

LETTERS TO THE EDITOR.

The United States, their Growth in Population in Two Hundred Years.

[The following letter was received from the Hon. W. E. Gladstone, in response to a copy of *Science* mailed him, containing Gen. M. C. Meigs's article on the above subject.]

Dear Sir your estimate, the
 hollow-then seen, is full of
 interest. Especially there is to be
 the development of material,
 from in the world, more full in
 America. I hope that we may
 have it to keep pace with it, then
 there may be a corresponding growth
 in the sentiment of humanity and
 we may reach the time of every
 good and happy life.

Yours faithfully
 W. E. Gladstone
 14th-13.89.

The Pennsylvania Weather Review.

THE monthly weather review of the Pennsylvania State Weather Service for August last contains an isothermal map of the State for the normals of the month, whose atrocious absurdity is paralleled only by the isothermal maps of New Hampshire in the report on the geology of that State several years ago. The isotherm of 67° performs the extraordinary feat of branching three times in its traverse of Pennsylvania. Three other isotherms end abruptly within the limits of the State, apparently not knowing how to get out. The lobate isotherm of 71°, that enters the State from the south and includes Gettysburg, fails to surround the adjacent isotherm of 74°, which reaches Harrisburg. It is remarkable that a travesty like this should appear under the direction of the committee on meteorology of the Franklin Institute of Philadelphia.

W.

Reformed Spelling.

So far, all attempts to introduce a reformation in spelling seem to have failed. The changes that are recommended by the philological societies and approved by scholars are disregarded, Mr. Ellis's "Glossic" has been before the public nearly twenty years, Dr. Hill's efforts for six years at Waltham produced no permanent effect, it is doubtful if Mr. Bell's "World English" will fare better, and Hosea Bigelow spelling is dropped by every one after they have wearied themselves over a few lines.

While so much study has been given to the changes that are desirable, the best way to introduce them has perhaps been less

considered. The eye is educated to catch syllables and words at a glance, and soon tires of picking out letters, although their combination may represent the sounds of words correctly. It is true that children can be easily taught to read phonetics; but, as one who has learned a foreign language lays it aside in his native land, so does the phonetic expert for the printed matter he finds in daily use, and the language floats on, unchanged and stationary.

How much, then, is it wise to attempt? Can any changes be proposed acceptable to readers, and such that printers will use them? Instead of attempting to introduce a phonetic system that is perfect, it may be well to employ one that is practical, and better than that at present in use, but not differing from it enough to embarrass the reader, and to keep words of uniform spelling if the correct sound of the letters in them is misused. No new letters should be used; nor does the eye tolerate new symbols, nor the use of accents, to determine sounds. This narrows the field in which changes can be made, yet leaves it large enough to furnish a spelling that will recommend itself to printers, foreigners, and illiterates; while children instinctively adopt it, when they can escape from the tyranny of the spelling-book, because it is uniform, and regulated by analogy.

First as regards the vowel-sounds. There seems to be no good reason to change the short sound of *a*. Its sound as in *trade* is fixed by *e* mute in all words except four. Its sound as in *marry* is fixed by the double consonant. "Glossic" doubles *a* in *father*, and adds *u* in *water*. Short *e* need not be changed. It is lengthened when it is in a final syllable or followed by *e* mute, which Professor Marsh tells us requires four per cent of all printed matter. "Glossic" uses *ei* for long *i*, which does not displease the eye. Of the four sounds of *o*, that as in *tone* is controlled by *e* mute or by accent in pronunciation. The sound as in *move* occurs in twelve words, which may be memorized. Words with the sound as in *dove* might perhaps drop *e* mute. The *bête noire* *ou*, with its seven sounds, has already caused a rebellion, as in *plow* for the time-honored *plough*, and may gradually drop most of them.

