

from the precipitous flanks of Epomeo, have covered a wide extent of chestnut-groves and vineyards; and on the southern slope are great fissures in the earth.

In summing up my observations of all the localities most devastated by the calamity, I am convinced that the buildings standing upon the trachyte at Lacco Ameno and Monte Zale suffered incalculably less than those built upon the tufa of Epomeo and the argillite resulting from its disintegration. Casamicciola was almost entirely built upon this argillite; and it can be said without exaggeration, that not one stone rests upon another. Forio was built upon tufa; and of this town, also, very little remains standing. At Lacco, the houses and walls erected on the trachyte offered, as was stated above, great resistance to the shock, while those built upon the tufa were destroyed.

This agrees completely with the theory of Mallet. Mallet says, that when a seismic or a terrestrial wave passes rapidly from a soil possessing limited elasticity, — as would be the case with our tufas and clays, — to another soil of great elasticity, like the trachytic lavas, it changes not only its velocity, but in some degree also its direction; one part being reflected, the other refracted. The seismic wave, being thus checked, produces a shock in the opposite direction, causing great injury to buildings by the recoil. At the same time the shocks are diminished in force when they reach the more elastic soil, such as granite or trachyte.

This would explain very satisfactorily why Ischia, separated from the cleft AB by the great masses of trachytic lava of Rotaro, Montagnone, and Arso, which would absorb much of the energy of the seismic wave, felt it in so slight a degree.

With respect to the causes of these seismic disturbances, which still continued after the great earthquake of the 28th July, other shocks, accompanied by subterranean rumbling, being felt even when I was on the island and afterwards, it seems to me that they must be attributed to an awakening of the residual volcanic activity of Epomeo. The opinion has been advanced by the illustrious Professor Palmieri, that the violence of the shocks might be especially attributed to the fact of the existence of great subterranean caverns directly beneath Casamicciola, and to the giving-way of the supports which upheld these vaults, caused by seismic action, and facilitated by the weakening of these supports by the underground flow of thermal waters. This opinion does not appear to me to be fully demonstrable. There exist, it is true, in the neighborhood of Casamicciola, caverns of plastic argillite, formed by the lapse of ages; but certainly it is not of these that the illustrious professor of Naples intends to speak: the cause would assuredly be insufficient to produce effects so imposing, and such far-reaching seismic disturbances. I could not enter these caves, for want of persons disposed to serve as guides at such a time; but it is certain that they could be only more or less tortuous galleries of small diameter and but a few metres in height, as is generally the case in such formations. I have been assured also, by persons worthy of trust,

and experienced in these caverns, that this is the case. Besides, neither at Casamicciola nor in the vicinity could I see any lowering whatever of the level of the soil: the roads which lead from Guardiola or the shore to Casamicciola, from Casamicciola to Lacco, from Lacco to Forio, have preserved their level perfectly, and show only the longitudinal or transverse fissures inevitable after such a telluric commotion. The only road completely destroyed (but not depressed) is that which leads from Forio to Casamicciola, along the side of Monte Epomeo, which, as we have seen, is directly along the cleft A B.

In any event, when this period of desolation and ruin has passed, when perhaps the time shall have come to decide upon the fittest place to rebuild the shattered dwellings, it would be useful to make a most accurate inspection of all the ancient and modern caverns of the island, and to determine what influence they may have upon the stability of the soil and the superincumbent buildings.

In conclusion, then, it appears to me, 1°. that no other cause need be sought for the shocks which have desolated the island than the volcanic activity which still remains, and awakes at intervals; 2°. that the residual volcanic activity of the island is manifested along two principal fissures, one, A B, a curve with its convexity to the north, from the baths of Ischia to Forio, the other, C D, directed approximately north-north-west and south-south-east, between Lacco Ameno and the stufas of Testaccio; 3°. that the place where Casamicciola stood is upon the intersection of these two lines, and, therefore, at the very focus of seismic activity, and that it has been, and always will be, the locality most liable to be devastated by earthquakes; 4°. finally, that buildings erected upon trachytic lava offer a resistance to the shocks, far superior to that of buildings erected upon tufa or clay, and that this circumstance should be borne in mind when it is proposed to restore the ruined villages.

Rome, Aug. 9, 1883.

JULY REPORTS OF STATE WEATHER SERVICES.

A NUMBER of states have organized weather services which are of material benefit to the people. A brief summary of the July reports that have been received is here given.

Georgia. — The July crop report contains meteorological data from fifteen stations. The special feature is the drought, of which it is said, "In northern and middle Georgia, the drought has been almost continuous since April 23, — the date of the last general rain in the state, — broken only by light and ineffective showers at considerable intervals. A few points reported sufficient rain, but the northern half of the state, with these exceptions, has suffered a most prolonged drought, which is yet unrelieved."

Illinois. — Minimum temperatures of 47° were reported, and maximum of 99°. The prevailing wind

direction was south-west to south; the highest wind velocity was eight miles per hour.

