance, for which in three observations the magnitudes are 5, 3, and 2.

VARIABLE NEBULÆ.—Prof. Winnecke in directing attention to the nebula H. II. 278 as probably affording the first indications of *periodical* variability of a nebula, refers to the one discovered in Taurus on October 11, 1852, by Mr. Hind, as affording the single case where astronomers generally have been agreed as to variation. That nebula was detected on the morning of October 11, in one of the most magnificent skies experienced in the Regent's Park, being caught at once in slow sweeping, with the low power-comet eye-piece of the 7-inch refractor. Towards the end of the year 1876, in a fine sky with the same telescope and eye-piece, not a vestige of it was perceptible, and the same result attended several attempts to discern the nebula in 1874 and 1875. Prof. Winnecke mentions that it is not at present visible in our most powerful telescopes.

MINOR PLANETS.—Observers who are still engaged in the exploration of the region of the ecliptic have given

signs of much activity of late. First we hear of a small planet detected by M. Perrotin at Toulouse, on January 29, position at 10h. in R.A. 8h. 43m. 13s. N.P.D. 71° 41 twelfth magnitude, which appears to have been independently discovered by Herr Palisa at Pola, on February 1 : by an observation at Pola, January 27, it seems this object is not to be confounded with *Rhodope*, No. 166, of which a corrected ephemeris is given in the *Circular* of the *Berliner Jahrbuch*, No. 84, but it is there conjectured that it may be *Urda* No. 167, found by Prof. Peters 1876, August 28. Calculating from the elements of *Urda* in *Circular* No. 64, for the time of the Berlin observation of M. Perrotin's planet on February 3, it results that with the correction $\delta M = + 5° 24' 9$ the computed and observed longitude will agree, but there is a difference of $- 1° 38'$ from the observed latitude which, in the present case, throws doubt upon the presumed identity. Again, on February 2, M. Cottenot, at Marseilles, detected a planet, tenth magnitude, position at 13h. 2m. in R.A., 10h. 2m. 29s. N.P.D., 78° 51′, which was also found by Prof. Peters at Clinton, U.S., on February 4 ; this object is probably new. Finally, on February 6, Prof. Peters met with another planet, also of the tenth magnitude, in R.A. 10h. 16m. N.P.D. 76° 17′, which he notified to the Paris Observatory through the Smithsonian Institution by cable ; it is probable, however, that the presence close to this position of his previously-discovered planet *Antigone*, No. 129, has escaped his attention, and as its brightness would also be about equal to that of stars of the tenth magnitude, it is most likely to be the object observed.

The number of minor planets appears now to have reached 180, and possibly 181.

The Supplement to the *Berliner Jahrbuch*, for 1880, contains ephemerides for the present year, of the small planets to No. 172 inclusive, excepting only *Dike* and *Scylla*, for which the necessary materials are not available. Polyhymnia in opposition on August 30, in 11° S. declination, is distant from the earth 0·88 ; Atalanta in opposition October 27, declination 37° N., is distant 0·98, and Felicitas in opposition November 11, declination 30° N., is distant 0·92 ; these are the three cases of nearest approach during the year. Of the minor planets discovered since 1845, Hebe attains the greatest brightness $- 7·4$ m. in the middle of November, 1878, while in the neighbourhood of ϵ Eridani.

METEOROLOGICAL NOTES

ATMOSPHERIC MOVEMENTS.—A first paper on this subject, by Mr. Ferrel, has been published by the United States Coast Survey Office, in which the inquiry is limited to an investigation into the mechanics and general motions of the atmosphere which are dependent on wide-spread and periodically-recurring disturbances. In consideration of the enormous difficulties in the way of investigating the effects of friction, the author adopts the only course open to him, viz., to introduce unknown functions into the equations representing the resistances from friction in the direction of the co-ordinates, leaving these to be determined approximately from a comparison of the final results deduced from the equations with observation. From a mathematical examination of the question it is concluded that in whatever direction a body moves upon the surface of the earth, there is a force arising from the earth's rotation tending to deflect it to the right in the northern but to the left in the southern hemisphere ; and that this deflecting force is exactly the same for motions in all directions, so that if any sensible effects of this sort arise in the case of rivers or of railroads running north or south, the very same effects must take place where they run east or west or in any other direction. The amount of this deflecting force is exactly double of that which is obtained in accordance with the principle adopted by Hadley. An elaborate examination is made of the distribution of temperature over the earth, the most important of the results being that the mean temperature of the whole surface of the earth is 60°·2, the mean for the northern hemisphere being 59°·5, and that for the southern hemisphere 60°·9. With reference to this result Mr. Ferrel remarks that if important data collected by Dr. Hann for the extreme southern latitudes had been at hand while he was engaged with the investigation, the results obtained for the mean temperatures of the two hemispheres might have been nearly equal. This result, which is essentially different from the commonly received opinion, has, it is obvious, important bearings on many questions of terrestrial physics. The distribution over the globe of atmospheric pressure is similarly examined with results of great importance in their relations to meteorological theories. The coefficient of the annual inequality of pressure in North America amounts to only about one-third of that of the interior of Asia, from which the important conclusion is drawn that the difference between Asia and America in this respect does not depend so much upon the difference in the extremes of temperature of the two continents, which is inconsiderable, as upon the difference in the extent of the two continents. The annual maximum of barometric pressure for the United States, except the Pacific coast, occurs about December 23, which is about sixteen days earlier than in Europe. In both continents the time is considerably earlier than the time of the minimum of temperature. The distribution of temperature and pressure and the prevailing normal winds of the globe are shown on seven well-executed maps. In succeeding papers Mr. Ferrel intends to investigate those disturbances in the distribution of temperature and humidity which are of a comparatively local character, and which result in the locally developed phenomena of cyclones and other storms ; and finally to apply the principles of atmospheric mechanics thus developed to the explication of oceanic currents.

CLIMATE OF INDIA.—We notice in a recent number of the *Isvestia* of the Russian Geographical Society, an interesting paper by M. Wojeikoff, being a sketch of the climate of India according to the recent works of Mr. Blanford, the reports of Mr. Wilson, and some notes taken by the author during his recent visit. M. Wojeikoff describes very clearly the main features of the climate, and accompanies his description by some tables which illustrate the prevailing and characteristic directions of the winds. Besides, by a comparison of the temperatures of some places in India and South America, situated the one in parts devoid of forests, and the others in places where the forests are yet preserved, M. Wojeikoff shows what a great influence forests have on climate, and he arrives at the conclusion that the absence of great heats and a continuous humidity of air are always met with at those places which, however far from sea, are situated in forest lands. He concludes, therefore, as to the importance of preserving the forests in India, and expects that detailed observations would yet more show their importance as well as the beneficent influence of the irrigation on climate.

LOW BAROMETRIC READING IN THE HEBRIDES, NOVEMBER 11, 1877.—We have received from Mr. Buchan, Scottish Meteorological Society, a communication on this subject. The following readings of the barometer, reduced to 32° and sea-level, were made by Mr. Youngclause, the Society's observer, at Monach Lighthouse (57° 31′ N. lat., 7° 42′ W. long.), on November 11, at 9 A.M., 28·330 ; 11 A.M., 28·120 ; 12.43 P.M., 28·008 ; 1.30 P.M., 27·912 ; 4.20 P.M., 27·861 ; 8 P.M. and 9 P.M., 27·752 ; and at 9 A.M. of the 12th, 27·968 ; and at 12·43 P.M., 28·038 inches. Thus for nearly twenty-four hours the barometer at this place was under 28·000 inches, and fell to 27·752 inches, the observer remarking that the rise which followed proceeded at a very slow rate.