Of the consonants, *c* is hard before *a*, *o*, *u*, which can easily be remembered, as it will be difficult to displace it by *k*; *g* has both hard and soft sounds before *e* and *i*, where *j* could be substituted, as *jenuine*. There would be few mourners at its burial should the printers condescend to drop *u* after *g*. The change to *tion* for *shun* is displeasing, and its pronunciation is uniform. The printing *dthis* for *this* is a stumbling-block in the way of any change.

The changes noted above are the principal ones that would go far to conform the spelling of the language to its pronunciation.

Perhaps the best way to have any changes adopted would be to have the most desirable printed on cards, to be kept in plain sight at every case of type, and have some editor who has the improvement of the language at heart print one article in his daily paper, with the approved spelling. If it is favorably received, increase it gradually as the readers approve it. The end can be gained by keeping the changes before the eye until they are accepted by habit.

W. C. Bryant used to say, "When you reformers agree among yourselves as to what you want, it will be time enough for us of the press to give the matter our attention." It cannot now be said that there is uncertainty as to the proposed reform. The action of the phonological societies, the efforts of linguists, the whole literature of phonetics, furnish a magazine to supply all that is needed to move upon the conservative forces that delay reform. But the press should take the initiative; for with little effort they can make it familiar to every reader, and give it success. The results on the brotherhood of mankind will be such that every one who is in a position to forward the reform should take an active share in its introduction.

M.

INDUSTRIAL NOTES.

Electric Apparatus for South Africa.

OUR readers are well acquainted with the many electric-railway installations which have been made during the past two years, and with the fact that the manufacture of electric apparatus for this work has grown rapidly. It is now estimated that there are from 150 to 200 electric street-railways in this country, either in operation or in course of construction.

Electricity promises to be the coming medium for transmission of power not only for street-railways, but also for mining industries; and it is hard to imagine an agent for transmitting power which is more easily handled, and the apparatus for which is, on the whole, more economical and inexpensive.

Among the electric mining plants which are now being installed by American manufacturers of electric apparatus, who lead the rest of the world, are a number not only in this country, but

abroad; and it is no unusual thing to hear of another mining company which has decided to adopt electric power in its mines.

Among recent contracts which have been awarded the Sprague Electric Railway and Motor Company of New York for electric-mining apparatus is one which comes from Transvaal, South Africa; and it is interesting to note that the fame for American electric-mining apparatus for durability, economy, and convenience, is recognized in these fields as well as in this country. The company which is now installing Sprague apparatus in Transvaal is the Forbes-Reef Gold-Mining Company, who have ordered through Chester & Gibb, mining engineers of London, Eng., a complete electrical equipment for transmitting power, including four Sprague long-distance motors, and dynamos for transmitting 140 horse-power over a distance of three miles. The primal source of power is a waterfall situated about three miles distant from the mines as the crow flies. These points are connected by insulated wires, which are carried on poles.

At the power-station will be placed three Pelton wheels furnished by Frazer & Chalmers of Chicago. To each of two of these wheels will be belted one long-distance transmission constant potential Edison dynamo of 50,000 watts, or 67 horse-power, capacity each. To the other wheel will be belted a dynamo of the same type and voltage as the others, but of only 40,000 watts, or 55 horse-power, capacity. These dynamos are similar in appearance to the standard Edison dynamo which is used in incandescent lighting; but their winding is modified according to the regular Sprague system, adapting them for the long-distance transmission of power. These machines have an efficiency of over 95 per cent.

At the mines are located the four Sprague motors, which are belted direct to the mining-machinery. These motors are divided into two groups; two 20 horse-power Sprague motors and one 80 horse-power motor forming one group, and a single 20 horse-power Sprague motor forming the other group. Each group is supplied with current by a separate set of wires, thus practically insuring a constant flow of electricity under all circumstances.

The method of regulating the motors and keeping up a constant speed in spite of the varying loads thrown on the mining-machinery is accomplished by winding the motors in a special way, so that there is no mechanical governor to get out of order. The governor being in the winding, and consequently acting without making any movement, the motors are more durable, and the use of any complicated mechanical governor is avoided. The motors are to run on a constant potential circuit, and all the motors of each group are connected together from positive to negative wires, thus equalizing the strain on the dynamos when the loads are thrown on the motors. This method of connecting dynamos and motors is in use in all Sprague stations for the transmission of power; and it is much superior in reliability and economy to the series method of putting each motor on a separate connection. In principle it is the same as supplying a city with water by running city mains instead of using a separate conductor for each consumer.