Indiana. — The special feature of this report is the minimum temperature of 50° ; the highest temperature noted was 96° , and the rainfall varied from 2.83 to 7.72 inches.

Iowa. — In this state the weather "was very favorable to the crops, being fair, nearly normal in temperature, with an excess of rainfall, and southerly winds prevailing." The greatest rainfall was that of nearly ten inches in north-eastern Iowa, from the 20th to the 23d inst. A number of severe squalls and local storms were reported, which did much damage. Insolation has been high, because cloudy days were rare; the sun thermometer exceeded 140° on twenty-one days.

Kansas. — The report includes one station only, — Topeka; and the month is reckoned from June 20 to July 20. On fifteen days the temperature exceeded 90° , the maximum being 98° . "On June 23, just after a heavy rainstorm, the air having had a temperature of 65° to 70° all the forenoon, the temperature suddenly rose more than 20° , in consequence of a hot current of air from the south. This lasted but half an hour, when the temperature fell as suddenly as it had risen."

Missouri. — The temperature has been considerably below the normal; there being but five instances since 1837, when lower average temperatures in July have been recorded. A minimum of 52° was observed. On the 13th a destructive wind-storm passed through the north-western and northern portions of the state. A railway train, near Browning, was blown from the track, and many towns suffered much damage. This storm was not a tornado, but 'a steady straight blow for upwards of half an hour.'

New Jersey. — The maximum temperatures range from 91° to 98° , the minimum from 52° to 61° , the rainfall from 2.21 to 4.38 inches.

Ohio. — The mean height of the barometer, 30.025 inches, was higher than that of either of the three months preceding. A minimum temperature of 43° was reported. The rainfall ranged from 1.55 at Lebanon to 7.23 at Quaker City, and was above the July normal. "The railway weather signals were continued during July, and by examination of the reports it is found that eighty-six per cent of the predictions were verified." The predictions are those of the U. S. signal office.

Tennessee. — The temperature ranged from 56° to 98° . A range of 0° was reported from Smithville on the 7th. The rainfall ranged from 1.20 to 7.99 inches. Rain fell on the average on nine and two-thirds days, but the rainfall was rather unevenly distributed. "In some localities the extensive rains have greatly injured the crops of wheat, oats, and hay that had been cut, causing the former to sprout, and rendering much of it unmarketable, while in other localities a continuous drought has materially lessened the chances for the growing crops, which were full of sap, and it will require very favorable conditions during the coming month to even partially restore them."

W. U.

THE MEETING OF SWISS NATURALISTS.

THE sixty-sixth annual reunion of the *Société helvétique des sciences naturelles* took place this year at Zurich, Aug. 6-9. As at all these Swiss meetings, discussions were happily mingled with daily banquets, at which toasts were offered to fatherland, to guests, and to the older honored names in Swiss science, — Studer, Heer, and Mousson, founders of the society. Sometimes German, and sometimes French, was spoken, and sometimes both by one speaker in the same speech. This year this venerable society gathered men of many countries, and Zurich received them cordially. Daubrée and Hébert of Paris were there; Lory of Grenoble, Credner of Dresden, Fritsch of Halle, Fontannes of Lyons, Hughes and Madame Hughes of Cambridge, Blanford of London, Dewalque of Liège, Kölliker and Fick of Wurzburg, Kundt of Strasburg, Clausius of Bonn, Szabo, Schuler, and Wartha of Budapest, Wislicenus of Wurzburg, Krauss of Stuttgart, von Hauer, Suess, Neumayr, Mojsisovics, and Goldschmidt of Vienna, Vilanova of Madrid, Beyrich and Richthofen of Berlin, Capellini of Bologna, Giordano of Rome, Wiedmann and His of Leipsic, and Seguin of New York.

From communications to the *Journal de Genève*, under initials which we presume to refer to the well-known physicist, Raoul Pictet, we glean the following account of the scientific sessions of the meeting, which began on the morning of Aug. 7.

Mr. Cramer, professor of botany at the university of Zurich, and president of the assembly, opened the meeting with a very noteworthy address before an interested audience of more than three hundred persons. He reviewed the chief progress of the natural sciences, and laid particular stress on the study of those minute organisms which constitute life within life, and whose appearance and development accompany epidemic diseases among men.

Reports on the various commissions (on finance, geology, geodesy, earthquakes, etc.) were followed by two communications from Profs. V. Meyer of Zurich and H. Fol of Geneva.

Mr. Meyer traced the progress of chemistry under the influence of the ideas of Mendelejeff and L. Mayer. He explained how these investigators had been able to classify all simple solids under five distinctly separated families. All these bodies are similar as to their general properties, the gradual increase of their atomic weights, the similarity of their chemical reactions, their atomic volume, etc. These likenesses are so striking, that the memorable discovery of gallium by M. Lecoq de Boisbaudran of Paris was foreseen three years before that simple body was separated. The density and atomic weight of this metal had been determined by calculation before its actual presence was demonstrated beyond doubt by the well-known experiments of the French chemist.

Professor Meyer concluded by showing the indebtedness of science to men who think, to men