The question of efficiency, or the amount of the primal power which is delivered at the farther end after the transmission, is one which is very important. Upon this point electric transmission compares very favorably with all other methods of transmitting power. In this case the efficiency of the entire system, from the turbine pulley to the mining-machines at the farther end, is about 70 per cent; that is, 70 per cent of the energy which is delivered from the turbine pulleys at the power-station is given off the motor pulleys for work.

New Electric Street-Railways.

DURING the last week there have been a number of street-railway companies which have contracted for electric-railway apparatus in spite of the lateness of the season. The latest contracts closed by the Sprague Electric Railway and Motor Company of New York are for street-railways in Piqua, O., and South Nashville, Tenn.

The road at Piqua is an entirely new road, never having been operated by any power before. The number of cars which will be equipped will be four, and the line will extend for a few miles on the main streets of Piqua.

The South Nashville Street Railway Company will equip eight

cars at present, but it is expected that the entire road will be run by electric power before long.

The Elliott Non-Electric Telephone.

A PATENT was recently issued to Larkin V. Elliott of Moorestown, Ind., for an improved form of mechanical or non-electric telephone, which seems to possess several advantages over other instruments of its class. The general appearance of this telephone is shown in the accompanying illustration. The mouth-piece is bell-shaped, and about four inches in diameter at its larger part, the bore narrowing to about an inch and a quarter where it joins the base. The aperture in the latter is cone-shaped, narrowing from about four inches in diameter where it joins the mouth-piece to half that size at the rear. Between the mouth-piece and the base the diaphragm is securely fastened. The diaphragm consists of two sheets of stretched rawhide, with an interposed layer of soft fibrous material and a covering of some soft fabric. It is made in the following manner. A sheet of thick rawhide is first stretched tightly across the aperture in the base, preferably while wet, so that when it dries it will be still more tightly drawn. Over this is laid a layer of cotton batting or other soft fibrous material. Over this a sheet of thin rawhide is stretched, but not as tightly as the



first sheet. Lastly comes a sheet of velveteen. The whole is secured firmly between the base and mouth-piece.

The line-wire passes through an opening in the centre of the diaphragm, being provided on its end with a button, which bears against the velveteen surface of the diaphragm. The inventor claims that this peculiar construction of the diaphragm, together with the shapes of the apertures in the base and mouth-piece, not only prevent the usual roaring sound in the receiver, but improve the sound by rendering it more distinct, reproducing a clear, natural tone of voice, similar to that which acts upon the diaphragm at the other end of the line-wire.

The claims of the inventor in regard to the good qualities of these telephones are borne out by the testimonials of many business-men who have had them in use for several months. They are intended only for short lines, from a few rods up to a couple of miles. Proper suspension devices are provided, so that the line-wire may be carried around angles without impairing the efficiency of the instruments. An electric call-bell may be used in connection with this telephone if desired.

American Apparatus in Italy.

WORK on the electric-railway apparatus for the Florence and Fiesole Road has been commenced upon at Schenectady, N.Y., which will be ready for shipment before long. This road will be operated entirely by electric power, and Sprague electric cars will be used throughout the entire line.

The road connects the city of Florence with the city of Fiesole, a distance of about five miles. The grades upon this line will be very severe, sufficiently so to have precluded the use of horses upon it. The regular Sprague system of overhead wires, using main conductor with feeders, will be used.

The fact that American railway apparatus have been adopted on this line is extremely flattering to the company to whom the order is given, and gratifying to the patriotism of every American. The fact that the Sprague system was brought into direct competition, in the matter of equipment of this road, with all the systems of electric street-railways in Europe, shows in an additional way the favorable reputation of American apparatus.